Targeted Flora and Fauna Assessment

Lot 4 Flynn Drive Neerabup

Prepared for
City of Wanneroo

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Abbreviations

Abbreviation	Description
CBC	Carnaby's Black-Cockatoo
DBH	Diameter at breast height
DEC	WA Department of Environment and Conservation
DRF	Declared Rare Flora
ELA	Eco Logical Australia
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FCT	Floristic Community Type
GSM	Graceful Sun Moth
IBRA	Interim Biogeographic Regionalisation for Australia
Lh	*Lomandra hermaphrodita*
Lm	*Lomandra maritima*
MRS	Metropolitan Region Scheme
NIA	Neerabup Industrial Area
PEC	Priority Ecological Community
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
TEC	Threatened Ecological Community

1 Introduction

1.1 Project overview

The City of Wanneroo is pursuing resource extraction and industrial land development on approximately 210 ha of land at Lots 4, 41 and 1002 Flynn Drive as well as Part Lots 53 and 2692 (hereafter referred to as Lot 4 Flynn Drive) in Neerabup (the site; **Figure 1**) and is seeking to progress towards having the required subdivision planning and environmental approvals in place to proceed. The site forms part of the Neerabup Industrial Area (NIA), and within that, the Meridian Business Park (**Figure 2**).

As recognized in the Gap Analysis and Approvals Strategy report (ELA 2012a), Eco Logical Australia (ELA) identified the requirement for additional ecological investigations to support State and Federal environmental approvals for Lot 4 Flynn Drive. ELA were subsequently commissioned to undertake assessments of the following:

- Targeted flora and fungi survey, vegetation community assessment and PATN analysis
- Carnaby's Black-Cockatoo breeding habitat assessment
- Graceful Sun Moth habitat assessment.

This report presents the results of the targeted flora and fungi survey and vegetation community assessment, and the ecological investigations into Carnaby's Black-Cockatoo (CBC) and Graceful Sun Moth (GSM) habitat assessments.

The purpose of the targeted flora and fungi survey was to identify the presence of any Priority Ecological Communities (PECs), Threatened Ecological Communities (TECs), Declared Rare Flora (DRF), or Priority and other locally significant flora species with Lot 4 Flynn Drive. The purpose of the vegetation community assessment was to assess the presence of vegetation communities in the north-west corner of Lot 4 Flynn Drive by use of statistical analysis to determine Floristic Community Types (FCTs) and the accuracy of previously inferred FCTs by ATA Environmental (2007).

The purpose of the fauna assessment was to determine the potential presence and extent of habitat for both CBC and GSM within the site. Both surveys were carried out according to methodology endorsed by the WA Department of Environment and Conservation (DEC), which provides reliable evidence of presence or absence of CBC and GSM within the site. Accordingly, this enables the extent of potential impact on the species resulting from the project to be determined.

1.2 Background Information

The site was zoned 'Industrial' in the Metropolitan Region Scheme (MRS) following advice from the Environmental Protection Authority (EPA) to the State Planning Commission (now Western Australian Planning Commission) in 1994 on MRS Major Amendment no 948/33 for the North West Corridor (East Wanneroo). The EPA identified key issues to be addressed to ensure development in the areas subject to the Amendment could be implemented without causing unacceptable environmental impacts. The land was subsequently zoned appropriately under the City of Wanneroo Town Planning Scheme subject to a Structure Plan.

A referral to the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) by LandCorp on behalf of the City of Wanneroo occurred in 2007 (EPBC Reference: 2007/3479), with the action considered to be a controlled action requiring assessment. The (now) Department of Sustainability, Environment, Water, Populations and

Communities (SEWPaC) sought additional information on the proposal, however, this was not provided. The proponent for the proposed action has since been transferred from LandCorp to the City of Wanneroo.

The site includes open woodland over degraded pasture, Jarrah and Banksia woodland over mixed low shrubland and a small amount of Tuart woodland. The site contains potential habitat for several threatened species including the federally listed Endangered Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) and Graceful Sun Moth (*Synemon gratiosa*).

The following flora and fauna surveys have previously been undertaken on land considered part of the Lot 4 Flynn Drive project area:

- RPS Bowman Bishaw Gorham (2006) – Neerabup Industrial Area: Vegetation and Flora Surveys
- ATA Environmental (2007) – Flora, vegetation and vertebrate fauna assessment Neerabup Industrial Area (NIA), Neerabup
- Coffey Environmental (2008) – Flora and Fauna Survey of Flynn Drive for City of Wanneroo, Perth
- Eco Logical Australia (2012) Ground truthing of environmental values for Lot 4 Flynn Drive Neerabup.

The previous surveys were undertaken prior to the release of both the EPBC Act referral guidelines for threatened black cockatoo species (SEWPaC 2012c), and the survey guidelines for GSM by the DEC (Bishop *et al*. 2010a). As a result, further surveys of Lot 4 were required to systematically map all potential habitat for both of these species.

Flora and Fauna surveys undertaken by Coffey Environmental (Coffey 2008) found no presence of *Lomandra* species within the survey site. It is understood that the CoW has previously undertaken a survey for GSM within Lot 4 and that a 'Nil Return' was submitted to the DEC, which infers that GSM was not detected within Lot 4.

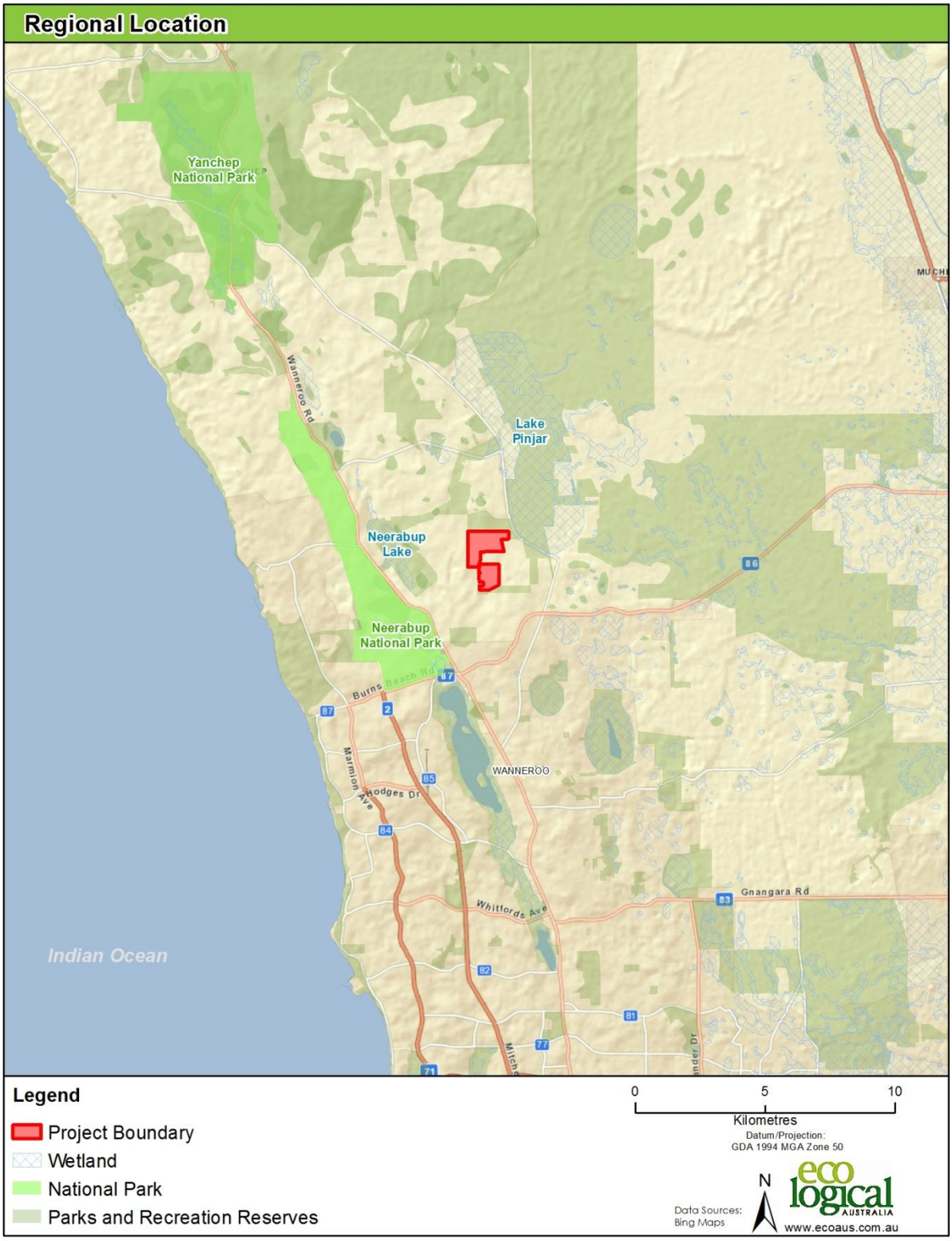

Figure 1: Regional location

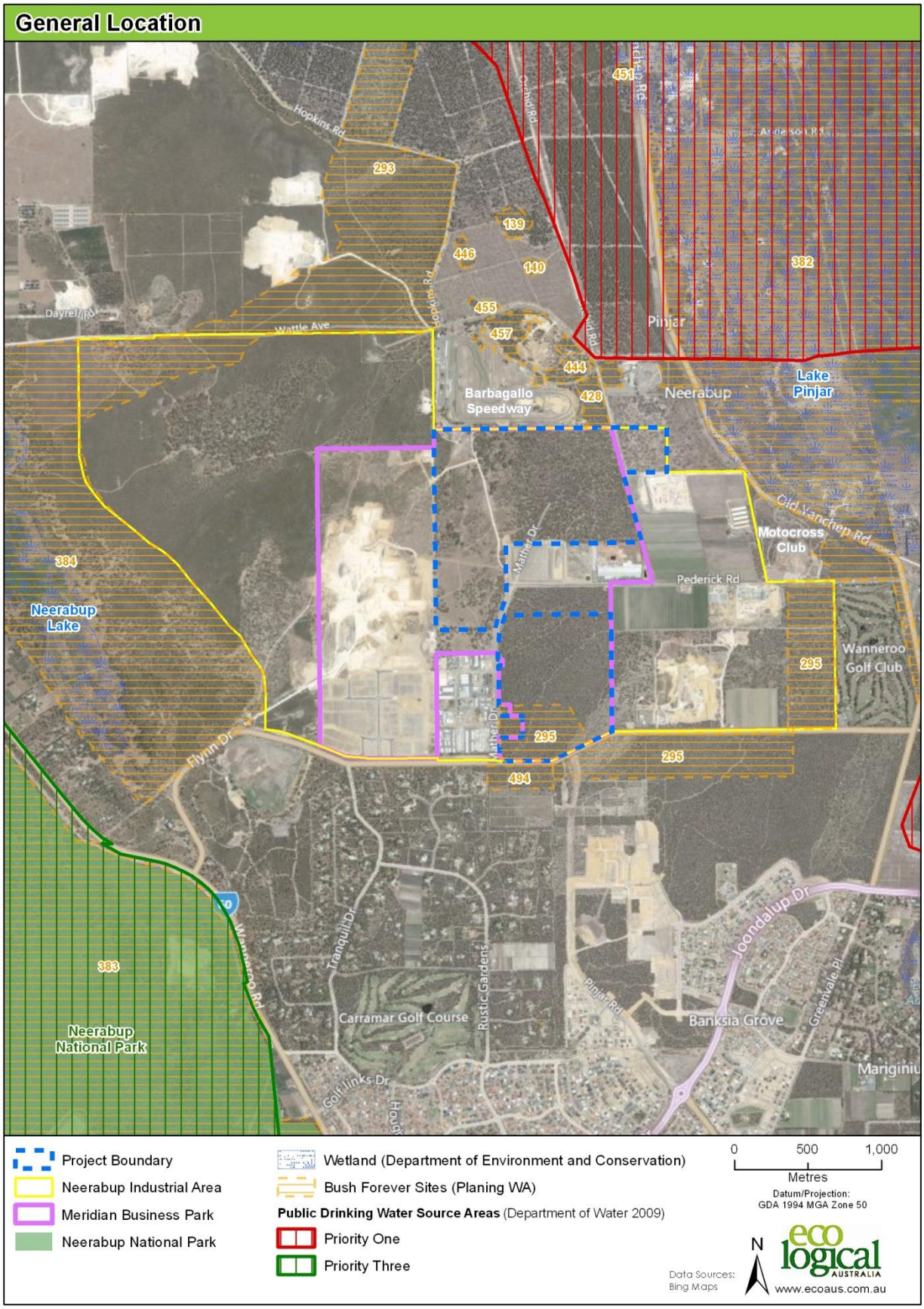

Figure 2: General location

2 Desktop Review

A desktop review was carried out for conservation significant flora, fungi and ecological communities only. The fauna component of this report only deals with the Carnaby's Black-Cockatoo and Graceful Sun Moth values and consequently did not require a review of all potential conservation significant fauna.

2.1 Literature review and database searches

Several databases were consulted to develop a list of potential flora and fungi or ecological communities that may occur in the site, including any conservation significant flora, Priority Ecological Communities (PECs) and Threatened Ecological Communities (TECs):

- EPBC Act Protected Matters database (SEWPaC 2012a)
- DEC and WA Museum's NatureMap online database (DEC 2012a)
- DEC TECs and PECs database (DEC 2012b)
- DEC Threatened Flora Database for Declared Rare Flora (DRF) listed under the latest WA Wildlife Conservation (Rare Flora) Notice and Priority Flora recognised by the DEC (DEC 2012c).

The search area was bounded by 31˚40'31"S and 115˚47'23"E, with a 10 km radius searched.

In addition, publications reporting on flora and vegetation surveys (see **Section 1.2**) were consulted to gather information on previous surveys in the area and to add to the list of potentially occurring flora and fungi, and ecological communities.

Species from database searches and relevant literature were combined to produce a list of threatened flora species that may occur within the site (**Table 1**). Conservation codes for conservation significant flora are provided in **Appendix A**. Note that the list of potential species includes species that have been recorded in the general region but may be unlikely to occur in the site due to a lack of suitable habitat. Some flora species have specific habitat requirements that may be present in the general area but not in the specific site. As a result, many species have been included in the list produced from database searches but will not be present in the actual site.

2.2 Likelihood of occurrence

2.2.1 Conservation significant flora species

Specific criteria were used to assess the likelihood of occurrence of conservation significant flora species, identified from searches of State and Federal databases, listed in **Table 1**.

The likelihood of occurrence assessment was based on the species matching one or more of the criteria below.

Likelihood: No

- Species not known to occur within the IBRA (Interim Biogeographic Regionalisation for Australia) bioregion
- The site lacks important habitat for a species that has highly selective habitat requirements
- Species has been historically recorded within the site or locally, however it is considered locally extinct due to significant habitat changes such as land clearing

Likelihood: Unlikely

- Species has been recorded within the bioregion based on literature review, but not recorded locally based on DEC database search, and adequate survey efforts (such as a standardised methodology) have not detected the species
- Species has been recorded locally through DEC database search, however, is unlikely to occur due to lack of critical habitat and/or the site being severely degraded
- Species has been recorded locally through DEC database search, however, is unlikely to occur due to few historic record/s and no other current collections in the local area

Likelihood: Possible

- Species has not been previously recorded in the site, however, targeted surveys may locate the species based on records occurring in proximity to the site (1-5 km) and suitable habitat potentially occurring in the site
- Species has been recorded in the site by a previous consultant survey, however, doubt remains over the species taxonomic identification
- Historical evidence of species occurrence within or outside of the site with coordinates doubtful

Likelihood: Likely

- Critical habitat in excellent condition and landform for the species occurs within the site
- Species has been recorded in proximity (<1 km) and in similar habitat to that which occurs within the area

Likelihood: Yes

- Species previously recorded within the site from DEC database search results and the species has been confirmed through a current vouchered specimen at WA Herbarium.

Table 1: Threatened and priority flora identified from searches of State and Federal databases as potentially occurring, and their likelihood of occurrence in the site

Species/taxon	Conservation status[1]	Preferred habitat	Likelihood of occurrence (based on the habitat types and condition identified within the site together with local occurrence, and habitat requirements of each species)
Acacia benthamii	P2	Limestone breakaways, sand	Possible. Several records within 5 km radius
Andersonia gracilis	T, E	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps	No. Lack of suitable habitat within the site
Caladenia huegelii	T, E	Grey or brown sand, clay loam, Banksia woodland	Possible. One record within 5 km and suitable habitat present in the site
Calectasia sp. Pinjar (C. Tauss 557)	P1	On gentle slope above dampland, deep grey quartz sand	No. Lack of suitable habitat in the site
Centrolepis caespitosa	P4, E	White sand, clay. Salt flats, wet areas	No. Lack of suitable habitat in the site
Conostylis bracteata	P3	Confined to coastal heath and scrub; sand, well-watered depressions in undulating sand dunes close to limestone	No. Lack of suitable habitat in the site
Cyathochaeta teretifolia	P3	Grey sand, sandy clay. Swamps, creek edges with Melaleuca	No. Lack of suitable habitat in the site
Darwinia foetida	T, CR	Grey-white sand on swampy, seasonally wet the sites along sump land (land where water collects) under *Regelia inops* and *Kunzea recurva* tall shrubland, *Hypocalymma angustifolium* low shrubland, or low *Melaleuca* spp. shrubland	No. Lack of suitable habitat in the site
Drosera x sidjamesii	P1	Peaty sand, along lake margins, close to winter high-water line	No. Lack of suitable habitat in the site
Epiblema grandiflorum	E	Melaleuca wetlands	No. Lack of suitable habitat in the site
Eucalyptus argutifolia	T, V	Mallee. Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops	No. Lack of suitable habitat in the site
Fabronia hampeana	P2	Limestone outcrops, on trunk of *Macrozamia*	No. Lack of suitable habitat in the site

Species/taxon	Conservation status[1]	Preferred habitat	Likelihood of occurrence (based on the habitat types and condition identified within the site together with local occurrence, and habitat requirements of each species)
Grevillea curviloba subsp. *curviloba*	T, E	Amongst medium trees, or low trees; in sand, grey sand and winter-wet heath	No. Lack of suitable habitat in the site and species occurs greater than 5km from the site
Grevillea curviloba subsp. *incurva*	T, E	Amongst low trees, or tall (sclerophyll) shrubland; in sand, or clay; occupying winter wet flats	No. Lack of suitable habitat in the site and species occurs greater than 5km from the site
Hibbertia spicata subsp. *leptotheca*	P3	Grey-yellow-white sand. Near-coastal limestone ridges, outcrops & cliffs	No. Lack of suitable habitat in the site
Isopogon uncinatus	T, E	Loam or sand on granite, peaty sand. Swampy depressions, hillslopes	No. Lack of suitable habitat in the site
Jacksonia sericea	P4	Calcareous and sandy soils in Banksia/Eucalypt woodland	Possible. Several records within 5km of the site
Lecania turicensis var. *turicensis*	P2	Coastal rocks, limestone	No. Lack of suitable habitat in the site
Lepidosperma rostratum	T, E	Peaty sand, clay	No. Lack of suitable habitat in the site
Leucopogon sp. Yanchep (M. Hislop 1986)	P3	Low hill, grey sand over limestone close to the coast	No. Lack of suitable habitat in the site
Marianthus paralius	T	White sand over limestone. Low coastal cliffs	No. Lack of suitable habitat in the site
Melaleuca sp. Wanneroo (G.J. Keighery 16705)	P1	Rugged limestone ridge. Mossy black sand	No. Lack of suitable habitat in the site
Pithocarpa corymbulosa	P3	Gravelly or sandy loam. Amongst granite outcrops	No. Lack of suitable habitat in the site
Sarcozona bicarinata	P3	White sand over limestone. Open areas	No. Lack of suitable habitat in the site
Stenanthemum sublineare	P2	Sand plain. Littered white sand. Banksia woodland	Possible. Several records within 5km from the site
Stylidium longitubum	P3	Seasonal wetland, flat ground, dark brown clay loam some peat, over clay. Poor drainage, wet during winter/spring	No. Lack of suitable habitat in the site

Species/taxon	Conservation status[1]	Preferred habitat	Likelihood of occurrence (based on the habitat types and condition identified within the site together with local occurrence, and habitat requirements of each species)
Stylidium maritimum	P3	On limestone outcrops in crater-like depressions filled with black sandy soil, grey sand-loam, slope, ridge, limestone	No. Lack of suitable habitat in the site
Tetraria sp. Chandala (G.J. Keighery 17055)	P2	Mound springs. Peaty sand	No. Lack of suitable habitat in the site
Thelymitra variegata	P3	Sand clay, sand, laterite. Limestone hills, uplands	No. Lack of suitable habitat in the site
Tripterococcus paniculatus	P4	Seasonal Wetland, flat ground, black fine peaty clay loam sand, poor drainage, wet during winter/spring.	No. Lack of suitable habitat in the site

Source: DEC 2012c, DEC 2012d, SEWPac 2012b

[1] V = Listed as 'Vulnerable', E= 'Endangered' and CR='Critically Endangered' under the EPBC Act, T = Threatened Flora under the WC Act and P = Priority Flora listed by DEC

Previous surveys did not record flora species of conservation significance (RPS 2006, ATA 2007), nor are there any other records of conservation significant flora occurring in the site (DEC 2012c).

2.2.2 Conservation significant vegetation communities

The site is known to contain an occurrence of the FCT SCP 20a *Banksia attenuata* woodland over species rich dense shrublands, within the southern portion of Lot 4 (DEC 2012b). This FCT is a TEC which is categorised as Endangered.

3 Field Survey and Analysis Methods

3.1 Targeted flora and fungi survey, and re-assessment of vegetation communities

3.1.1 Targeted flora and fungi survey

Conservation significant flora and fungi species identified during desktop review and classed as previously recorded, having the potential to occur, or likely to occur (see **Section 2.2**) were targeted during field survey.

In undertaking targeted survey, searches were conducted for DRF, Priority and other locally significant species using meandering walks along across the site which were approximately 30-60 m apart. Targeted searches in specific habitat in the site that were likely to contain conservation significant flora and fungi species were also conducted.

The targeted flora and fungi survey was conducted on 25th September 2012 by two ELA botanists, Joel Collins and Sarah Dalgleish. The survey was conducted under scientific collection licence SL010104 (Joel Collins) and SL009759 (Sarah Dalgleish) and permit to take DRF collection licence 34-1213 (Joel Collins) and 30-1213 (Sarah Dalgleish).

3.1.2 Reassessment of vegetation communities

As part of reassessing previously determined vegetation communities, one quadrat (Q13), previously sampled by ATA Environmental (2007), was re-sampled. Quadrat 13 is located in the vegetation community EgOW as shown in **Figure 3**. An additional quadrat (quadrat 2) was established in vegetation community EgOW. A further two quadrats in the ATA Environmental (2007) vegetation community ScEmAf were established by ELA as this community was not the subject of quadrat sampling at the time of the original survey. Where required, ELA described new vegetation communities to replace the existing descriptions by ATA Environmental (2007).

ATA Environmental (2007) vegetation community boundaries were ground truthed and re-mapped based on dominant species present, landform, and soil type and described using Keighery (1994). Vegetation condition assessment was in accordance with the Bush Forever Vegetation Condition Scale (Government of Australia 2000). Mapping of vegetation communities and condition utilised aerial imagery to assist in defining boundaries as well as utilising GPS to spatially record waypoints and tracks.

Sampling techniques were in accordance with Guidance Statement No. 51 (EPA 2004) and included the use of 10 x 10 m quadrats. ELA established at least two quadrats per vegetation community. Data were recorded on datasheets as shown in **Appendix B**.

The quadrat-based surveys were conducted in conjunction with the targeted flora and fungi survey. For licence details, refer to **Section 3.1.1**. For further details regarding vegetation community extent and composition at the site, refer to '*Ground truthing of Environmental Values'* report (ELA 2012b).

3.2 Floristic community type statistical analysis

FCT statistical analysis was conducted on ATA Environmental (2007) quadrat data to determine the accuracy of the FCTs inferred by ATA Environmental (2007). It was also conducted on ELA quadrat data to determine similarities between the vegetation communities sampled and the FCTs classified by Gibson *et al.* (1994). In conducting FCT analyses, species lists for each quadrat were entered into the

statistical analysis package Primer (version 6.1.11). The taxonomy of each species was aligned with that used by Gibson *et al.* (1994) to permit direct comparison between datasets[1]. The complete dataset of Gibson *et al*. (1994) was entered into Primer and merged with the ATA Environmental (2007) and ELA datasets to allow comparisons of all quadrats against all FCT quadrats of Gibson *et al.* (1994).

All data were analysed using presence/absence of each species within each quadrat. Species richness (total number of species) was calculated for each quadrat. The ATA and ELA datasets were analysed separately.

Datasets were analysed using hierarchical cluster analysis (Everitt 1980). The Primer routine uses hierarchical agglomerative clustering, which takes a similarity matrix and successively fuses the samples into groups and the groups into larger clusters, starting with the highest mutual similarities then gradually lowering the similarity level at which groups are formed (Clarke and Warwick 2001). The result of hierarchical clustering is represented by a dendrogram, with the *x*-axis representing the full set of samples (in this case, the quadrats sampled by ATA/ELA and Gibson *et al*. 1994) and the *y*-axis defining a similarity level at which two samples or groups are considered to have fused. The purpose of this analysis was to determine whether the quadrats sampled in the site were similar in species composition to any of those quadrats sampled by and therefore similar to a FCT assigned by Gibson *et al*. (1994). If quadrats in the site are similar in species composition to Gibson *et al.* (1994) they would be fused into a group together in the dendrogram. Hierarchical clustering was performed on similarity matrices computed using the Bray-Curtis coefficient and using the 'group average' cluster mode (refer to Clarke and Warwick 2001 for more information).

3.3 Carnaby's Black-Cockatoo habitat assessment

The habitat assessment was carried out in accordance with the EPBC referral guidelines for threatened black cockatoo species (SEWPaC 2012c). For breeding habitat, a systematic and thorough search of the site was carried out by two ecologists on the 4th and 5th October 2012 in woodlands of *Eucalyptus gomphocephala* (Tuart), *Corymbia calophylla* (Marri) and *E. marginata* (Jarrah). All Jarrah, Marri and Tuart trees with DBH (diameter at breast height) of greater than 50 cm were recorded as waypoint locations using GPS together with other relevant tree data such as presence of potential hollows (**Appendix C**).

Previous vegetation community mapping by ATA (2007) and RPS (2006) has delineated a number of vegetation associations within Lot 4 that include known CBC foraging plant species. These are predominantly *Eucalyptus* and *Banksia* species known to be medium to high priority foraging plant species. Foraging habitat was assessed based on the presence of known foraging plant species. Evidence of CBC foraging activity or individual birds observed foraging was also recorded within the site.

3.4 Graceful Sun Moth habitat assessment

The habitat assessment for GSM is to provide detailed information of the presence, distribution and density of *Lomandra hermaphrodita* - a host plant species for the Graceful Sun Moth. The GSM habitat assessment is a requirement of DEC and the survey methodology adhered to stage one of the standard procedure stipulated by the DEC (Bishop et al. 2010a). The primary objective of the survey was to map

[1] Some of the species names in Gibson have been superseded

Lomandra hermaphrodita which was previously identified as being present in the Banksia woodlands on site. However, any occurrences of *Lomandra maritima* (which is usually present on coastal heathland rather than Banksia woodland) were also recorded with data taken in accordance with DEC survey guidelines (Bishop et al. 2010a).

An extensive search of the site was carried out by two ecologists (one of whom has completed the DEC GSM training course) on 11th and 12th October 2012. Transects were walked throughout the site, and 2 m x 2 m quadrats surveyed by each ecologist, with the aim of determining fine-scale *Lomandra* species presence and density within the site. Additional site characteristics were collected such as habitat quality and fire history as per survey methodology guidelines (Bishop et. al. 2010a).

Based on vegetation types present, a preliminary estimate of the area of potential GSM habitat within Lot 4 Flynn Drive is approximately 120 hectares. Based on this area, up to 180 sample quadrats were required to provide adequate data on the distribution of the *Lomandra* plant (host species) within the site (Bishop et al. 2010a). A total of 199 quadrats were surveyed for *Lomandra* within suitable habitat across the site (**Appendix D**). Other factors such as vegetation condition, soil type and slope were assessed within each quadrat as per the GSM Survey Guidelines (Bishop et al. 2010a).

4 Results

4.1 Re-assessment of vegetation communities

Descriptions of the vegetation where ELA quadrats were established are shown in **Table 2**. This table also shows the corresponding ATA Environmental (2007) vegetation codes in which the ELA quadrats were established and, if required, the updated vegetation codes for the communities sampled. Locations of the four ELA quadrats are shown in **Figure 3.**

Table 2: ATA Environmental (2007) Vegetation Codes in comparison to ELA Quadrats

Vegetation code (ATA 2007)	E;A flora description based on quadrats	ELA flora quadrats	ELA vegetation code*
EgOW	*Allocasuarina fraseriana* low woodland over *Jacksonia sternbergiana* and *Jacksonia furcellata* tall open shrubland over *Xanthorrhoea preissii* open shrubland over *Mesomelaena pseudostygia* very open sedgeland This quadrat was established in the *Eucalyptus gomphocephala* open woodland broad vegetation community	Re-sampled Q13 (ATA Environmental 2007)	Unchanged - EgOW
	Eucalyptus gomphocephala woodland over *Hibbertia hypericoides* and *Xanthorrhoea preissii* low open shrubland over **Ehrharta calycina* grassland	Q02	
ScEmAf	*Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* open forest over *Hibbertia hypericoides* low open shrubland over **Ehrharta calycina, *Ehrharta longiflora* and **Bromus diandrus* open grassland	Q03	CcEmOF
	Eucalyptus marginata subsp. *marginata* open woodland over *Hakea prostrata* shrubland over *Hibbertia hypericoides* and *Hakea lissocarpha* low shrubland over **Ehrharta calycina* and **Ehrharta longiflora* grassland	Q04	

* If required to be changed from the ATA Environmental (2007) vegetation community descriptions

Flora quadrat data sheets are presented in **Appendix B**. The spatial extent of each vegetation community as mapped by ATA Environmental (2007) and subsequently modified by ELA is shown in **Figures 3 and 4.** The location of each ELA quadrat and ATA Environmental (2007) quadrat 13 is shown in **Figure 4.**

The vegetation community EgOW *Eucalyptus gomphocephala* open woodland in the north-west corner of Lot 4 was confirmed to extend along the western boundary of Lot 4 as shown in **Figure 4**. The vegetation code EgOW remains unchanged from the ATA Environmental (2007) survey as the community represents the vegetation composition present. The vegetation condition became more degraded in areas with a high cover of introduced species and a lack of understorey.

ELA re-sampled quadrat 13 and recorded 23 native flora species and eight introduced species, excluding taxa recorded outside the quadrat. ATA Environmental (2007) recorded 13 native flora species and three introduced species from quadrat 13. The reduced number of species recorded by ATA Environmental (2007) may be a result of factors such as the survey season and timing. Quadrat 13 was originally surveyed on the 5 th October 2006 after a drought year, which may have reduced the number of native flora species present at the time of survey.

Quadrats 3 and 4 were established in the vegetation community described by ATA Environmental (2007) as ScEmAf - scattered *Eucalyptus marginata* and *Allocasuarina fraseriana*. ELA has assigned a new vegetation description and code for this community, CcEmOF - *Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* open forest over *Hibbertia hypericoides* and *Hakea prostrata* low shrubland to open shrubland over **Ehrharta calycina, *Ehrharta longiflora* and **Bromus diandrus* open grassland. Quadrat 3 recorded eight native species and six introduced species while quadrat 4 recorded 10 native species and eight introduced species. The vegetation community also included dominant overstorey species *Allocasuarina fraseriana* and *Banksia attenuata* and was degraded with minimal understorey and high weed cover.

All vegetation communities in the north-west corner of the site have been subject to historic disturbances, such as vegetation clearing, grazing, weeds and too-frequent fires. These disturbances have modified the vegetation structure, increased weed invasion and reduced native species diversity across the majority of the site. Vegetation condition ranged from Excellent to Degraded across the whole Lot 4 (**Figure 5**).

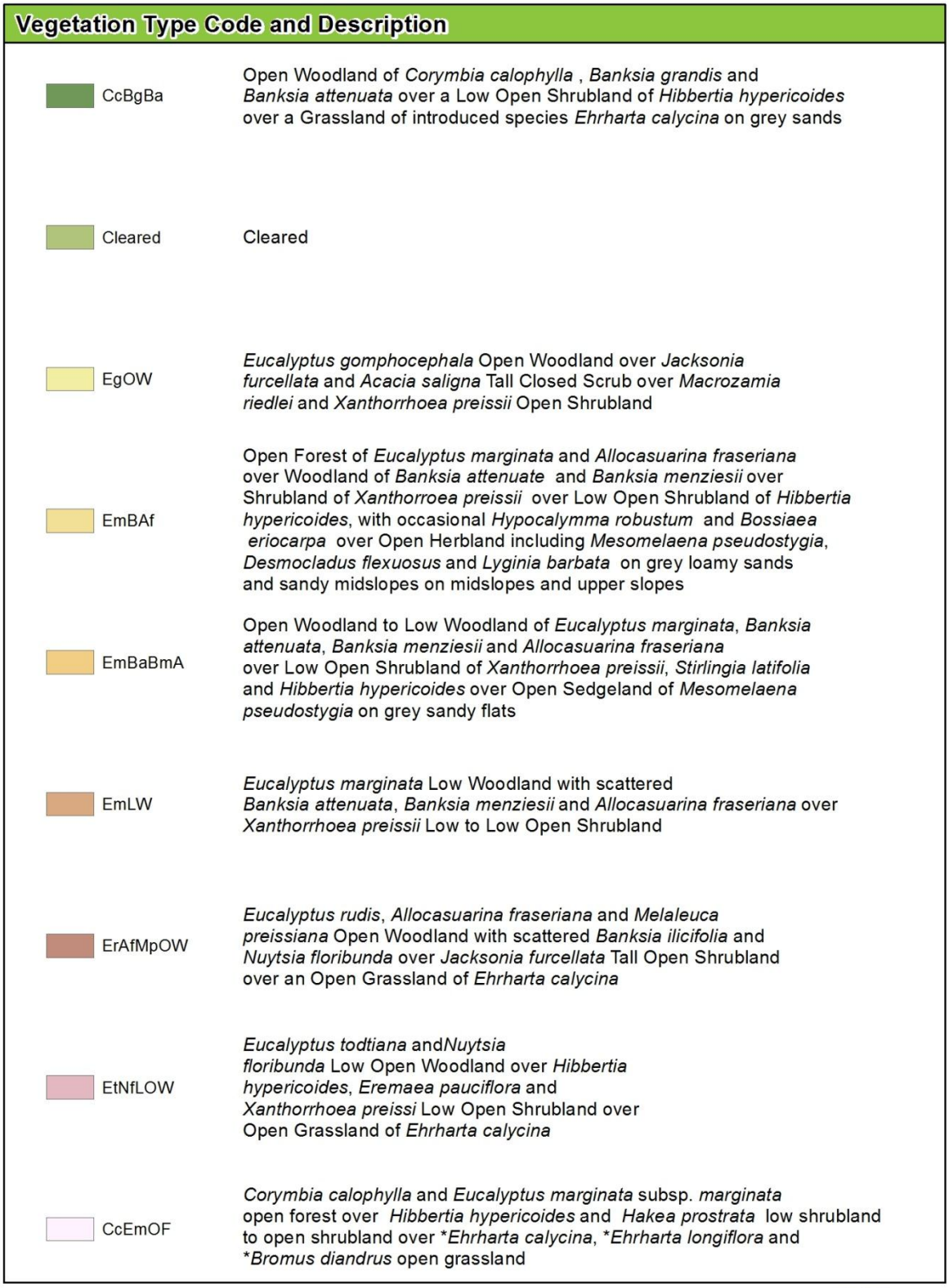

Figure 3: Vegetation type code and description (ATA Environmental 2007, RPS 2006 and ELA 2012)

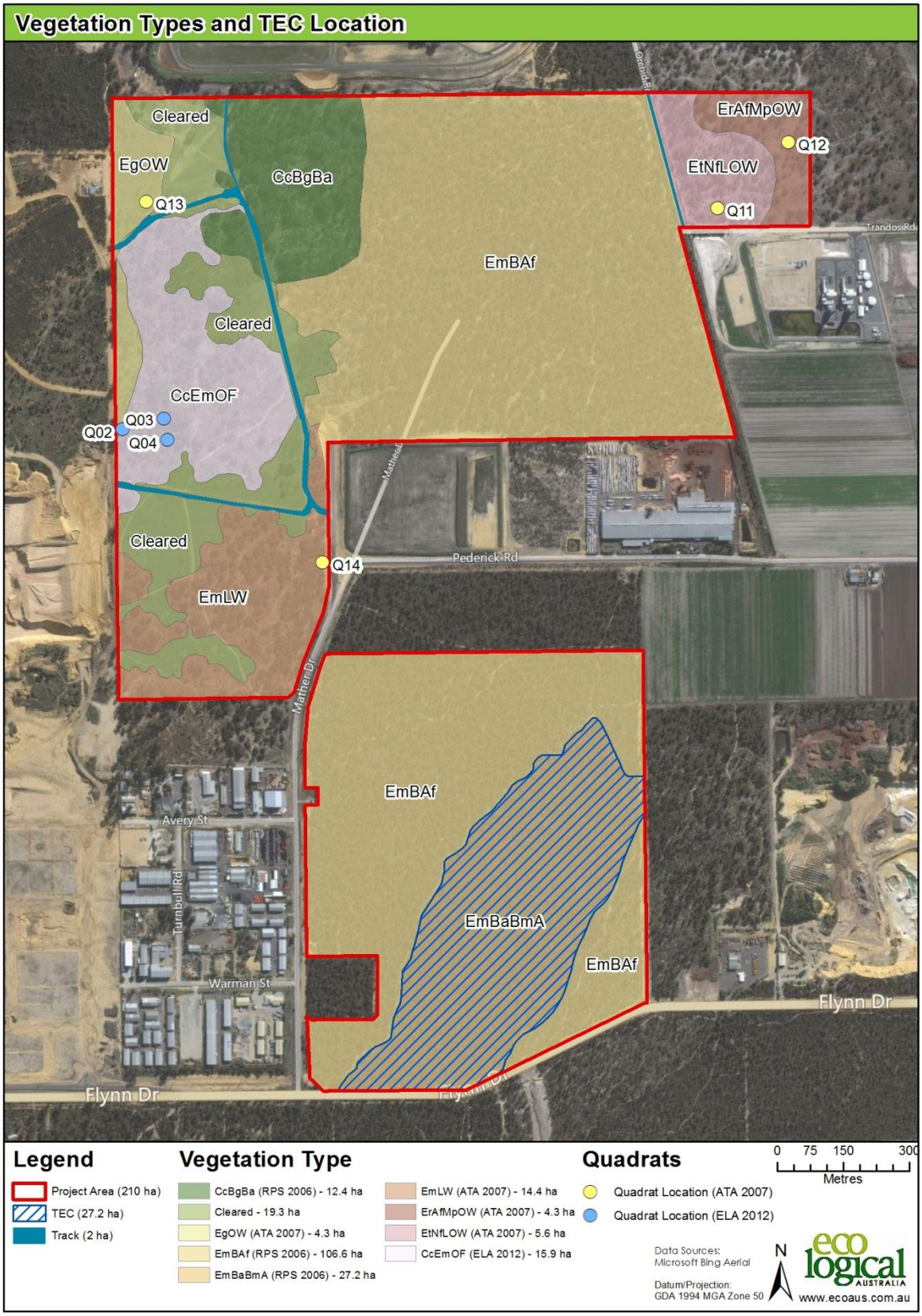

Figure 4: Vegetation types and TEC location (ATA Environmental 2007, RPS 2006 and ELA 2012)

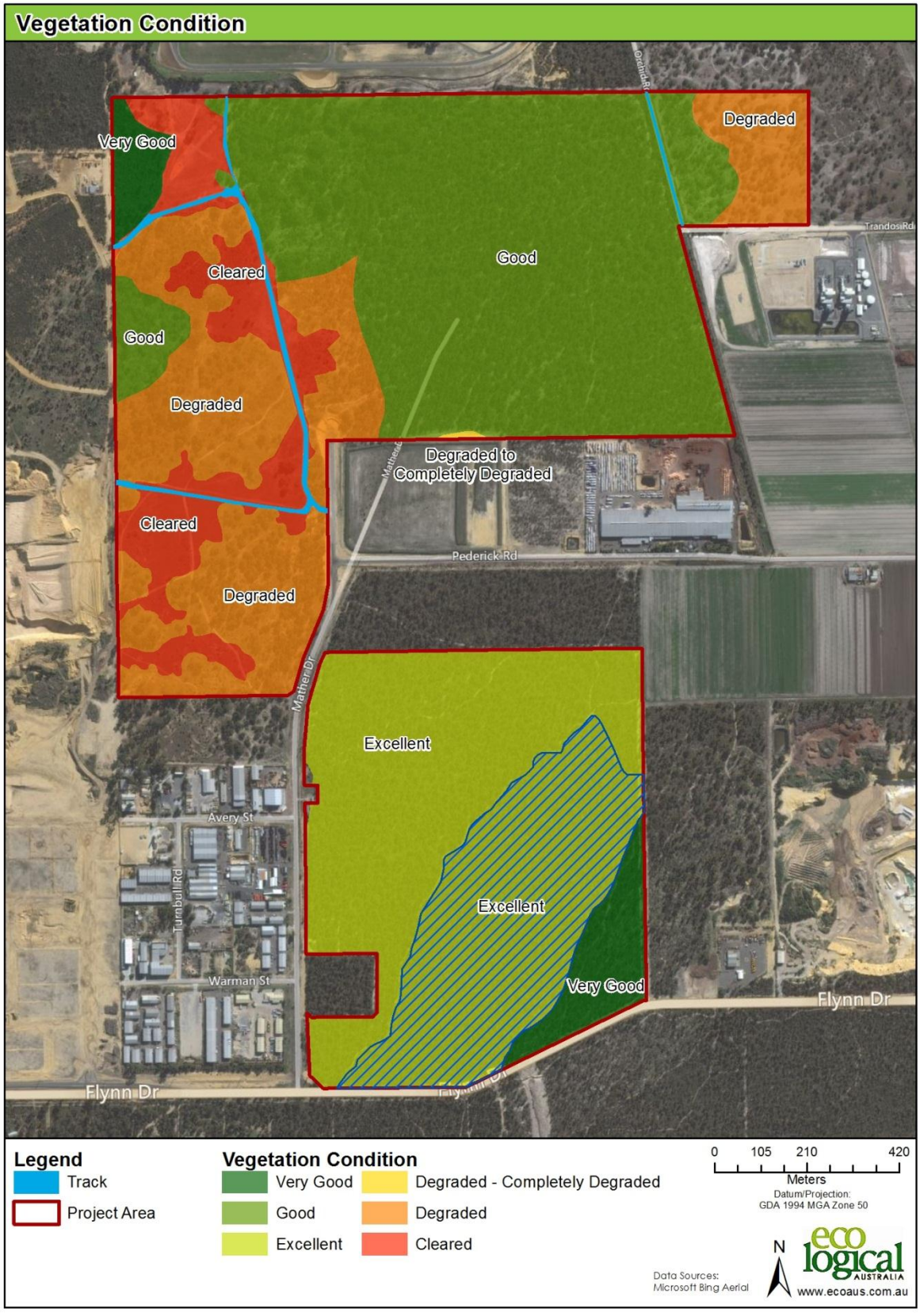

Figure 5: **Vegetation condition**

4.2 Targeted flora and fungi survey

No Threatened (DRF) or Priority flora or fungi species were recorded from the site. No species were considered Likely to occur in the site based on the presence of suitable habitat and species distribution patterns. One species recorded during the survey, *Conostylis aculeata* subsp. *cygnorum*, is listed in Bush Forever as significant flora of the Perth Metropolitan Region (Government of Western Australia 2000).

4.3 Floristic community type statistical analysis

4.3.1 ELA Quadrats

Results of the cluster analysis indicated that ELA quadrat (ECO_Q1) had a low similarity to the other three ELA quadrats (ELA_Q2, ELA_Q3 and ELA_Q4 at 18.6%, 10.5% and 14.0% respectively). However, the three ELA quadrats, had high similarities to each other, with ELA_Q3 and ELA_Q4 the most similar (52.2%), clustering with ELA_Q2 at 46.7% similarity. The results of the cluster analysis and FCT similarity with Gibson et al (1994) quadrats is shown in **Appendix E**.

ELA_Q1 had a fairly low similarity to Gibson quadrats. It grouped with a large cluster of Gibson quadrats (63 quadrats) classed mostly as FCT SCP 28 (33 quadrats) at 24.6%. ELA_Q2, Q3 and Q4 also had a very low similarity to Gibson plots with FCT 30a having the highest similarity of 10.4%. **Table 3** provides the summary of the cluster analysis and similarities to Gibson quadrats.

Table 3: Results of the FCT cluster analysis for ELA quadrats

ELA quadrat	Vegetation code	% similarity	FCTs within cluster	Number of quadrats (Gibson et al 1994)
ELA_Q1 (Re-sample Q13)	EgOW	24.6%	SCP 28	33 quadrats
			SCP 25	10 quadrats
			SCP 24	seven quadrats
			SCP 26b	six quadrats
			SCP 21a	six quadrats
			SCP 30b	one quadrat
ELA-Q2, ELA_Q3 and ELA_Q4	CcEmOF	10.4%	SCP 30a	one quadrat

4.3.2 ATA quadrats

Results of the cluster analysis indicated that the ATA plot ATA_Q12 had a low similarity to the other three ATA quadrats, ATA_Q11, ATA_Q13 and ATA_Q14 (19.0%, 16.7% and 13.3% respectively). These three ATA quadrats had slightly higher similarities to each other, although these were still relatively low. ATA_Q11 and ATA_Q13 were the most similar (27.6%), clustering with ATA_Q14 at 18.7% similarity. The results of the cluster analysis are shown in **Appendix E**.

The ATA quadrats had a very low similarity to Gibson quadrats. Given the extremely low similarity of ATA quadrats with Gibson quadrats, results of the cluster analysis are not considered conclusive to allow allocation of the quadrats to a FCT. **Table 4** provides the summary of the cluster analysis and similarities to Gibson quadrats.

Table 4: Results of the FCT cluster analysis for ATA quadrats

ATA quadrat	% similarity	FCTs within cluster	Number of quadrats (Gibson et al 1994)
ATA_Q12	20.23%	SCP 14	Two quadrats
ATA_Q12 and FCT 14 (milt5 and yan21 quadrats) then join a much larger group	4.88%	There are too many FCTs to list to make any similarities with FCTs meaningful	-
ATA_Q11, ATA_Q13 and ATA_Q14 join a much larger group	8.9%	There are too many FCTs to list to make any similarities with FCTs meaningful	-

4.4 Carnaby's Black-Cockatoo habitat assessment

4.4.1 Foraging Habitat

Figure 4 shows the boundaries and respective area of each vegetation type within Lot 4. Vegetation types include Jarrah - Banksia and Marri - Banksia woodlands, which are dominated by important foraging species for Carnaby's Black-Cockatoo. The following assessment provides a breakdown of area and foraging habitat value for each vegetation type within Lot 4.

Based on the habitat assessment of the vegetation types (**Table 5**), Lot 4 contains approximately 162 hectares of high value foraging habitat, 18.7 hectares of moderate value foraging habitat and 20.2 hectares low value foraging habitat. The foraging habitat value in the context of Carnaby's Black-Cockatoo does not correlate directly with the vegetation condition mapped in **Figure 5** as in some areas the vegetation community can be in degraded condition because the lower strata flora species may be

absent. However the plant species important to CBC such as Eucalyptus and Banksia species are present, providing increased foraging value.

Table 5: Foraging Habitat Value for Carnaby's Cockatoo

Vegetation type code	Plant species of foraging value	Foraging habitat value	Area (HA)
CcBgBa	Marri (*Corymbia calophylla*) *Banksia grandis* *Banksia attenuata* *Banksia menziesii*	High	12.4
EmBAf	Jarrah (*Eucalyptus marginata*) *Banksia attenuata* *Banksia menziesii*	High	106.6
EmBaBmA	Jarrah *Banksia attenuata* *Banksia menziesii*	High	27.2
CcEmOF	Marri Jarrah *Banksia attenuata* *Banksia grandis*	High	15.9
EmLW	Jarrah	Moderate	14.4
EgOW	Tuart (*Eucalyptus gomphocephala*)	Moderate	4.3
EtNfLOW	*Eucalyptus todtiana*	Low	5.6
ErAfMpOW	Nil	Low	4.3
Cleared land	Nil	Low	19.3

Carnaby's Black-Cockatoos were observed, in large numbers (approximately 100 birds), foraging across the site on both survey days, mainly in the northern portion of Lot 4 Flynn Drive (**Figure 7)**. In addition, evidence of foraging activity was observed throughout the site by ELA ecologists (**Figure 6**).

Breeding Habitat

Approximately 694 trees were identified as potential nesting trees (trees with DBH of greater than 50 cm) across the site. This includes 539 Jarrah, 127 Marri, and 28 Tuart trees (**Figure 7; Appendix C**). Of these, approximately 120 trees, comprising 111 Jarrah, seven Marri, and two Tuart trees had hollows possibly suitable for CBC nesting. It is important to note that detection of hollows via ground-based observations is a limitation to breeding habitat assessment. However, SEWPaC considers that all trees with DBH greater than 50 cm have the potential to form hollows suitable for CBC nesting within the short to medium term (SEWPaC 2012c).

Figure 6: Foraging evidence: (left to right) Banksia grandis, B. attenuata and Marri seed pods

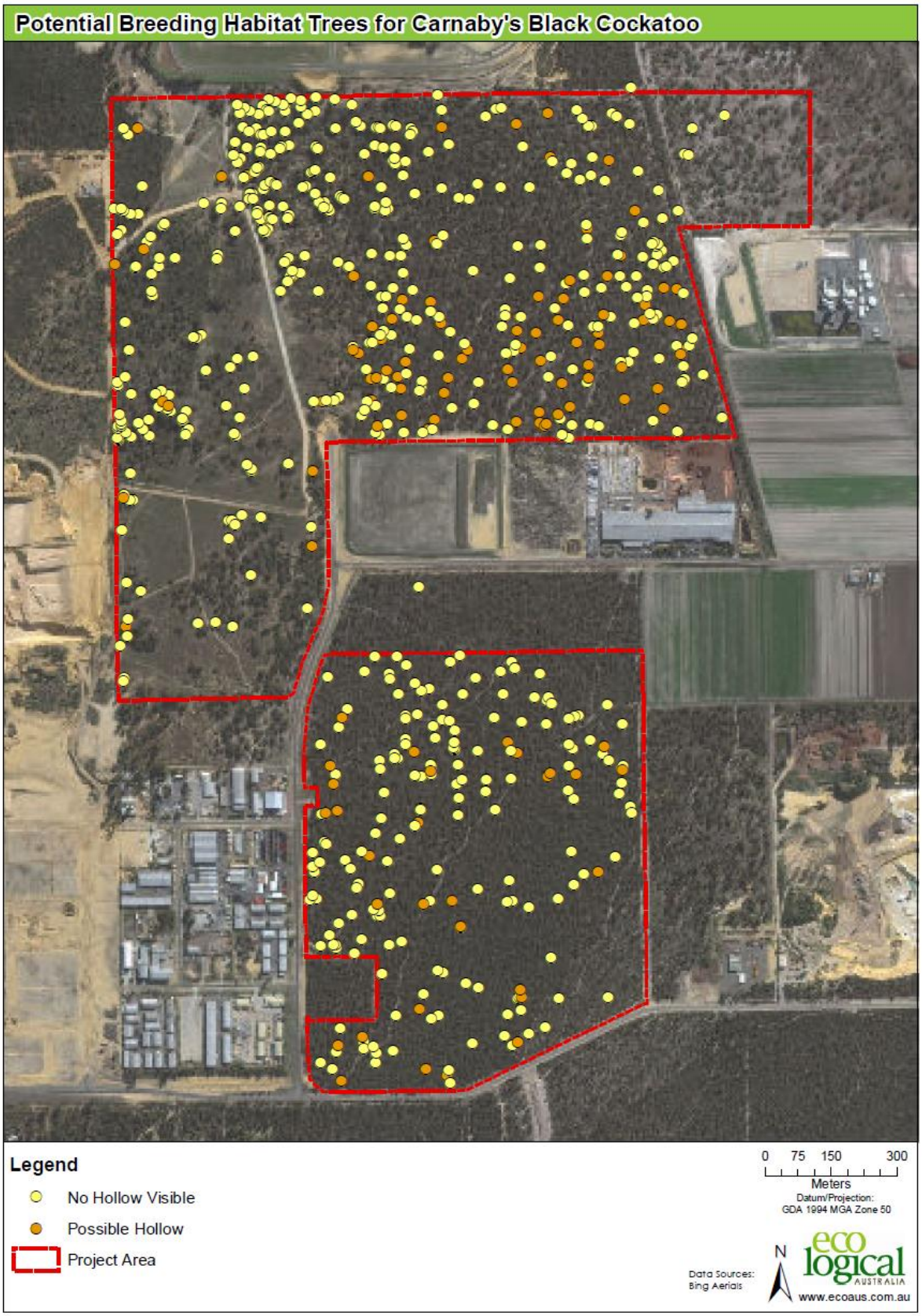

Figure 7: Potential breeding habitat trees for Carnaby's Black-Cockatoo

4.5 Graceful Sun Moth habitat assessment

A total of 203 quadrats were sampled for host plants (potential breeding habitat) of the Graceful Sun Moth. Both known host plants were recorded within Lot 4 during the survey. *Lomandra hermaphrodita* (**Figure 8**) was recorded within 58 quadrats surveyed within the southern portion of Lot 4. *Lomandra maritima* (**Figure** 9) was recorded on the site within 16 quadrats surveyed in the northern portion of Lot 4. The locations of the *Lomandra* survey quadrats are shown in **Figure 10**, and the GSM habitat assessment data is presented as **Appendix D**.

Figure 8: Photos of *Lomandra hermaphrodita* identified within the site

Figure 9: Photos of *Lomandra maritima* identified within the site

The number of *Lomandra hermaphrodita* plants detected per quadrat (2 x 2 m) ranged from zero to 18 representing a density of 0 – 5 plants per square metre. The percentage cover of *L. maritima* per quadrat ranged from 5 – 20 % where it occurred sporadically within the Jarrah/Marri woodland in the northern portion of Lot 4. *L. maritima* occurred in areas where *L. hermaphrodita* was not recorded in quadrats within a portion of the site that had relatively good condition vegetation (**Figure 5**).

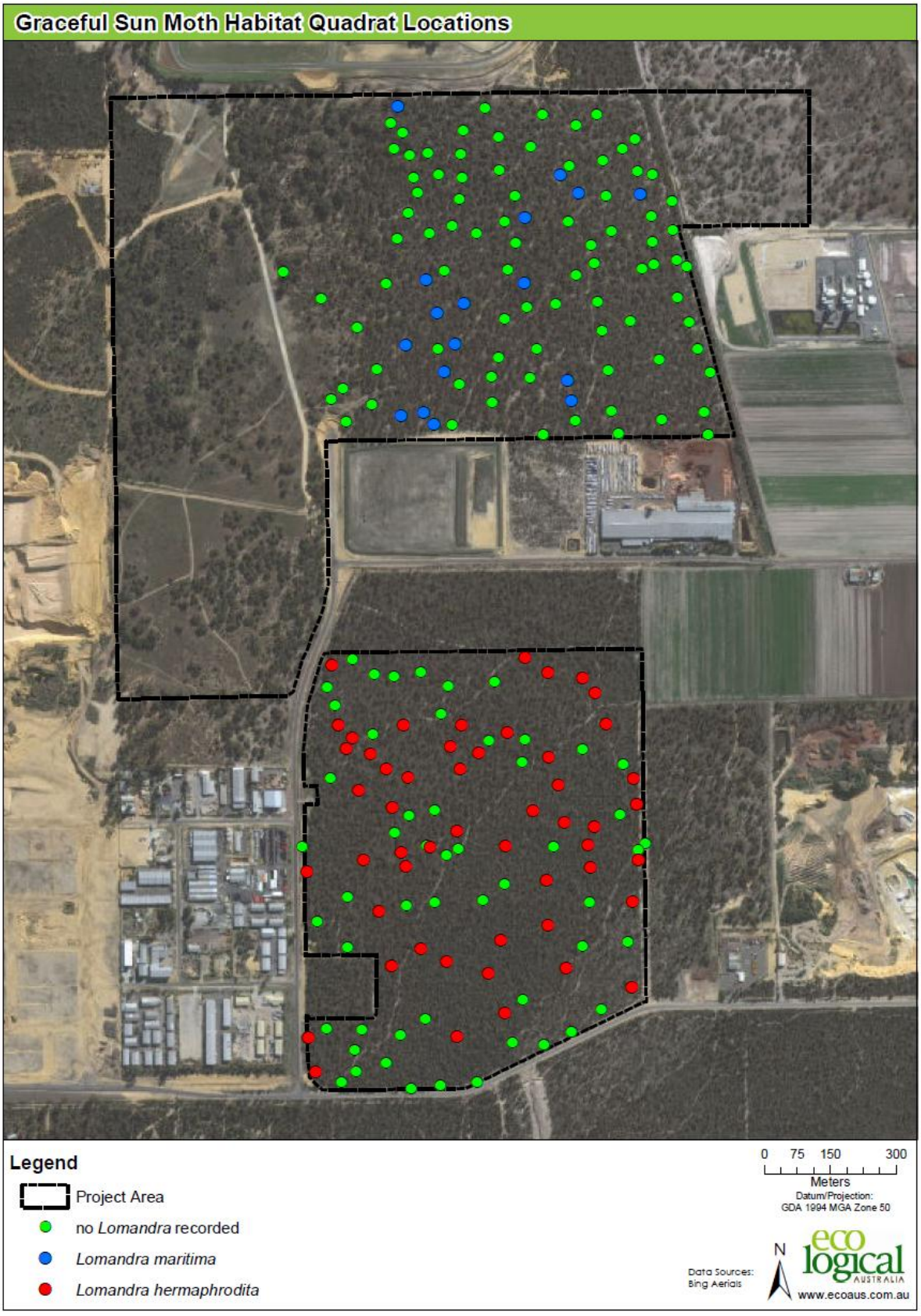

Figure 10: Graceful Sun Moth habitat quadrat locations

5 Discussion and Conclusions

5.1 Targeted flora and fungi survey, and re-assessment of vegetation communities

The site does not contain any known records of conservation significant flora and fungi species (DEC 2012c) and previous flora surveys by RPS (2006) and ATA Environmental (2007) did not record conservation significant flora or fungi species.

Of the conservation significant flora and fungi species that occur within a 10 km radius of the site (**Table 1**) no species were considered Likely to occur based on habitat preferences and distribution patterns. Four species, *Acacia benthamii* (Priority 2), *Caladenia huegelii* (Threatened), *Jacksonia sericea* (Priority 4) and *Stenanthemum sublineare (*Priority 2), were considered Possible to occur based on potentially similar habitat and distribution records within 5 km from the site. While the site was suitably searched, with increased survey transects in vegetation in excellent and very good condition, these species were not recorded by ELA. As such, based on current and previous survey efforts it is highly likely that flora and fungi species of conservation significance do not occur.

The species *Conostylis aculeata* subsp. *cygnorum* was recorded during the survey and is listed in Bush Forever as a significant flora species of the Perth Metropolitan Region due to being endemic to the Swan Coastal Plain (Government of Western Australia 2000). While this species is endemic to the region it does not have a formal conservation ranking and is not considered to be under threat. The species *Astroloma microcalyx* (formerly listed as Priority 3) was recorded by RPS (2006) within a road reserve; however, this species has subsequently been de-listed and now has no conservation ranking.

There were some differences in the numbers of species recorded between ATA and ELA, which is likely to reflect climatic conditions prior to and during the time of the survey. ELA also made some changes to the vegetation community descriptions based on the establishment of new quadrats. ELA described the vegetation community CcEmOF - *Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* open forest to replace the ATA Environmental (2007) vegetation community ScEmAf. This change was due to the presence of dominant overstorey species *Corymbia calophylla* throughout the community.

The vegetation community EgOW as described by ATA Environmental (2007) was considered an accurate description; however, the extent required amendment as this community continues along the western boundary as shown in **Figure 4**. The vegetation condition for this community ranges from Very Good to Degraded and remains unchanged since it was mapped by ATA Environmental (2007).

The species diversity recorded in the quadrats 3 and 4 were low due to the degraded condition and high weed cover. The vegetation condition remains unchanged since it was mapped by ATA Environmental (2007), however, ELA mapped a greater extent of cleared areas around vegetation community CcEmOF. The updated vegetation condition mapping is shown in **Figure 5**.

5.2 Floristic community type statistical analysis

The analysis conducted by ELA for ATA and ELA quadrats showed a low similarity to a number of Gibson quadrats. The quadrats from vegetation community EgOW had the highest similarity (24.6%) to FCT SCP 28 – Spearwood *Banksia attenuata* or *B. attentuata – Eucalyptus* woodlands (Gibson *et al.* 1994). The quadrats from vegetation community CcEmOF showed a low similarity of 10.4% to FCT SCP 30a – *Callitris preissii* (or *M. lanceolata)* forests and woodlands. FCT SCP 30a does not occur in Lot 4 as the dominant species that form this community are absent.

ATA Environmental (2007) identified that the vegetation for the north-west corner of Lot 4 may represent FCT SCPs 28, 21a, 23a or 24, however, statistical analysis was not conducted. RPS (2006) determined FCTs associated with each of the sample sites through statistical analysis and determined that the majority of their study area surveyed belonged to FCT SCP 28. RPS (2006), however, did not sample quadrats in the north-west corner of Lot 4 and these vegetation communities did not form part of the FCT analysis. RPS (2006) indicated that FCT SCPs 23a, 24, 26a and 26b may be present, however, did not draw a conclusion on the FCT present.

FCT SCP 20a – *Banksia attenuata* woodlands over species rich dense shrublands was also identified as occurring on Lot 4. FCT SCP 20a is listed by the DEC as a TEC and was confirmed as occurring in the southern portion of Lot 4 (**Figure 3**).

Given the findings of RPS (2006) and ATA Environmental (2007) it is likely that the vegetation communities EgOW and CcEmOF are representative of FCT SCP 28. As the results of the statistical analysis did not indicate a high similarity, other supporting factors that support this conclusion are:

- FCT SCP 28 is restricted to the Spearwood landform where Lot 4 occurs
- Dominant over-storey species that are known to occur in FCT SCP 28, such as *Eucalyptus marginata, Corymbia calophylla, Eucalyptus gomphocephala, Allocasuarina fraseriana* and *Banksia attenuata,* also occur in vegetation communities EgOW and CcEmOF
- Vegetation communities EgOW and CcEmOF are not analogous to the FCT SCP 20a, 26a or 26b based on species composition and landform
- Vegetation communities EgOW and CcEmOF are not analogous to the PEC FCT SCP 24 – Northern Spearwood shrublands and woodlands as this community forms heaths with *E. gomphocephala* and includes *Banksia sessilis*, which was recorded but was not dominant in vegetation communities EgOW and CcEmOF.

Based on these factors combined with the results of previous assessments the vegetation communities EgOW and CcEmOF are concluded to be representative of FCT SCP 28.

5.3 Carnaby's Black-Cockatoo breeding habitat assessment

Breeding Habitat

Lot 4 Flynn Drive, Neerabup contains habitat that meets the criteria determined by SEWPaC as potential breeding habitat for CBC with 694 Eucalyptus trees with DBH greater than 50 cm recorded (SEWPaC 2012c). Cale (2003) defined hollows suitable for nesting CBC to average 6.3 m above ground, and be approximately 110 cm deep (ranging from 25-250 cm). Following this criteria, approximately 120 trees were assessed as having hollows potentially suitable for nesting CBC. Potential breeding trees comprised Jarrah, Tuart and Marri all of which are listed in the SEWPaC Referral Guidelines as breeding habitat.

The majority (539) of these potential breeding trees are Jarrah, and whilst there is anecdotal evidence of CBC nesting in Jarrah tree hollows, there is no literature within the public domain documenting this occurring. Based on documented breeding occurrences, Jarrah trees are considered to be a very infrequently utilised breeding tree species.

Tuart trees are considered to be a secondary or non-preferred breeding tree species based on recorded usage of Tuart compared to Wandoo and Salmon Gum. However there are several records of Carnaby's Black Cockatoo breeding within Tuart trees on the Swan Coastal Plain (Johnstone and Kirkby, 2011). The closest of these locations are 16 km away at Yanchep National Park (Department of

Planning 2011) which also contains some of the Northern Swan Coastal Plain's highest quality foraging habitat for CBC. Although there is a documented 48,648 ha of potential CBC habitat within a 20km radius of Yanchep National Park, the Park has the only known breeding record within this area, and is the closest record to Lot 4 Flynn Drive.

Foraging Habitat

Evidence of foraging, in the form of chewed nuts and seed pods, was observed across the site, as well as large flocks (approximately 100 birds) of CBC seen foraging in and around the northern portion of Lot 4 during the site inspection.

The vegetation communities within Lot 4 include extensive areas of Eucalyptus – Banksia woodland. These communities comprise a number of known foraging plant species for Carnaby's Black Cockatoo. Important foraging species identified are Marri, Jarrah, *Banksia attenuata, B. menziesii,* and *B. grandis.* Approximately 160 hectares of vegetation within Lot 4 is assessed as foraging habitat on the basis that it comprises one or more of these foraging plant species as a dominant component of the vegetation community.

The vegetation condition across Lot 4 varies markedly, however even some areas mapped as Degraded (**Figure 5**) in the western portion support an open canopy of Jarrah and Marri which has foraging value, even though these areas lack lower strata shrub species.

Based on the habitat assessment, Lot 4 contains approximately 162 hectares of high value foraging habitat, 18.7 hectares of moderate value foraging habitat, and 20.2 hectares low value foraging habitat In some areas of Lot 4, even though the overall vegetation was in degraded to good condition, lacking most of the shrub and ground strata species, the value is considered to be high in terms of CBC foraging habitat due to the presents of important remnant canopy and understorey trees such as Eucalyptus and Banksia species.

Roosting Habitat

Lot 4 supports tree species known as roost species for Carnaby's Black Cockatoo. These include Tuart and Flooded Gum which occur in the north-west and north-east portions respectively. There are approximately 16 known roost sites within a 6 kilometre radius of Lot 4 based on mapping by the Department of Planning (2011). However there are no known roost sites recorded within Lot 4 and the absence of permanent, or at least autumn persisting wetlands, within Lot 4 indicates it is unlikely to be, or at best is marginally suitable as, a roost site.

The site is located also directly to the east of Neerabup National Park and is contiguous with similar habitat within extensive areas of State forest in the locality thus providing connectivity between potential breeding and foraging habitats to assist with the birds' movements through the landscape.

5.4 Graceful Sun Moth habitat assessment

The presence of *Lomandra hermaphrodita* and *L. maritima* indicate that Lot 4 contains potential GSM habitat. *L. hermaphrodita* was not detected within the northern portion of Lot 4 during the GSM habitat assessment, however this plant has been observed within this portion of the site during previous site inspections (R.Browne-Cooper, pers.obs).

It should be noted that since November 2012, conservation status reviews by DEC have demonstrated that GSM are now adequately conserved in the wild, with GSM being found to occur over a wider distribution and wider host plant range on the Swan Coastal Plain (Bishop et.al. 2010b; DEC 2011),

hence GSM has recently been removed from Schedule 1 of the *Wildlife Conservation Act 1950* and is currently listed as a Priority 4 species. Notwithstanding this, GSM currently remains listed as Endangered under the EPBC Act although is currently the subject of a proposal to de-list the species. Until such time as the species is de-listed however, it must continue to be assessed under the EBPC Act.

GSM has been recorded in extensive numbers in the Quindalup dune systems of the north-west corridor of the Perth Metropolitan Region. A previous unreported survey by the City of Wanneroo for the site provided a 'nil return' to the DEC for GSM at the site. The nearest extant record of GSM to the Neerabup site is Tamala Park, situated approximately 6 km to the south-west of the site. It is notable that the species was historically recorded at Neerabup in Bush Forever site 293, but has not been recorded in recent times, leading the DEC to conclude it is locally extinct (DEC 2011).

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Appendix A: Conservation codes for flora species

IUCN categories (based on review by Mace and Stuart 1994) as used for the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Extinct. Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild. Taxa known to survive only in captivity.
Critically Endangered. Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered. Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable. Taxa facing a high risk of extinction in the wild in the medium-term future.
Near Threatened. Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent. Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more Severely Threatened.
Data Deficient (Insufficiently Known). Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern. Taxa that are not Threatened.

Flora conservation codes as defined by DEC and the WA Herbarium:

Conservation code	Description
T: Threatened Flora (Declared Rare Flora — Extant)	Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*). Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: ▪ CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild ▪ EN: Endangered – considered to be facing a very high risk of extinction in the wild ▪ VU: Vulnerable – considered to be facing a high risk of extinction in the wild.
X: Presumed Extinct Flora (Declared Rare Flora — Extinct)	Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the *Wildlife Conservation Act 1950*).

Conservation code	Description
1: Priority One: Poorly-known taxa	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2: Priority Two: Poorly-known taxa	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3: Priority Three: Poorly-known taxa	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4: Priority Four: Rare, Near Threatened and other taxa in need of monitoring	1. **Rare**. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently Threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. 2. **Near Threatened**. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. 3. Taxa that have been removed from the list of Threatened species during the past five years for reasons other than taxonomy.
5: Priority Five: Conservation Dependent taxa	Taxa that are not Threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming Threatened within five years.

Appendix B: Vegetation and flora field survey data sheets

* = Introduced Species

Project #: 11PERPLA - 0041 **Date:** 25/09/2012

	Project area: Neerabup	**Quadrat # :** Q01 (Q13 ATA 2007)		**Observer/s:** JC, SD
	Aspect: SE	**Slope (%):** Nil	**Quadrat dimensions (m):** 10 x 10	
	Coordinates: (UTM)	NW Cnr: E 384877	N 6495607	WPT: 002
		SE Cnr: E 0384889	N 6495599	WPT: 003

Habitat

Landform unit: Slight slope
Rock type: Some limestone
Soil:
Colour: Yellow - grey
Type: Sand
Condition: Moist
Outcropping: Nil
Veg Condition: Good - Very Good
Disturbance type: Grazing, weeds

Age since fire (yrs): 1-10
Habitat Description: Eucalypt/Allocasuarina/Banksia woodland

Bare Soil (%): 5	**Leaf litter (%):** 8	**Logs (%):** +
Cover (%): Overstorey: 20	Midstorey: 10	Understorey: 10
Vegetation description:		
Allocasuarina fraseriana low woodland over *Jacksonia sternbergiana* and *Jacksonia furcellata* tall open shrubland over		
Xanthorrhoea preissii open shrubland over *Mesomelaena pseudostygia* very open sedgeland		

Specimen #	Species name	Height (m)	Cover (%)
01.05	**Aira cupaniana (Silvery Hairgrass)*	0.1	+
NC	**Arctotheca calendula* (Cape Weed)	0.3	Out
01.14	**Avellinia michelii*	0.1	+
NC	**Avena barbata* (Bearded Oat)	0.5	Out
NC	**Briza maxima* (Blowfly Grass)	0.1	1
NC	**Ehrharta calycina* (Perennial Veldt Grass)	0.5	Out
NC	**Ehrharta longiflora* (Annual Veldt Grass)	0.2	+
NC	**Gladiolus caryophyllaceus* (Wild Gladiolus)	0.4	Out
NC	**Lysimachia arvensis* (Pimpernel)	0.1	+
NC	**Sonchus oleraceus*	0.1	+
01.15	**Trifolium arvense (Hare's Foot Clover)*	0.1	+
01.17	**Vulpia myuros (Rat's Tail Fescue)*	0.15	+

Specimen #	Species name	Height (m)	Cover (%)
NC	*Acacia saligna*	2	Dead
NC	*Acanthocarpus preissii*	0.3	1
NC	*Allocasuarina fraseriana* (Sheoak)	7	20
NC	*Banksia attenuata* (Slender Banksia)	2	Out
01.19	*Banksia dallanneyi* var. *dallanneyi*	0.3	Out
NC	*Banksia grandis* (Bull Banksia)	2.8	Out
NC	*Banksia sessilis*	1.5	Out
NC	*Burchardia congesta*	0.3	Out
01.16	*Calandrinia granulifera* (Pygmy Purslane)	0.1	+
01.11	*Centrolepis drummondiana*	0.1	+
01.04	*Conostylis aculeata* subsp. *cygnorum*	0.3	+
NC	*Corynotheca micrantha* (Sand Lily)	0.4	+
01.07	*Crassula colorata* var. *colorata*	0.1	+
01.02	*Desmocladus asper*	0.15	1
NC	*Drosera erythrorhiza* subsp. *erythrorhiza*	0.1	+
01.09	*Drosera macrantha subsp. macrantha*	0.15	+
NC	*Eucalyptus gomphocephala* (Tuart)	10	Out
01.03	*Glischrocaryon aureum* (Common Popflower)	0.4	1
NC	*Hakea lissocarpha* (Honey Bush)	0.5	Out
NC	*Hardenbergia comptoniana* (Native Wisteria)	0.3	+
NC	*Hibbertia hypericoides* (Yellow Buttercups)	0.6	Out
01.13	*Homalosciadium homalocarpum*	0.1	+
NC	*Jacksonia furcellata* (Grey Stinkwood)	2-3	1
NC	*Jacksonia sternbergiana* (Stinkwood)	2.5	2
01.21	*Lepidosperma leptostachyum*	0.5	Out
01.18	*Lepidosperma striatum*	0.3	Out
NC	*Lobelia tenuior*	0.3	+
NC	*Macrozamia riedlei* (Zamia)	0.9	Out
01.01	*Mesomelaena pseudostygia*	0.4	1
01.22	*Muehlenbeckia adpressa (Climbing Lignum)*	0.3	Out
01.20	*Podolepis lessonii*	0.15	Out
01.12	*Poranthera microphylla (Small Poranthera)*	0.1	+

Specimen #	Species name	Height (m)	Cover (%)
NC	*Ptilotus polystachyus* (Prince of Wales Feather)	0.3	Out
01.10	*Schoenus clandestinus*	0.1	+
01.06	*Syntrichia antarctica*	0.1	+
01.08	*Trachymene pilosa (Native Parsnip)*	0.1	+
NC	*Xanthorrhoea preissii*	1.5	8

Project #: 11PERPLA - 0041 **Date:** 25/09/2012

	Project area: Neerabup		**Quadrat # :** Q 02		**Observer/s:** JC, SD
	Aspect: SE		**Slope (%): N**il		**Quadrat dimensions (m):** 10 x 10
	Coordinates: (UTM)	NW Cnr: E 0384821	N 6495074	WPT: 004	
		SE Cnr: E 0384832	N 6495062	WPT: 005	

Habitat

Landform unit: Gentle slope
Rock type: N/A
Soil:
Colour: Grey-yellow
Type: Sand
Condition:
Outcropping: Nil
Veg Condition: Degrade
Disturbance type: Weed

Age since fire (yrs): 1-10
Habitat Description: Eucalypt woodland

Bare Soil (%): +	**Leaf litter (%):** +	**Logs (%):** +
Cover (%): Overstorey: 25	Midstorey: 5	Understorey: 60
Vegetation description:		
Eucalyptus gomphocephala woodland over *Hibbertia hypericoides* and *Xanthorrhoea preissii* low open shrubland over		
**Ehrharta calycina* grassland		

Specimen #	Species name	Height (m)	Cover (%)
NC	**Asparagus asparagoides* (Bridal Creeper)	0.3	Out
NC	**Avena barbata (Wild Oat)*	0.5	+
02.03	**Bromus diandrus (Great Brome)*	0.3	+
NC	**Ehrharta calycina* (Perennial Veldt Grass)	0.5	60
NC	**Ehrharta longiflora* (Annual Veldt Grass)	0.3	+
02.01	**Lolium perenne (Perennial Ryegrass)*	0.3	+
NC	**Solanum nigrum (Black Berry Nightshade)*	0.1	+
NC	**Sonchus oleraceus*	0.15	+
NC	*Burchardia congesta*	0.3	+
NC	*Eucalyptus gomphocephala* (Tuart)	15 - 18	25
NC	*Eucalyptus marginata* subsp. *marginata* (Jarrah)	2	Out

Specimen #	Species name	Height (m)	Cover (%)
NC	*Hakea lissocarpha* (Honey Bush)	0.4	+
NC	*Hardenbergia comptoniana* (Native Wisteria)	0.3	+
NC	*Hibbertia hypericoides* (Yellow Buttercups)	0.4	2
02.02	*Lepidosperma striatum*	0.4	+
NC	*Xanthorrhoea preissii* (Grass tree)	0.4	+

Project #: 11PERPLA - 0041 **Date:** 25/09/2012

	Project area: Neerabup		**Quadrat # :** Q 03		**Observer/s:** JC, SD
	Aspect: SE		**Slope (%):** Nil	**Quadrat dimensions (m):** 10 x 10	
	Coordinates: (UTM)	NW Cnr:	E 0384915	N 6495099	WPT: 006
		SE Cnr:	E 0384925	N 6495088	WPT: 007

Habitat

Landform unit: Gentle slope
Rock type: N/A
Soil:
Colour: Brown/grey - Yellow
Type: Sand
Condition:
Outcropping: Nil
Veg Condition: Degraded
Disturbance type: Weeds, grazing, tracks, clearing

Age since fire (yrs): 1 -10
Habitat Description: Eucalypt woodland

Bare Soil (%): +	**Leaf litter (%):** 3	**Logs (%):** 1

Cover (%): Overstorey: 70 Midstorey: Understorey: 30

Vegetation description:

Corymbia calophylla and *Eucalyptus marginata* open forest over *Hibbertia hypericoides* low open shrubland over **Ehrharta calycina,*

**Ehrharta longiflora* and **Bromus diandrus* open grassland

Specimen #	Species name	Height (m)	Cover (%)
02.03	**Bromus diandrus (Great Brome)*	0.3	5
NC	**Ehrharta calycina* (Perennial Veldt Grass)	0.8	8
NC	**Ehrharta longiflora* (Annual Veldt Grass)	0.3	5
NC	**Erodium botrys* (Long Storksbill)	0.3	Out
NC	**Euphorbia terracina* (Geraldton Carnation Weed)	0.3	Out
NC	**Romulea rosea* (Guildford grass)	0.2	+
NC	*Allocasuarina fraseriana* (Sheoak)	8	Out
NC	*Banksia attenuata* (Slender Banksia)	2	Out
NC	*Corymbia calophylla* (Marri)	10 - 12	65
03.01	*Desmocladus flexuosus*	0.3	+
NC	*Eucalyptus marginata* subsp. *marginata* (Jarrah)	8	5
NC	*Hakea prostrata* (Harsh Hakea)	1.5	Out

Specimen #	Species name	Height (m)	Cover (%)
NC	*Hibbertia hypericoides* (Yellow Buttercups)	1	4
NC	*Ptilotus polystachyus* (Prince of Wales Feather)	0.3	Out
NC	*Xanthorrhoea preissii* (Grass tree)	0.2	+

Project #: 11PERPLA - 0041 **Date:** 25/09/2012

	Project area: Neerabup		**Quadrat # :** Q 04		**Observer/s:** JC, SD
	Aspect: W		**Slope (%):** Nil		**Quadrat dimensions (m):** 10 x 10
	Coordinates: (UTM)	NW Cnr: E 0384923	N 6495050	WPT: 009	
		SE Cnr: E 0384934	N 6495042	WPT: 008	

Habitat

Landform unit:
Rock type: Nil
Soil:
Colour: Brown - grey
Type: Sand
Condition:
Outcropping: Nil
Veg Condition: Degraded
Disturbance type: Weeds, grazing, tracks, clearing

Age since fire (yrs): 1 - 10
Habitat Description:

Bare Soil (%): 5	**Leaf litter (%):** 2	**Logs (%): 2**

Cover (%): Overstorey: 30 Midstorey: 15 Understorey: 45

Vegetation description:

Eucalyptus marginata subsp *marginata* open woodland over *Hakea prostrata* shrubland over *Hibbertia hypericoides*

and *Hakea lissocarpha* low shrubland over **Ehrharta calycina* and **Ehrharta longiflora* grassland

Specimen #	Species name	Height (m)	Cover (%)
NC	**Avena barbata* (Bearded Oat)	0.5	+
02.03	**Bromus diandrus (Great Brome)*	0.3	+
NC	**Ehrharta calycina* (Perennial Veldt Grass)	0.5	30
NC	**Ehrharta longiflora* (Annual Veldt Grass)	0.3	10
NC	**Erodium botrys* (Long Storksbill)	0.1	+
04.01	**Geranium molle (Dove's Foot Cranesbill)*	0.15	+
04.02	**Ornithopus compressus (Yellow Serradella)*	0.15	+
	**Trifolium arvense (Hare's Foot Clover)*	0.1	+
NC	*Allocasuarina fraseriana* (Sheoak)	7	Out
NC	*Banksia attenuata* (Slender Banksia)	2	Out
NC	*Eucalyptus marginata* subsp. *marginata* (Jarrah)	6	30

Specimen #	Species name	Height (m)	Cover (%)
NC	*Grevillea vestita* subsp. *vestita*	1.5	Out
NC	*Hakea lissocarpha* (Honey Bush)	0.5	2
NC	*Hakea prostrata* (Harsh Hakea)	1.5	15
NC	*Hibbertia hypericoides* (Yellow Buttercups)	0.6	25
NC	*Macrozamia riedlei* (Zamia)	1.1	Out
NC	*Ptilotus polystachyus* (Prince of Wales Feather)	0.4	+
NC	*Xanthorrhoea preissii* (Grass tree)	0.5	+

Appendix C: CBC raw data

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
ELA Ecologist - N.Thompson					
24	60	Jarrah	6493635	385397.3	No hollows visible
25	50	Jarrah	6493658	385398.9	No hollows visible
26	60	Jarrah	6493663	385436.2	No hollows visible
27	90	Jarrah	6493621	385511.4	Branch and Stem hollow possible
28	60	Jarrah	6493619	385562	No hollows visible
29	60	Jarrah	6493606	385559.4	End hollow possible
30	50	Jarrah	6493590	385566.7	No hollows visible
31	60	Jarrah	6493679	385615.7	No hollows visible
32	70	Jarrah	6493744	385539.1	No hollows visible
33	70	Jarrah	6493736	385523.9	No hollows visible
34	50	Jarrah	6493757	385496.8	Trunk hollow possible
35	50	Jarrah	6493744	385443.4	No hollows visible
36	60	Jarrah	6493792	385504.8	No hollows visible
37	60	Jarrah	6493744	385695.9	No hollows visible
38	60	Jarrah	6493696	385690	No hollows visible
39	50	Jarrah	6493673	385706.7	No hollows visible
40	100	Jarrah	6493680	385720	Trunk hollow possible
41	90	Jarrah	6493702	385745.2	No hollows visible
42	50	Jarrah	6493755	385725.7	No hollows visible
43	70	Jarrah	6493781	385720	No hollows visible
44	70	Jarrah	6493785	385727.5	Trunk hollow possible
45	100	Jarrah	6493785	385723.4	No hollows visible
46	150	Jarrah	6493801	385724.8	Trunk hollow possible
47	70	Jarrah	6493806	385630.1	No hollows visible
48	50	Marri	6493814	385602.1	No hollows visible
49	70	Jarrah	6493839	385549.2	No hollows visible
50	60	Jarrah	6493845	385537.1	No hollows visible
51	70	Jarrah	6494002	385519.2	No hollows visible
52	50	Jarrah	6494210	385667	No hollows visible
53	150	Jarrah	6494293	385792.8	Trunk and Branch hollows possible
54	200	Jarrah	6494286	385788.1	End, Branch and Trunk hollows possible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
55	50	Jarrah	6494348	385844.7	No hollows visible
57	60	Jarrah	6494359	385835.5	No hollows visible
58	70	Jarrah	6494406	385956.4	No hollows visible
59	60	Jarrah	6494353	385915.8	Trunk hollow possible
60	50	Jarrah	6494337	385912.6	No hollows visible
61	60	Jarrah	6494322	385927	No hollows visible
62	70	Jarrah	6494305	385955.1	No hollows visible
63	300	Jarrah	6494300	385956.8	Trunk hollow possible
64	50	Jarrah	6494310	385959.4	No hollows visible
65	50	Jarrah	6494272	385954.2	No hollows visible
66	90	Jarrah	6494246	385949.9	No hollows visible
67	80	Jarrah	6494233	385846.8	No hollows visible
68	50	Jarrah	6494254	385833.1	No hollows visible
69	90	Jarrah	6494292	385852.3	Stag (dead) Trunk hollow possible
70	50	Jarrah	6494310	385834.9	No hollows visible
71	90	Jarrah	6494217	385974.2	No hollows visible
72	50	Jarrah	6494203	385978.6	No hollows visible
73	60	Jarrah	6494103	385940.9	No hollows visible
74	70	Jarrah	6494067	385901.5	Trunk hollow possible
75	100	Jarrah	6494063	385869.5	No hollows visible
76	60	Jarrah	6494039	385846.7	No hollows visible
77	70	Jarrah	6494007	385809.8	No hollows visible
78	90	Jarrah	6494003	385707.6	No hollows visible
79	90	Jarrah	6494000	385695.2	No hollows visible
80	70	Jarrah	6494048	385699.2	No hollows visible
81	100	Jarrah	6494003	385569.5	Trunk hollow possible
82	50	Jarrah	6493944	385588.6	Stag (dead) Trunk hollow possible
83	60	Jarrah	6493944	385589	No hollows visible
84	100	Jarrah	6493784	385923.9	No hollows visible
85	80	Jarrah	6494913	384845.8	No hollows visible
86	70	Jarrah	6494911	384838.7	No hollows visible
87	150	Jarrah	6494917	384824.2	Trunk hollow possible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
88	50	Jarrah	6494925	384825.7	No hollows visible
89	200	Marri	6494846	384820.6	No hollows visible
90	50	Marri	6494725	384831.3	No hollows visible
91	50	Jarrah	6494706	384863.4	No hollows visible
92	100	Marri	6494643	384835.2	No hollows visible
93	200	Jarrah	6494625	384829.6	Branch hollow possible
94	100	Marri	6494605	384833.4	No hollows visible
95	150	Marri	6494583	384816.9	No hollows visible
96	60	Jarrah	6494509	384825.5	No hollows visible
97	50	Jarrah	6494501	384824.5	No hollows visible
98	50	Jarrah	6494633	384992.7	No hollows visible
99	90	Jarrah	6494636	385032.8	No hollows visible
100	60	Jarrah	6494625	385070.8	No hollows visible
101	60	Jarrah	6494826	385063.2	No hollows visible
102	60	Jarrah	6494868	385062	No hollows visible
103	50	Jarrah	6494867	385069.4	No hollows visible
104	70	Jarrah	6494857	385077.1	No hollows visible
105	50	Jarrah	6494877	385093.8	No hollows visible
106	50	Jarrah	6494874	385136.4	No hollows visible
107	70	Jarrah	6494852	385250.4	No hollows visible
108	150	Jarrah	6494809	385251.4	Trunk hollow possible
109	50	Jarrah	6494668	385240.4	No hollows visible
110	50	Jarrah	6494742	385112.6	No hollows visible
111	60	Jarrah	6495561	384857.3	No hollows visible
112	50	Jarrah	6495564	384840.2	No hollows visible
113	55	Jarrah	6495571	384823.2	No hollows visible
115	60	Jarrah	6495577	384801.3	No hollows visible
122	80	Marri	6495422	385206.9	No hollows visible
123	55	Marri	6495422	385202.6	No hollows visible
124	50	Marri	6495408	385196.6	No hollows visible
125	80	Marri	6495389	385180	No hollows visible
126	50	Marri	6495428	385225.3	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
127	80	Jarrah	6495420	385346.8	Branch hollow possible
128	60	Jarrah	6495429	385458.2	No hollows visible
129	80	Jarrah	6495433	385617.9	No hollows visible
130	60	Jarrah	6495416	385700.9	No hollows visible
131	150	Jarrah	6495346	385691.2	No hollows visible
132	70	Jarrah	6495331	385690.8	No hollows visible
133	50	Jarrah	6495309	385684	No hollows visible
134	90	Jarrah	6495297	385717	Branch hollow possible
135	120	Jarrah	6495258	385726.7	Branch hollow possible
136	100	Jarrah	6495251	385710.5	No hollows visible
137	200	Jarrah	6495266	385714.4	No hollows visible
138	150	Jarrah	6495246	385693.3	No hollows visible
139	170	Jarrah	6495210	385695.8	Branch hollow possible
140	90	Jarrah	6495181	385707.2	Branch hollow possible
141	200	Jarrah	6495090	385716.1	Branch hollow possible
142	50	Jarrah	6495073	385695.6	No hollows visible
143	70	Jarrah	6495083	385661.8	No hollows visible
144	100	Jarrah	6495132	385620.2	No hollows visible
145	100	Jarrah	6495180	385630.8	No hollows visible
146	90	Jarrah	6495234	385593.6	Branch hollow possible
147	300	Jarrah	6495253	385604.8	Branch hollow possible
148	60	Jarrah	6495269	385597.3	No hollows visible
149	70	Jarrah	6495297	385565.1	No hollows visible
150	200	Jarrah	6495315	385544.2	Branch and Trunk hollows possible
151	80	Jarrah	6495329	385540.5	No hollows visible
152	240	Jarrah	6495342	385521.8	No hollows visible
153	110	Jarrah	6495363	385520.7	Branch and Trunk hollows possible
154	50	Jarrah	6495390	385480.2	No hollows visible
155	80	Jarrah	6495368	385456.9	Branch hollow possible
156	90	Jarrah	6495346	385452.4	No hollows visible
157	50	Jarrah	6495327	385468.7	No hollows visible
158	100	Jarrah	6495322	385490	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
159	60	Jarrah	6495242	385538.5	No hollows visible
160	90	Jarrah	6495191	385560.1	Branch and Trunk hollows possible
161	100	Jarrah	6495157	385551.6	Branch and Trunk hollows possible
162	110	Jarrah	6495123	385568.7	No hollows visible
163	80	Jarrah	6495073	385516.6	Branch hollow possible
164	90	Jarrah	6495074	385525.1	No hollows visible
165	110	Jarrah	6495096	385529.5	Branch hollow possible
166	80	Jarrah	6495170	385500.7	No hollows visible
167	80	Jarrah	6495183	385501.4	No hollows visible
168	80	Jarrah	6495200	385465.8	No hollows visible
169	160	Jarrah	6495229	385464.7	Branch hollow possible
170	80	Jarrah	6495256	385473.7	No hollows visible
171	60	Jarrah	6495290	385432.8	No hollows visible
172	80	Jarrah	6495297	385414.9	No hollows visible
173	80	Jarrah	6495286	385407.4	No hollows visible
174	120	Jarrah	6495309	385389.6	Trunk hollow possible
175	200	Jarrah	6495399	385385.1	No hollows visible
176	90	Jarrah	6495270	385381.9	No hollows visible
177	70	Jarrah	6495272	385388.4	No hollows visible
178	80	Jarrah	6495277	385408.6	Branch hollow possible
179	80	Jarrah	6495191	385446.6	Branch hollow possible
180	90	Jarrah	6495169	385431.7	No hollows visible
181	300	Jarrah	6495167	385454.4	Branch hollow possible
182	80	Jarrah	6495160	385496.3	No hollows visible
183	50	Jarrah	6495068	385503.8	No hollows visible
184	50	Jarrah	6495067	385461.2	No hollows visible
185	100	Jarrah	6495104	385454.6	Branch hollow possible
186	50	Jarrah	6495085	385422.7	No hollows visible
187	50	Jarrah	6495062	385405.1	No hollows visible
188	50	Jarrah	6495068	385396	No hollows visible
189	80	Jarrah	6495082	385400.5	Trunk hollow possible
190	60	Jarrah	6495127	385396.6	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
191	60	Jarrah	6495136	385377.2	No hollows visible
192	100	Jarrah	6495139	385387	Branch hollow possible
193	100	Jarrah	6495188	385413.9	No hollows visible
194	110	Jarrah	6495206	385421.5	Trunk hollow possible
195	50	Jarrah	6495190	385398.3	Trunk hollow possible
196	150	Jarrah	6495186	385384.9	Branch hollow possible
197	60	Jarrah	6495210	385375.6	No hollows visible
198	50	Jarrah	6495148	385313.3	No hollows visible
199	60	Jarrah	6495140	385302.3	No hollows visible
200	90	Jarrah	6495140	385284.4	No hollows visible
201	200	Jarrah	6495138	385275.5	Branch hollow possible
202	60	Jarrah	6495138	385254.9	No hollows visible
203	70	Jarrah	6495104	385365.1	No hollows visible
204	60	Jarrah	6495118	385371.1	No hollows visible
205	80	Jarrah	6495246	385357.8	Trunk hollow possible
206	100	Jarrah	6495252	385345.5	Trunk hollow possible
207	50	Jarrah	6495262	385344.6	No hollows visible
208	80	Jarrah	6495376	385408.6	No hollows visible
209	60	Jarrah	6495375	385419.8	No hollows visible
210	50	Jarrah	6495348	385412.3	No hollows visible
211	90	Jarrah	6495324	385434.6	Branch hollow possible
212	50	Jarrah	6495395	385435.8	No hollows visible
213	60	Marri	6495389	385265.9	No hollows visible
214	120	Jarrah	6495384	386096.7	No hollows visible
215	60	Jarrah	6495393	386080.4	Branch hollow possible
216	50	Jarrah	6495393	386051.3	Stag (dead) branch hollow possible
217	200	Jarrah	6495391	386014.4	No hollows visible
218	90	Jarrah	6495377	386011.5	No hollows visible
219	120	Jarrah	6495372	385990	No hollows visible
220	100	Jarrah	6495357	386008.2	Branch hollow possible
221	50	Jarrah	6495398	385966.4	No hollows visible
222	60	Jarrah	6495421	385989.2	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
223	50	Jarrah	6495421	385951.4	No hollows visible
224	100	Jarrah	6495423	385923.1	Branch hollow possible
225	50	Jarrah	6495425	385868.6	No hollows visible
226	60	Jarrah	6495412	385838.1	Trunk hollow possible
227	160	Jarrah	6495329	385725.9	No hollows visible
228	60	Jarrah	6495328	385723.7	Branch hollow possible
229	230	Jarrah	6495292	385760.9	Branch hollow possible
230	110	Jarrah	6495231	385771.8	Branch hollow possible
231	50	Jarrah	6495238	385794.6	Stag (dead)
232	90	Jarrah	6495193	385789.2	No hollows visible
233	70	Jarrah	6495177	385819.8	Branch hollow possible
234	300	Jarrah	6495112	385767	Trunk hollow possible
235	320	Jarrah	6495088	385769.3	Trunk hollow possible
236	70	Jarrah	6495082	385779.9	Trunk hollow possible
237	80	Jarrah	6495085	385784.4	Trunk hollow possible
238	100	Jarrah	6495108	385809.9	Trunk hollow possible
239	120	Jarrah	6495124	385837.1	Branch hollow possible
240	90	Jarrah	6495210	385845	No hollows visible
241	70	Jarrah	6495272	385853	Trunk hollow possible
242	100	Jarrah	6495309	385833	No hollows visible
243	90	Jarrah	6495323	385810.2	Branch and Trunk hollows possible
244	70	Jarrah	6495348	385802.9	No hollows visible
245	80	Jarrah	6495374	385765.7	Branch hollow possible
246	80	Jarrah	6495441	385769.2	No hollows visible
247	50	Jarrah	6495405	385827.8	Stag (dead)
248	180	Jarrah	6495371	385822.1	Trunk hollow possible
249	70	Jarrah	6495306	385891.1	No hollows visible
250	60	Jarrah	6495306	385900.9	No hollows visible
251	50	Jarrah	6495292	385901.5	Branch and Trunk hollows possible
252	260	Jarrah	6495265	385904.4	Branch and Trunk hollows possible
253	120	Jarrah	6495219	385880.1	Trunk hollow possible
254	70	Jarrah	6495190	385880.4	Trunk hollow possible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
255	50	Jarrah	6495180	385876.5	No hollows visible
256	70	Jarrah	6495088	385883.9	No hollows visible
257	80	Jarrah	6495084	385842.2	No hollows visible
258	50	Jarrah	6495053	385835.4	No hollows visible
259	50	Jarrah	6495061	385820	No hollows visible
260	70	Jarrah	6495099	385816.4	No hollows visible
261	50	Jarrah	6495082	385903.2	No hollows visible
262	100	Jarrah	6495142	385962.8	Branch hollow possible
263	60	Jarrah	6495215	385955.6	Trunk hollow possible
264	100	Jarrah	6495227	385953.9	Stag (dead)
265	80	Marri	6495228	385971.6	No hollows visible
266	80	Jarrah	6495250	385981.4	No hollows visible
267	100	Jarrah	6495316	385983.1	Stag (dead)
268	130	Jarrah	6495329	385929.1	No hollows visible
269	60	Jarrah	6495334	385913.6	Trunk hollow possible
270	80	Jarrah	6495395	385907.8	No hollows visible
271	50	Jarrah	6495385	385871.7	No hollows visible
272	100	Jarrah	6495336	386018.5	Stag (dead)
273	80	Jarrah	6495333	386034.8	No hollows visible
274	80	Jarrah	6495324	386025.5	No hollows visible
275	100	Jarrah	6495322	386005.1	Branch hollow possible
276	50	Jarrah	6495235	386041.5	No hollows visible
277	90	Jarrah	6495165	386037.6	Trunk hollow possible
278	80	Jarrah	6495121	386051.4	Branch hollow possible
279	50	Jarrah	6495094	386026.1	No hollows visible
280	70	Jarrah	6495069	386081.8	No hollows visible
281	60	Jarrah	6495180	386092.4	Stag (dead)
282	80	Jarrah	6495188	386097.5	No hollows visible
283	50	Jarrah	6495218	386095.1	No hollows visible
284	80	Jarrah	6495244	386088.8	Stag (dead) branch hollow possible
285	80	Jarrah	6495254	386091.4	Branch hollow possible
286	50	Jarrah	6495264	386108.4	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
287	50	Jarrah	6495264	386080.5	No hollows visible
288	90	Jarrah	6495281	386116.3	No hollows visible
289	150	Jarrah	6495311	386090.9	Branch hollow possible
290	50	Jarrah	6495320	386063.8	Branch hollow possible
291	130	Jarrah	6495441	386051.1	No hollows visible
292	60	Jarrah	6495198	386140.7	No hollows visible
293	50	Jarrah	6495102	386183.2	No hollows visible
ELA Ecologist – R.Browne-Cooper					
1	75	Jarrah	6469880	410312	No hollows visible
2	100	Jarrah	6469872	410308	Spout hollow possible
3	60	Jarrah	6469833	410293	No hollows visible
4	85	Jarrah	6469785	410293	No hollows visible
5	60	Jarrah	6494028	385628	No hollows visible
6	80	Jarrah	6494367	385883	No hollows visible
7	100	Jarrah	6493593	385318	Spout hollow possible
8	60	Jarrah	6494115	385840	No hollows visible
9	65	Jarrah	6493988	385744	No hollows visible
10	70	Jarrah	6493873	385795	No hollows visible
11	85	Jarrah	6493783	385813	No hollows visible
12	70	Jarrah	6493714	385781	No hollows visible
13	90	Jarrah	6494716	385494	No hollows visible
14	150	Jarrah	6493622	385298	No hollows visible
15	85	Jarrah	6495058	384883	No hollows visible
16	60	Jarrah	6493636	385272	No hollows visible
17	55	Jarrah	6495586	385006	No hollows visible
18	55	Jarrah	6495579	385185	No hollows visible
19	65	Jarrah	6495849	385977	No hollows visible
20	55	Jarrah	6468951	386095	No hollows visible
21	80	Jarrah	6468951	386095	No hollows visible
22	90	Jarrah	6493660	385308	No hollows visible
23	65	Jarrah	6493674	385311	Spout hollow possible
24	60	Jarrah	6493713	385316	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
25	150	Jarrah	6493694	385366	Spout hollow possible
26	60	Jarrah	6493690	385368	No hollows visible
27	70	Jarrah	6493682	385369	No hollows visible
28	100	Jarrah	6493667	385369	No hollows visible
29	75	Jarrah	6493672	385392	No hollows visible
30	55	Jarrah	6493837	385411	No hollows visible
31	60	Jarrah	6493905	385427	No hollows visible
32	55	Jarrah	6493911	385455	No hollows visible
33	55	Jarrah	6493970	385400	No hollows visible
34	51	Jarrah	6493970	385406	No hollows visible
35	60	Jarrah	6493981	385404	No hollows visible
36	160	Jarrah	6493994	385400	Trunk hollow possible
37	70	Jarrah	6493983	385391	No hollows visible
38	65	Jarrah	6493914	385364	No hollows visible
39	60	Jarrah	6493885	385348	No hollows visible
40	85	Jarrah	6493898	385307	No hollows visible
41	55	Jarrah	6493902	385306	No hollows visible
42	85	Jarrah	6493904	385301	No hollows visible
43	75	Jarrah	6493901	385271	No hollows visible
44	65	Jarrah	6493926	385291	No hollows visible
45	90	Jarrah	6493951	385313	No hollows visible
46	70	Jarrah	6493972	385342	No hollows visible
47	70	Jarrah	6494008	385263	No hollows visible
48	70	Jarrah	6494006	385247	No hollows visible
49	80	Jarrah	6494017	385253	No hollows visible
50	65	Jarrah	6494068	385258	No hollows visible
51	70	Jarrah	6494070	385257	No hollows visible
52	70	Jarrah	6494080	385254	No hollows visible
53	55	Jarrah	6494091	385269	No hollows visible
54	65	Jarrah	6494112	385253	No hollows visible
55	60	Jarrah	6494136	385281	No hollows visible
56	60	Jarrah	6494131	385284	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
57	60	Jarrah	6494199	385273	No hollows visible
58	100	Jarrah	6494203	385283	Trunk hollow possible
59	90	Jarrah	6494207	385310	Spout hollow possible
60	65	Jarrah	6494268	385301	Spout hollow possible
61	100	Jarrah	6494289	385305	No hollows visible
62	90	Jarrah	6494311	385293	Trunk hollow possible
63	130	Jarrah	6494360	385271	No hollows visible
64	55	Jarrah	6494396	385313	No hollows visible
65	70	Jarrah	6494420	385320	Spout hollow possible
66	70	Jarrah	6494437	385331	No hollows visible
67	60	Jarrah	6494513	385287	No hollows visible
68	60	Jarrah	6494524	385371	No hollows visible
69	70	Jarrah	6494558	385395	No hollows visible
70	55	Jarrah	6494520	385427	No hollows visible
71	56	Jarrah	6494507	385428	No hollows visible
72	51	Jarrah	6494472	385449	No hollows visible
73	65	Jarrah	6494423	385465	No hollows visible
74	51	Jarrah	6494416	385464	No hollows visible
75	55	Jarrah	6494427	385490	No hollows visible
76	60	Jarrah	6494369	385465	No hollows visible
77	70	Jarrah	6494357	385464	No hollows visible
78	100	Jarrah	6494341	385485	Branch hollow possible
79	70	Jarrah	6494327	385447	No hollows visible
80	75	Jarrah	6494337	385439	No hollows visible
81	70	Jarrah	6494327	385439	No hollows visible
82	90	Jarrah	6494321	385405	No hollows visible
83	90	Jarrah	6494302	385408	No hollows visible
84	60	Jarrah	6494248	385416	No hollows visible
85	85	Jarrah	6494189	385409	No hollows visible
86	120	Jarrah	6494158	385397	No hollows visible
87	80	Jarrah	6494106	385383	Branch hollow possible
88	80	Jarrah	6494115	385364	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
89	70	Jarrah	6494094	385327	No hollows visible
90	65	Jarrah	6494077	385339	No hollows visible
91	51	Jarrah	6494043	385357	No hollows visible
92	70	Jarrah	6494032	385354	No hollows visible
93	55	Jarrah	6494019	385429	No hollows visible
94	65	Jarrah	6493994	385505	Branch hollow possible
95	55	Jarrah	6494074	385535	No hollows visible
96	70	Jarrah	6494093	385424	No hollows visible
97	70	Jarrah	6494144	385451	No hollows visible
98	60	Jarrah	6494174	385486	No hollows visible
99	80	Jarrah	6494181	385492	Branch hollow possible
100	85	Jarrah	6494212	385497	No hollows visible
101	60	Jarrah	6494211	385498	No hollows visible
102	70	Jarrah	6494285	385500	No hollows visible
103	85	Jarrah	6494288	385486	No hollows visible
104	90	Jarrah	6494291	385523	No hollows visible
105	100	Jarrah	6494297	385522	Spout hollow possible
106	60	Jarrah	6494311	385523	No hollows visible
107	75	Jarrah	6494312	385521	No hollows visible
108	51	Jarrah	6494374	385532	No hollows visible
109	130	Jarrah	6494400	385527	No hollows visible
110	70	Jarrah	6494415	385548	No hollows visible
111	51	Jarrah	6494448	385548	No hollows visible
112	60	Jarrah	6494484	385517	No hollows visible
113	55	Jarrah	6494481	385500	No hollows visible
114	100	Jarrah	6494497	385486	No hollows visible
115	60	Jarrah	6494538	385466	No hollows visible
116	60	Jarrah	6494559	385445	No hollows visible
117	80	Jarrah	6494545	385565	No hollows visible
118	70	Jarrah	6494560	385587	No hollows visible
119	65	Jarrah	6494509	385624	No hollows visible
120	70	Jarrah	6494473	385594	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
121	70	Jarrah	6494343	385629	No hollows visible
122	51	Jarrah	6494280	385648	No hollows visible
123	51	Jarrah	6494280	385647	No hollows visible
124	55	Jarrah	6494249	385646	No hollows visible
130	60	Jarrah	6494198	385584	No hollows visible
131	60	Jarrah	6494238	385586	No hollows visible
132	80	Jarrah	6494269	385581	No hollows visible
133	51	Jarrah	6494277	385593	No hollows visible
134	60	Jarrah	6494313	385584	No hollows visible
135	80	Jarrah	6494347	385578	No hollows visible
136	60	Jarrah	6494349	385577	No hollows visible
137	65	Jarrah	6494352	385574	No hollows visible
138	70	Jarrah	6494362	385576	No hollows visible
139	60	Jarrah	6494389	385577	No hollows visible
140	51	Jarrah	6494412	385564	No hollows visible
141	55	Jarrah	6494420	385665	No hollows visible
142	55	Jarrah	6494473	385686	No hollows visible
143	60	Jarrah	6494524	385680	No hollows visible
144	75	Jarrah	6494545	385705	No hollows visible
145	55	Jarrah	6494532	385713	No hollows visible
146	51	Jarrah	6494531	385712	No hollows visible
147	65	Jarrah	6494520	385769	No hollows visible
148	100	Jarrah	6494466	385757	No hollows visible
149	60	Jarrah	6494448	385922	No hollows visible
150	55	Jarrah	6494424	385856	No hollows visible
151	55	Jarrah	6494422	385848	No hollows visible
152	60	Jarrah	6494417	385836	No hollows visible
153	80	Jarrah	6494458	385785	No hollows visible
154	60	Jarrah	6494467	385789	No hollows visible
155	60	Jarrah	6494452	385796	No hollows visible
156	55	Jarrah	6494404	385784	No hollows visible
157	65	Jarrah	6494409	385728	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
158	90	Jarrah	6494364	385697	Branch hollow possible
159	65	Jarrah	6494345	385704	No hollows visible
160	70	Jarrah	6494339	385718	Branch hollow possible
161	55	Jarrah	6494281	385704	No hollows visible
162	85	Jarrah	6494980	385115	No hollows visible
163	75	Jarrah	6494983	385114	No hollows visible
164	80	Jarrah	6494993	385104	No hollows visible
165	55	Jarrah	6494996	385199	No hollows visible
166	90	Jarrah	6494979	385254	Branch hollow possible
167	55	Jarrah	6495059	385078	No hollows visible
168	60	Jarrah	6495064	385075	No hollows visible
169	51	Jarrah	6495101	385089	No hollows visible
170	55	Jarrah	6495127	385058	No hollows visible
171	60	Jarrah	6495166	385099	No hollows visible
172	75	Marri	6495115	384967	No hollows visible
173	60	Marri	6495097	384960	No hollows visible
174	51	Marri	6495095	384960	No hollows visible
175	55	Marri	6495095	384959	No hollows visible
176	60	Marri	6495098	384958	No hollows visible
177	51	Marri	6495069	384967	No hollows visible
178	65	Marri	6495074	384972	No hollows visible
179	75	Marri	6495063	384965	No hollows visible
181	51	Jarrah	6494974	384840	No hollows visible
182	55	Marri	6495115	384930	No hollows visible
183	60	Marri	6495120	384924	No hollows visible
184	100	Jarrah	6495126	384926	Stag (dead) spout hollow possible
186	70	Marri	6495138	384913	Stag (dead) branch hollow possible
187	55	Marri	6495152	384927	No hollows visible
188	95	Marri	6495162	384909	No hollows visible
189	55	Marri	6495155	384897	No hollows visible
190	100	Tuart	6495124	384905	No hollows visible
191	80	Tuart	6495095	384880	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
192	85	Tuart	6495072	384869	No hollows visible
193	110	Tuart	6495056	384841	No hollows visible
194	100	Tuart	6495050	384814	No hollows visible
195	55	Tuart	6495051	384810	No hollows visible
196	65	Tuart	6495055	384809	No hollows visible
197	60	Tuart	6495066	384828	No hollows visible
198	60	Tuart	6495076	384810	No hollows visible
199	60	Tuart	6495081	384811	No hollows visible
200	65	Tuart	6495082	384819	No hollows visible
201	55	Tuart	6495087	384819	No hollows visible
202	80	Tuart	6495094	384819	No hollows visible
203	80	Tuart	6495107	384814	No hollows visible
204	60	Marri	6495089	384857	No hollows visible
205	55	Jarrah	6495153	384842	No hollows visible
206	100	Tuart	6495175	384812	No hollows visible
207	75	Tuart	6495180	384809	No hollows visible
208	70	Tuart	6495192	384827	No hollows visible
209	80	Tuart	6495252	384835	No hollows visible
210	100	Jarrah	6495317	384826	No hollows visible
211	60	Jarrah	6495208	385011	No hollows visible
212	60	Jarrah	6495214	385066	No hollows visible
213	90	Jarrah	6495235	385083	No hollows visible
214	110	Jarrah	6495239	385118	No hollows visible
215	60	Marri	6495289	385000	No hollows visible
217	80	Marri	6495279	384990	No hollows visible
218	51	Marri	6495283	384984	No hollows visible
219	60	Marri	6495284	384982	No hollows visible
220	51	Marri	6495379	384889	No hollows visible
222	80	Marri	6495426	384887	No hollows visible
223	110	Marri	6495444	384904	No hollows visible
225	80	Marri	6495464	384942	No hollows visible
226	65	Marri	6495464	384906	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
227	75	Marri	6495443	384853	Stage (dead). No hollows visible
228	60	Marri	6495442	384850	No hollows visible
229	150	Tuart	6495450	384804	Branch hollow possible
230	95	Tuart	6495483	384870	Trunk hollow possible
231	60	Tuart	6495499	384877	No hollows visible
232	120	Tuart	6495512	384886	No hollows visible
233	75	Tuart	6495536	384912	No hollows visible
234	65	Tuart	6495541	384917	No hollows visible
236	65	Marri	6495471	385037	No hollows visible
237	51	Marri	6495461	385036	No hollows visible
238	55	Marri	6495587	385047	No hollows visible
239	51	Marri	6495575	385044	No hollows visible
240	60	Marri	6495524	385077	No hollows visible
241	55	Marri	6495580	385088	No hollows visible
242	80	Tuart	6495527	384818	No hollows visible
243	80	Tuart	6495515	384810	No hollows visible
244	60	Tuart	6495576	384819	No hollows visible
245	51	Tuart	6495626	384866	No hollows visible
246	80	Marri	6495744	384834	No hollows visible
248	80	Marri	6495757	384824	No hollows visible
249	85	Marri	6495758	384855	Branch hollow possible
250	150	Jarrah	6495647	385047	Branch hollow possible
251	95	Marri	6495463	385199	No hollows visible
252	80	Marri	6495433	385207	No hollows visible
253	60	Marri	6495453	385189	No hollows visible
254	90	Marri	6495470	385235	No hollows visible
255	75	Jarrah	6495452	385310	No hollows visible
256	70	Jarrah	6495444	385333	No hollows visible
257	80	Jarrah	6495444	385336	No hollows visible
258	55	Jarrah	6495472	385387	No hollows visible
259	65	Jarrah	6495469	385429	Stag (dead) No hollows visible
260	80	Marri	6495468	385453	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
261	65	Jarrah	6495493	385465	No hollows visible
262	60	Jarrah	6495507	385459	No hollows visible
263	100	Jarrah	6495501	385531	Branch hollow possible
264	70	Jarrah	6495493	385536	No hollows visible
265	80	Jarrah	6495514	385550	No hollows visible
266	90	Jarrah	6495491	385719	No hollows visible
267	80	Jarrah	6495492	385770	No hollows visible
268	100	Jarrah	6495625	385679	No hollows visible
269	65	Jarrah	6495631	385629	No hollows visible
270	60	Jarrah	6495598	385609	No hollows visible
271	100	Jarrah	6495599	385585	No hollows visible
272	65	Jarrah	6495621	385547	No hollows visible
273	80	Jarrah	6495703	385516	No hollows visible
274	100	Jarrah	6495760	385546	Branch hollow possible
275	51	Jarrah	6495799	385546	No hollows visible
276	51	Jarrah	6495834	385537	No hollows visible
277	70	Jarrah	6495758	385477	No hollows visible
278	80	Jarrah	6495750	385480	No hollows visible
279	85	Marri	6495742	385475	Stag (dead) No hollows visible
280	150	Jarrah	6495681	385465	No hollows visible
281	80	Jarrah	6495689	385440	Stag (dead) No hollows visible
282	60	Jarrah	6495684	385436	No hollows visible
283	60	Marri	6495677	385441	No hollows visible
284	65	Jarrah	6495652	385458	No hollows visible
285	80	Jarrah	6495607	385486	No hollows visible
286	70	Jarrah	6495575	385426	No hollows visible
287	70	Jarrah	6495571	385418	No hollows visible
288	100	Jarrah	6495590	385419	No hollows visible
289	60	Jarrah	6495576	385395	No hollows visible
290	60	Jarrah	6495579	385394	No hollows visible
291	110	Jarrah	6495622	385409	No hollows visible
292	100	Jarrah	6495647	385381	Branch hollow possible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
293	51	Jarrah	6495699	385371	No hollows visible
294	60	Marri	6495718	385395	No hollows visible
295	130	Jarrah	6495714	385403	Branch hollow possible
296	55	Marri	6495714	385415	No hollows visible
297	55	Marri	6495713	385441	No hollows visible
298	65	Marri	6495765	385435	No hollows visible
299	80	Marri	6495763	385441	Branch hollow possible
300	65	Jarrah	6495764	385442	No hollows visible
301	65	Jarrah	6495759	385397	No hollows visible
302	60	Marri	6495759	385403	No hollows visible
303	70	Jarrah	6495759	385407	No hollows visible
304	60	Jarrah	6495762	385362	No hollows visible
305	55	Jarrah	6495773	385352	No hollows visible
306	80	Marri	6495812	385342	No hollows visible
307	100	Marri	6495822	385304	No hollows visible
308	60	Marri	6495827	385260	No hollows visible
309	85	Jarrah	6495797	385259	No hollows visible
310	60	Marri	6495789	385241	No hollows visible
311	65	Marri	6495770	385221	No hollows visible
312	100	Marri	6495806	385227	No hollows visible
313	65	Marri	6495820	385227	No hollows visible
314	60	Marri	6495826	385203	No hollows visible
315	65	Jarrah	6495803	385192	No hollows visible
316	55	Marri	6495796	385191	No hollows visible
317	55	Marri	6495810	385186	No hollows visible
318	51	Marri	6495818	385168	No hollows visible
319	55	Marri	6495825	385155	No hollows visible
320	51	Marri	6495807	385139	No hollows visible
321	60	Jarrah	6495799	385148	No hollows visible
322	60	Marri	6495795	385154	No hollows visible
323	60	Jarrah	6495789	385131	No hollows visible
324	51	Marri	6495758	385126	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
325	85	Jarrah	6495798	385111	No hollows visible
326	51	Marri	6495804	385099	No hollows visible
327	80	Jarrah	6495792	385087	No hollows visible
328	50	Marri	6495810	385082	No hollows visible
329	55	Marri	6495760	385095	No hollows visible
330	60	Marri	6495751	385108	No hollows visible
331	80	Jarrah	6495725	385077	No hollows visible
332	60	Marri	6495742	385136	No hollows visible
333	51	Marri	6495742	385142	No hollows visible
334	51	Marri	6495751	385159	No hollows visible
335	65	Marri	6495750	385192	No hollows visible
336	55	Marri	6495718	385201	No hollows visible
337	60	Marri	6495717	385183	No hollows visible
338	55	Marri	6495713	385179	No hollows visible
339	60	Marri	6495715	385260	No hollows visible
340	70	Marri	6495711	385264	No hollows visible
341	65	Marri	6495757	385305	No hollows visible
342	51	Marri	6495645	385294	No hollows visible
343	60	Marri	6495604	385316	No hollows visible
344	60	Marri	6495599	385320	No hollows visible
345	70	Marri	6495598	385324	No hollows visible
346	60	Marri	6495571	385290	No hollows visible
347	60	Marri	6495577	385287	No hollows visible
348	55	Marri	6495588	385280	No hollows visible
349	65	Marri	6495590	385268	No hollows visible
350	51	Marri	6495577	385278	No hollows visible
351	60	Jarrah	6495529	385152	No hollows visible
352	55	Marri	6495521	385147	No hollows visible
353	110	Jarrah	6495525	385141	No hollows visible
354	55	Marri	6495547	385135	No hollows visible
355	51	Marri	6495551	385135	No hollows visible
356	80	Marri	6495557	385156	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
357	80	Marri	6495551	385159	No hollows visible
358	70	Marri	6495551	385163	No hollows visible
359	65	Marri	6495559	385200	No hollows visible
360	100	Marri	6495553	385197	No hollows visible
361	70	Jarrah	6495609	385259	No hollows visible
362	55	Marri	6495627	385237	No hollows visible
363	65	Jarrah	6495623	385231	No hollows visible
364	60	Marri	6495659	385250	No hollows visible
365	75	Marri	6495661	385255	No hollows visible
366	60	Marri	6495663	385259	No hollows visible
367	75	Jarrah	6495700	385157	No hollows visible
368	51	Marri	6495714	385135	No hollows visible
369	60	Marri	6495704	385135	No hollows visible
370	80	Jarrah	6495688	385089	No hollows visible
371	55	Marri	6495679	385083	No hollows visible
372	80	Jarrah	6495698	385074	No hollows visible
373	70	Jarrah	6495713	385104	No hollows visible
374	70	Marri	6495671	385131	Stag (dead) No hollows visible
375	60	Marri	6495667	385127	Stag (dead) No hollows visible
376	60	Marri	6495663	385122	No hollows visible
377	51	Jarrah	6495658	385121	No hollows visible
378	70	Marri	6495650	385103	Branch hollow possible
379	55	Marri	6495646	385097	No hollows visible
380	60	Marri	6495645	385097	No hollows visible
381	60	Marri	6495609	385115	No hollows visible
382	70	Jarrah	6495609	385111	No hollows visible
383	60	Marri	6495596	385108	No hollows visible
384	70	Jarrah	6495596	385119	No hollows visible
385	51	Marri	6495619	385141	No hollows visible
386	70	Jarrah	6495630	385145	No hollows visible
387	51	Marri	6495634	385157	No hollows visible
388	51	Marri	6495631	385168	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
389	80	Jarrah	6495627	385171	No hollows visible
390	70	Marri	6495582	385155	No hollows visible
391	51	Jarrah	6495570	385128	No hollows visible
392	70	Jarrah	6495563	385127	No hollows visible
393	55	Jarrah	6495455	386073	No hollows visible
394	80	Jarrah	6495443	386056	No hollows visible
395	55	Jarrah	6495479	386047	No hollows visible
396	70	Jarrah	6495470	386036	No hollows visible
397	70	Jarrah	6495488	386033	No hollows visible
398	65	Jarrah	6495493	386037	No hollows visible
399	55	Jarrah	6495500	386028	No hollows visible
400	65	Jarrah	6495496	386024	No hollows visible
401	150	Jarrah	6495466	386003	Stag (dead) No hollows visible
402	70	Jarrah	6495449	386026	Stag (dead) No hollows visible
403	80	Jarrah	6495469	385954	Branch hollow possible
404	60	Jarrah	6495471	385946	No hollows visible
405	55	Jarrah	6495514	385954	No hollows visible
406	80	Jarrah	6495521	385954	No hollows visible
407	70	Jarrah	6495507	385876	No hollows visible
408	90	Jarrah	6495529	385876	Branch hollow possible
409	90	Jarrah	6495539	385874	No hollows visible
410	70	Jarrah	6495624	385746	No hollows visible
411	70	Jarrah	6495721	385562	No hollows visible
412	100	Jarrah	6495785	385646	No hollows visible
413	60	Jarrah	6495800	385670	No hollows visible
414	70	Jarrah	6495803	385682	No hollows visible
415	100	Jarrah	6495767	385716	Trunk hollow possible
416	70	Jarrah	6495718	385730	No hollows visible
417	80	Jarrah	6495638	385917	No hollows visible
418	51	Jarrah	6495651	385886	No hollows visible
419	70	Jarrah	6495641	385860	Stag (dead) No hollows visible
420	90	Jarrah	6495655	385830	No hollows visible

Waypoint	DBH (cm)	Tree sp.	Easting	Northing	Hollows
421	70	Jarrah	6495676	385840	No hollows visible
422	51	Jarrah	6495680	385797	No hollows visible
423	85	Jarrah	6495693	385793	Branch hollow possible
424	60	Jarrah	6495792	385788	Branch hollow possible
425	90	Jarrah	6495692	385889	No hollows visible
426	140	Jarrah	6495686	385926	Branch hollow possible
427	65	Jarrah	6495761	385888	No hollows visible
428	75	Jarrah	6495762	385881	No hollows visible
429	60	Jarrah	6495779	385865	No hollows visible
430	60	Jarrah	6495799	385853	No hollows visible
431	90	Jarrah	6495792	385934	No hollows visible
432	100	Jarrah	6495784	385944	No hollows visible
433	85	Jarrah	6495767	385974	No hollows visible
434	90	Jarrah	6495660	385993	No hollows visible
435	130	Jarrah	6495568	385986	Branch hollow possible
436	65	Jarrah	6495543	386006	No hollows visible
437	70	Jarrah	6495553	386047	No hollows visible
438	75	Jarrah	6495615	386038	No hollows visible
439	100	Jarrah	6495756	386116	No hollows visible
440	65	Jarrah	6495699	386098	No hollows visible
441	75	Jarrah	6495697	386107	No hollows visible
442	55	Jarrah	6495569	386084	No hollows visible
443	60	Jarrah	6495787	386189	No hollows visible

Appendix D: GSM raw data

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
ELA Ecologist – N. Thompson														
001	6494114	385994	10	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
002	6494090	385995	30	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	2.00	*L. hermaphrodita*	
003	6493997	385982	60	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	1.00	*L. hermaphrodita*	
004	6493906	385971	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
005	6493803	385981	60	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	VG	4.00	*L. hermaphrodita*	
006	6493753	385910	20	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
007	6493895	385867	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	VG	0.00		
008	6493995	385883	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
009	6494075	385885	15	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	1.00	*L. hermaphrodita*	
010	6494127	385880	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	2.00	*L. hermaphrodita*	
011	6494123	385801	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
012	6494046	385786	60	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	2.00	*L. hermaphrodita*	
013	6493944	385788	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	VG	3.00	*L. hermaphrodita*	

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
014	6493846	385831	8	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	2.00	*L. hermaphrodita*	
015	6493701	385842	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
016	6493672	385781	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
017	6493776	385731	15	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
018	6493910	385681	70	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	2.00	*L. hermaphrodita*	
019	6494038	385692	30	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
020	6494125	385692	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	1.00	*L. hermaphrodita*	
021	6494117	385586	90	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	CD	0.00		
022	6493999	385640	10	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
023	6493834	385654	40	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	VG	1.00	*L. hermaphrodita*	
024	6493743	385692	60	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	1.00	*L. hermaphrodita*	
025	6493677	385709	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
026	6493588	385628	15	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	0.00		
027	6493691	385581	25	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	Yes	P	2.00	*L. hermaphrodita*	

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
028	6493861	385559	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	1.00	*L. hermaphrodita*	
029	6493997	385532	15	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	P	0.00		
030	6494121	385521	10	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	4.00	*L. hermaphrodita*	
031	6494079	385466	35	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	P	3.00	*L. hermaphrodita*	
032	6493989	385469	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	P	0.00		
033	6493890	385499	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	No	G	18.00	*L. hermaphrodita*	
034	6493731	385511	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	Yes	G	0.00		
035	6493580	385544	20	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
036	6493572	385478	95	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	CD	0.00		
037	6493693	385453	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	0.00		
038	6493706	385366	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
039	6493708	385285	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	0.00		
040	6493689	385244	90	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	CD	1.00	*L. hermaphrodita*	
041	6493660	385350	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	0.00		
042	6493631	385422	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
043	6493612	385353	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
044	6493586	385320	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
045	6493611	385261	15	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	1.00	*L. hermaphrodita*	
046	6493852	385434	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	2.00	*L. hermaphrodita*	
047	6493894	385333	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	0.00		
048	6493952	385264	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	0.00		
049	6494067	385242	50	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	2.00	*L. hermaphrodita*	
050	6494007	385334	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	0.00		
051	6494092	385370	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	2.00	*L. hermaphrodita*	
052	6493976	385405	15	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	VG	1.00	*L. hermaphrodita*	
053	6495434	385698	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00	*L. hermaphrodita*	
054	6495322	385692	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00	*L. hermaphrodita*	
055	6495234	385676	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00	*L. hermaphrodita*	

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
056	6495191	385660	20	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00	*L. hermaphrodita*	
057	6495132	385663	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00	*L. hermaphrodita*	
058	6495174	385587	15	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00	*L. hermaphrodita*	
059	6495265	385579	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	2.00	*L. maritima*	10
060	6495358	385597	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	1.00	*L. maritima*	5
061	6495431	385554	10	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
062	6495410	385512	30	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
063	6495335	385538	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	3.00	*L. maritima*	20
064	6495254	385540	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
065	6495201	385554	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	1.00	*L. maritima*	5
066	6495082	385571	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
067	6495083	385529	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	1.00	*L. maritima*	5
068	6495109	385507	20	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	2.00	*L. maritima*	15
069	6495264	385466	50	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	2.00	*L. maritima*	10
070	6495404	385421	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
071	6495303	385356	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
072	6495206	385400	30	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	CD	0.00		
073	6495103	385455	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	1.00	*L. maritima*	10
074	6495126	385389	10	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
075	6495163	385324	75	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	CD	0.00		
076	6495140	385296	5	1-2◦		Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
077	6495088	385331	0	1-2◦		Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
078	6495367	385274	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
079	6495403	385735	25	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	1.00	*L. maritima*	5
080	6495347	385741	40	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
081	6495254	385765	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
082	6495189	385748	80	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	CD	0.00		
083	6495058	385778	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
084	6495090	385852	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
085	6495137	385842	30	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	2.00	*L. maritima*	10
086	6495184	385834	50	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	CD	2.00	*L. maritima*	15
087	6495356	385806	85	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	CD	0.00		
088	6495421	385853	10	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
089	6495360	385902	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
090	6495293	385912	60	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
091	6495205	385926	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
092	6495113	385933	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
093	6495063	385949	2	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
094	6495094	386048	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
095	6495230	386042	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
096	6495317	385976	10	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
097	6495438	386003	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
098	6495371	386083	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
099	6495314	386110	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
100	6495254	386130	5	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
101	6495200	386159	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
102	6495110	386145	20	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	P	0.00		
103	6495058	386153	0	N/A	N/A	Flat	yellow grey sand	light brown sand	N/A	no	G	0.00		
ELA Ecologist – K. Zeehandelaar														
001	6494315	385730	10	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	0.00		
002	6494365	385738	40	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
003	6494383	385696	20	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
004	6494365	385655	50	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	0.00		
005	6494335	385633	5	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	2.00	*L. hermaphrodita*	
006	6494299	385590	20	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	5.00	*L. hermaphrodita*	
007	6494350	385568	0	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	2.00	*L. hermaphrodita*	
008	6494401	385593	40	1-2◦		Flat	grey yellow sand	brown sand	none	<5 years	VG	8.00	*L. hermaphrodita*	
009	6494498	385667	90	1-2◦		Flat	grey yellow sand	brown sand	none	<5 years	G	0.00		
010	6494553	385736	2	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	5.00	*L. hermaphrodita*	
011	6494517	385789	60	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
012	6494507	385868	5	3-9◦		Upper slope	grey sand	brown sand	none	<5 years	VG	2.00	*L. hermaphrodita*	
013	6494473	385896	40	3-9◦	E	midslope	grey sand	brown sand	none	<5 years	VG	3.00	*L. hermaphrodita*	

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
014	6494402	385921	60	3-9◦	E	midslope	grey sand	brown sand	none	2-5	VG	1.00	*L. hermaphrodita*	
015	6494309	385961	5	3-9◦	E	midslope	grey sand	brown sand	none	2-6	VG	0.00		
016	6494276	385984	50	3-9◦	E	midslope	grey sand	brown sand	none	2-7	VG	5.00	*L. hermaphrodita*	
017	6494220	385991	5	1-2◦	E	midslope	grey sand	brown sand	none	2-8	VG	2.00	*L. hermaphrodita*	
018	6494195	385952	70	1-2◦	E	midslope	grey sand	brown sand	none	2-9	VG	0.00		
019	6494168	385895	85	1-2◦	E	midslope	grey sand	brown sand	none	2-10	VG	5.00	*L. hermaphrodita*	
020	6494176	385826	10	1-2◦	E	midslope	grey sand	brown sand	none	2-11	VG	1.00	*L. hermaphrodita*	
021	6494206	385755	2	1-2◦	E	Mid-upper slope	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
022	6494263	385812	70	1-2◦	E	upper slope	grey sand	brown sand	none	<5 years	VG	16.00	*L. hermaphrodita*	
023	6494344	385868	10	3-9◦	E	mid-upper slope	grey sand	brown sand	none	<5 years	VG	0.00		
024	6494326	385791	-	1-2◦	E	mid slope	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
025	6494158	385583	50	1-2◦	W	Flat	grey sand	brown sand	none	<5	VG	4.00	*L.*	

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
										years			*hermaphrodita*	
026	6494206	385533	50	1-2◦	W	Flat	grey sand	brown sand	none	<5 years	VG	0.00		
027	6494212	385435	20	1-2◦	W	Flat	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
028	6494251	385359	40	1-2◦		Flat	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
029	6494276	385295	40	3-9◦	W	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
030	6494346	385330	70	1-2◦	W	mid slope	grey sand	brown sand	none	<5 years	VG	3.00	*L. hermaphrodita*	
031	6494379	385391	10	1-2◦		mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
032	6494400	385461	50	1-2◦		mid slope	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
033	6494425	385547	40	1-2◦		mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
034	6494488	385563	10	1-2◦		mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
035	6494518	385501	70	1-2◦		mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
036	6494508	385440	40	1-2◦		mid slope	grey sand	brown sand	none	<5	VG	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
										years				
037	6494513	385394	70	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
038	6494548	385345	0	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
039	6494536	385299	5	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
040	6494484	385288	10	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
041	6494444	385305	70	1-2◦	SE	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
042	6494400	385312	15	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
043	6494370	385345	5	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	1.00	*L. hermaphrodita*	
044	6494333	385386	80	1-2◦	SE	mid slope	grey sand	brown sand	none	<5 years	VG	2.00	*L. hermaphrodita*	
045	6494300	385421	85	1-2◦	SE	mid slope	grey sand	brown sand	none	<5 years	VG	4.00	*L. hermaphrodita*	
046	6494279	385471	80	1-2◦		flat	grey sand	brown sand	none	<5 years	VG	2.00	*L. hermaphrodita*	
047	6494192	385472	40	1-2◦		flat	grey sand	brown sand	none	<5	VG	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
										years				
048	6494154	385441	60	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
049	6494110	385456	70	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	2.00	*L. hermaphrodita*	
050	6494126	385514	20	1-2◦	S	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
051	6495505	385446	10	3-9◦	E	mid slope	grey sand	brown soil	none	<5 years	G	0.00		
052	6495516	385520	15	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
053	6495534	385570	5	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
054	6495517	385626	40	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
055	6495544	385691	10	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
056	6495494	385716	<1	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
057	6495553	385738	10	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G		*L. maritima*	15%
058	6495601	385713	10	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5	G	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
										years				
059	6495660	385678	0	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
060	6495737	385677	70	3-9◦	S	mid slope	grey sand	brown sand	none	<5 years	G	0.00		
061	6495802	385646	30	3-9◦	S	upper slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
062	6495749	385597	30	1-2◦	S	upper slope	grey sand	brown sand	none	<5 years	G	0.00		
063	6495698	385592	10	3-9◦	S	upper slope	grey sand	brown sand	none	<5 years	G	0.00		
064	6495642	385595	95	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
065	6495594	385588	30	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
066	6495650	385541	10	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
067	6495699	385515	5	3-9◦	S	mid slope	grey sand	Brown soil	none	<5 years	G	0.00		
068	6495746	385459	10	3-9◦	S	mid slope	grey sand	Brown soil	none	<5 years	G	0.00		
069	6495806	385448	20	3-9◦	S	upper	grey yellow sand	Brown soil	none	<5	G		*L. maritima*	5%

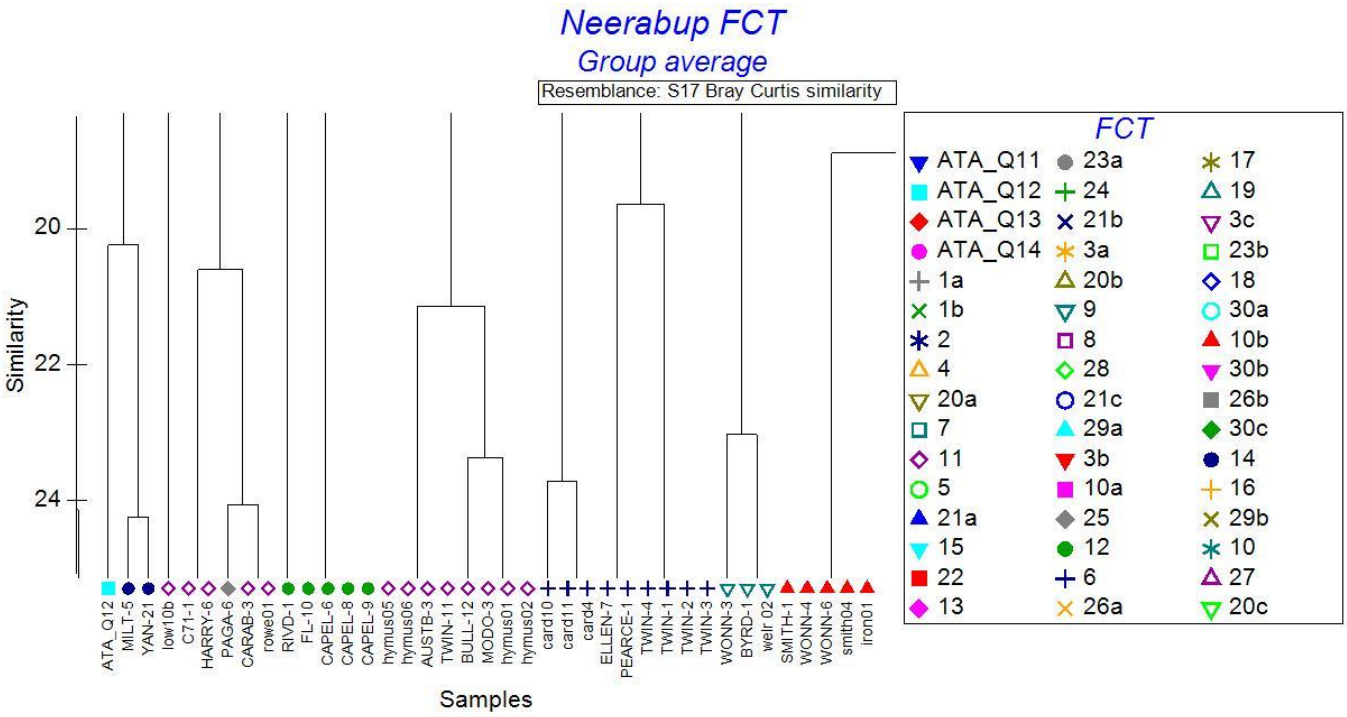
Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
						slope				years				
070	6495768	385432	5	3-9◦	S	upper slope	grey sand	Brown soil	none	<5 years	G	0.00		
071	6495709	385439	5	3-9◦	S	mid slope	grey sand	Brown soil	none	<5 years	G	0.00		
072	6495694	385475	15	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
073	6495645	385484	25	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
074	6495609	385493	30	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
075	6495563	385471	20	3-9◦	S	mid slope	grey yellow sand	Brown soil	none	<5 years	G	0.00		
076	6495454	386082	5	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	VG-G	0.00		
077	6495524	386073	5	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	VG-G	0.00		
078	6495589	386070	15	3-9◦	E	mid slope	grey sand	brown sand	none	<5 years	VG	0.00		
079	6495649	386027	40	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	VG	0.00		
080	6495732	385988	60	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5	VG-	0.00		

Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
										years	G			
081	6495787	385899	15	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
082	6495762	385853	30	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
083	6495786	385777	30	3-9◦	SE	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
084	6495714	385749	0	3-9◦	SE	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
085	6495671	385838	80	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
086	6495650	385818	10	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G		*L. maritima*	5%
087	6495608	385858	90	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G		*L. maritima*	10%
088	6495541	385835	15	1-2◦	SE	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
089	6495489	385887	10	1-2◦		upper slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
090	6495449	385895	40	1-2◦		upper slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
091	6495521	385934	30	1-2◦	E	upper	grey yellow sand	brown sand	none	<5	G	0.00		

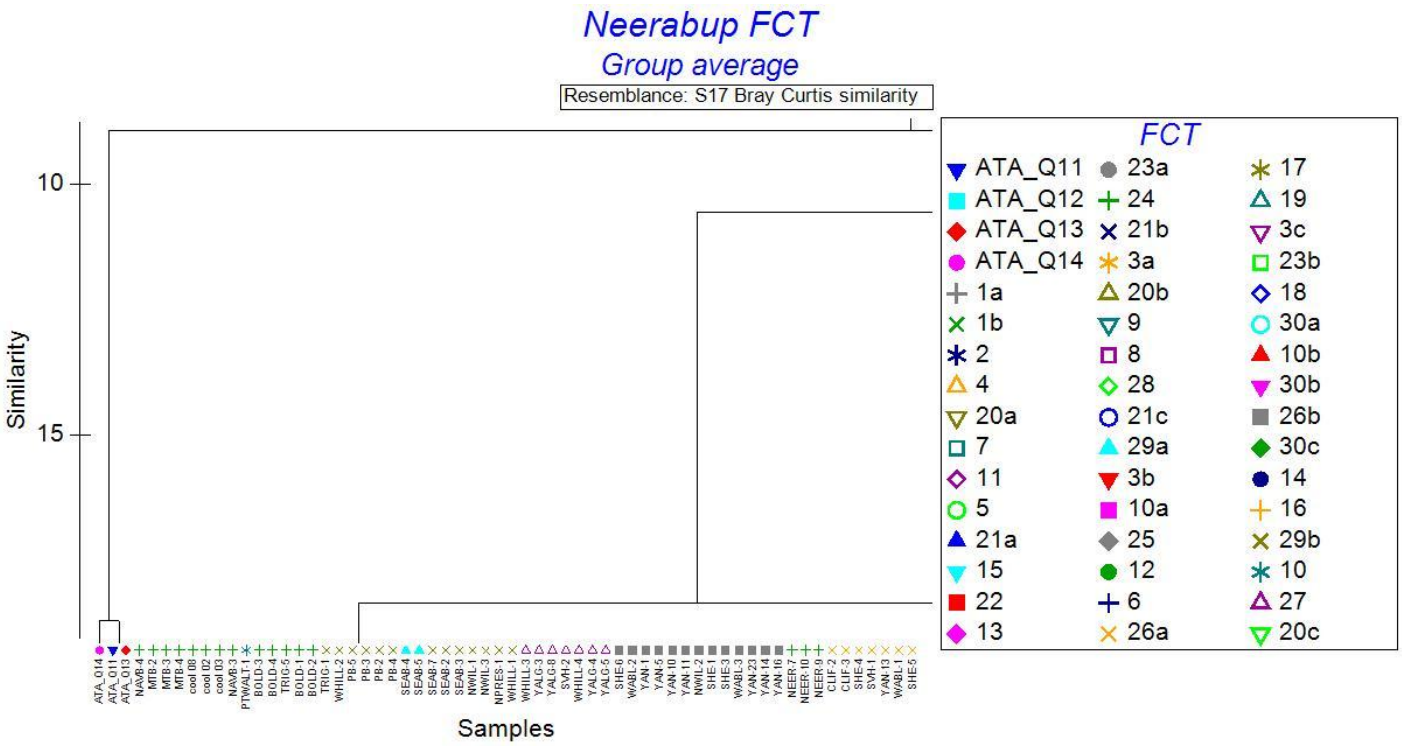
Waypoint	Easting	Northing	Bare ground (%)	Slope	Aspect	Position in landscape	Surface soil	Sub-surface soil	Exposed rock	Recent burn	Vegetation condition	Lomandra count	Lomandra sp.	% cover (*l. Maritima* only)
						slope				years				
092	6495603	385921	15	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
093	6495681	385913	10	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
094	6495708	385959	50	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
095	6495658	385993	15	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
096	6495607	386000	80	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G		*L. maritima*	5%
097	6495557	386024	75	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
098	6495497	386027	20	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		
099	6495447	386030	20	3-9◦	E	mid slope	grey yellow sand	brown sand	none	<5 years	G	0.00		

Appendix E: Dendrogram from the cluster analysis

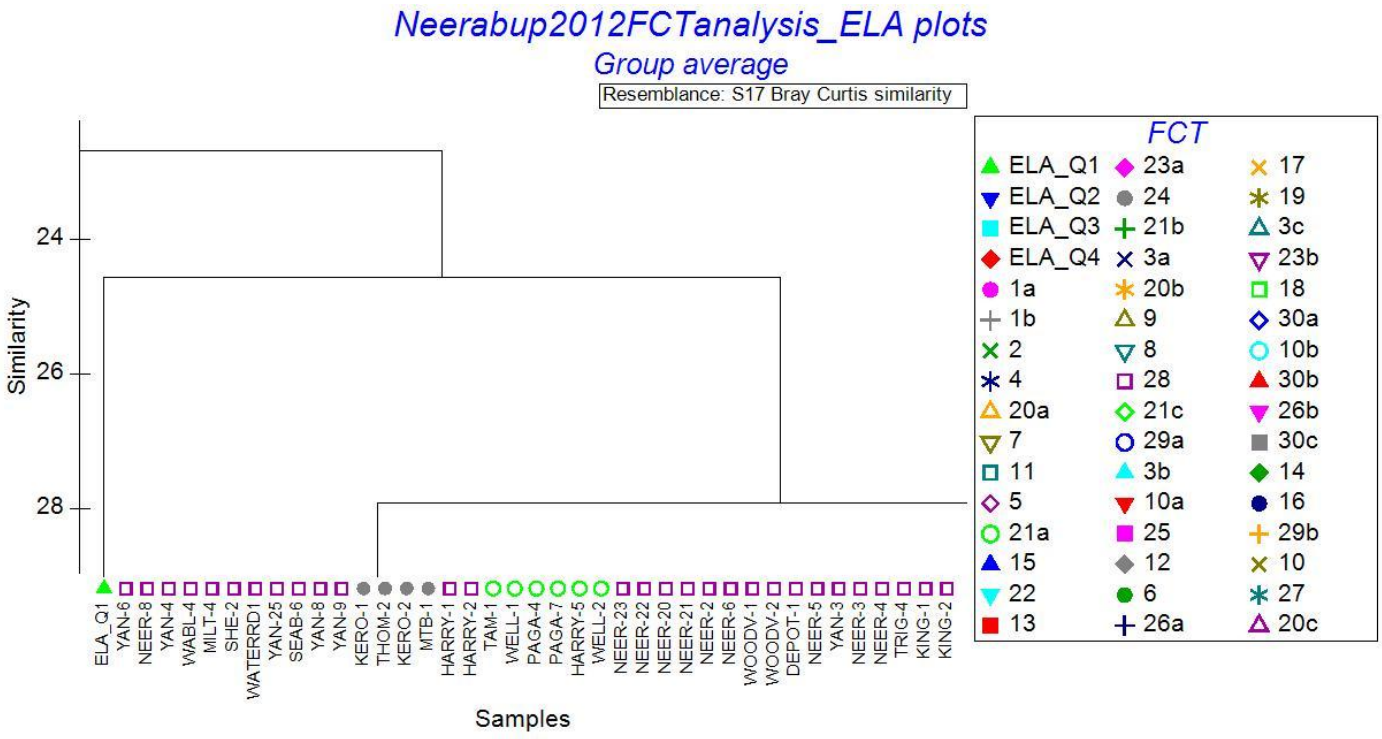
The dendrogram presented here are zoomed section of one overall dendrogram that displayed agglomerative clustering of the sites and groups using data for quadrats sampled in this study, the quadrat sampled by ELA and ATA Environmental (2007) for the site, and quadrats sampled by Gibson et al. (1994) to develop the FCTs.



Dendrogram 1: this displays where ATA Environmental (2007) Q12 is grouped with low similarity to a number of Gibson quadrats.



Dendrogram 2: this displays where ATA Environmental (2007) Q11, Q13 and Q14 are grouped with low similarity to a number of Gibson quadrats across a wide range of FCTs.



Dendrogram 3: this displays where ELA Q1, Q2, Q3 and Q4 are grouped with low similarity to a number of Gibson quadrats across a wide range of FCTs.

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