Detailed Flora and Vegetation Assessment

Lot 822 Youle-Dean Road, Brabham

Project No: EP17-131(27)

Prepared for Peet Limited
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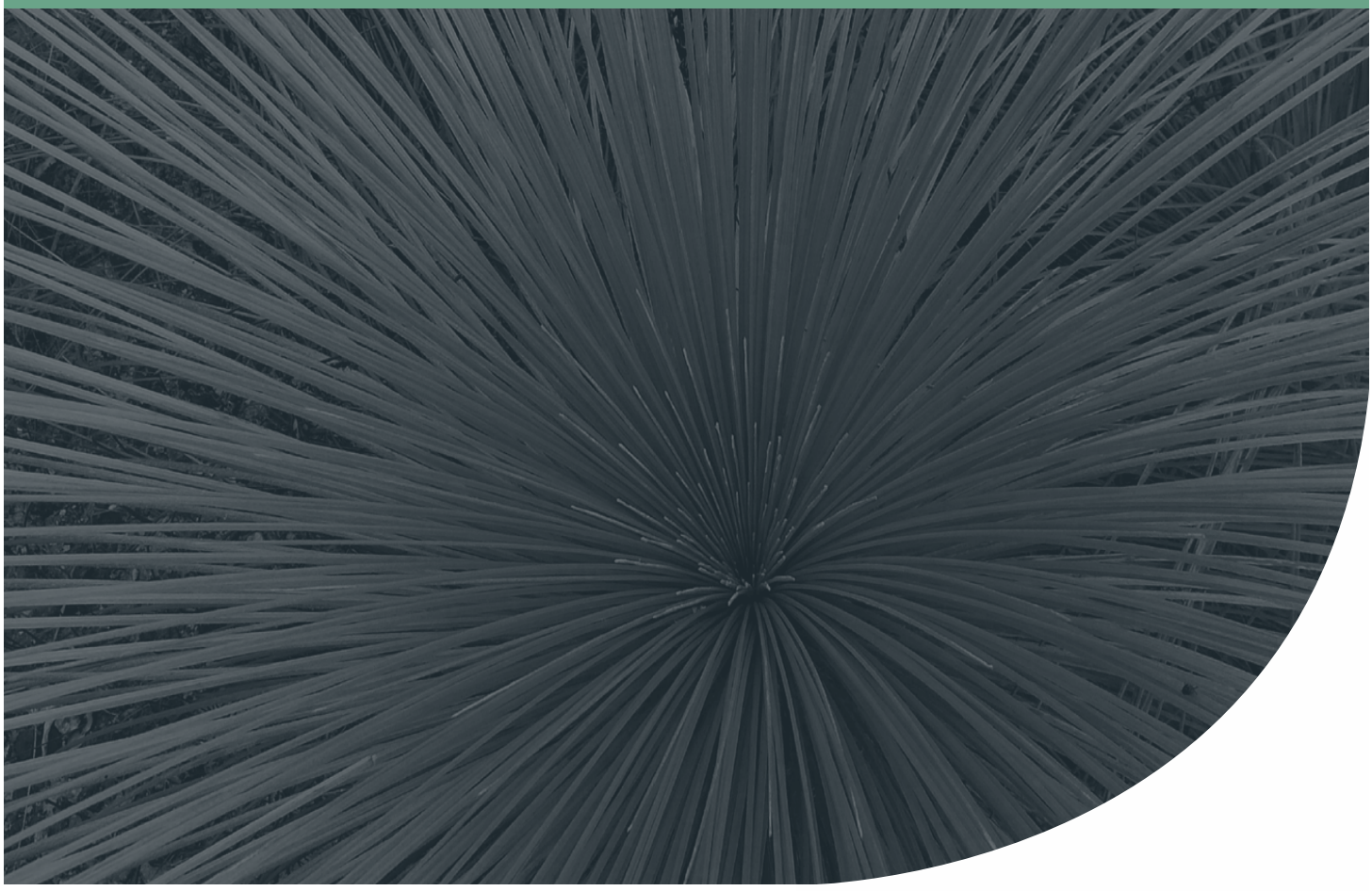

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Executive Summary

Peet Limited engaged Emerge Associates to conduct a detailed flora and vegetation assessment to provide information on the flora and vegetation values within Lot 822 Youle-Dean Road in Brabham (referred to herein as the 'site').

As part of the assessment a desktop review of relevant background information was completed and a field survey was undertaken on 29 and 30 September, 27 October 2021 and 10 January and 24 March 2022. During the field survey an assessment was made on the type, condition and values of vegetation across the site.

Outcomes of the survey include the following:

- Non-native vegetation and cleared bare ground is present across 29% of the site.
- Remnant native vegetation is present across 71% of the site in varying levels of condition.
- A total of 103 native and 53 non-native (weed) species were recorded in the site.
- One priority flora species, *Verticordia lindleyi* subsp. *lindleyi* (P4) was recorded within the site.
- No other threatened or priority species are considered likely to occur.
- The vegetation within the site was classified into the following nine plant communities that are present in 'very good', 'good', 'degraded' and 'completely degraded' condition.
    - Plant community **BAfCcEm** includes the highest quality vegetation and is present in the southern half of the site. This community showed high similarity to multiple 'floristic community types' (FCTs) but was considered to represent FCT 21a 'Central *Banksia attenuata – Eucalyptus marginata* woodlands'.
    - Plant communities **Ep**, **Ms** and **VdSi** are present as previously disturbed areas within the **BAfCcEm** vegetation, and as such represent altered forms of FCT 21a.
    - Plant community **Mr** is present in the northern most portion of the site and represents FCT 13 'Deeper wetlands on heavy soils'.
    - Plant communities **CcMp** and **ErMp** occur within the central portion of the site and were determined to represent degraded forms of FCT 11 'wet forests and woodlands'.
    - Plant community **Mp** consists of a canopy of native trees over introduced pasture grasses that was too degraded to assign to an FCT.
    - Cleared vegetation that contains bare ground and non-native vegetation occurs across the remainder of the site.
- The **BAfCcEm** vegetation represents the 'banksia woodlands of the Swan Coastal Plain' 'threatened ecological community' (TEC) and state listed 'priority ecological community' (PEC) of the same name (P3) (25.92 ha in total).

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Abbreviation Tables

Table A1: Abbreviations – Organisations

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

Table A2: Abbreviations – General terms

General terms	
CCW	Conservation category wetland
DSP	District Structure Plan
ESA	Environmentally sensitive area
FCT	Floristic community type
IBRA	Interim Biogeographic Regionalisation of Australia
MUW	Multiple use wetland
NVIS	National Vegetation Inventory System (ESCAVI 2003)
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
P5	Priority 5
PEC	Priority ecological community
REW	Resource enhancement wetland
T	Threatened
TEC	Threatened ecological communities
UFI	Unique feature identifier

Table A3: Abbreviations – Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
BC Act	*Biodiversity Conservation Act 2016*
BC Regs	Biodiversity Conservation Regulations 2018

Table A4: Abbreviations – Units of measurement

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

1 Introduction

1.1 Project background

Emerge Associates (Emerge) were engaged by Peet Limited to characterise the flora and vegetation values within Lot 822 Youle-Dean Road in Brabham (referred to herein as the 'site'). This lot is located approximately 17 kilometres (km) north-east of the Perth Central Business District within the City of Swan.

The site is approximately 109.8 hectares (ha) in size and is bounded by bushland and a historical airstrip to the east, Youle-Dean Road to the north, Isoodon Street to the west and bushland to the south. The location and extent of the site is shown in **Figure 1**.

1.2 Purpose and scope of work

The scope of work was specifically to undertake a flora and vegetation assessment within the site to the standard required of a detailed survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2016).

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

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for threatened flora species and ecological communities.
- A field survey to record a comprehensive list of flora species and assess vegetation type and condition.
- Mapping of plant communities, vegetation condition and conservation significant flora and vegetation.
- Identification of potential habitat for conservation significant flora and vegetation and an assessment of likelihood of occurrence.
- Documentation of the desktop assessment, methodology, field survey and results into a report.

2 Environmental Context

2.1 Climate

Climate influences the types of vegetation that grow in a region and the life cycles of the flora present. Therefore, it is critical for a flora and vegetation survey to respond appropriately to climatic conditions to ensure that surveys are conducted during times when flora species are easiest to detect and identify.

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

An average of 752.2 millimetres (mm) of rainfall is recorded annually from the Whiteman Park weather station (no. 9263), which is the closest weather station, located approximately 1 km from the site. The majority of this rainfall is received between the months of May and September. Mean maximum temperatures at the Millendon weather station, which is the nearest temperature recording station approximately 5 km north-east of the site, range from 18.1°C in July to 32.2°C in January, while mean minimum temperatures range from 6.3°C in June to 17.1°C in February (BoM 2022).

A total of 377.5 mm of rain was recorded from May to September 2021 prior to the survey, which is approximately 68% of the mean of 556 mm for this period (BoM 2022). Although lower than the mean this amount of rainfall was considered to have been sufficient to promote the flowering and emergence of native flora.

2.2 Geomorphology and soils

Landform and soils influence vegetation types at regional and local scales. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area. The Swan Coastal Plain is approximately 500 km long and 20 to 30 km wide and is roughly bound by the Indian Ocean to the west and the Darling Scarp to the east. Broadly the Swan Coastal Plain consists of two sedimentary belts of different origin. Its eastern side comprises the Pinjarra Plain which formed from the deposition of alluvial material washed down from the Darling Scarp, while its western side comprises three dune systems that run roughly parallel to the Indian Ocean coastline (Seddon 2004). These dune systems, referred to as Quindalup, Spearwood and Bassendean associations, represent a succession of coastal deposition that has occurred since the late Quaternary period (approximately two million years ago) (Kendrick *et al.* 1991) and, as a result, they contain soils at different stages of leaching and formation.

Examination of broad scale soil mapping places the site within the within the Southern River association of the Bassendean dunes (Churchward and McArthur 1980). The Southern River association is described as comprising a sandplain with low dunes and many intervening swamps, iron and humus podzols, peats and clays.

The soil types mapped within the site are shown in **Figure 2**.

The site is not known to contain any restricted landforms or unique geological features.

2.3 Topography

The elevation of the site ranges from 22 m in relation to the Australian height datum (mAHD) on the south eastern side of the site to 26 mAHD on the south western side of the site (DoW 2008) (**Figure 2**).

2.4 Hydrology and wetlands

Wetlands are areas of seasonally, intermittently or permanently waterlogged land such as poorly drained soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetlands Advisory Committee 1977). Wetlands can be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al.* 1996).

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

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

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

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) shows the following four wetland or water related features occur within the site:

- Four earth dams
- Two minor drains.

The Department of Biodiversity, Conservation and Attractions (DBCA) has developed the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2021). This dataset maps geomorphic wetland features and classifies them based on their landform shape and water permanence. Each feature is assigned to one of three management categories which guides land use and conservation.

A review of the *Geomorphic Wetlands, Swan Coastal Plain* dataset indicated that a 'resource enhancement' category wetland (unique feature identifier (UFI) 8807) occurs within the north-eastern portion of the site and extends further north outside of the site (DBCA 2021). Another 'resource enhancement' category wetland feature (UFI 8814) occurs in the centre of the site. Both

features are classified as sumpland wetlands. The locations of the geomorphic wetlands in the site are shown in **Figure 2**.

2.5 Regional vegetation

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides Australia into floristic subregions (Environment Australia 2000).

The site is contained within the Swan Coastal Plain IBRA region and within the 'SWA02' or Perth subregion. The Perth subregion is characterised by mainly banksia low woodland on leached sands with melaleuca swamps where ill-drained; and woodland of *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Corymbia calophylla* (marri) on less leached soils (Beard 1990). This subregion is recognised as a biodiversity hotspot and contains a wide variety of endemic flora and vegetation types.

Variations in native vegetation can be further classified based on regional vegetation mapping. Heddle *et al.* (1980) mapping shows the site as comprising the 'Southern River' complex, which is described as comprising open woodland of *Corymbia calophylla, Eucalyptus marginata* and *Banksia* spp. with fringing woodland of *Eucalyptus rudis* and *Melaleuca rhaphiophylla* along creek beds.

The Southern River complex was determined to have 18.4% of its pre-European extent remaining in 2018, of which 1.4% was protected for conservation purposes (Government of Western Australia 2019).

2.6 Historical land use

Review of historical images available from 1953 onwards shows that portions of the site were cleared of native vegetation prior to this time, particularly in the northern portion of the site and for construction of the two airstrips in the site (WALIA 2022). The site was commissioned as a military airfield in 1944. After the war, the site was used for motor racing until 1969 when it was reactivated as a military base (PGV Environmental 2013). Excepting the intersecting airstrips, the southern portion of the site retained fairly intact vegetation from 1953 but was subsequently subject to scattered clearing between 1965 to 1979 and 1985 to 1989. Since this time the vegetation has remained relatively stable, with some of the areas of clearing showing evidence of recolonisation in more recent aerials. From 2015, additional clearing is visible in the northern portion of the site associated with the residential development occurring to the north of the site and the expansion of Youle-Dean Road.

2.7 Conservation significant values

2.7.1 Threatened and priority flora

Certain flora taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Threatened flora species listed under the EPBC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia flora species may also be classed as 'threatened' under *the Biodiversity Conservation Act 2016* (BC Act). Similarly, it is an offence to 'take' or 'disturb' threatened flora listed under the BC Act without Ministerial approval.

Flora species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Flora List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes.

Further information on threatened and priority species and their categories is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.2.1**).

2.7.2 Threatened and priority ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat. An ecological community's structure, composition and distribution are influenced by environmental factors such as soil type, position in the landscape, altitude, climate and water availability (DAWE 2021a). 'Threatened ecological communities' (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under the EPBC Act. Similar to flora species, TECs listed under the EPBC Act are assigned a conservation status. Any action likely to have a significant impact on a community listed under the EPBC Act requires Ministerial approval.

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

An ecological community that is under consideration for listing as a TEC in Western Australia but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). Listing as a PEC is similarly considered during State approval processes.

Further information on categories of TECs and PECs is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.3.1**).

2.8 Weeds and pests

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

native species are considered to be weeds. The likelihood of weeds occurring is higher in areas disturbed areas, especially areas that have been agricultural or urban landuse.

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to *Western Australia's Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread.

The Commonwealth government has further compiled a list of 32 *Weeds of National Significance* (WoNS) (DAWE 2021b). Whilst the WoNS list is non-statutory, many WoNS are also listed under the BAM Act. Further information on weeds and declared pests is provided in **Appendix A**.

2.9 Bush Forever

The Government of Western Australia's *Bush Forever* policy is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of *Bush Forever* is to protect comprehensive representations of all original ecological communities by targeting a minimum of 10% of each vegetation complex for protection (Government of WA 2000a). *Bush Forever* sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

No *Bush Forever* sites occur within the site. Bush Forever site no. 200 (Caversham Airfield Bushland, West Swan/Whiteman) lies directly adjacent to the southern and eastern site boundary. The locations of this *Bush Forever* site and additional *Bush Forever* sites in the wider area of the site are shown in **Figure 3**.

2.10 Ecological linkages

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

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004).

Biodiversity linkage no. 32 intersects the western and southern portions of the site and extends beyond the site in an east-west direction, linking bushland to the east of the site to Whiteman Park. The locations of this linkage and additional linkages in the wider area of the site are shown in **Figure 3**.

2.11 Previous surveys

A number of previous flora and vegetation assessments have been undertaken within the site, as detailed in **Table 1**.

Table 1: Previous flora and vegetation assessments

Author	Purpose, extent and significant results
Ecoscape (2001)	Flora and vegetation survey (undertaken in 1997) of the greater Albion District Structure Plan (DSP) area which included the site.
Ecologia (1999)	Survey of the Broader Caversham airfield (including the adjacent Bush Forever areas).
Ecoscape (2002)	A threatened ecological community (TEC) assessment was undertaken within the site.
Western Botanical (2006)	Survey of the site and adjacent Bush Forever areas undertaken in February 2006. Western Botanical recorded one priority flora species occurring within the site, *Verticordia lindleyi* subsp. *lindleyi* (P4). *Goodenia filiformis* was also recorded, this species was listed as priority 3 at the time but has since been delisted.
Eco Logical (2010)	A targeted survey was undertaken to determine the potential occurrence and extent of TECs. The results of this survey are not known.
PGV Environmental (2013)	Flora and vegetation survey undertaken as part of the broader EPBC Act referral process to enable development of the site. *Verticordia lindleyi* subsp. *lindleyi* (P4) was also recorded during this survey.

3 Methods

3.1 Database searches

A search was conducted for threatened and priority flora that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), *NatureMap* (DBCA 2022) and DBCA's threatened and priority flora database (reference no. 43-1121FL).

A search was also conducted for TECs and PECs that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), the *weed and native flora dataset* (Keighery *et al.* 2012) and DBCA's threatened and priority ecological communities' database (reference no. 30_1121EC).

Prior to undertaking the field survey, information on the habitat preferences of threatened and priority flora species and communities identified from database searches was reviewed. This was compared to existing environmental information available for the site, such as geomorphology, soils, regional vegetation and historic land use, to identify species and communities for which habitat may occur in the site.

3.2 Field survey

Botanists and ecologists from Emerge visited the site on 29 and 30 September, 27 October 2021 and 10 January and 24 March 2022 to conduct the flora and vegetation field survey.

The site was traversed on foot and the composition and condition of vegetation was recorded. Photographs were taken throughout the field visit to show particular site conditions. Flora species not native to Western Australia are denoted by an asterisk ('*') in text and raw data.

Plant specimens collected during the field survey were dried, pressed and named in accordance with requirements of the Western Australian Herbarium (2022). Identification of specimens occurred through comparison with named material and through the use of taxonomic keys.

3.2.1 Sampling

Detailed sampling of the vegetation was undertaken using a combination of non-permanent 10 x 10 m quadrats and relevés. The quadrats were established using fence droppers bound by measuring tape. The relevés were completed over an equivalent 10 x 10 m area without the use of physical markers and were included to provide a more rapid sample of patches of vegetation in poorer condition and/or of smaller size. The position of each sample was recorded with a hand-held GPS unit.

The data recorded within each sample included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event)

- biological information (vegetation structure and condition, degree of disturbance and species present). 'Foliage projective cover' (FPC) was also recorded for quadrats.

Additional plant taxa not observed within samples were recorded opportunistically as the botanists traversed the site.

3.2.2 Targeted searches

The suitability of habitat within the site for conservation significant flora and communities identified in the desktop assessment was assessed (refer **Section 3.1**). Areas of suitable habitat were traversed along transects and searched for conservation significant species, as required.

3.2.3 Vegetation condition

Vegetation condition was assigned at each sample and changes in vegetation condition were also noted and mapped across the site. The condition of the vegetation was assessed using the Keighery (1994) scale (**Table 1**). For vegetation in the site containing *Banksia* spp., the condition scale provided in the conservation advice for the 'banksia woodlands of the Swan Coastal Plain TEC' (DoEE 2016a) was applied in addition to the Keighery scale, as shown in **Table 1**.

Table 2: Vegetation condition scale applied during the field assessment

Condition category	Definition (Keighery 1994)	Indicator (DoEE 2016a)	
		Typical native vegetation composition	Typical weed cover
Pristine	Pristine or nearly so, no obvious signs of disturbance.	Native plant species diversity fully retained or almost so	Zero or close to
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.	High native plant species diversity	Less than 10%
Very good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Moderate native plant species diversity	5-20%
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.	Low native plant species diversity	5-50%
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	Very low native plant species diversity	20-70%
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.	Very low to no native species diversity	Greater than 70%

3.3 Mapping and analysis

3.3.1 Conservation significant flora and communities

Based on the database searches and information recorded during the field survey, an assessment of the likelihood of occurrence of threatened and priority flora species and communities within the site was undertaken using the categories outlined in **Table 2**.

Table 3: Likelihood of occurrence assessment categories and definitions

Likelihood	Definition
Recorded	The species was recorded during the current field survey.
Likely	The site contains suitable habitat for the species and it is likely the species may occur based on presence of a recent historical record within or close to the site.
Possible	The site contains suitable habitat for the species but there is no other information to suggest that the species may occur within or close to the site.
Unlikely	The site does not contain suitable habitat for the species or the site contains suitable habitat for the species within which thorough targeted searches were completed and conclusion has been made that the species is unlikely to be present.

3.3.2 Plant community identification and description

The plant communities within the site were identified from the sample data collected during the field survey. The vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (NVIS Technical Working Group 2017). The identified plant communities were mapped on aerial photography from the sample locations and boundaries were interpreted from aerial photography and notes taken in the field. Vegetation condition was mapped on aerial photography based on the samples and notes recorded during the field survey to define areas with differing condition.

3.3.3 Floristic community type assignment

The identified plant communities were then compared to the regional 'floristic community type' (FCT) dataset *A floristic survey of the southern Swan Coastal Plain* (Gibson *et al.* 1994). Each sample was compared to Gibson *et al.* (1994) separately to limit the influence of spatial correlation when assigning an FCT. FCT analysis was not undertaken for samples located within disturbed vegetation with low native species diversity as the vegetation was considered unlikely to currently represent an FCT.

Sample data (presence/absence) was first reconciled with Gibson *et al.* (1994) by standardising the names of taxa with those used in the earlier study. This was necessary due to changes in nomenclature in the intervening period. Taxa that were only identified to genus level were excluded, while some infra-species that have been identified since 1994 were reduced to species level. The combined dataset was then imported into the statistical analysis package PRIMER v6 (Clarke and Gorley 2006).

A resemblance matrix was generated using the Bray-Curtis distance measure which provided the percentage similarity between all pairs of samples. Subsequently, a cluster analysis was undertaken using the resemblance matrix and hierarchical agglomerative clustering, to produce a dendrogram.

Where a sample tended to cluster with a grouping of different FCTs, the resemblance matrix was examined. Ultimately a combination of cluster analysis, resemblance matrix and contextual information relating to the soils, landforms and known FCTs within the region was considered in the final determination of an FCT for vegetation within the site.

3.3.4 Threatened and ecological communities

Areas of native vegetation potentially representing a TEC were assessed against key diagnostic characteristics and, if available, size and/or vegetation condition thresholds.

3.3.5 Species accumulation curve

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

3.4 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) is provided in **Table 3**.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA (2016)

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information described in **Section 2** is adequate to place the site and vegetation in context.
	No limitation	A number of previous flora and vegetation surveys have been conducted within the site. These surveys were considered when undertaken the current assessment.
	No limitation	Regarding assignment of FCTs, the authoritative Gibson *et al.* (1994) dataset was derived from a necessarily limited sample of vegetation from largely publicly owned land which is now more than 20 years out of date. Consequently, it is unknown to what degree official FCTs are appropriate reference to biodiverse vegetation across the Swan Coastal Plain. Furthermore, Gibson *et al.* (1994) collected data in the spring main flowering period and in many cases sampled plots multiple times to provide a complete species list.

Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by qualified botanists with three to 11 years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with 11 years' experience in environmental science in Western Australia.
Suitability of timing	No limitation	The survey was conducted in September, October, January and March and thus both within and outside of the main flowering season. Moderate rainfall was recorded from May to September 2021 in the months preceding the site visit. Therefore it is likely that many plant species would have been in flower and/or visible at the time of survey. The survey timing was considered adequate to allow the detection of species for which seasonal timing is critical.
Temporal coverage	No limitation	Detailed flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was visited multiple times in spring 2021 and in January and March 2022. The January and March site visits provided an insight into the vegetation condition and composition out of the main flowering period. Therefore, according to the EPA guidelines this survey is considered to meet the requirements of a 'detailed' survey.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	No limitation	All parts of the site could be accessed as required.
Sampling intensity	Minor limitation	A total of 157 species were recorded, of which 130 were recorded from 13 sample locations and 27 were recorded opportunistically. Minimum species richness within site is estimated at between 184 (Jacknife1) and 190 (Chao2) species (refer species accumulation curve and estimates shown in **Plate 15**). The number of species recorded in the site (157) is between 82 and 85% of the estimated 184-190 species in the site were recorded and, combined with the degraded nature of the majority of the site, demonstrates that survey effort was adequate to prepare a comprehensive species inventory for the site.
Influence of disturbance	Minor limitation	Time since fire is greater than 60 years as interpreted from aerial imagery and therefore short lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance was evident in parts of the site. The disturbance history of the site was considered when undertaking field sampling.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

4 Results

4.1 General site conditions

The site is relatively flat and intersected by two airstrips (**Plate 1**). The majority of the site comprises remnant native vegetation with varying levels of disturbance. The northwestern corner of the site is currently in use as a sales centre and a building is also present in the south-eastern portion. There has been recent clearing undertaken in the northern portion of the site to function as a temporary drainage basin associated with development to the north of Youle-Dean Road (**Figure 1**). Standing water was noted along the northern boundary in August 2019 (**Plate 2**) and also in October 2021. One man-made dam is also present in the centre of the site (**Plate 3**). The dam appears to maintain some water levels throughout summer. Soils in the northern portion of the site appear to be sands with underlying clay whilst the southern portion comprises deeper grey sands with dryland vegetation (**Plate 4**).

Plate 1: Historical airstrip with some standing water (August 2019).

Plate 2: Standing water near the northern boundary of the site (August 2019).

Plate 3: Man-made dam in the central portion of the site.

Plate 4: Dryland vegetation and grey sands in the southern portion of the site.

4.2 Flora

4.2.1 Desktop assessment

The database search results identified a total of 27 threatened and 40 priority flora species occurring or potentially occurring within a 10 km radius of the site. Information on these species including their habitat preferences and flowering period is provided in **Appendix B**.

Verticordia lindleyi subsp. *lindleyi* (P4) has been previously recorded in the site (**Section 2.11**). Based on background information available for the site, suitable habitat was considered to potentially occur within the site for 11 threatened flora species and 20 priority flora species as shown in **Table 4**.

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Drakaea elastica	CR	EN	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically in banksia woodland or thickets of *Kunzea glabrescens*.	late Sep-Oct/Nov, survey Jul-Aug
Calytrix breviseta subsp. *breviseta*	CR	EN	P	Seasonally wet sandy-clay soil on swampy flats	Oct-Nov
Caladenia huegelii	CR	EN	PG	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov
Grevillea curviloba	EN	EN	P	Sand, sandy loam. Winter-wet heath.	Aug-Sep
Diuris purdiei	EN	EN	PG	Sand to sandy clay soils in areas subject to winter inundation.	late September to mid-October
Darwinia foetida	EN	EN	P	Grey-white sand on swampy, seasonally wet sites.	Oct-Nov
Macarthuria keigheryi	EN	EN	P	Low-lying winter-wet damp grey/white sands in open patches.	Sep-Dec or Feb-Mar
Drakaea micrantha	EN	VU	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct
Anigozanthos viridis subsp. *terraspectans*	VU	VU	P	Grey sand, clay loam. Winter-wet depressions.	Aug-Sep
Conospermum undulatum	VU	VU	P	Sand and sandy clay soils, on flat or gently sloping sites between the Swan and Canning Rivers	May-Oct
Diuris drummondii	VU	VU	PG	In low-lying depressions in peaty and sandy clay swamps.	Nov-Jan
Bolboschoenus fluviatilis	P1	-	P	Floodplain with grey/brown wet sand.	Nov

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences (cont.)

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Hydrocotyle striata	P1	-	A	Sand and clay in springs and creeklines.	Nov
Stachystemon sp. Keysbrook (R. Archer 17/11/99)	P1	-	P	White grey sand.	Oct
Poranthera moorokatta	P2	-	A	Sandy or clay soils. Dampland or low sandy dunes in banksia woodland.	Oct or Feb
Lepyrodia curvescens	P2	-	P	Sand, laterite. Seasonally inundated swampland.	Sep-Nov
Isopogon autumnalis	P3	-	P	Yellow-grey sand.	Feb,Mar,Ap, May or June
Haemodorum loratum	P3	-	P	Grey or yellow sand, gravel.	Nov
Thysanotus anceps	P3	-	P	White or grey sand, lateritic gravel, laterite.	Oct-Dec
Cyathochaeta teretifolia	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan
Byblis gigantea	P3	-	P	Sandy-peat swamps. Seasonally wet areas.	Sep-Jan
Stylidium trudgenii	P3	-	P	Grey sand, dark grey to black sandy peat. Margins of winter-wet swamps, depressions	Sep-Jan
Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)	P3	-	P	Grey brown sand or clay in winter wet flats.	Sep-Nov
Hydrocotyle lemnoides	P4	-	A	Floating in swamps.	Aug-Oct
Jacksonia sericea	P4	-	P	Calcareous and sandy soils on Swan Coastal Plain	Dec-Feb
Anigozanthos humilis subsp. *chrysanthus*	P4	-	P	Grey or yellow sand	Jul-Oct
Verticordia lindleyi subsp. *lindleyi*	P4	-	P	Sand and sandy clay in winter wet areas.	May or Nov-Jan
Drosera occidentalis	P4	-	P	Flat, brown/white/yellow moist sand/clay/peat, often near swamps.	Oct-Dec/Jan
Thysanotus glaucus	P4	-	P	White, grey or yellow sand, sandy gravel.	Oct-Mar
Hypolaena robusta	P4	-	P	White sand. Sandplains	Sep-Oct
Schoenus griffinianus	P4	-	P	White sand.	Sep-Oct

CR=critically endangered, EN=endangered, VU=vulnerable, P1-P4=Priority 1-Priority 4, A=annual, P=perennial, PG=perennial geophyte.

4.2.2 Species inventory

A total of 101 native and 56 non-native (weed) species were recorded within the site during the field survey, representing 55 families and 125 genera. The dominant families containing native taxa were Myrtaceae (16 native taxa and three weed taxa) and Orchidaceae (nine native taxa and one weed taxa). The most common genera were *Eucalyptus* with six taxa and *Drosera* with four taxa. Of the species recorded 130 were recorded in sample locations and 27 were recorded opportunistically.

A complete species list is provided in **Appendix C.**

4.2.3 Threatened and priority flora

One priority flora species, *Verticordia lindleyi* subsp. *lindleyi* (P4) was recorded as occurring within the site (**Plate 5**). Four individuals were recorded in the central portion of the site, as shown on **Figure 6**.

The majority of the threatened and priority flora species identified in the desktop assessment are not considered to occur in the site due to lack of suitable habitat and/or because they were not recorded during the field survey.

The likelihood of occurrence results are provided in **Appendix B**.

Plate 5: Verticordia lindleyi subsp. lindleyi (P4) recorded in the site.

4.2.4 Locally and regionally significant flora

Two flora species cited as locally or regionally significant in *Bush Forever* (1980) were recorded in the site: *Conostylis aculeata* subsp. *cygnorum* (taxa endemic to the Swan Coastal Plain) and *Verticordia lindleyi* subsp. *lindleyi* (considered to be poorly reserved and significant populations).

4.2.5 Declared pests

Four species listed as a declared pest (C3) pursuant to the BAM Act, **Asparagus asparagoides* (bridal creeper), **Gomphocarpus fruticosus* (narrowleaf cottonbush), **Moraea flaccida* (one leaf cape tulip) and **Zantedeschia aethiopica* (arum lily), was recorded within the site.

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

4.3 Vegetation

4.3.1 Desktop assessment

The database search results identified 17 TECs and seven PECs occurring or potentially occurring within a 10 km radius of the site. Information on these communities is provided in **Appendix D**.

Based geomorphology, soils and regional vegetation patterns, four TECs and four PECs were considered to have potential to occur in the site:

- 'Banksia woodlands of the Swan Coastal Plain' TEC which is listed as 'endangered' under EPBC Act and priority (P3) in WA.
- *'Corymbia calophylla - Xanthorrhoea preissii* woodlands and shrublands of the Swan Coastal Plain' (SCP3c) which is listed as 'endangered' under EPBC Act and 'critically endangered' under the BC Act.
- 'Shrublands and woodlands of the eastern side of the Swan Coastal Plain' (SCP20c) which is listed as 'endangered' under EPBC Act and 'critically endangered' under the BC Act.
- *'Banksia attenuata* woodlands over species rich dense shrublands' (SCP20a) which is listed as 'endangered' under the BC Act.
- 'Low lying *Banksia attenuata* woodlands or shrublands' (SCP21c) (P3).
- '*Banksia ilicifolia* woodlands' (SCP22) (P3).
- 'Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands' (SCP23b) (P3).

4.3.2 Plant communities

A total of 13 locations were sampled, comprised of seven quadrats and six relevés, as shown in **Figure 4**.

Nine plant communities were identified within the site. Plant community **BAfCcEm** exists across the southern portions of the site. Plant communities **Ep**, **Ms** and **VdSi** exist as small patches within the **BAfCcEm** vegetation. Plant communities **ErMp** and **CcMp** occurs over most of the northern portion of the site. Plant community **Mr** occurs in the north-western portion of the site and plant community **Mp** occurs in the central portion of the site as multiple patches. The remainder of the site contains non-native vegetation with bare soil, weeds or planted vegetation (31.85 ha).

A description and the area of each plant community is provided in **Table 5** and representative photographs of each are provided in **Plate 6** to **Plate 14**. The location of each plant community is shown in **Figure 4**. A matrix of species recorded within each plant community is provided in **Appendix E** and raw sample data in **Appendix F**.

Table 6: Description and extent of plant communities identified within the site

Plant community	Description	Area (ha)
BAfCcEm	Low open woodland of *Banksia menziesii, Banksia attenuata*, *Banksia ilicifolia*, *Allocasuarina fraseriana, Corymbia calophylla* and *Eucalyptus marginata* over tall open to closed shrubland of **Leptospermum laevigatum* and **Acacia longifolia* (or layer absent) over open shrubland to shrubland of *Xanthorrhoea spp., Stirlingia latifolia* and *Hibbertia spp*. over forbland of *Caladenia flava*, *Drosera erythrorhiza*, *Lagenophora huegelii, Poranthera microphylla, Podotheca gnaphalioides*, *Stylidium* spp., **Hesperantha falcata* and **Hypochaeris glabra* and open grassland of **Ehrharta* spp. (**Plate 6**)	25.92
CcMp	Open woodland of *Corymbia calophylla* and *Melaleuca preissiana* open forbland dominated by weeds and bare ground (**Plate 7**)	28.15
Ep	Low shrubland of *Eremaea pauciflora* subsp. *pauciflora* and *Scholtzia involucrata* over forbland of *Patersonia occidentalis, Podotheca gnaphalioides* and *Trachymene pilosa* (**Plate 8**)	0.32
ErMp	Low open forest of *Eucalyptus rudis* and *Melaleuca preissiana* over sparse forbland dominated by weeds (**Plate 9**)	12.79
Mp	Low closed forest of *Melaleuca preissiana* over sparse forbland dominated by weeds (**Plate 10**)	4.36
Mr	Low closed forest of *Melaleuca rhaphiophylla* over sparse to closed sedge/rush land of *Leptocarpus decipiens*, *Baumea juncea, Juncus pallidus* and **Juncus microcephalus* over open forbland of *Centella asiatica, Lobelia anceps* and **Mentha pulegium* (**Plate 11**)	3.07
Ms	Low shrubland of *Melaleuca seriata* over forbland of *Podotheca gnaphalioides* and **Arctotheca calendula* (**Plate 12**)	1.8
VdSi	Shrubland of *Verticordia densiflora* var. *densiflora*, *Calytrix fraseri, Hibbertia racemosa* and *Scholtzia involucrata* over open forbland *Drosera* spp., *Haemodorum spicatum*, *Laxmannia squarrosa, Waitzia suaveolens* var. *suaveolens* and **Ursinia anthemoides* (**Plate 13**)	1.49
Cleared	Heavily disturbed areas comprising bare ground and weeds with occasional native trees (**Plate 14**)	31.85

*Plate 6: Plant community **BAfCcEm** in 'very good' condition*

*Plate 7: Plant community **CcMp** in 'degraded' condition*

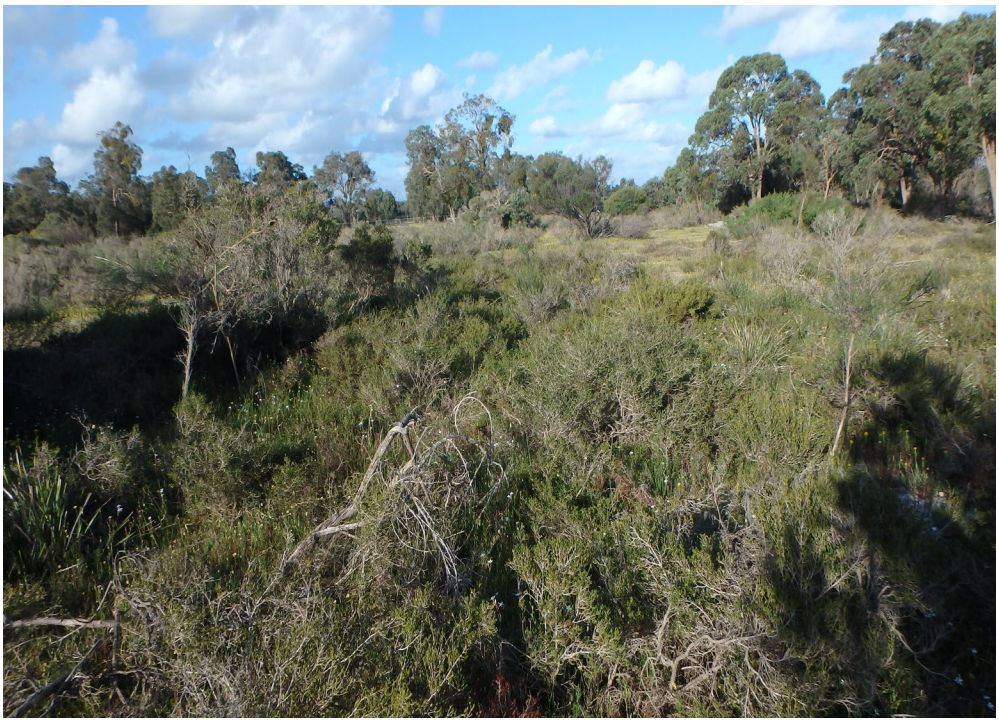

*Plate 8: Plant community **Ep** in 'good' condition.*

*Plate 9: Plant community **ErMp** in 'degraded' condition*

*Plate 10: Plant community **Mp** in 'degraded' condition*

*Plate 11: Plant community **Mr** in 'good' condition. Soil indentations show evidence of winter inundation.*

*Plate 12: Plant community **Ms** in 'good' condition*

*Plate 13: Plant community **VdSi** in 'good' condition*

Plate 14: Cleared vegetation in 'completely degraded' condition

4.3.3 Vegetation condition

The most intact native vegetation was located in the south-eastern portion of the site (approximately 7.5 ha of the **BAfCcEm** plant community). This portion of the **BAfCcEm** vegetation was mapped as being in 'very good' condition as it retains the structure expected of a banksia woodland community and has moderate native species diversity. Past disturbance of this area is evident from historical aerial photography, sparser than expected native understorey cover and through the presence of weeds. Portions of the **BAfCcEm** vegetation in the southern portion of the site were mapped as being in 'good' or 'degraded' condition due to higher weed cover and lower native species cover.

The **VdSi**, **Ep** and **Ms** vegetation comprise small patches in the southern portion of the site that show evidence of historical clearing but have been recolonised by various native species from the adjacent **BAfCcEm** vegetation. The majority of the **VdSi**, **Ep** and **Ms** vegetation was mapped as being in 'good' condition due to the high cover of a small number of native species and relatively low weed densities. One area of the **VdSi** vegetation was mapped as being in 'degraded' condition due to higher weed cover and sparser native species.

The **Mr** vegetation in the north-western corner of the site comprises an intact tall shrubland layer, over scattered patches of intact understorey wetland species. The areas of **Mr** vegetation with dense native understorey species were mapped as being in 'good' condition due to the small size of the intact patches, and the remainder was mapped as being in 'degraded' condition as the understorey was dominated by weed species.

The **CcMp** and **ErMp** vegetation in the northern half of the site consist of native trees over scattered native shrubs and dense pasture weeds. The **CcMp** and **ErMp** vegetation was mapped as being in

'degraded' condition as it lacks understory structure and has very low native species diversity. Past disturbance and clearing is particularly evident in these areas.

Remaining areas in the site are in 'completely degraded' condition and consist of bare ground and non-native species such as pasture grasses and planted trees (particularly **Eucalyptus camaldulensis*). The airstrips and sandy tracks within the site were also mapped as being in 'completely degraded' condition.

The extent of vegetation by condition category is detailed in **Table 6** and shown in **Figure 5**.

Table 7: Extent of vegetation condition categories within the site

Condition category (Keighery 1994)	Size (ha)
Pristine	0
Excellent	0
Very good	7.51
Good	13.69
Degraded	56.69
Completely degraded	31.85

4.3.4 Floristic community types

Whilst the vegetation showed high similarity to a number of FCTs, plant community **BAfCcEm** was considered most likely to represent FCT 21a 'Central *Banksia attenuata – Eucalyptus marginata* woodlands'. Samples within this community showed 37% to 47% similarity to Gibson *et al.* (1994) sites representing this FCT as shown in **Table 7**. Plant communities **Ep**, **Ms** and **VdSi** were also considered to represent disturbed forms of FCT 21a.

Plant communities **ErMp** and **CcMp** were considered to represent FCT 11 'wet forests and woodlands'. Samples R5, R9 and R12 clustered with FCT 11 with 24% to 30% similarity (**Table 7**).

Plant community **Mr** was determined to represent FCT 13 'deeper wetlands on heavy soils'. Sample Q10 clustered with a Gibson *et al.* (1994) site representing FCT 13 with 45% similarity.

Plant community **Mp** was too degraded to assign to an FCT.

The relevant portions of the cluster dendrograms are provided in **Appendix E**.

Table 8: Plant community and likely FCT represented within the site for each sample

Plant community	Sample unit	Most similar Gibson *et al.* (1994) sites	Similarity (%)	Most likely floristic community type (FCT)	Reservation and conservation status (Gibson *et al.* 1994)
BAfCcEm	Q2^	TWIN-8 (FCT 21c)	47	FCT 21a: Central *Banksia attenuata – Eucalyptus marginata* woodlands	Well reserved Low risk
		LOW07 (FCT 21c)	45		
		HARRY-5 (FCT 21a)	44		
		YULE-1 (FCT 23a)	42		
	R3^	WOODV-1 (FCT 28)	40		
		LOW12B (FCT 21a)	37		
	Q8^	LOW04 (FCT 21a)	47		
		NEER-2 (FCT 28)	46		
		HARRY-5 (FCT 21a)	44		
	R13^	HYMUS04 (FCT 21c)	45		
		LOW07 (FCT 21c)	44		
		FL-6 (FCT 21c)	43		
		LOW04 (FCT 21a)	41		
Ep	Q6^	HARRY-5 (FCT 21a)	37		
VdSi	R7^	FL-6 (FCT 21c)	29		
		YULE-1 (FCT 23a)	28		
		WHITE-1 (FCT 23a)	27		
ErMp	R9	MODO3 (FCT 11)	24	FCT 11: Wet forests and woodlands	Well reserved Low risk
		HYMUS01 (FCT 11)	24		
CcMp	R12^	ROWE01 (FCT 11)	26		
		HYMUS01 (FCT 11)	21		
	R5^	HYMUS01 (FCT 11)	30		
		NEER-22 (FCT 28)	27		
		LOW10A (FCT 21a)	27		
		WELL-1 (FCT 21a)	27		
Mr	Q10	PAGA-2 (FCT 13)	45	FCT 13: Deeper wetlands on heavy soils	Well reserved Low risk
	Q11^	ELLIS-1 (FCT 17)	38		
		PAGA-5 (FCT 17)	38		
		MTB-5 (FCT 17)	36		
		MCLART-1 (FCT 13)	35		

Note: ^ shows highest percent similarity to individual Gibson et al. (1994) samples rather than similarity to a cluster of samples.

4.3.5 Threatened and priority ecological communities

The following TEC and PEC were identified within the site:

- 'Banksia woodlands of the Swan Coastal Plain' TEC.
- 'Banksia woodlands of the Swan Coastal Plain' PEC.

The locations of the TEC and PEC within the site are shown in **Figure 6**.

The structure, composition and patch size of plant community **BAfCcEm** indicates that it represents the Commonwealth listed 'banksia woodlands of the Swan Coastal Plain' TEC, as outlined in **Table 8**.

Table 9: Criteria for determining presence of Banksia Woodlands of the Swan Coastal Plain TEC adapted from DoEE (2016a)

Criteria	Requirements for meeting criteria	Site implications
1. Must meet key diagnostic characteristics	A variety of factors relating to: • Location • Soils • Structure • Composition	• Site meets location and soils criteria. • The **BAfCcEm** vegetation includes the key diagnostic feature of a tree layer of *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia*. • The **BAfCcEm** vegetation within site also meets structure and composition criterion. FCT 21a is identified as one of the FCTs comprising the banksia woodland TEC.
2. Must meet condition thresholds	• A patch should at least meet the 'good' condition category (see **Table 1**)	• The **BAfCcEm** vegetation is present in 'very good', 'good' and 'degraded' condition, which meets this criterion. The conservation advice indicates that a single patch may include areas of variable condition, meaning parts of the **BAfCcEm** vegetation in 'degraded' condition may still be considered the TEC.
3. Must meet minimum patch size	Minimum size of patch: • Pristine=no minimum size • Excellent=0.5 ha • Very Good=1 ha • Good=2 ha	• The **BAfCcEm** vegetation in 'very good' condition comprises 7.51 ha and independently meets this criterion. • The **BAfCcEm** vegetation in 'good' condition comprises 11.49 ha and also independently meets this criterion. • The adjoining **BAfCcEm** vegetation in 'degraded' condition' would be viewed as contiguous and part of the same patch. Therefore the mapped 25.92 ha of **BAfCcEm** vegetation comprises a patch of the TEC.

Table 8: Criteria for determining presence of Banksia Woodlands of the Swan Coastal Plain TEC adapted from DoEE (2016a) (cont.)

Criteria	Requirements for meeting criteria	Site implications
4. Must incorporate surrounding context	• Breaks (e.g. tracks) < 30 m do not separate vegetation into separate patches • Buffer zones may apply (20-50 m recommended from patch edge) • The site should be thoroughly sampled (2 surveys in same spring). • Survey timing should be appropriate. • Surrounding environment should be considered (e.g. connectivity, conservation values, fauna habitat)	• Small scale tracks (<30 m wide) exist within the patch. • Intact native vegetation that is likely to represent the banksia woodland TEC exists to the south and east of the patch and is contiguous with the banksia woodland vegetation within the site. • This survey was conducted in September, October, January and March (both within and outside of the main flowering season) • The survey timing is appropriate for a detailed assessment. • Land surrounding the patch is a combination of rural, native vegetation and bare ground.
Result	The site supports 25.92 ha of the banksia woodland of the Swan Coastal Plain TEC.	

DBCA's *Priority Ecological Community* list indicates that the description, area and condition thresholds that apply to the Commonwealth-listed TEC of the same name also apply to the 'banksia woodlands of the Swan Coastal Plain' PEC (DBCA 2020). Therefore, a total of 25.92 ha of this PEC occurs within the site as shown in **Figure 6**.

The presence of tuart trees indicated that the Commonwealth listed 'tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' TEC had potential to occur within the site. However, based on the assessment outlined in **Table 9**, the vegetation does not represent the TEC, or the State listed PEC of the same name.

Table 10: Assessment of site conditions against the tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC criteria (adopted from (DoEE 2019))

Criteria	Requirements for meeting criteria	Site implications
1. Must meet key diagnostic characteristics	• Located in appropriate bioregion and landform. • At least 2 living established *E. gomphocephala* trees with DBH≥ 15cm present in canopy layer and with <60 m between the outer edges of canopies^ • Vegetation structure is a woodland, forest, open forest, open woodland, or mallee (various forms).	• Site is located in appropriate bioregion but is further east than the TEC is usually found to occur. • The patches contain one and two living established *E. gomphocephala* trees with DBH≥ 15cm present in canopy layer and with <60 m between the outer edges of canopies. The second patch meets this requirement. • Vegetation within the patch comprises a woodland to open woodland structure.

Table 9: Assessment of site conditions against the tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC criteria (adopted from (DoEE 2019)) (cont.)

Criteria	Requirements for meeting criteria	Site implications
2. Must meet size threshold	• A patch must be larger than 0.5 ha[#]	• The patches comprise 0.42 ha and 0.52 ha. The second patch meets this requirement.
3. Must meet condition thresholds	• Patches >5 ha: no condition threshold • Patches ≥0.5 – <2 ha: 'very high' or 'high' condition† • Patches ≥2 – ≤5 ha: 'very high', 'high' or 'moderate' condition†	• The patch is 0.52 ha and is subject to condition thresholds. The patch is in 'poor' condition with 30-40% native understorey which does not meet this criterion.
4. Must incorporate surrounding context	• Breaks (e.g. tracks, cleared areas) < 30 m do not separate vegetation into separate patches • The site should be thoroughly sampled in the appropriate season. • Survey timing should be appropriate. • Surrounding environment should be considered (e.g. connectivity, conservation values, fauna habitat)	• Breaks such as tracks exist within the patch but do not separate the patch. • The survey timing was sufficient to determine that the patch does not represent the TEC. • The surrounding area does not contain any other tuart trees.
Result	The site does not contain the tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC.	

^Includes dead trees. Where species of dead tree is unclear it is assumed to be *E. gomphocephala* if its canopy is within 60 m of an identified *E. gomphocephala tree*. #Note that a patch comprises a 30 m buffer around the canopy of each *E. gomphocephala* canopy tree, may extend beyond a lot boundary and may include areas of bare ground, waterbodies and hardscape. †Using the condition scale provided in (DoEE 2019).

The likelihood of occurrence of TECs and PECs are provided in **Appendix C**.

No other TECs or PECs occur within the site.

4.3.6 Locally and regionally significant vegetation

Mature eucalypt trees (diameter at breast height larger than 500 mm) including *Corymbia calophylla* (marri), *Eucalyptus rudis* (flooded gum), *Eucalyptus marginata* (jarrah) and *Eucalyptus gomphocephala* (tuart) are present in the site. These trees have the potential to provide foraging, roosting and nesting habitat for threatened black cockatoos, along with other ecological services.

4.4 Species richness

A total of 130 species were recorded from 13 samples. A species accumulation curve derived from sample data is presented in **Plate 15**. After 13 samples the curve has begun to flatten. This indicates that a small proportion of species likely remain undetected by sampling.

Species richness was estimated in PRIMER v6 to be between 184 (Jacknife1) and 190 (Chao2). Based on the trend of the species accumulation curve approximately 50 to 60 samples would be required to capture that many species. Including the 27 additional species recorded opportunistically, a total of 157 species was recorded in the site. This indicates that between 82 and 85% of the estimated 184-190 species in the site were recorded. Considering the degraded nature of portions of the site and

the time spent sampling and searching the vegetation, the survey effort was considered to be adequate to prepare a near-comprehensive species inventory.

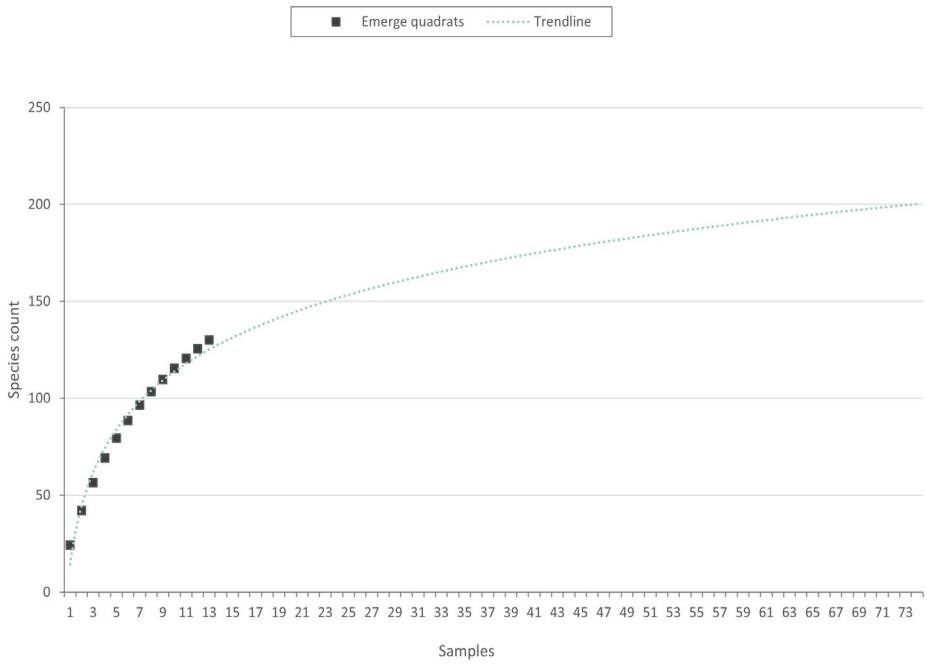

Plate 15: Species accumulation curve derived from sample data y= 43.165ln(x) + 14.447 R^2 = 0.9821).

5 Discussion

5.1 Threatened and priority flora

One priority flora species, *Verticordia lindleyi* subsp. *lindleyi* (P4) was recorded within the site. A population of six individuals were recorded in the central portion of the site. The location was different to the original location recorded by DBCA in 1998 and PGV Environmental in 2013. The older recorded location was searched extensively as part of this survey but no individuals were recorded.

Prior to the survey, based on background information, 12 threatened and 21 priority flora species were considered to potentially occur within the site. The field surveys in September, October, January and March were considered sufficient to determine that these species are unlikely to occur. This is because either suitable habitat does not occur or the species were not recorded during traverses within potentially suitable habitat. The timing of the surveys coincided with the main flowering period of the conservation significant flora identified in the desktop assessment and therefore they should have been visible, if present. The survey effort was considered sufficient to confirm the absence of additional threatened and priority species.

5.2 Vegetation condition

The method applied to assess vegetation condition was robust, as it combined the standard qualitative, categorical scheme of Keighery (1994), with the additional indicators for diversity and weed cover outlined in DoEE (2016b). Categorisation of vegetation into the categories outlined in **Table 1** was relatively straightforward as the vegetation clearly met the descriptions.

5.3 Floristic community type assignment

The FCT cluster analysis showed that samples within plant community **BAfCcEm** had high similarity to multiple FCTs, including FCTs 21a, 21c, 28 and 23a. FCT 21a is considered to be the most likely FCT present over the site as samples Q2, R3, Q8 and R13 all showed high similarity to this FCT. Sample R3 clustered with FCT 28, which is centred on the Spearwood dunes to the west of the site so is not considered likely to occur within the site. Sample Q8 showed highest similarity to FCT 21a and Q2 and R13 showed highest similarity to FCT 21c. FCT 21c tends to be more low-lying and is separated from FCT 21a by the presence of *Sowerbaea laxiflora* and *Styphelia propinqua* (Gibson *et al.* 1994), which are present within the **BAfCcEm** vegetation in the site. FCT 23a occurs on the Bassendean dunes and also has the potential to represent the vegetation on the site. However, FCT 21a is considered to be more likely as banksia woodland within Bush Forever site no. 200 directly adjacent was determined to represent this FCT (Government of WA 2000b).

Due to the presence of marri trees as a dominant species and occasional *Xanthorrhoea preissii* in the understorey, plant community **CcMp** had the potential to represent FCT 3c '*Corymbia calophylla* – *Xanthorrhoea preissii* woodlands'. However, the vegetation is degraded and there are limited additional species remaining to compare with the typical species recorded in FCT 3c, and the FCT analysis did not show a high similarity to FCT 3c. Only ten species were recorded in R12 of which

three were introduced species, whereas the average species richness of FCT 3c is 48 (Gibson *et al.* 1994). The low diversity of native species on the site in plant community **CcMp** does not allow a conclusive assessment on whether or not FCT 3c occurs or occurred on the site. However, the co-dominance of *Melaleuca preissiana* trees in the **CcMp** vegetation indicates that these areas are wetter than expected for FCT 3c as *Melaleuca preissiana* was not recorded in any of the quadrats identified in the Gibson *et al.* (1994) survey as FCT 3c. Two REWs are also present within these areas confirming that the area is lower lying than would be expected for FCT 3c.

5.4 Threatened and priority ecological communities

With regard to the Commonwealth banksia woodlands TEC, the **BAfCcEm** vegetation includes the key diagnostic feature of a tree layer of *Banksia attenuata*, *B. menziesii* and *B. illicifolia*. It also showed high similarity (27-47%) with four FCTs (FCT 21a, 21c, 23a and 28) that are all regional FCTs identified in the banksia woodland TEC conservation advice (DoEE 2016). However, to be considered the banksia woodland TEC a patch of banksia vegetation must also meet thresholds for condition and minimum patch size (refer to **Table 9**). The conservation advice states that a patch may include areas of variable condition and that the condition that is most representative should be used to assign overall condition of a patch.

For the **BAfCcEm** community, 7.51 ha was mapped as very good and 11.49 ha was mapped as good, while 6.91 ha was mapped as degraded. As there are no breaks of 30 m or more to separate the areas of varying condition, these areas were understood as a single patch. The area directly to the south and east also comprises banksia woodland as is included in Bush Forever site no. 200 and comprises approximately 100 ha. As Bush Forever site no. 200 was not surveyed as part of the current assessment, it has been conservatively assumed that the vegetation within Bush Forever site no. 200 is likely to be in very good or better condition. On this basis 'very good' condition was considered to be representative of the whole patch and the **BaAfCcEm** vegetation within the site was conservatively assessed as being in very good condition. The DoEE (2016b) conservation advice states that a patch of banksia woodland vegetation in good condition must be greater than 2 ha in size for it to be considered the TEC. Based on this, the **BAfCcEm** vegetation does meet the minimum patch size threshold.

5.5 Locally and regionally significant flora and vegetation

Flora and vegetation may be significant irrespective of protection under policy or legislation. Five key reasons that flora or vegetation within the site may be significant are listed below:

- The site is directly adjacent to Bush Forever site no. 200.
- The vegetation is associated with wetlands.
- The vegetation provides or contributes to an ecological linkage.
- The vegetation has potential value as habitat for threatened or priority fauna species. In particular, the **BAfCcEm** and **CcMp** vegetation contains mature *Corymbia calophylla*, *Eucalyptus marginata* and *Eucalyptus gomphocephala* trees that have the potential to provide nesting, foraging and/or roosting values for black cockatoos listed as threatened under the EPBC Act and BC Act.

- One flora species listed in *Bush Forever* 'significant flora of the Bassendean dunes in the Perth metropolitan region', *Verticordia lindleyi subsp. lindleyi*, occurs within the site (Government of WA 2000b).

6 Conclusions

The site shows evidence of considerable historical disturbance, with approximately 81% of the site containing 'completely degraded' or 'degraded' vegetation. The remaining 19% (21.2 ha) of the site supports native vegetation that is present in 'good' to 'very good' condition and has moderate species diversity.

One priority flora species, *Verticordia lindleyi* subsp. *lindleyi* (P4) was recorded in the central portion of the site. No other threatened or priority flora species are considered likely to occur.

A total of 25.92 ha of vegetation present in the southern half of the site represents the 'Banksia woodlands of the Swan Coastal Plain' Commonwealth listed TEC and State listed PEC of the same name (P3). This vegetation adjoins banksia woodland present to the south and south-east within Bush Forever site no. 200. No other TECs or PECs occur within the site.

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7.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 7.1**, with access date information provided in **Table R 1**.

Table R 1 Access dates for online references

Reference	Date accessed	Website or dataset name
BoM (2022)	14 March 2022	Climate Data Online
DAWE (2021a)	14 March 2022	Threatened Ecological Communities
DAWE (2021b)	14 March 2022	Weeds of National Significance (WoNS)
DAWE (2022)	14 March 2022	Protected Matters Search Tool
DBCA (2022)	16 March 2022	NatureMap
WALIA (2022)	16 March 2022	Landgate Map Viewer
Western Australian Herbarium (2022)	16 March 2022	Florabase

Figures

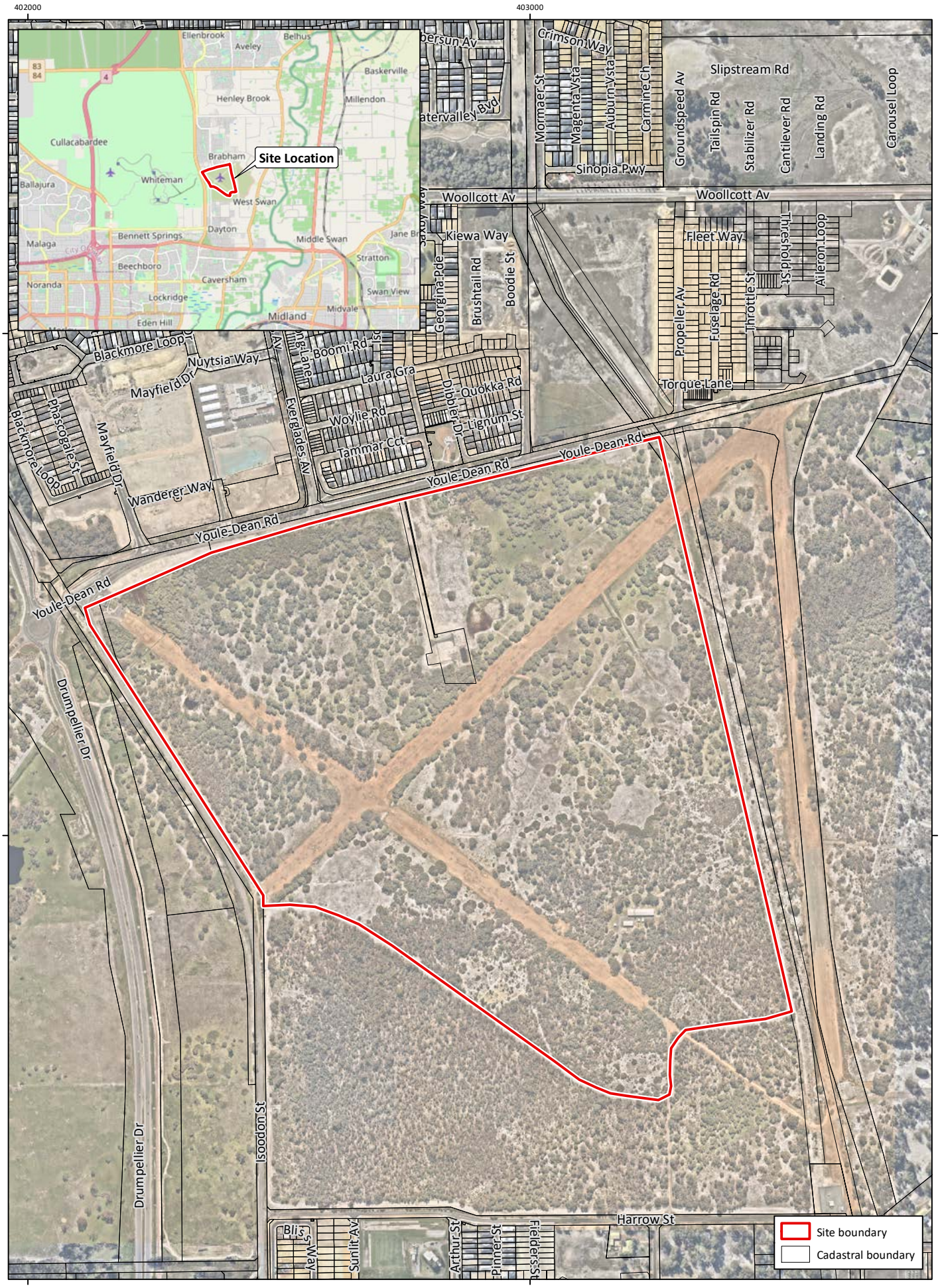

Figure 1: **Site Location**

Project:	Detailed Flora and Vegetation Assessment Lot 822 Youle-Dean Rd, Brabham
Client:	Peet Limited

Plan Number:
EP17-131(27)--F190

Drawn:	GAR
Date:	20/05/2022
Checked:	SKP
Approved:	RAW
Date:	19/10/2022

N

0 100 200
Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

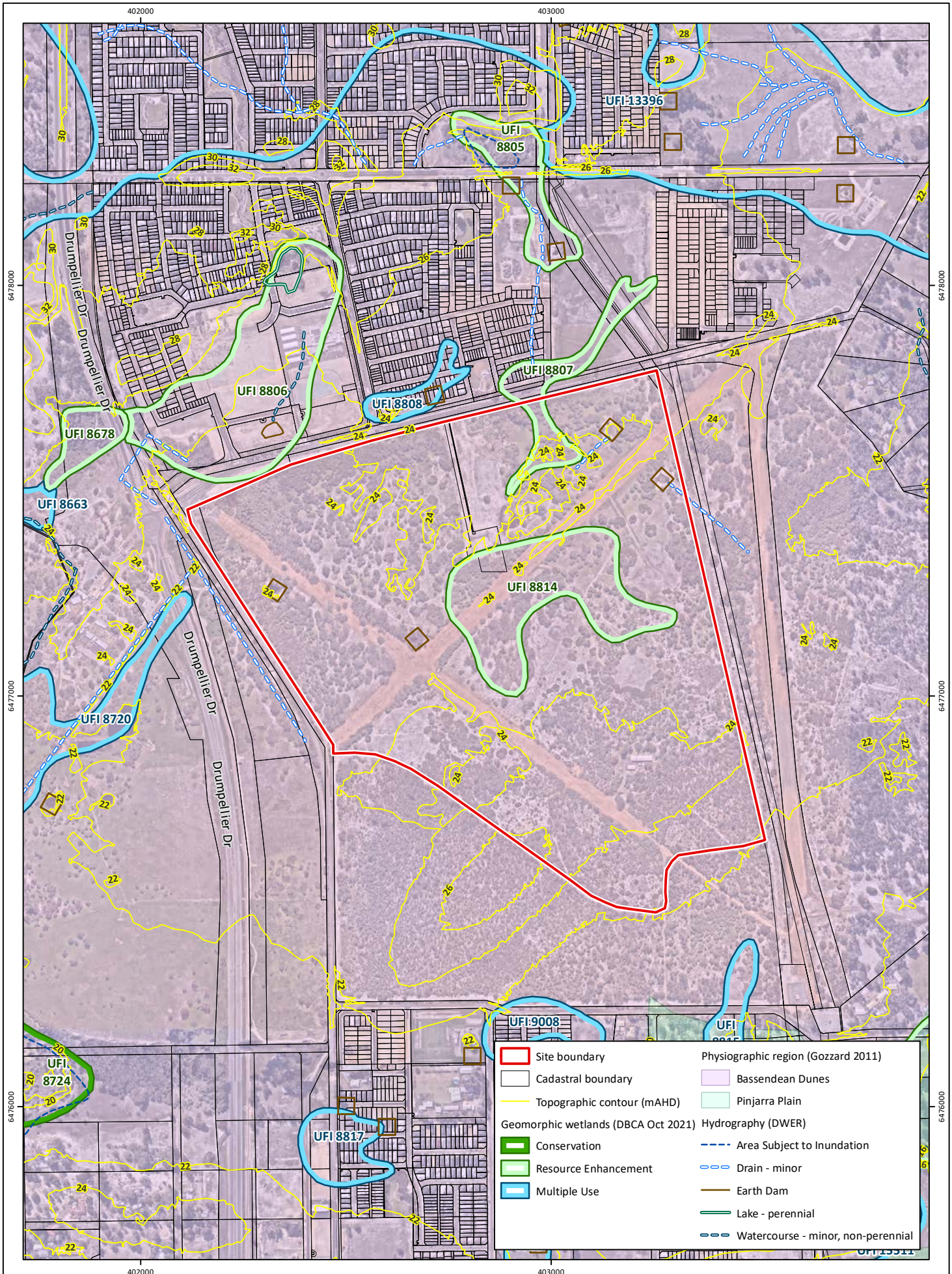

Figure 2: Hydrography, Soils and Topography

Project: Detailed Flora and Vegetation Assessment
Lot 822 Youle-Dean Rd, Brabham

Client: Peet Limited

Plan Number: EP17-131(27)--F191

Drawn:	GAR
Date:	20/05/2022
Checked:	SKP
Approved:	RAW
Date:	19/10/2022

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Metres

Scale: 1:12,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

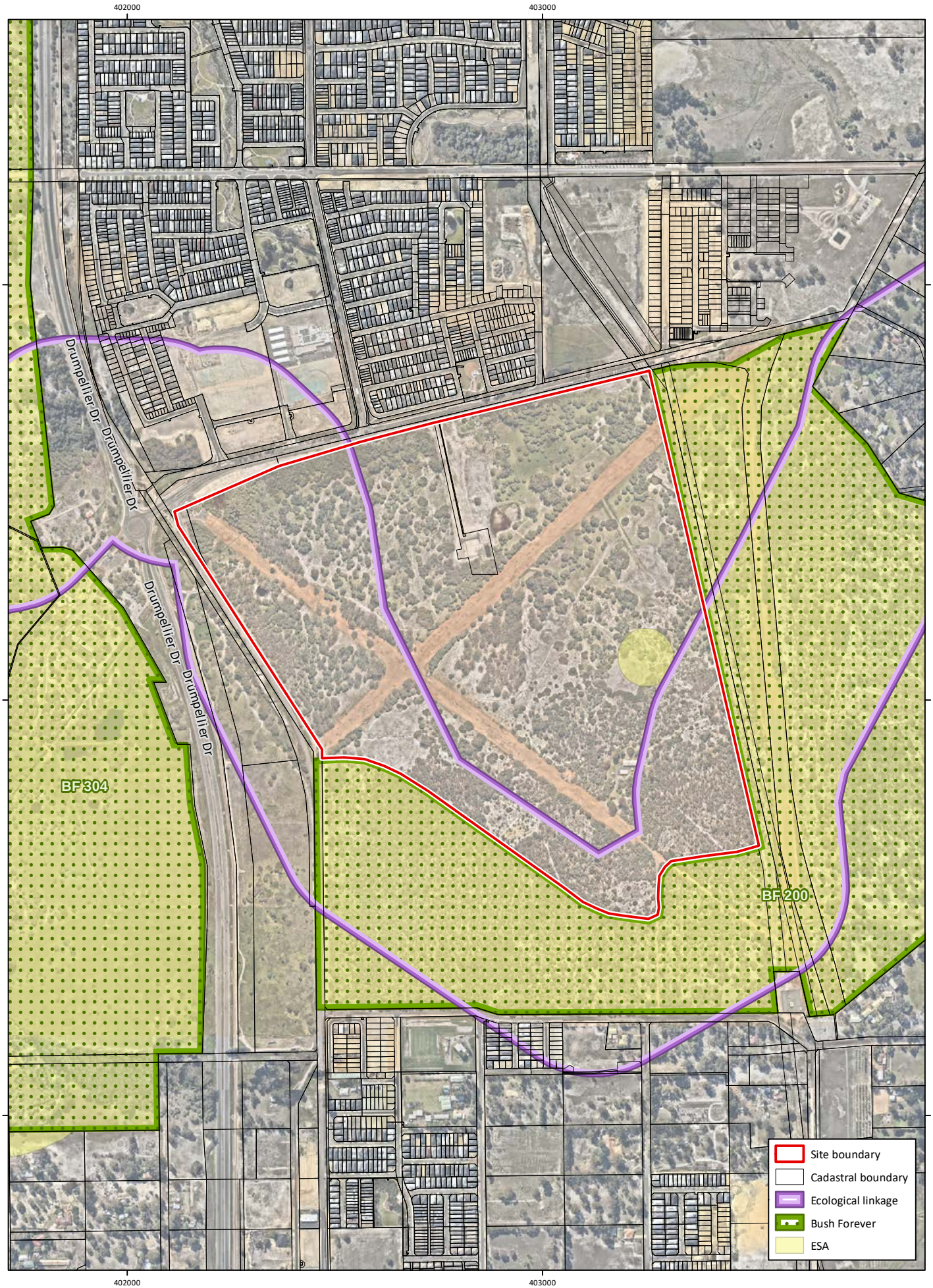

Figure 3: Environmental Features

Project: Detailed Flora and Vegetation Assessment
Lot 822 Youle-Dean Rd, Brabham

Client: Peet Limited

Plan Number:
EP17-131(27)--F192

Drawn:	GAR
Date:	20/05/2022
Checked:	SKP
Approved:	RAW
Date:	19/10/2022

N

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Metres

Scale: 1:12,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

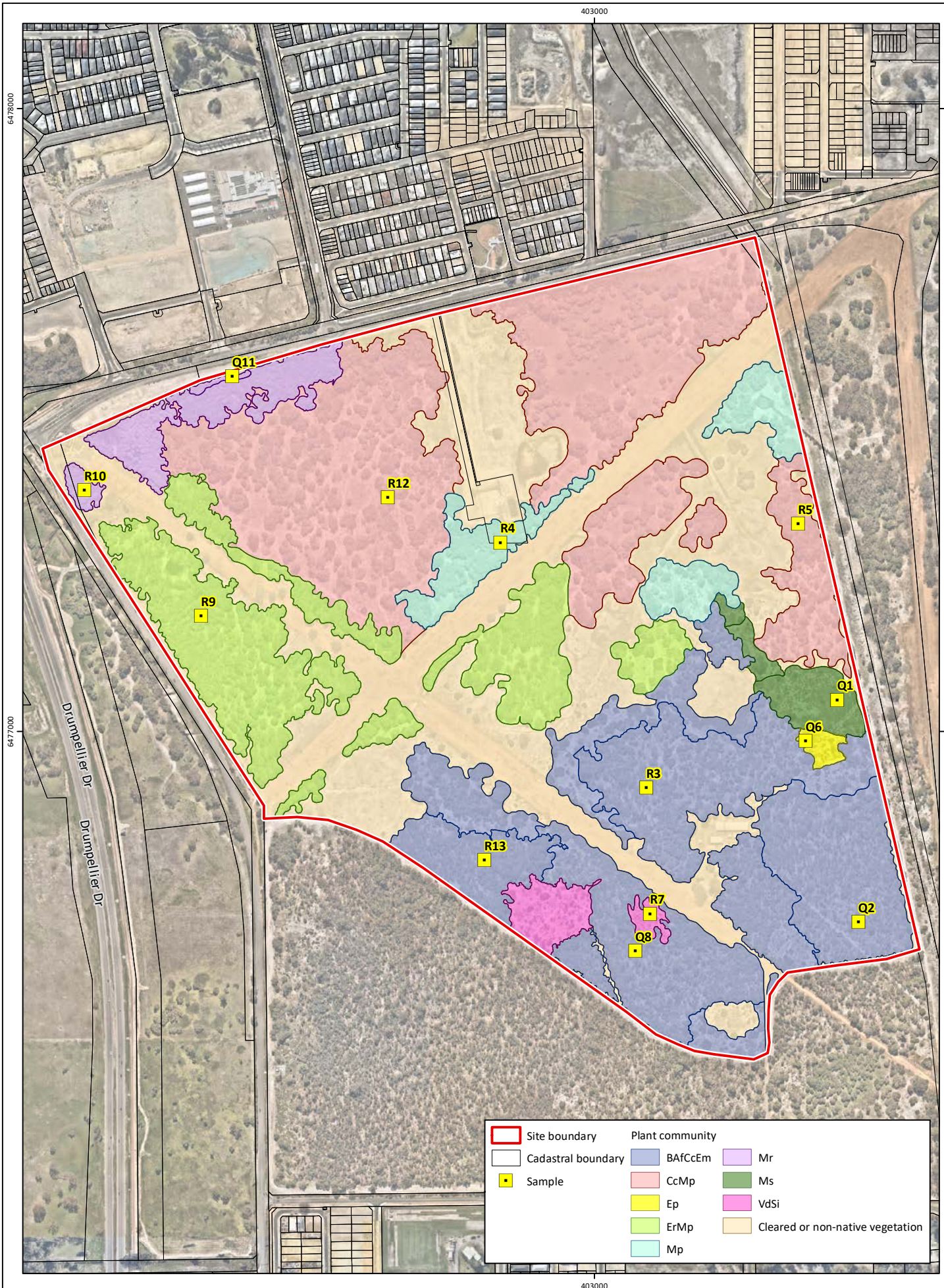

Figure 4: Plant Communities

Project: Detailed Flora and Vegetation Assessment
Lot 822 Youle-Dean Rd, Brabham

Client: Peet Limited

Plan Number: EP17-131(27)--F193

Drawn:	GAR
Date:	20/05/2022
Checked:	SKP
Approved:	RAW
Date:	19/10/2022

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Metres

Scale: 1:8,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

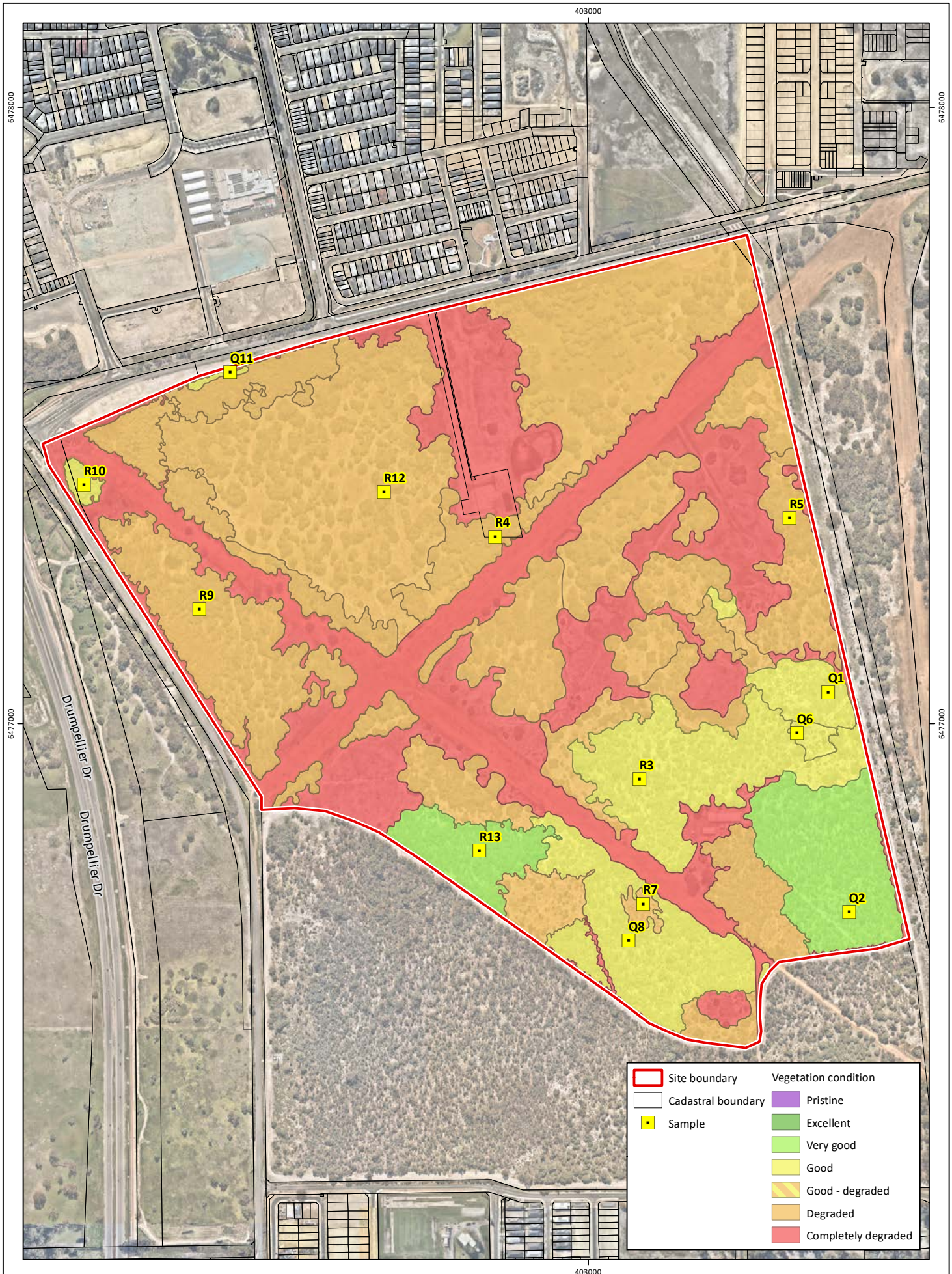

Figure 5: Vegetation Condition

Project: Detailed Flora and Vegetation Assessment
Lot 822 Youle-Dean Rd, Brabham

Client: Peet Limited

Plan Number: EP17-131(27)--F194

Drawn:	GAR
Date:	20/05/2022
Checked:	SKP
Approved:	RAW
Date:	19/10/2022

N

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Metres

Scale: 1:8,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

Figure 6: Conservation Significant Values

Project: Detailed Flora and Vegetation Assessment
Lot 822 Youle-Dean Rd, Brabham

Client: Peet Limited

Plan Number:
EP17-131(27)--F195

Drawn:	GAR
Date:	20/05/2022
Checked:	SKP
Approved:	RAW
Date:	19/10/2022

N

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Metres

Scale: 1:8,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

Appendix A

Additional Information

Conservation Significant Flora and Vegetation

Threatened and priority flora

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

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

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

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

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

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

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

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

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

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

Threatened and priority ecological communities

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

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

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

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

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

An ecological community that is under consideration for listing as a TEC, but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). PECs are categorised as priority category 1, 2 or 3 as described in **Table 3**. Ecological communities that are adequately known and are rare but not threatened, or meet criteria for 'near threatened', or that have been recently removed from the threatened list, are placed in 'priority 4'. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in 'priority 5' (DEC 2013). Listed PECs are published by DBCA (DBCA 2017b).

Table 3: Categories of priority ecological communities (DEC 2013)

Priority code	Description
P1	Priority One: Poorly known ecological communities Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	Priority Two: Poorly known ecological communities Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	Priority Three: Poorly known ecological communities (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	Priority Five: Conservation Dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Weeds

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

Declared Pests

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

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 7**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 8**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 9**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DPIRD 2020).

Table 4: Legal status of declared pest species listed under the BAM Act (DPIRD 2020)

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

Table 5: Control categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their

Category	Description
	damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DPIRD 2020)

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

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017a) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 10**.

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

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

Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 11**.

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

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

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

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

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

Wetland reclassification

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

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Appendix B

Conservation Significant Flora Species and likelihood of Occurrence Assessment

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Calectasia cyanea	CR	CR	P	Heathland on white sand or laterite gravel over laterite. Known only from one population near Albany.	Jun-Oct	Unlikely
Drakaea elastica	CR	EN	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically in banksia woodland or thickets of Kunzea glabrescens.	late Sep-Oct/Nov, survey Jul-Aug	Unlikely
Grevillea curviloba	CR	EN	P	Winter wet, deep peaty grey sands over limestone at depth.	Sep-Oct	Unlikely
Calytrix breviseta subsp. breviseta	CR	EN	P	Seasonally wet sandy-clay soil on swampy flats	Oct-Nov	Unlikely
Synaphea sp. Pinjarra (R. Davis 6578)	CR	CR	P	White grey clayey sand on the edges of seasonally inundated low lying or swamp areas in dense wetland heath and shrubland.	Sep	Unlikely
Thelymitra dedmaniarum	CR	EN	PG	Red brown sandy loam with dolerite and granite outcrops.	Oct-Nov	Unlikely
Trithuria occidentalis	CR	EN	A	Partly submerged on the edge of shallow winter-wet clay pans in very open shrubland.	Oct-Nov	Unlikely
Caladenia huegelii	CR	EN	PG	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov	Unlikely
Eucalyptus x balanites	CR	EN	P	Light coloured sandy soils over laterite. Habitat consists of gently sloping heathlands; open mallee woodland over shrubland (Population 2) or heathland with emergent mallees (population 1)	Oct - Feb	Unlikely
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	CR	CR	P	Low woodland on grey, clayey sand with lateritic pebbles (Pinjarra Plain) near winter wet flats.	Sep-Nov	Unlikely
Grevillea curviloba subsp. incurva	EN	EN	P	Sand, sandy loam. Winter-wet heath.	Aug-Sep	Unlikely
Diplolaena andrewsii	EN	EN	P	Granite outcrops & hillsides.	Jul-Oct	Unlikely

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Diuris purdiei	EN	EN	PG	Sand to sandy clay soils in areas subject to winter inundation.	late September to mid-October, but only after a summer or early autumn fire (Brown et al., 1998)	Unlikely
Darwinia foetida	EN	EN	P	Grey-white sand on swampy, seasonally wet sites.	Oct-Nov	Unlikely
Macarthuria keigheryi	EN	EN	P	Low-lying winter-wet damp grey/white sands in open patches.	Sep-Dec or Feb-Mar	Unlikely
Grevillea christineae	EN	EN	P	Clay loam, sandy clay, often moist.	Aug-Sep	Unlikely
Drakaea micrantha	EN	VU	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct	Unlikely
Thelymitra stellata	EN	EN	PG	Sandy loam, clay or gravel over laterite or gravel.	Sep-Nov	Unlikely
Anigozanthos viridis subsp. Terraspectans	VU	VU	P	Grey sand, clay loam. Winter-wet depressions.	Aug-Sep	Unlikely
Anthocercis gracilis	VU	VU	P	Steep granite slopes along the Darling Scarp in shallow, humis-rich sandy or loamy soils.	Sep-Oct, Apr	Unlikely
Conospermum undulatum	VU	VU	P	Sand and sandy clay soils, on flat or gently sloping sites between the Swan and Canning Rivers	May-Oct	Unlikely
Diuris drummondii	VU	VU	PG	In low-lying depressions in peaty and sandy clay swamps.	Nov-Jan	Unlikely
Chamelaucium lullfitzii	VU	EN	P	White yellow sand in low woodland. Dandaragan Plain	Oct-Nov	Unlikely
Andersonia gracilis	VU	EN	P	Seasonally damp, black sandy clay flats near or on the margins of swamps.	Sep-Nov	Unlikely
Diuris micrantha	VU	VU	PG	Dark grey-black sandy clay-loam in winter wet depressions or swamps. Often in shallow standing water.	Aug/Sep-early Oct	Unlikely

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Eleocharis keigheryi	VU	VU	P	Clay or sandy loam in freshwater creeks and transient waterbodies such as seasonally wet clay pans.	Aug-Dec	Unlikely
Grevillea flexuosa	VU	VU	P	Red-brown sand with laterite & gravel, sand over granite, on hilltops, slopes and in gullies.	May-Oct	Unlikely
Bolboschoenus fluviatilis	P1	-	P	Floodplain with grey/brown wet sand.	Nov	Unlikely
Hydrocotyle striata	P1	-	A	Sand and clay in springs and creeklines.	Nov	Unlikely
Stachystemon sp. Keysbrook (R. Archer 17/11/99)	P1	-	P	White grey sand.	Oct	Unlikely
Acacia benthamii	P2	-	P	Sand, typically on limestone breakaways	Aug-Sept	Unlikely
Poranthera moorokatta	P2	-	A	Sandy or clay soils. Dampland or low sandy dunes.	Oct or Feb	Unlikely
Millotia tenuifolia var. laevis	P2	-	A	Granite or lateritic soils.	Sep-Oct	Unlikely
Phyllangium palustre	P2	-	A	Winter-wet claypans, low-lying seasonal wetlands on clay.	Oct-Nov	Unlikely
Lepyrodia curvescens	P2	-	P	Sand, laterite. Seasonally inundated swampland.	Sep-Nov	Unlikely
Acacia oncinophylla subsp. oncinophylla	P3	-	P	Granitic soils	Aug-Oct	Unlikely
Beaufortia purpurea	P3	-	P	Lateritic or granitic soils on rocky slopes.	Oct-Feb	Unlikely
Isopogon autumnalis	P3	-	P	Yellow-grey sand.	Feb,Mar,Apr,May or June	Unlikely
Carex tereticaulis	P3	-	P	Black peaty sand.	Sep-Oct	Unlikely
Eryngium sp. Subdecumbens (G.J. Keighery 5390)	P3	-	A	Clay in seasonal wetlands.	Sep-Nov	Unlikely
Halgania corymbosa	P3	-	P	Gravelly soils, soils over granite.	Aug-Nov	Unlikely
Haemodorum loratum	P3	-	P	Grey or yellow sand, gravel.	Nov	Unlikely
Lasiopetalum glutinosum subsp. glutinosum	P3	-	P	Brown clay loam on slopes	Sep-Dec	Unlikely
Thysanotus anceps	P3	-	P	White or grey sand, lateritic gravel, laterite.	Oct-Dec	Unlikely
Meionectes tenuifolia	P3	-	P	Clay loam in seasonally wet areas.	Oct-Dec	Unlikely

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
Myriophyllum echinatum	P3	-	A	Clay in winter-wet flats.	Nov	Unlikely
Pithocarpa corymbulosa	P3	-	P	Gravelly or sandy loam, amongst granite outcrops.	Jan-Apr	Unlikely
Schoenus capillifolius	P3	-	A	Brown mud in claypans.	Oct-Nov	Unlikely
Cyathochaeta teretifolia	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan	Unlikely
Schoenus sp. Waroona (G.J. Keighery 12235)	P3	-	A	Clay or sandy clay. Winter-wet flats.	Oct-Nov	Unlikely
Tetratheca pilifera	P3	-	P	Gravelly soils.	Aug-Oct	Unlikely
Byblis gigantea	P3	-	P	Sandy-peat swamps. Seasonally wet areas.	Sep-Jan	Unlikely
Stylidium trudgenii	P3	-	P	Grey sand, dark grey to black sandy peat. Margins of winter-wet swamps, depressions	Sep-Jan	Unlikely
Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)	P3	-	P	Grey brown sand or clay in winter wet flats.	Sep-Nov	Unlikely
Hydrocotyle lemnoides	P4	-	A	Floating in swamps.	Aug-Oct	Unlikely
Jacksonia sericea	P4	-	P	Calcareous and sandy soils on Swan Coastal Plain	Dec-Feb	Unlikely
Anigozanthos humilis subsp. chrysanthus	P4	-	P	Grey or yellow sand	Jul-Oct	Unlikely
Cyanicula ixioides subsp. ixioides	P4	-	P	Laterite, gravel.	Aug-Oct	Unlikely
Darwinia pimelioides	P4	-	P	Loam, sandy loam on granite outcrops.	Sep-Oct	Unlikely
Verticordia lindleyi subsp. lindleyi	P4	-	P	Sand and sandy clay in winter wet areas.	May or Nov-Jan	Recorded
Persoonia sulcata	P4	-	P	Lateritic or granitic soils.	Sep-Nov	Unlikely
Drosera occidentalis	P4	-	P	Flat, brown/white/yellow moist sand/clay/peat, often near swamps.	Oct-Dec/Jan	Unlikely
Senecio leucoglossus	P4	-	A	Gravelly lateritic or granitic soils on outcrops or slopes.	Aug-Dec	Unlikely
Thysanotus glaucus	P4	-	P	White, grey or yellow sand, sandy gravel.	Oct-Mar	Unlikely
Stylidium longitubum	P4	-	A	Sandy clay, clay. Seasonal wetlands.	Oct-Dec	Unlikely
Hypolaena robusta	P4	-	P	White sand. Sandplains	Sep-Oct	Unlikely
Schoenus griffinianus	P4	-	P	White sand.	Sep-Oct	Unlikely

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

Appendix C

Species List

Family	Status	Species
Aizoaceae		
	*	*Carpobrotus edulis*
Amaranthaceae		
		Ptilotus polystachyus
Anarthriaceae		
		Lyginia barbata
		Lyginia imberbis
Apiaceae		
		Centella asiatica
Araceae		
	*, DP	*Zantedeschia aethiopica*
Araliaceae		
		Trachymene pilosa
Asparagaceae		
	*, DP	*Asparagus asparagoides*
		Laxmannia squarrosa
		Lomandra caespitosa
		Lomandra hermaphrodita
		Sowerbaea laxiflora
		Thysanotus manglesianus
Asteraceae		
	*	*Arctotheca calendula*
	*	*Cotula coronopifolia*
	*	*Dittrichia graveolens*
	*	*Erigeron bonariensis*
	*	*Hypochaeris glabra*
		Lagenophora huegelii
		Podotheca angustifolia
		Podotheca gnaphalioides
	*	*Quinetia urvillei*
		Senecio pinnatifolius var. *pinnatifolius*
		Siloxerus humifusus
	*	*Sonchus oleraceus*
	*	*Symphyotrichum squamatum*
	*	*Ursinia anthemoides*
	*	*Vellereophyton dealbatum*
		Waitzia suaveolens var. *suaveolens*
Boraginaceae		
	*, DP	*Echium plantagineum*
Campanulaceae		
		Lobelia anceps
	*	*Wahlenbergia capensis*
		Wahlenbergia preissii
Caryophyllaceae		
	*	*Petrorhagia dubia*
	*	*Silene gallica*
	*	*Stellaria media*

Family	Status	Species
Casuarinaceae		
		Allocasuarina fraseriana
Centrolepidaceae		
		Centrolepis drummondiana
Colchicaceae		
		Burchardia congesta
Crassulaceae		
		Crassula colorata
		Crassula decumbens
		Crassula glomerata
Cyperaceae		
		Baumea juncea
		Isolepis marginata
Dasypogonaceae		
		Dasypogon bromeliifolius
Dilleniaceae		
		Hibbertia huegelii
		Hibbertia hypericoides
		Hibbertia racemosa
Droseraceae		
		Drosera erythrorhiza
		Drosera glanduligera
		Drosera menziesii
		Drosera nitidula
Ericaceae		
		Leucopogon propinquus
Fabaceae		
	*	*Acacia longifolia*
		Acacia saligna
		Gompholobium tomentosum
		Jacksonia furcellata
		Jacksonia sternbergiana
		Kennedia prostrata
	*	*Lotus subbiflorus*
	*	*Misopates orontium*
	*	*Trifolium campestre* var. *campestre*
		Viminaria juncea
Geraniaceae		
	*	*Pelargonium capitatum*
Haemodoraceae		
		Conostylis aculeata subsp. *cygnorum*
		Haemodorum spicatum
Hemerocallidaceae		
		Arnocrinum preissii
		Corynotheca micrantha
Iridaceae		
	*	*Freesia alba × leichtlinii*
	*	*Gladiolus caryophyllaceus*

Family	Status	Species
Iridaceae (cont.)	*	*Hesperantha falcata*
	*, DP	*Moraea flaccida*
		Patersonia occidentalis
	*	*Romulea rosea*
Juncaceae		
	*	*Juncus microcephalus*
		Juncus pallidus
Juncaginaceae		
		Cycnogeton lineare
Lamiaceae		
	*	*Mentha pulegium*
Lauraceae		
		Cassytha flava
Loganiaceae		
		Phyllangium paradoxum
Loranthaceae		
		Amyema miquelii
		Nuytsia floribunda
Macarthuriaceae		
		Macarthuria australis
Montiaceae		
		Calandrinia sp.
Myrtaceae		
		Astartea scoparia
		Calytrix fraseri
		Corymbia calophylla
		Eremaea pauciflora var. *pauciflora*
	*	*Eucalyptus camaldulensis*
	Pl	*Eucalyptus gomphocephala*
		Eucalyptus marginata
		Eucalyptus rudis
		Eucalyptus todtiana
	*	*Eucalyptus* sp.
		Hypocalymma angustifolium
	*	*Leptospermum laevigatum*
		Melaleuca preissiana
		Melaleuca rhaphiophylla
		Melaleuca seriata
		Pericalymma ellipticum
		Scholtzia involucrata
		Verticordia densiflora var. *densiflora*
	P4	*Verticordia lindleyi* subsp. *lindleyi*
Oleaceae		
	*	*Olea europaea*
Orchidaceae		
		Caladenia flava
		Caladenia latifolia
	*	*Disa bracteata*

Family	Status	Species
Orchidaceae (cont.)		*Elythranthera brunonis*
		Leporella fimbriata
		Leptoceras menziesii
		Pterostylis pyramidalis
		Pterostylis sp.
		Pyrorchis nigricans
Orobanchaceae		
	*	*Parentucellia latifolia*
Oxalidaceae		
	*	*Oxalis purpurea*
Papaveraceae		
	*	*Fumaria capreolata*
Phyllanthaceae		
		Poranthera microphylla
Phytolaccaceae		
	*	*Phytolacca octandra*
Poaceae		
	*	*Aira praecox*
	*	*Aira* sp.
		Austrostipa compressa
	*	*Briza maxima*
	*	*Briza minor*
	*	*Bromus arenarius*
	*	*Ehrharta calycina*
	*	*Ehrharta longiflora*
		Microlaena stipoides
	*	*Pentameris airoides*
	*	*Poa annua*
		Sporobolus virginicus
	*	*Vulpia* sp.
Polygonaceae		
	*	*Rumex acetosella*
	*	*Rumex crispus*
Portulacaceae		
	*	*Portulaca oleracea*
Primulaceae		
	*	*Lysimachia arvensis*
Proteaceae		
		Banksia attenuata
		Banksia ilicifolia
		Banksia menziesii
		Petrophile linearis
		Stirlingia latifolia
Restionaceae		
		Alexgeorgea nitens
		Desmocladus flexuosus
		Hypolaena exsulca
		Leptocarpus decipiens

Family	Status	Species
Rubiaceae		
	*	*Galium murale*
Rutaceae		
		Philotheca spicata
Scrophulariaceae		
	*	*Dischisma capitatum*
Solanaceae		
	*	*Solanum nigrum*
Stylidiaceae		
		Levenhookia pusilla
		Levenhookia stipitata
		Stylidium androsaceum
		Stylidium neurophyllum
Typhaceae		
		Typha orientalis
Xanthorrhoeaceae		
		Chamaescilla corymbosa
		Xanthorrhoea brunonis
		Xanthorrhoea preissii
Zamiaceae		
		Macrozamia fraseri

*=non-native, Pl=planted

Appendix D

Conservation Significant Communities and Likelihood of Occurrence Assessment

Code	Community name	TEC/ PEC	Level of significance		Likelihood of occurrence
			State	EPBC Act	
Mound Springs	Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain	TEC	CR	EN	Does not occur
SCP3a	*Corymbia calophylla - Kingia australis* woodlands on heavy soils, Swan Coastal Plain	TEC	CR	CR	Does not occur
SCP3c	*Corymbia calophylla - Xanthorrhoea preissii* woodlands and shrublands of the Swan Coastal Plain	TEC	CR	EN	Does not occur
SCP20c	Shrublands and woodlands of the eastern side of the Swan Coastal Plain	TEC	CR	EN	Does not occur
SCP02	Southern wet shrublands	TEC	EN	-	Does not occur
SCP20a	*Banksia attenuata* woodlands over species rich dense shrublands	TEC	EN	-	Does not occur
Muchea Limestone	Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain	TEC	EN	EN	Does not occur
SCP20b	*Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain	TEC	EN	-	Does not occur
-	Claypans of the Swan Coastal Plain	TEC	-	CR	Does not occur
SCP07	Herb rich saline shrublands in clay pans	TEC	VU	CR	Does not occur
SCP08	Herb rich shrublands in clay pans	TEC	VU	CR	Does not occur
Banksia WL SCP	Banksia woodlands of the Swan Coastal Plain	PEC/ TEC	P3	EN	Present
Tuart WLs	Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community	PEC/ TEC	P3	CR	Does not occur
SCP21c	Low lying *Banksia attenuata* woodlands or shrublands	PEC/ TEC	P3	EN	Not likely to occur
SCP22	*Banksia ilicifolia* woodlands	PEC/ TEC	P3	EN	Does not occur
SCP23b	Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands	PEC/ TEC	P3	EN	Does not occur
Coastal saltmarsh	Subtropical and Temperate Coastal Saltmarsh	PEC/ TEC	P3	VU	Does not occur
Central Granite Shrubland	Central Northern Darling Scarp Granite Shrubland Community	PEC	P4	-	Does not occur

Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P3=priority 3, P4=priority 4

Appendix E

Species x Plant Community Matrix

Species	Plant community								
	BAfCcEm	CcMp	Ep	ErMp	Mp	Mr	Ms	VdSi	Cleared
Acacia longifolia	X	X		X	X	X	X		
Acacia saligna						X			
Aira praecox	X						X		
Aira sp.	X			X					
Alexgeorgea nitens	X								
Allocasuarina fraseriana	X	X							
Amyema miquelii		X							
Arctotheca calendula	X	X	X		X		X		
Arnocrinum preissii	X								
Asparagus asparagoides	X	X			X		X		
Astartea scoparia				X					
Austrostipa compressa	X								
Banksia attenuata	X							X	
Banksia ilicifolia	X							X	
Banksia menziesii	X							X	
Baumea juncea						X			
Briza maxima	X		X	X			X		
Briza minor	X	X							
Bromus arenarius							X		
Burchardia congesta	X								
Caladenia flava	X		X					X	
Caladenia latifolia	X								
Calandrinia sp.	X								
Calytrix fraseri								X	
Carpobrotus edulis	X								
Cassytha flava			X						
Centella asiatica						X			
Centrolepis drummondiana	X		X						
Chamaescilla corymbosa	X								
Conostylis aculeata subsp. cygnorum							X		

Species	Plant community								
	BAfCcEm	CcMp	Ep	ErMp	Mp	Mr	Ms	VdSi	Cleared
Corymbia calophylla	X	X							
Corynotheca micrantha	X			X					
Cotula coronopifolia						X			
Crassula colorata	X						X		
Crassula decumbens		X							
Crassula glomerata								X	
Cycnogeton lineare						X			
Dasypogon bromeliifolius	X	X							
Desmocladus flexuosus	X								
Disa bracteata	X								
Dischisma capitatum			X	X				X	
Dittrichia graveolens									X
Drosera erythrorhiza	X		X					X	
Drosera glanduligera							X		
Drosera menziesii	X								
Drosera nitidula								X	
Echium plantagineum					X				
Ehrharta calycina	X	X	X	X					
Ehrharta longiflora	X	X	X		X		X	X	
Elythranthera brunonis	X								
Eremaea pauciflora subsp. pauciflora			X						
Erigeron bonariensis		X		X					
Eucalyptus camaldulensis									X
Eucalyptus gomphocephala									X
Eucalyptus marginata	X								
Eucalyptus rudis				X	X	X			
Eucalyptus sp.	X								
Eucalyptus todtiana		X							
Freesia alba × leichtlinii			X						
Fumaria capreolata	X								

Species	Plant community								
	BAfCcEm	CcMp	Ep	ErMp	Mp	Mr	Ms	VdSi	Cleared
Galium murale	X	X			X				
Gladiolus caryophyllaceus	X							X	
Gompholobium tomentosum	X								
Haemodorum spicatum			X					X	
Hesperantha falcata	X	X	X		X			X	
hibbertia huegelii	X								
Hibbertia hypericoides	X								
Hibbertia racemosa	X							X	
Hypocalymma angustifolium	X								
Hypochaeris glabra	X	X	X				X	X	
Hypolaena exsulca	X								
Isolepis marginata	X						X		
Jacksonia furcellata	X								
Jacksonia sternbergiana			X						
Juncus microcephalus						X			
Juncus pallidus				X		X			
Kennedia prostrata	X								
Lagenophora huegelii	X		X						
Laxmannia squarrosa								X	
Leporella fimbriata	X								
Leptocarpus decipiens						X			
Leptoceras menziesii	X								
Leptospermum laevigatum	X								
Leucopogon propinquus	X								
Levenhookia pusilla	X								
Levenhookia stipitata	X								
Lobelia anceps						X			
Lomandra caespitosa	X		X						
Lomandra hermaphrodita	X								
Lotus subbiflorus	X	X							

Species	Plant community								
	BAfCcEm	CcMp	Ep	ErMp	Mp	Mr	Ms	VdSi	Cleared
Lyginia barbata	X		X						
Lyginia imberbis	X						X		
Lysimachia arvensis	X	X							
Macarthuria australis								X	
Macrozamia fraseri	X								
Melaleuca preissiana		X		X	X	X			
Melaleuca rhaphiophylla				X		X			
Melaleuca seriata	X		X				X		
Mentha pulegium						X			
Microlaena stipoides	X	X					X		
Moraea flaccida	X	X	X	X	X		X		
Nuytsia floribunda	X	X							
Olea europaea				X					
Oxalis purpurea	X								
Parentucellia latifolia			X						
Patersonia occidentalis	X		X	X					
Pelargonium capitatum		X							
Pentameris airoides							X		
Pericalymma ellipticum							X		
Petrophile linearis	X								
Petrorhagia dubia			X				X	X	
Philotheca spicata	X								
Phyllangium paradoxum	X								
Phytolacca octandra					X				
Poa annua						X			
Podotheca angustifolia	X								
Podotheca gnaphalioides	X		X				X	X	
Poranthera microphylla	X		X						
Portulaca oleracea						X			
Pterostylis pyramidalis	X								

Species	Plant community								
	BAfCcEm	CcMp	Ep	ErMp	Mp	Mr	Ms	VdSi	Cleared
Pterostylis sp.	X								
Ptilotus polystachyus	X								
Pyrorchis nigricans	X						X		
Quinetia urvillei	X								
Romulea rosea	X						X		
Rumex acetosella	X			X					
Rumex crispus						X			
Scholtzia involucrata	X		X					X	
Senecio pinnatifolius var. pinnatifolius	X								
Silene gallica								X	
Siloxerus humifusus	X								
Solanum nigrum	X				X	X			
Sonchus oleraceus	X	X			X	X			
Sowerbaea laxiflora	X								
Sporobolus virginicus						X			
Stellaria media		X			X				
Stirlingia latifolia	X								
Stylidium androsaceum	X								
Stylidium neurophyllum	X								
Symphyotrichum squamatum						X			
Thysanotus manglesianus	X								
Trachymene pilosa	X	X	X						
Trifolium campestre var. campestre		X							
Typha orientalis						X			
Ursinia anthemoides	X	X	X	X			X	X	
Vellereophyton dealbatum									X
Verticordia densiflora subsp. densiflora	X			X			X	X	
Verticordia lindleyi subsp. lindleyi					X				
Viminaria juncea						X			
Vulpia sp.						X			

Species	Plant community								
	BAfCcEm	CcMp	Ep	ErMp	Mp	Mr	Ms	VdSi	Cleared
Wahlenbergia capensis	X								
Wahlenbergia preissii	X								
Waitzia suaveolens var. suaveolens	X		X	X				X	
Xanthorrhoea brunonis	X		X	X					
Xanthorrhoea preissii	X	X							
Zantedeschia aethiopica	X	X							

Appendix F

Sample Data

Vegetation Sample Data

Sample Name: Q1

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM Q1: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	403389.4909	NW corner northing:	6477051.032
Altitude (m):	25	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - clearing weeds
Soil type/texture	sand/	Bare ground (%):	10
Rocks (%) and type:	No rocks	Soil colour:	grey/
Litter:	15% (twigs,leaves,)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: Q1

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM Q1: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Acacia longifolia*	opp
*	*Aira praecox*	0.5
*	*Arctotheca calendula*	2
*, DP, WoNS	*Asparagus asparagoides*	0.5
*	*Briza maxima*	opp
*	*Bromus arenarius*	2
	Conostylis aculeata subsp. cygnorum	1
	Crassula colorata	0.5
	Crassula colorata	0.5
	Drosera glanduligera	0.5
*	*Ehrharta longiflora*	2
*	*Hypochaeris glabra*	2
	Isolepis marginata	0.5
	Lyginia imberbis	1
	Melaleuca seriata	60
	Microlaena stipoides	0.5
*, DP	*Moraea flaccida*	opp
*	*Pentameris airoides*	0.5
	Pericalymma ellipticum	5
*	*Petrorhagia dubia*	0.5
	Podotheca gnaphalioides	2
	Pyrorchis nigricans	0.5
*	*Romulea rosea*	0.5
*	*Ursinia anthemoides*	1
	Verticordia densiflora subsp. densiflora	3

Vegetation Sample Data

Sample Name: Q2

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM Q2: Page 1 of 3

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	403423.323	NW corner northing:	6476693.613
Altitude (m):	20	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	low - weeds
Soil type/texture	sand/ with organic layer	Bare ground (%):	2
Rocks (%) and type:	No rocks	Soil colour:	grey/white
Litter:	70% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: Q2

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Acacia longifolia*	opp
*	*Aira sp.*	0.1
	Allocasuarina fraseriana	5
	Arnocrinum preissii	opp
*, DP, WoNS	*Asparagus asparagoides*	opp
	Banksia attenuata	opp
	Banksia menziesii	20
	Burchardia congesta	0.1
	Caladenia flava	0.1
	Centrolepis drummondiana	opp
	Corymbia calophylla	15
	Crassula colorata	opp
	Drosera erythrorhiza	0.1
	Drosera menziesii	0.1
*	*Ehrharta calycina*	0.1
*	*Ehrharta longiflora*	0.1
*	*Gladiolus caryophyllaceus*	0.1
	Gompholobium tomentosum	opp
*	*Hesperantha falcata*	0.1
	Hibbertia hypericoides	opp
	Hibbertia hypericoides	20
*	*Hypochaeris glabra*	0.1
	Isolepis marginata	0.5
	Jacksonia furcellata	opp
	Lagenophora huegelii	0.1
	Leporella fimbriata	0.1
	Lomandra caespitosa	0.1
	Lyginia barbata	1
*	*Lysimachia arvensis*	0.1
	Macrozamia fraseri	2
	Melaleuca seriata	2
	Microlaena stipoides	0.1
	Nuytsia floribunda	opp
	Patersonia occidentalis	5
	Petrophile linearis	opp
	Podotheca angustifolia	opp

Vegetation Sample Data

Sample Name: Q2

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Podotheca angustifolia	opp
	Podotheca gnaphalioides	opp
	Poranthera microphylla	0.1
	Pyrorchis nigricans	opp
*	*Romulea rosea*	0.1
	Scholtzia involucrata	1
*	*Solanum nigrum*	0.5
	Stirlingia latifolia	1
	Stylidium androsaceum	0.1
	Stylidium neurophyllum	opp
	Trachymene pilosa	0.1
*	*Ursinia anthemoides*	0.1
	Waitzia suaveolens var. suaveolens	opp
	Xanthorrhoea brunonis	5
	Xanthorrhoea preissii	5
*, DP	*Zantedeschia aethiopica*	0.5

Vegetation Sample Data

Sample Name: R3

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	403082.8815	NW corner northing:	6476909.351
Altitude (m):	15	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - clearing weeds
Soil type/texture	sand/ with organic layer	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	grey/white
Litter:	70% (leaves,branches,logs)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: R3

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM

Species Data

* denotes non-native species

Status	Confirmed name
	Allocasuarina fraseriana
*	*Arctotheca calendula*
	Banksia attenuata
	Banksia ilicifolia
	banksia menziesii
*	*Briza maxima*
	Caladenia flava
	Drosera erythrorhiza
*	*Ehrharta longiflora*
	Eucalyptus marginata
*	*Galium murale*
*	*Hesperantha falcata*
	hibbertia huegelii
*	*Hypochaeris glabra*
	Lagenophora huegelii
	Leporella fimbriata
	Leucopogon propinquus
*	*Lotus subbiflorus*
*	*Lysimachia arvensis*
	Microlaena stipoides
*, DP	*Moraea flaccida*
	Podotheca gnaphalioides
	Poranthera microphylla
*	*Rumex acetosella*
*	*Solanum nigrum*
	Sowerbaea laxiflora
	Stylidium androsaceum
	Trachymene pilosa

Vegetation Sample Data

Sample Name: R4

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM R4: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	402849.0995	NW corner northing:	6477303.348
Altitude (m):	15	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - clearing weeds
Soil type/texture	sand/ with organic layer	Bare ground (%):	1
Rocks (%) and type:	No rocks	Soil colour:	black/
Litter:	25% (bark,leaves,twigs)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: R4

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Acacia longifolia*	
*	*Arctotheca calendula*	
*, DP, WoNS	*Asparagus asparagoides*	
*, DP, WoNS	*Echium plantagineum*	
*	*Ehrharta longiflora*	
	Eucalyptus rudis	
*	*Galium murale*	
*	*Hesperantha falcata*	
	Melaleuca preissiana	
*, DP	*Moraea flaccida*	
*	*Phytolacca octandra*	
*	*Solanum nigrum*	
*	*Sonchus oleraceus*	
*	*Stellaria media*	

Vegetation Sample Data

Sample Name: R5

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	403326.7382	NW corner northing:	6477333.682
Altitude (m):	14	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	high - clearing weeds
Soil type/texture	sand/	Bare ground (%):	2
Rocks (%) and type:	No rocks	Soil colour:	grey/
Litter:	60% (leaves,branches,twigs)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: R5

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Acacia longifolia*	
	Allocasuarina fraseriana	
*	*Arctotheca calendula*	
*, DP, WoNS	*Asparagus asparagoides*	
*	*Briza minor*	
	Corymbia calophylla	
	Crassula decumbens	
*	*Ehrharta longiflora*	
*	*Erigeron bonariensis*	
*	*Galium murale*	
*	*Hesperantha falcata*	
*	*Hypochaeris glabra*	
*	*Lotus subbiflorus*	
*	*Lysimachia arvensis*	
	Melaleuca preissiana	
	Microlaena stipoides	
*, DP	*Moraea flaccida*	
*	*Sonchus oleraceus*	
*	*Stellaria media*	
	Trachymene pilosa	
*	*Trifolium campestre var. campestre*	
*	*Ursinia anthemoides*	
*, DP	*Zantedeschia aethiopica*	

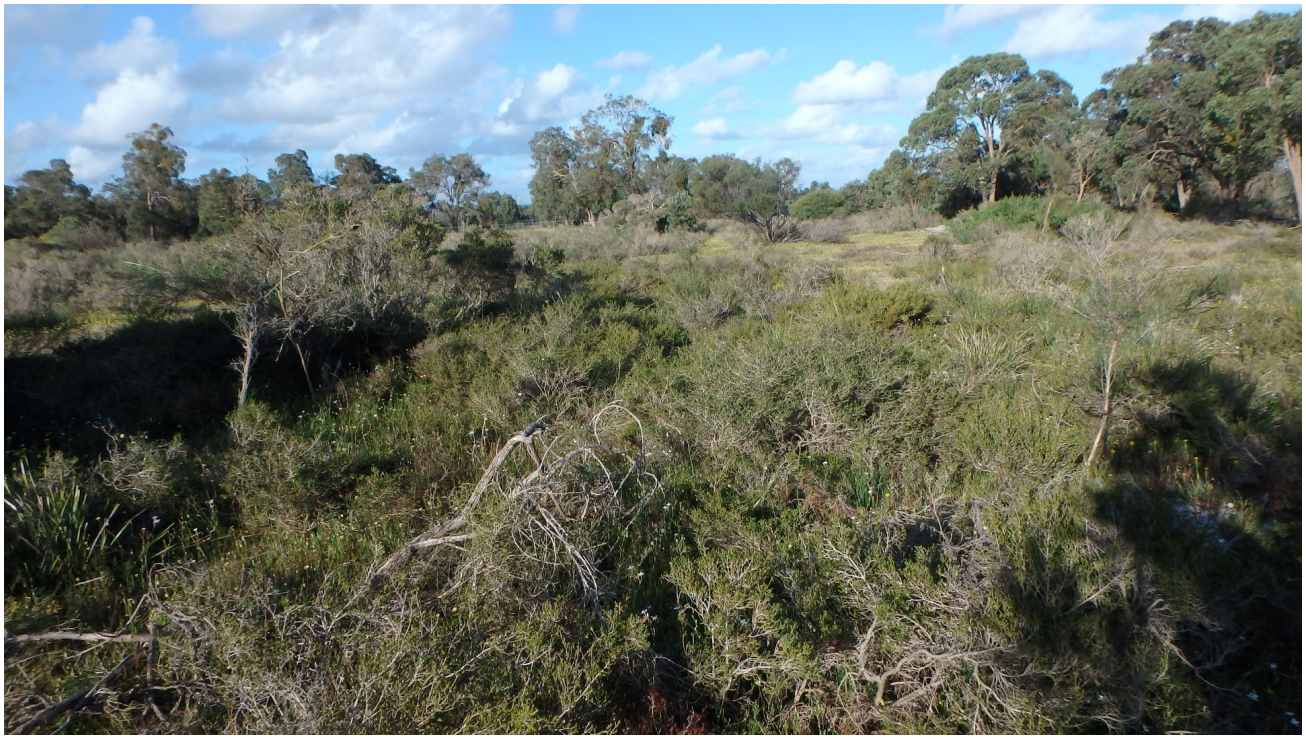
Vegetation Sample Data

Sample Name: Q6

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM Q6: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	403339.2952	NW corner northing:	6476984.711
Altitude (m):	14	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - clearing weeds
Soil type/texture	sand/	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	grey/white
Litter:	10% (twigs,branches,)	Vegetation condition:	very good



Vegetation Sample Data

Sample Name: Q6

Project no.: EP17-131
Date: 29/09/2021 **Status** Non-permanent
Author: RAO,SCM Q6: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Arctotheca calendula*	0.1
*	*Briza maxima*	0.1
	Caladenia flava	opp
	Cassytha flava	opp
	Centrolepis drummondiana	0.1
*	*Dischisma capitatum*	0.1
	Drosera erythrorhiza	0.1
*	*Ehrharta calycina*	0.1
*	*Ehrharta longiflora*	0.1
	Eremaea pauciflora subsp. pauciflora	30
*	*Freesia alba × leichtlinii*	0.1
	Haemodorum spicatum	opp
*	*Hesperantha falcata*	1
*	*Hypochaeris glabra*	2
	Jacksonia sternbergiana	1
	Lagenophora huegelii	0.1
	Lomandra caespitosa	0.1
	Lyginia barbata	1
	Melaleuca seriata	opp
	Melaleuca seriata	1
*, DP	*Moraea flaccida*	0.1
*	*Parentucellia latifolia*	0.1
	Patersonia occidentalis	5
*	*Petrorhagia dubia*	0.1
	Podotheca gnaphalioides	1
	Poranthera microphylla	opp
	Scholtzia involucrata	1
	Trachymene pilosa	1
*	*Ursinia anthemoides*	10
	Waitzia suaveolens var. suaveolens	0.1
	Xanthorrhoea brunonis	1

Vegetation Sample Data

Sample Name: R7

Project no.: EP17-131
Date: 30/09/2021 **Status** Non-permanent
Author: SKP,ASF R7: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	403089.4261	NW corner northing:	6476707.098
Altitude (m):	32	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	flat
Time since fire:	no evidence	Disturbance:	moderate - clearing weeds
Soil type/texture	sand/	Bare ground (%):	35
Rocks (%) and type:	No rocks	Soil colour:	grey/white
Litter:	2% (twigs,,)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: R7

Project no.: EP17-131
Date: 30/09/2021 **Status** Non-permanent
Author: SKP,ASF

Species Data

* denotes non-native species

Status	Confirmed name
	Banksia attenuata
	Banksia ilicifolia
	Banksia menziesii
	Caladenia flava
	Calytrix fraseri
*	*Crassula glomerata*
*	*Dischisma capitatum*
	Drosera erythrorhiza
	Drosera nitidula
*	*Ehrharta longiflora*
*	*Gladiolus caryophyllaceus*
	Haemodorum spicatum
*	*Hesperantha falcata*
	Hibbertia racemosa
*	*Hypochaeris glabra*
	Laxmannia squarrosa
	Laxmannia squarrosa
	Macarthuria australis
*	*Petrorhagia dubia*
	Podotheca gnaphalioides
	Scholtzia involucrata
*	*Silene gallica*
*	*Ursinia anthemoides*
	Verticordia densiflora subsp. densiflora
	Waitzia suaveolens var. suaveolens

Vegetation Sample Data

Sample Name: Q8

Project no.: EP17-131
Date: 30/09/2021 **Status** Non-permanent
Author: SKP,ASF Q8: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	403065.3853	NW corner northing:	6476647.341
Altitude (m):	31	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - tree deaths, loss of understorey
Soil type/texture	sand/ with organic layer	Bare ground (%):	2
Rocks (%) and type:	No rocks	Soil colour:	brown/grey
Litter:	80% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: Q8

Project no.: EP17-131
Date: 30/09/2021 **Status** Non-permanent
Author: SKP,ASF

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Acacia longifolia*	0.5
	Alexgeorgea nitens	0.1
	Allocasuarina fraseriana	10
*	*Arctotheca calendula*	0.1
*, DP, WoNS	*Asparagus asparagoides*	0.1
	Banksia attenuata	15
	Banksia menziesii	opp
	Burchardia congesta	opp
	Caladenia flava	0.1
	Desmocladus flexuosus	0.5
	Drosera erythrorhiza	2
	Eucalyptus marginata	10
*	*Eucalyptus sp.*	opp
	Hibbertia hypericoides	1
*	*Hypochaeris glabra*	0.1
	Kennedia prostrata	0.1
	Lagenophora huegelii	0.1
	Leptoceras menziesii	0.1
*	Leptospermum laevigatum	2
	Lomandra caespitosa	0.1
	Lomandra hermaphrodita	0.5
	Patersonia occidentalis	1
	Podotheca gnaphalioides	opp
	Poranthera microphylla	0.1
	Pterostylis sp.	0.1
	Quinetia urvillei	opp
*	Sonchus oleraceus	0.1
	Sowerbaea laxiflora	opp
	Stirlingia latifolia	1
	Stylidium androsaceum	opp
	Thysanotus manglesianus	0.1
	Trachymene pilosa	0.5
*	Ursinia anthemoides	0.1
	Waitzia suaveolens var. suaveolens	0.1
	Xanthorrhoea brunonis	1

Vegetation Sample Data

Sample Name: R9

Project no.: EP17-131
Date: 27/10/2021 **Status** Non-permanent
Author: SKP,ASF R9: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	402368.3566	NW corner northing:	6477185.366
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - clearing weeds
Soil type/texture	sand/	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	grey/brown
Litter:	% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: R9

Project no.: EP17-131
Date: 27/10/2021 **Status** Non-permanent
Author: SKP,ASF

Species Data

* denotes non-native species

Status	Confirmed name
*	*Acacia longifolia*
*	*Aira sp.*
	Astartea scoparia
*	*Briza maxima*
	Corynotheca micrantha
*	*Dischisma capitatum*
*	*Ehrharta calycina*
*	*Erigeron bonariensis*
	Eucalyptus rudis
	Juncus pallidus
	Melaleuca preissiana
	Melaleuca rhaphiophylla
*, DP	*Moraea flaccida*
*	*Olea europaea*
	Patersonia occidentalis
*	*Rumex acetosella*
*	*Ursinia anthemoides*
	Verticordia densiflora subsp. densiflora
	Waitzia suaveolens var. suaveolens
	Xanthorrhoea brunonis

Vegetation Sample Data

Sample Name: Q10

Project no.: EP17-131
Date: 27/10/2021 **Status** Non-permanent
Author: SKP,ASF Q10: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	402180.3721	NW corner northing:	6477387.139
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - adjacent clearing, weeds
Soil type/texture	sand/clay with organic layer	Bare ground (%):	1
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: Q10

Project no.: EP17-131
Date: 27/10/2021 **Status** Non-permanent
Author: SKP,ASF

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Acacia longifolia*	opp
	Acacia saligna	10
	Baumea juncea	0.5
	Centella asiatica	opp
*	*Cotula coronopifolia*	opp
	Cycnogeton lineare	opp
	Eucalyptus rudis	opp
	Eucalyptus rudis	opp
	Juncus pallidus	0.5
	Juncus pallidus	opp
	Melaleuca preissiana	opp
	Melaleuca rhaphiophylla	60
*	*Poa annua*	2
*	*Portulaca oleracea*	opp
*	*Rumex crispus*	0.5
*	*Solanum nigrum*	opp
*	*Sonchus oleraceus*	0.5
	Sporobolus virginicus	opp
*	*Symphyotrichum squamatum*	opp
	Typha orientalis	1
	Viminaria juncea	opp
*	*Vulpia sp.*	3

Vegetation Sample Data

Sample Name: Q11

Project no.: EP17-131
Date: 24/03/2022 **Status** Non-permanent
Author: SKP,MS Q11: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	402418.1838	NW corner northing:	6477570.538
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - adjacent clearing, weeds
Soil type/texture	sand/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	grey/brown
Litter:	% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: Q11

Project no.: EP17-131
Date: 24/03/2022 **Status** Non-permanent
Author: SKP,MS Q11: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Baumea juncea	10
	Centella asiatica	0.5
*	*Juncus microcephalus*	2
	Leptocarpus decipiens	3
	Lobelia anceps	1
	Melaleuca rhaphiophylla	75
*	*Mentha pulegium*	opp

Vegetation Sample Data

Sample Name: R12

Project no.: EP17-131
Date: 24/03/2022 **Status** Non-permanent
Author: SKP R12: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	402667.7501	NW corner northing:	6477376.158
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	high - clearing weeds
Soil type/texture	sand/	Bare ground (%):	30
Rocks (%) and type:	No rocks	Soil colour:	Grey/
Litter:	% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: R12

Project no.: EP17-131
Date: 24/03/2022 **Status** Non-permanent
Author: SKP

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
*	*Acacia longifolia*	5
	Amyema miquelii	2
	Corymbia calophylla	0.5
	Dasypogon bromeliifolius	1
*	*Ehrharta calycina*	1
	Eucalyptus todtiana	opp
	Melaleuca preissiana	60
	Nuytsia floribunda	opp
*	*Sonchus oleraceus*	1
	Xanthorrhoea preissii	1

Vegetation Sample Data

Sample Name: Q13

Project no.: EP17-131
Date: 30/09/2021 **Status** Non-permanent
Author: SKP Q13: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	402822.9252	NW corner northing:	6476793.435
Altitude (m):	0	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	flat
Time since fire:	> 5 yrs	Disturbance:	moderate - clearing weeds
Soil type/texture	sand/	Bare ground (%):	10
Rocks (%) and type:	No rocks	Soil colour:	grey/white
Litter:	% (leaves,twigs,branches)	Vegetation condition:	very good

Vegetation Sample Data

Sample Name: Q13

Project no.: EP17-131
Date: 30/09/2021 **Status** Non-permanent
Author: SKP

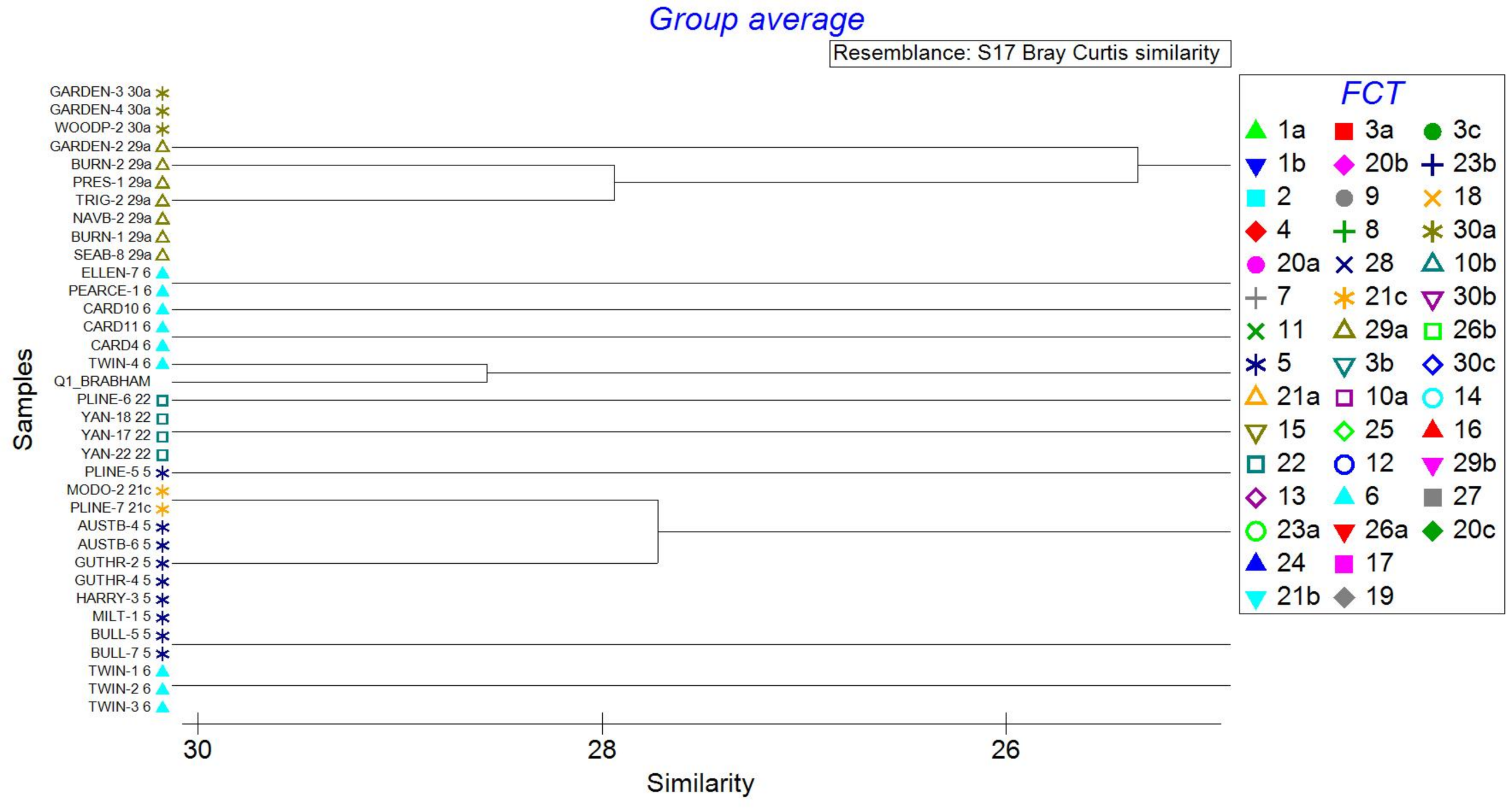
Species Data

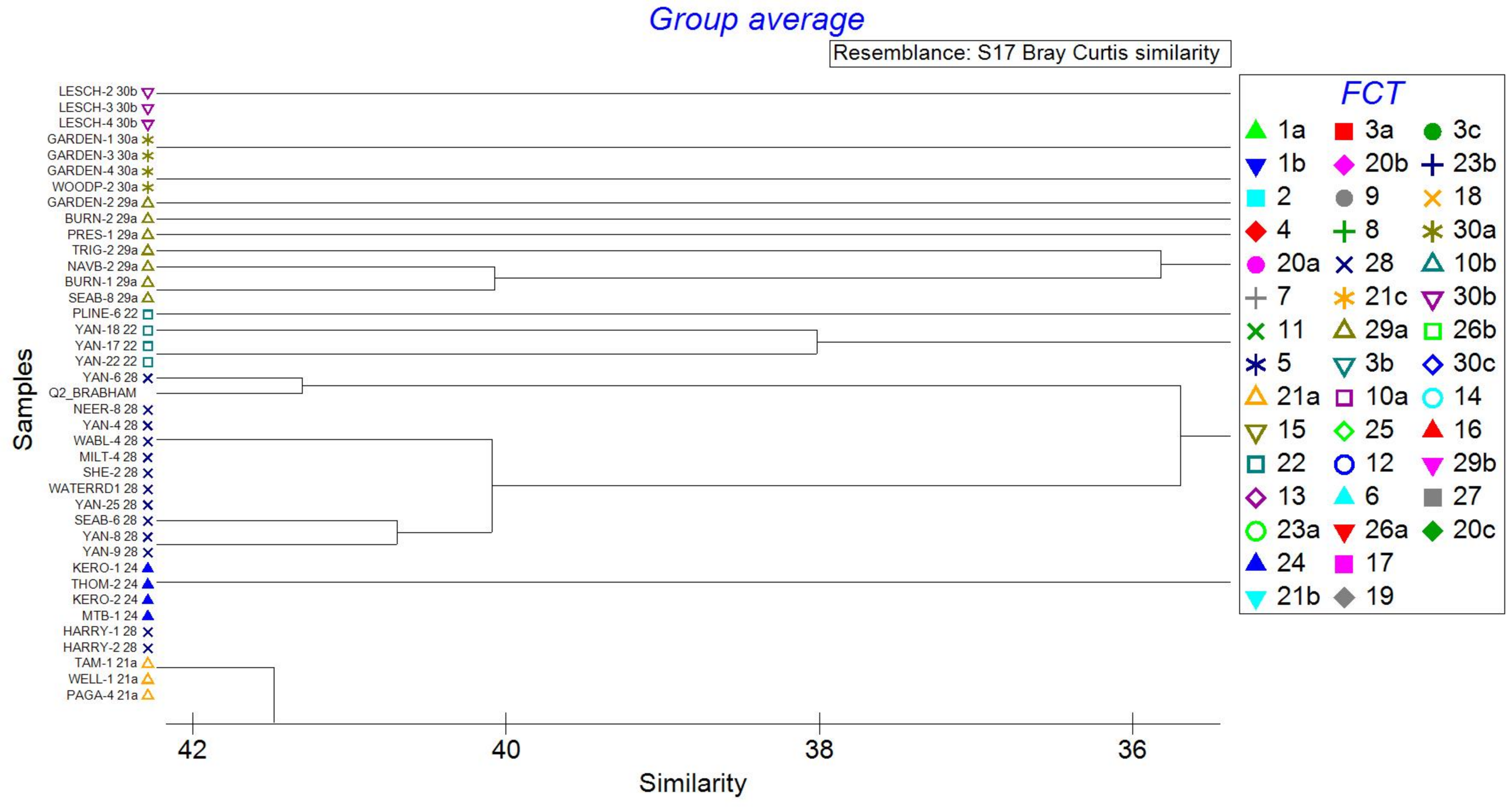
* denotes non-native species

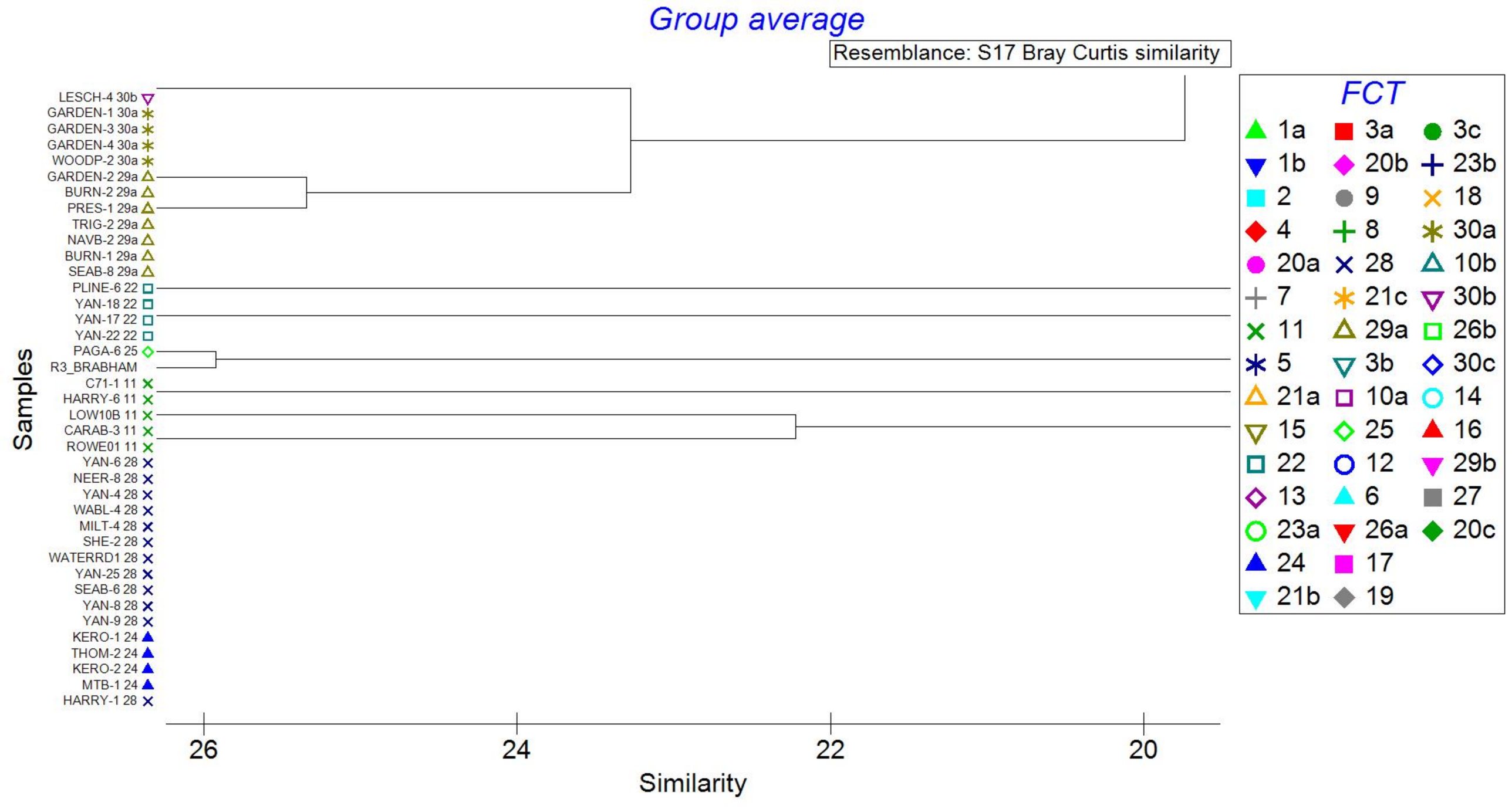
Status	Confirmed name
*	*Acacia longifolia*
	Alexgeorgea nitens
*	*Arctotheca calendula*
*, DP, WoNS	*Asparagus asparagoides*
	Banksia attenuata
	Banksia ilicifolia
	Banksia menziesii
*	*Briza maxima*
	Burchardia congesta
	Caladenia flava
	Corymbia calophylla
	Corynotheca micrantha
	Dasypogon bromeliifolius
	Desmocladus flexuosus
*	*Gladiolus caryophyllaceus*
	Hibbertia hypericoides
	Hibbertia racemosa
*	*Hypochaeris glabra*
*	*Leptospermum laevigatum*
	Lomandra hermaphrodita
	Nuytsia floribunda
	Patersonia occidentalis
	Podotheca gnaphalioides
	Poranthera microphylla
	Ptilotus polystachyus
	Stirlingia latifolia
	Thysanotus manglesianus
	Trachymene pilosa
*	*Ursinia anthemoides*
	Verticordia densiflora subsp. densiflora

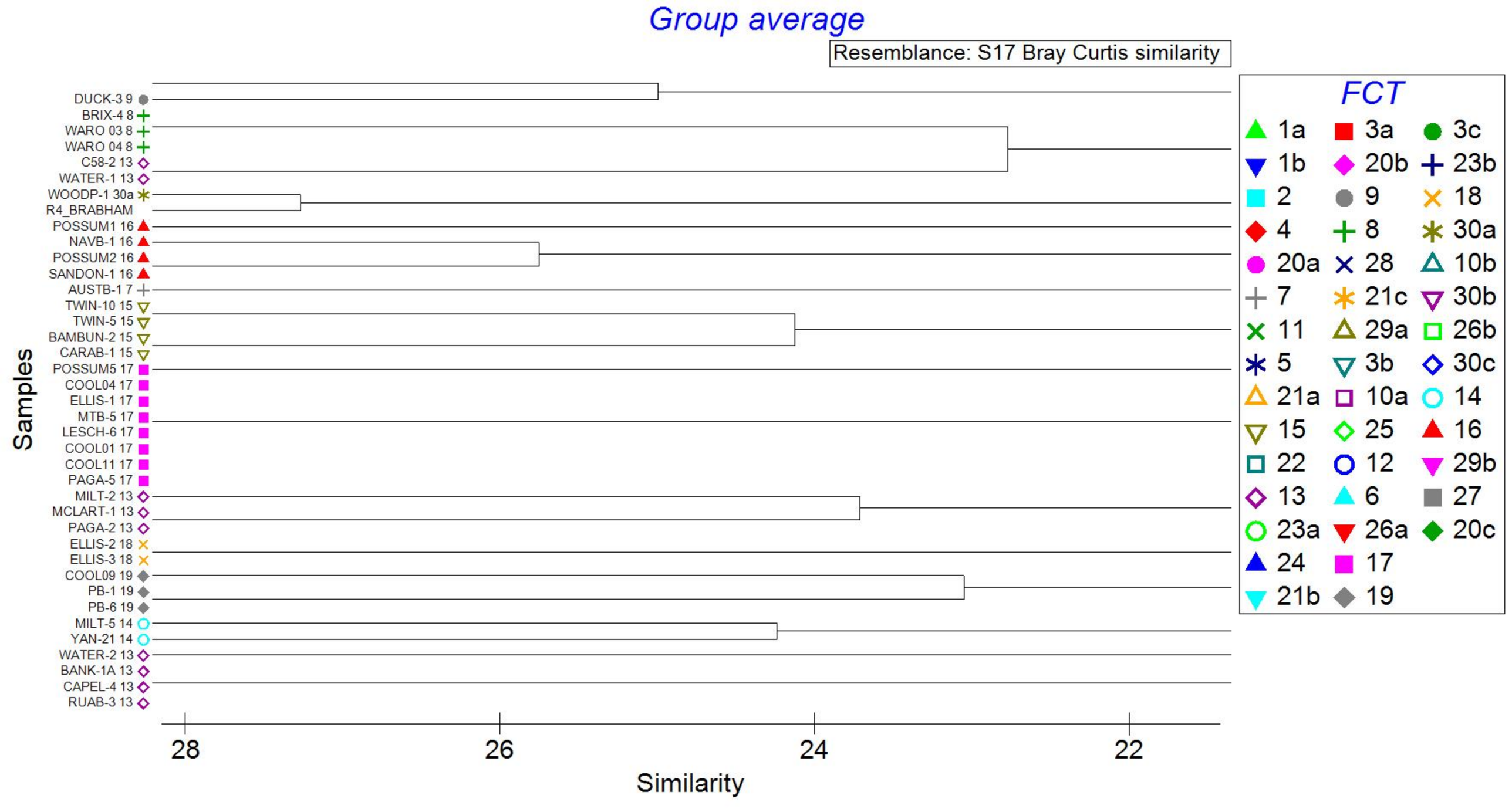
Appendix G

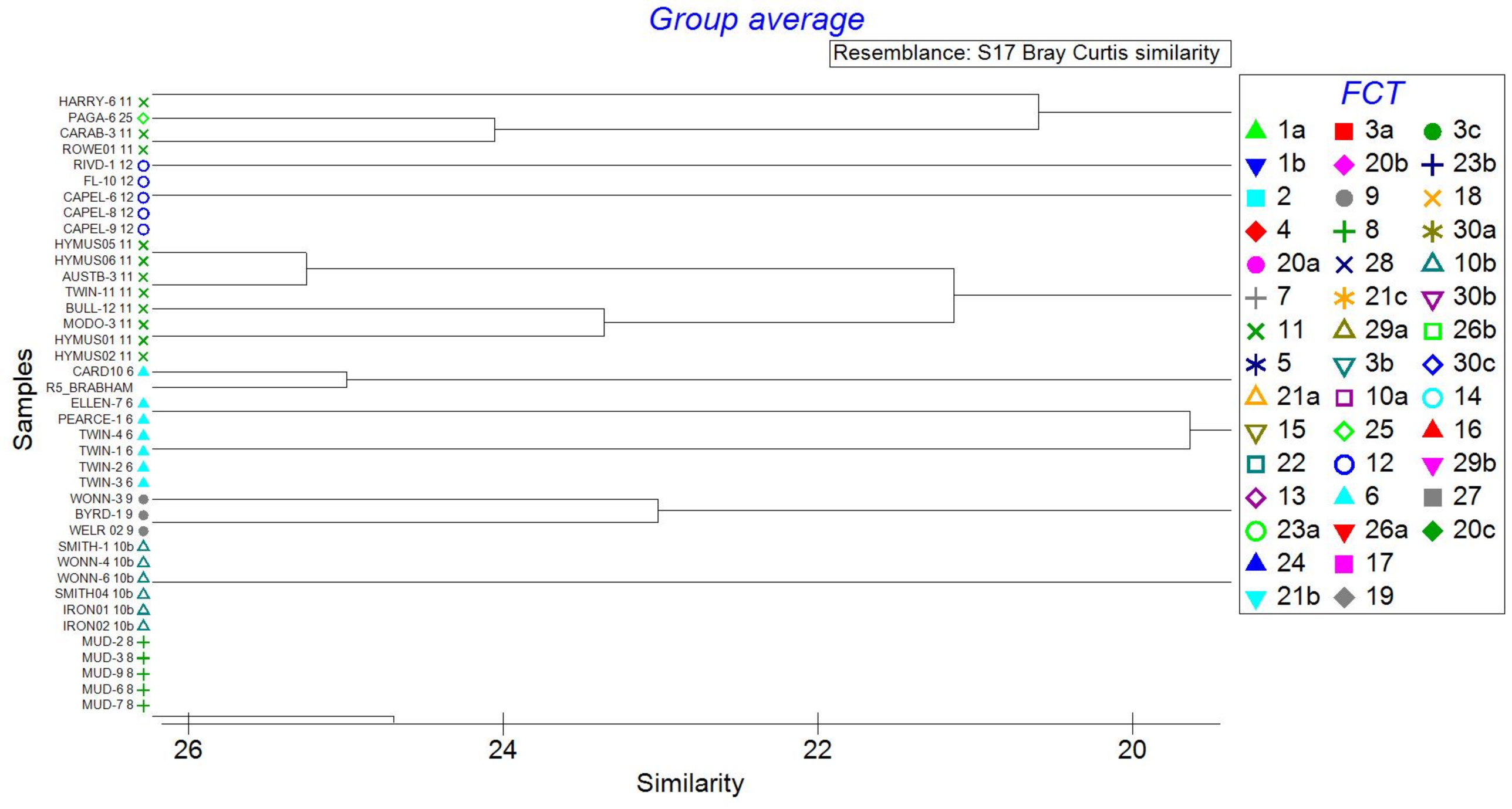
Cluster Dendrograms

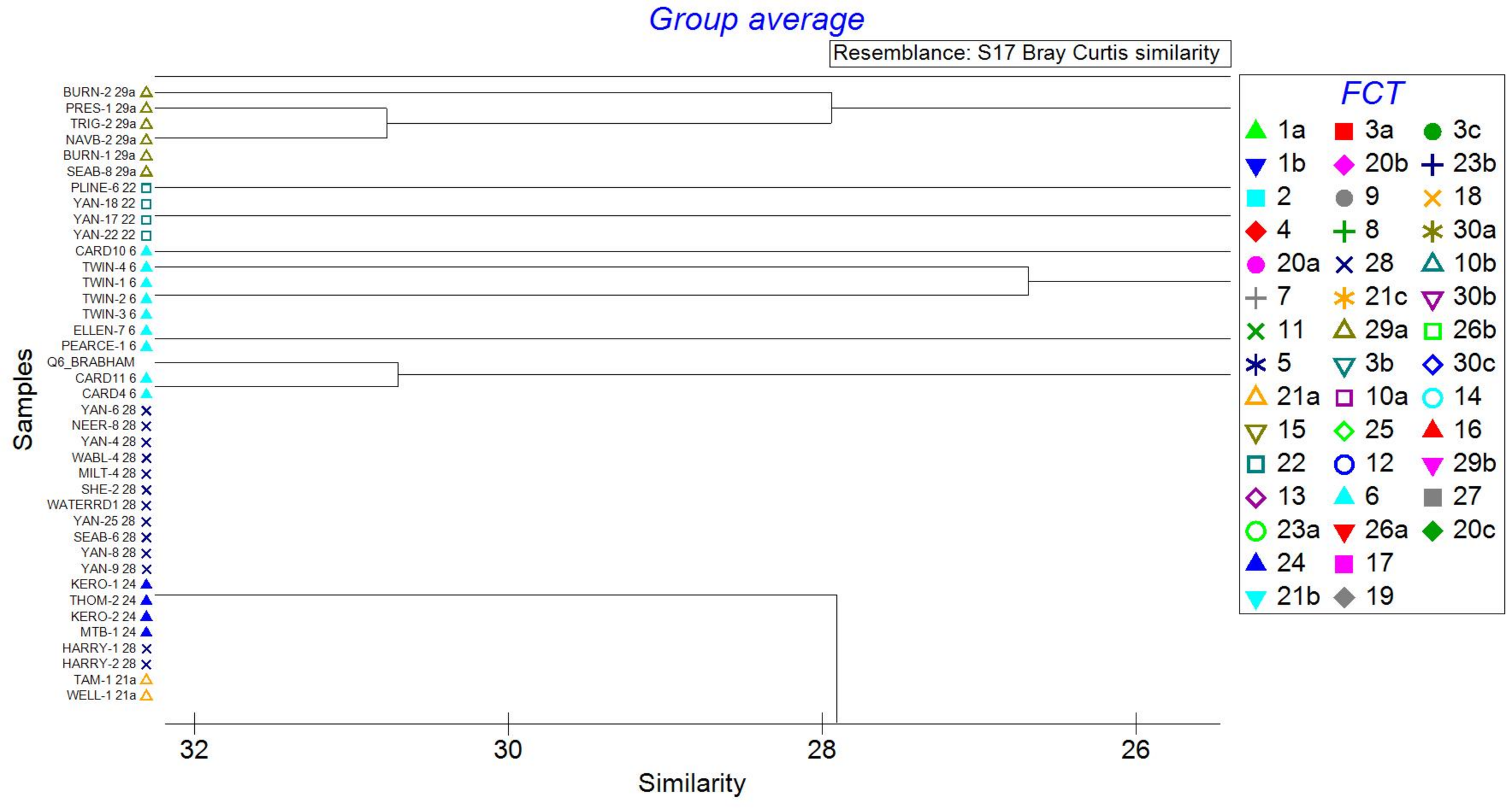

Group average
Resemblance: S17 Bray Curtis similarity
GARDEN-3 30a
GARDEN-4 30a
WOODP-2 30a
GARDEN-2 29a
BURN-2 29a
PRES-1 29a
TRIG-2 29a
NAVB-2 29a
BURN-1 29a
SEAB-8 29a
ELLEN-7 6
PEARCE-1 6
CARD10 6
CARD11 6
CARD4 6
TWIN-4 6
Q1_BRABHAM
PLINE-6 22
YAN-18 22
YAN-17 22
YAN-22 22
PLINE-5 5
MODO-2 21c
PLINE-7 21c
AUSTB-4 5
AUSTB-6 5
GUTHR-2 5
GUTHR-4 5
HARRY-3 5
MILT-1 5
BULL-5 5
BULL-7 5
TWIN-1 6
TWIN-2 6
TWIN-3 6
Samples
30
28
26
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19

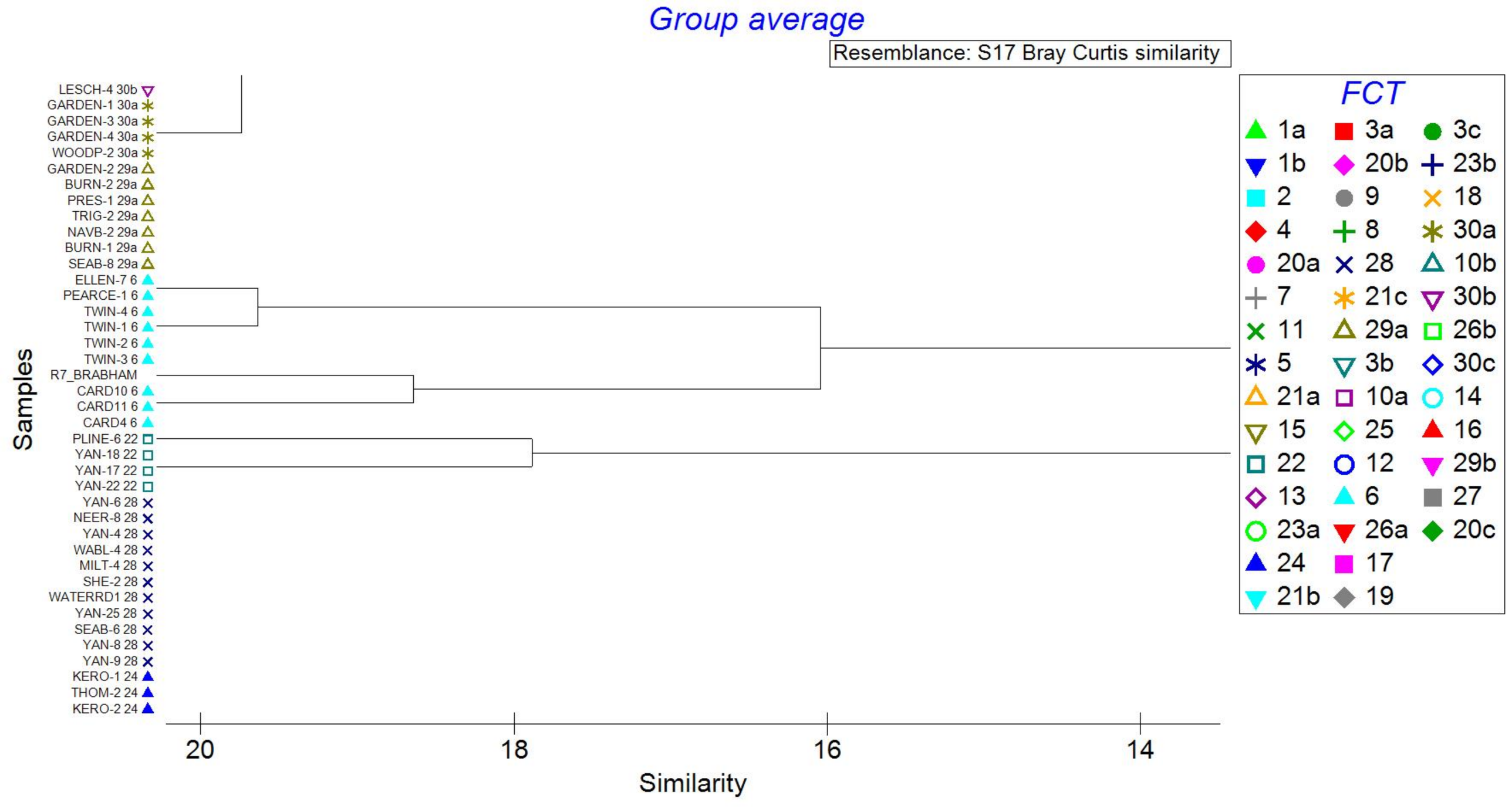

Group average
Resemblance: S17 Bray Curtis similarity
LESCH-2 30b
LESCH-3 30b
LESCH-4 30b
GARDEN-1 30a
GARDEN-3 30a
GARDEN-4 30a
WOODP-2 30a
GARDEN-2 29a
BURN-2 29a
PRES-1 29a
TRIG-2 29a
NAVB-2 29a
BURN-1 29a
SEAB-8 29a
PLINE-6 22
YAN-18 22
YAN-17 22
YAN-22 22
YAN-6 28
Q2_BRABHAM
NEER-8 28
YAN-4 28
WABL-4 28
MILT-4 28
SHE-2 28
WATERRD1 28
YAN-25 28
SEAB-6 28
YAN-8 28
YAN-9 28
KERO-1 24
THOM-2 24
KERO-2 24
MTB-1 24
HARRY-1 28
HARRY-2 28
TAM-1 21a
WELL-1 21a
PAGA-4 21a
Samples
42
40
38
36
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19

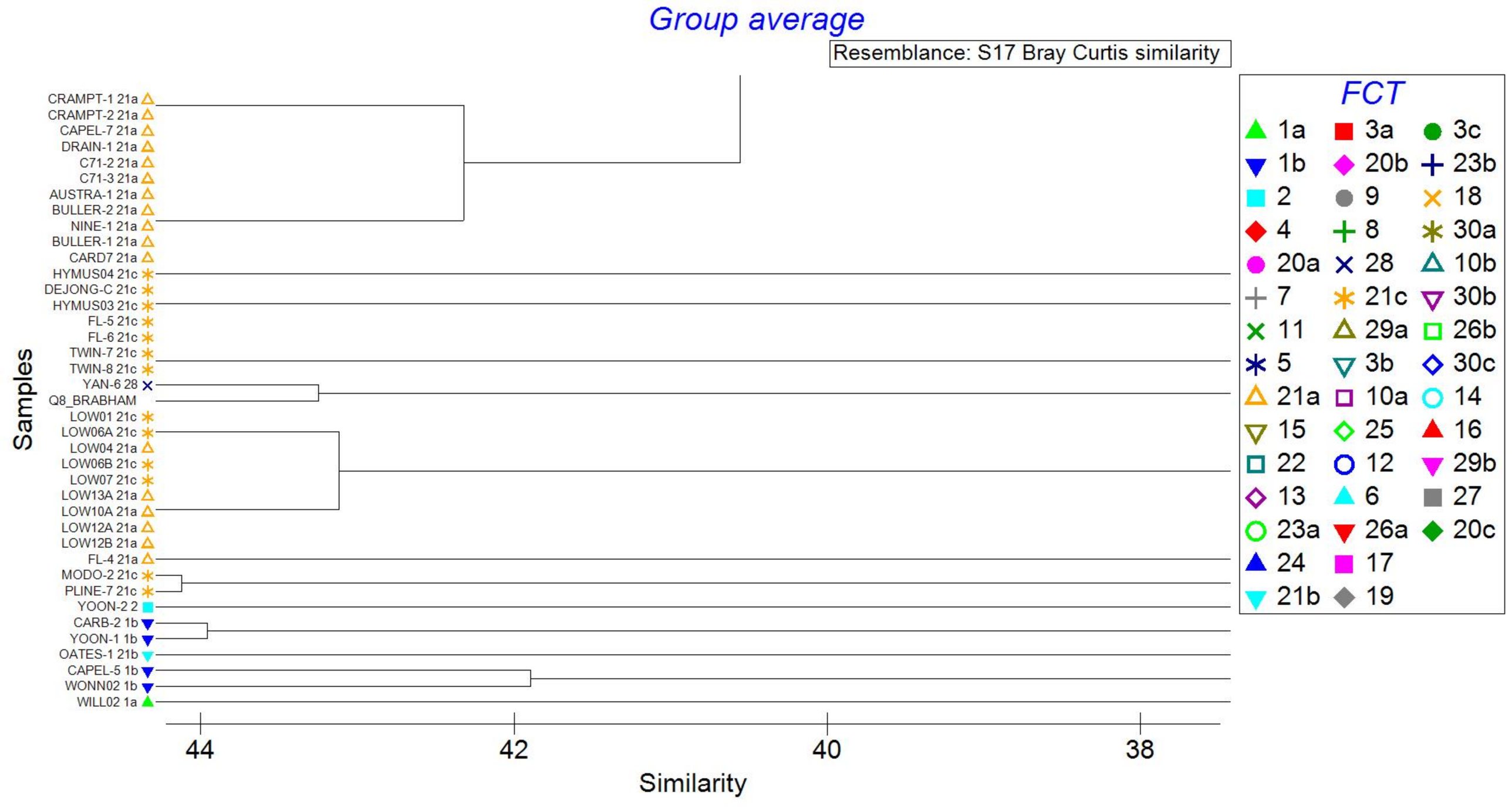

Group average
Resemblance: S17 Bray Curtis similarity
LESCH-4 30b
GARDEN-1 30a
GARDEN-3 30a
GARDEN-4 30a
WOODP-2 30a
GARDEN-2 29a
BURN-2 29a
PRES-1 29a
TRIG-2 29a
NAVB-2 29a
BURN-1 29a
SEAB-8 29a
PLINE-6 22
YAN-18 22
YAN-17 22
YAN-22 22
PAGA-6 25
R3_BRABHAM
C71-1 11
HARRY-6 11
LOW10B 11
CARAB-3 11
ROWE01 11
YAN-6 28
NEER-8 28
YAN-4 28
WABL-4 28
MILT-4 28
SHE-2 28
WATERRD1 28
YAN-25 28
SEAB-6 28
YAN-8 28
YAN-9 28
KERO-1 24
THOM-2 24
KERO-2 24
MTB-1 24
HARRY-1 28
Samples
26
24
22
20
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19

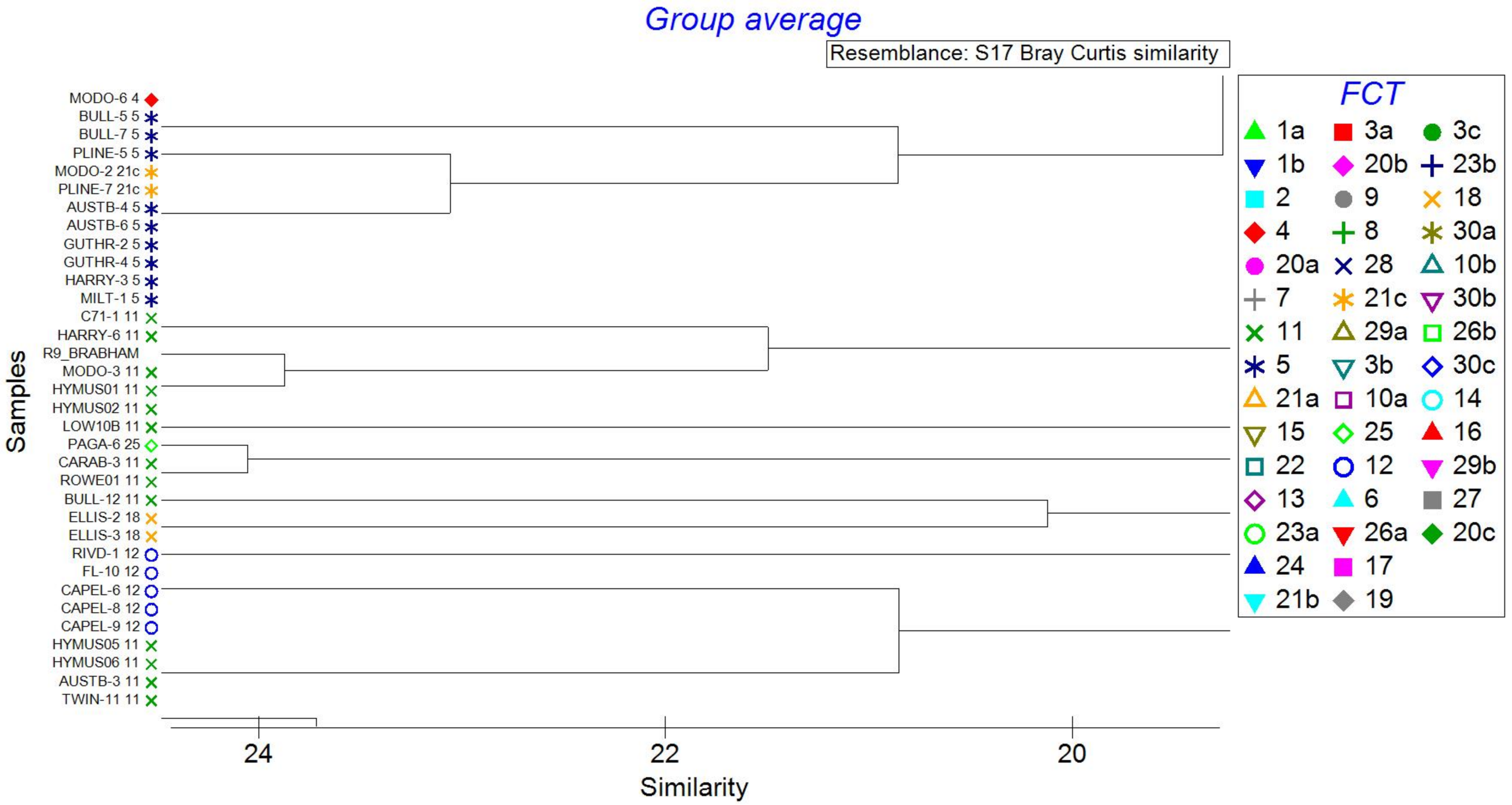

Group average
Resemblance: S17 Bray Curtis similarity
DUCK-3 9
BRIX-4 8
WARO 03 8
WARO 04 8
C58-2 13
WATER-1 13
WOODP-1 30a
R4_BRABHAM
POSSUM1 16
NAVB-1 16
POSSUM2 16
SANDON-1 16
AUSTB-1 7
TWIN-10 15
TWIN-5 15
BAMBUN-2 15
CARAB-1 15
POSSUM5 17
COOL04 17
ELLIS-1 17
MTB-5 17
LESCH-6 17
COOL01 17
COOL11 17
PAGA-5 17
MILT-2 13
MCLART-1 13
PAGA-2 13
ELLIS-2 18
ELLIS-3 18
COOL09 19
PB-1 19
PB-6 19
MILT-5 14
YAN-21 14
WATER-2 13
BANK-1A 13
CAPEL-4 13
RUAB-3 13
Samples
28
26
24
22
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19

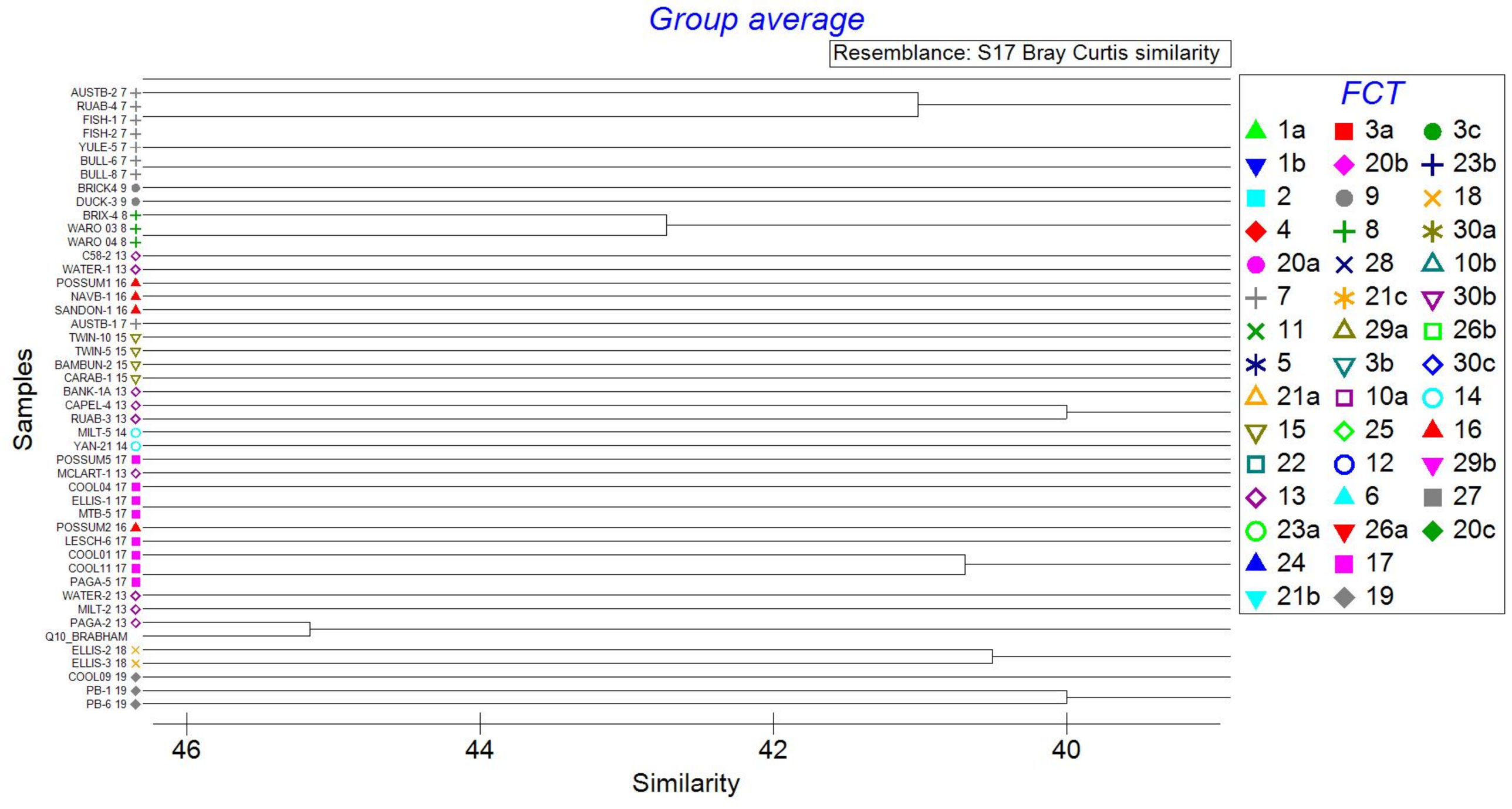

Group average
Resemblance: S17 Bray Curtis similarity
HARRY-6 11
PAGA-6 25
CARAB-3 11
ROWE01 11
RIVD-1 12
FL-10 12
CAPEL-6 12
CAPEL-8 12
CAPEL-9 12
HYMUS05 11
HYMUS06 11
AUSTB-3 11
TWIN-11 11
BULL-12 11
MODO-3 11
HYMUS01 11
HYMUS02 11
CARD10 6
R5_BRABHAM
ELLEN-7 6
PEARCE-1 6
TWIN-4 6
TWIN-1 6
TWIN-2 6
TWIN-3 6
WONN-3 9
BYRD-1 9
WELR 02 9
SMITH-1 10b
WONN-4 10b
WONN-6 10b
SMITH04 10b
IRON01 10b
IRON02 10b
MUD-2 8
MUD-3 8
MUD-9 8
MUD-6 8
MUD-7 8
Samples
26
24
22
20
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19

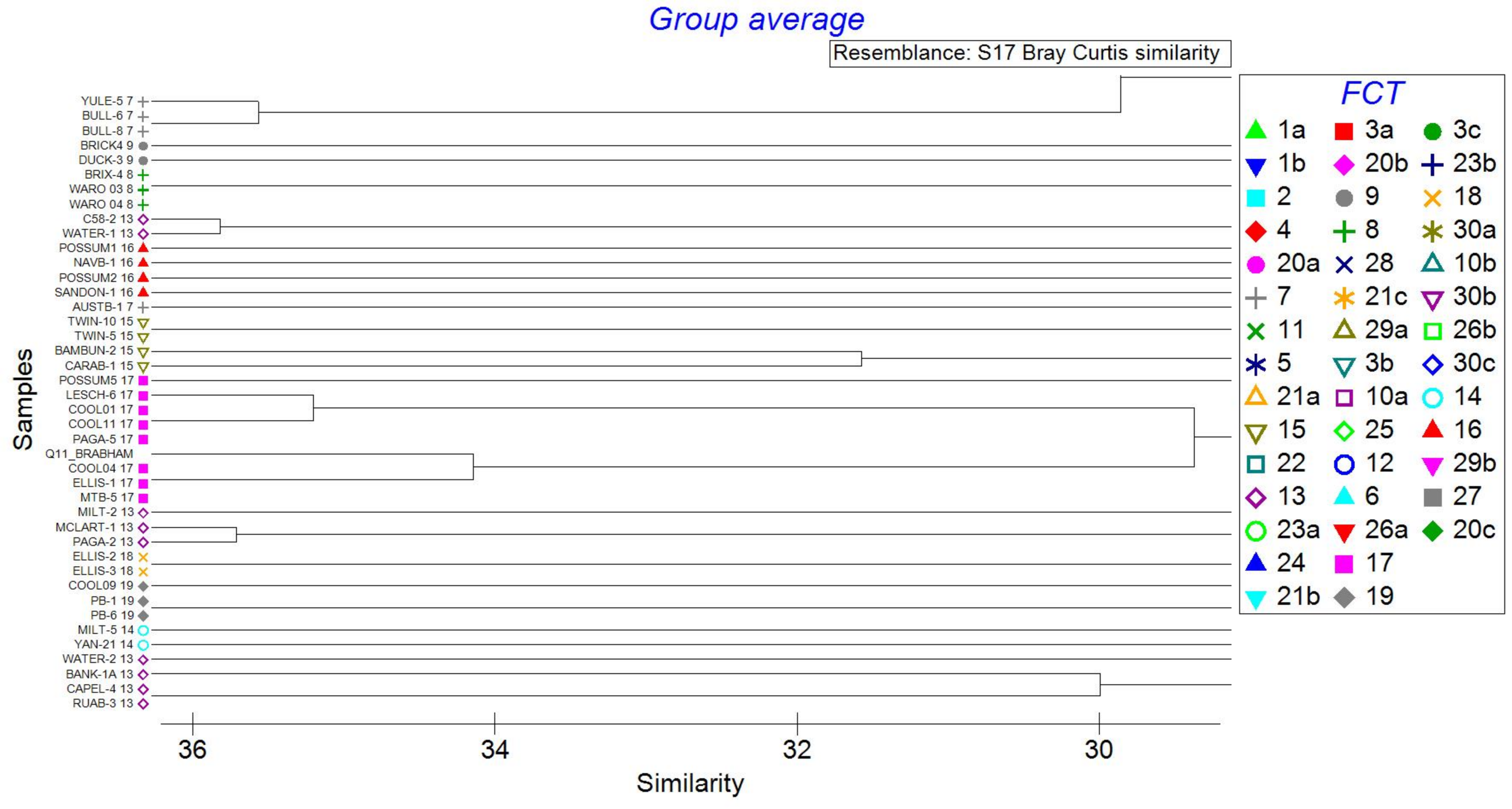

Group average
Resemblance: S17 Bray Curtis similarity
BURN-2 29a
PRES-1 29a
TRIG-2 29a
NAVB-2 29a
BURN-1 29a
SEAB-8 29a
PLINE-6 22
YAN-18 22
YAN-17 22
YAN-22 22
CARD10 6
TWIN-4 6
TWIN-1 6
TWIN-2 6
TWIN-3 6
ELLEN-7 6
PEARCE-1 6
Q6_BRABHAM
CARD11 6
CARD4 6
YAN-6 28
NEER-8 28
YAN-4 28
WABL-4 28
MILT-4 28
SHE-2 28
WATERRD1 28
YAN-25 28
SEAB-6 28
YAN-8 28
YAN-9 28
KERO-1 24
THOM-2 24
KERO-2 24
MTB-1 24
HARRY-1 28
HARRY-2 28
TAM-1 21a
WELL-1 21a
Samples
32
30
28
26
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19

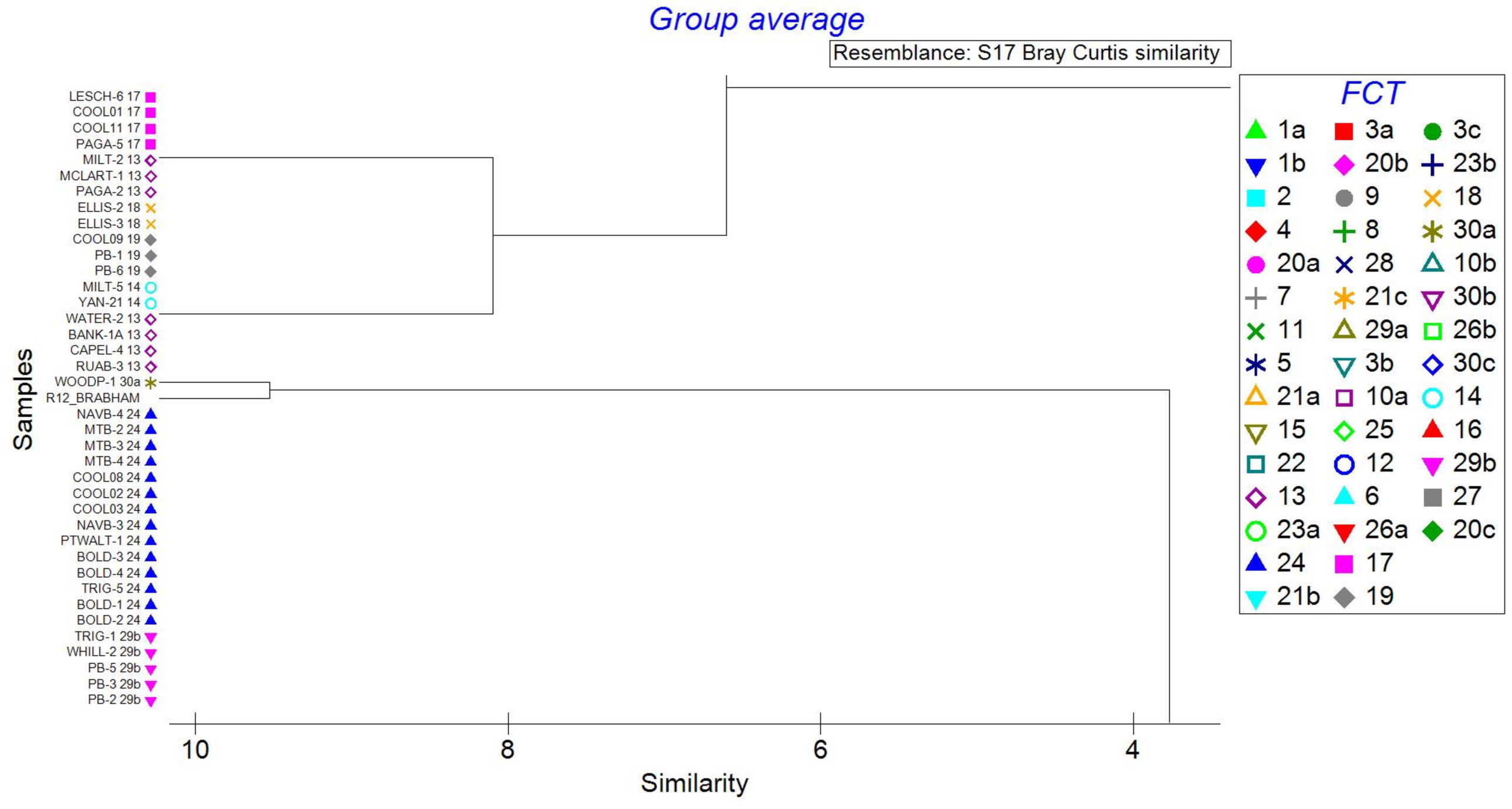

Group average
Resemblance: S17 Bray Curtis similarity
LESCH-4 30b
GARDEN-1 30a
GARDEN-3 30a
GARDEN-4 30a
WOODP-2 30a
GARDEN-2 29a
BURN-2 29a
PRES-1 29a
TRIG-2 29a
NAVB-2 29a
BURN-1 29a
SEAB-8 29a
ELLEN-7 6
PEARCE-1 6
TWIN-4 6
TWIN-1 6
TWIN-2 6
TWIN-3 6
R7_BRABHAM
CARD10 6
CARD11 6
CARD4 6
PLINE-6 22
YAN-18 22
YAN-17 22
YAN-22 22
YAN-6 28
NEER-8 28
YAN-4 28
WABL-4 28
MILT-4 28
SHE-2 28
WATERRD1 28
YAN-25 28
SEAB-6 28
YAN-8 28
YAN-9 28
KERO-1 24
THOM-2 24
KERO-2 24
Samples
20
18
16
14
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19

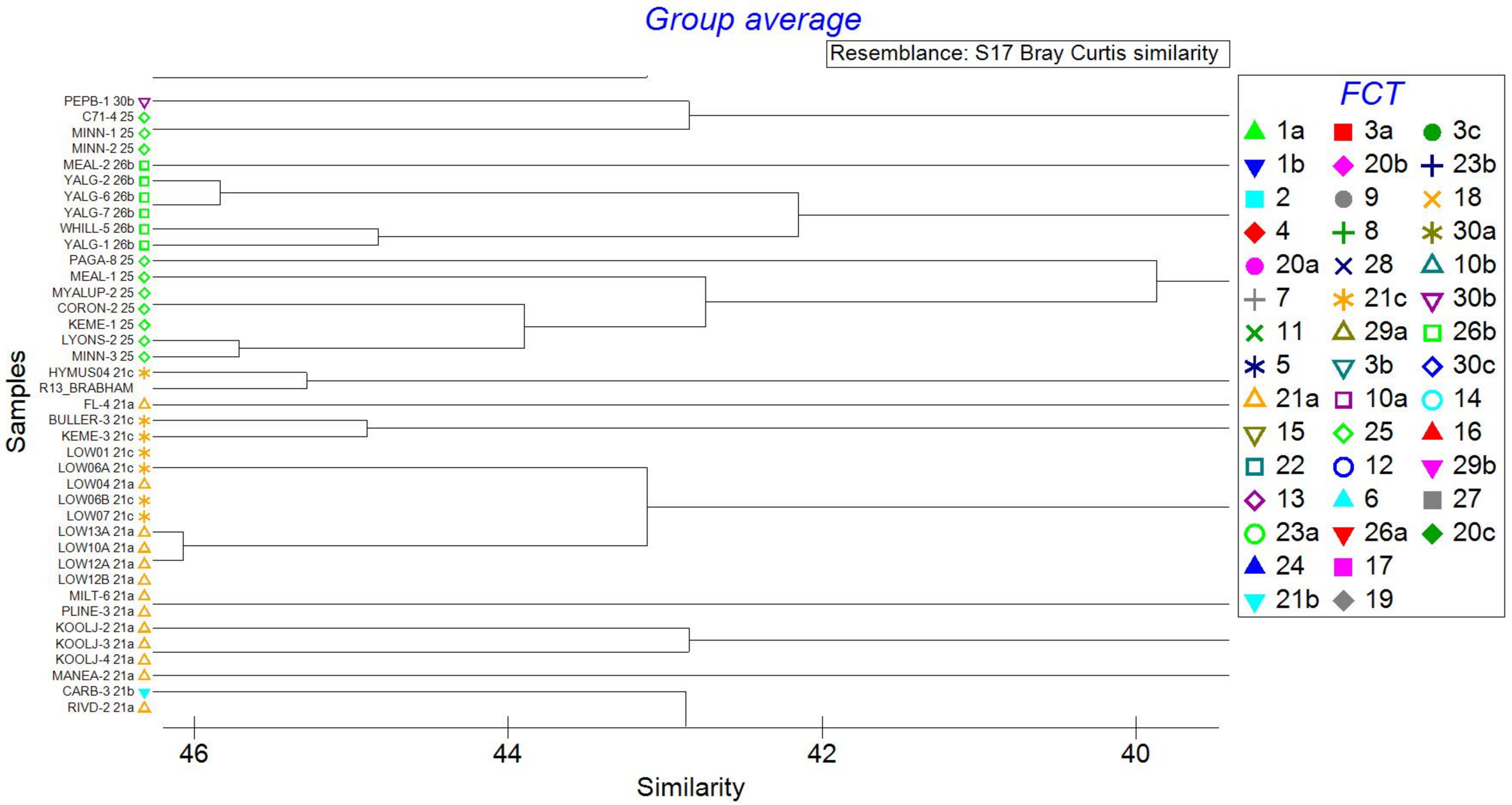

Group average
Resemblance: S17 Bray Curtis similarity
CRAMPT-1 21a
CRAMPT-2 21a
CAPEL-7 21a
DRAIN-1 21a
C71-2 21a
C71-3 21a
AUSTRA-1 21a
BULLER-2 21a
NINE-1 21a
BULLER-1 21a
CARD7 21a
HYMUS04 21c
DEJONG-C 21c
HYMUS03 21c
FL-5 21c
FL-6 21c
TWIN-7 21c
TWIN-8 21c
YAN-6 28
Q8_BRABHAM
LOW01 21c
LOW06A 21c
LOW04 21a
LOW06B 21c
LOW07 21c
LOW13A 21a
LOW10A 21a
LOW12A 21a
LOW12B 21a
FL-4 21a
MODO-2 21c
PLINE-7 21c
YOON-2 2
CARB-2 1b
YOON-1 1b
OATES-1 21b
CAPEL-5 1b
WONN02 1b
WILL02 1a
Samples
44
42
40
38
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19


Group average
Resemblance: S17 Bray Curtis similarity
Samples
MODO-6 4
BULL-5 5
BULL-7 5
PLINE-5 5
MODO-2 21c
PLINE-7 21c
AUSTB-4 5
AUSTB-6 5
GUTHR-2 5
GUTHR-4 5
HARRY-3 5
MILT-1 5
C71-1 11
HARRY-6 11
R9_BRABHAM
MODO-3 11
HYMUS01 11
HYMUS02 11
LOW10B 11
PAGA-6 25
CARAB-3 11
ROWE01 11
BULL-12 11
ELLIS-2 18
ELLIS-3 18
RIVD-1 12
FL-10 12
CAPEL-6 12
CAPEL-8 12
CAPEL-9 12
HYMUS05 11
HYMUS06 11
AUSTB-3 11
TWIN-11 11
24
22
20
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19


Group average
Resemblance: S17 Bray Curtis similarity
AUSTB-2 7
RUAB-4 7
FISH-1 7
FISH-2 7
YULE-5 7
BULL-6 7
BULL-8 7
BRICK4 9
DUCK-3 9
BRIX-4 8
WARO 03 8
WARO 04 8
C58-2 13
WATER-1 13
POSSUM1 16
NAVB-1 16
SANDON-1 16
AUSTB-1 7
TWIN-10 15
TWIN-5 15
BAMBUN-2 15
CARAB-1 15
BANK-1A 13
CAPEL-4 13
RUAB-3 13
MILT-5 14
YAN-21 14
POSSUM5 17
MCLART-1 13
COOL04 17
ELLIS-1 17
MTB-5 17
POSSUM2 16
LESCH-6 17
COOL01 17
COOL11 17
PAGA-5 17
WATER-2 13
MILT-2 13
PAGA-2 13
Q10_BRABHAM
ELLIS-2 18
ELLIS-3 18
COOL09 19
PB-1 19
PB-6 19
Samples
46
44
42
40
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19


Group average
Resemblance: S17 Bray Curtis similarity
YULE-5 7
BULL-6 7
BULL-8 7
BRICK4 9
DUCK-3 9
BRIX-4 8
WARO 03 8
WARO 04 8
C58-2 13
WATER-1 13
POSSUM1 16
NAVB-1 16
POSSUM2 16
SANDON-1 16
AUSTB-1 7
TWIN-10 15
TWIN-5 15
BAMBUN-2 15
CARAB-1 15
POSSUM5 17
LESCH-6 17
COOL01 17
COOL11 17
PAGA-5 17
Q11_BRABHAM
COOL04 17
ELLIS-1 17
MTB-5 17
MILT-2 13
MCLART-1 13
PAGA-2 13
ELLIS-2 18
ELLIS-3 18
COOL09 19
PB-1 19
PB-6 19
MILT-5 14
YAN-21 14
WATER-2 13
BANK-1A 13
CAPEL-4 13
RUAB-3 13
Samples
36
34
32
30
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19


Group average
Resemblance: S17 Bray Curtis similarity
LESCH-6 17
COOL01 17
COOL11 17
PAGA-5 17
MILT-2 13
MCLART-1 13
PAGA-2 13
ELLIS-2 18
ELLIS-3 18
COOL09 19
PB-1 19
PB-6 19
MILT-5 14
YAN-21 14
WATER-2 13
BANK-1A 13
CAPEL-4 13
RUAB-3 13
WOODP-1 30a
R12_BRABHAM
NAVB-4 24
MTB-2 24
MTB-3 24
MTB-4 24
COOL08 24
COOL02 24
COOL03 24
NAVB-3 24
PTWALT-1 24
BOLD-3 24
BOLD-4 24
TRIG-5 24
BOLD-1 24
BOLD-2 24
TRIG-1 29b
WHILL-2 29b
PB-5 29b
PB-3 29b
PB-2 29b
Samples
10
8
6
4
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19


Group average
Resemblance: S17 Bray Curtis similarity
PEPB-1 30b
C71-4 25
MINN-1 25
MINN-2 25
MEAL-2 26b
YALG-2 26b
YALG-6 26b
YALG-7 26b
WHILL-5 26b
YALG-1 26b
PAGA-8 25
MEAL-1 25
MYALUP-2 25
CORON-2 25
KEME-1 25
LYONS-2 25
MINN-3 25
HYMUS04 21c
R13_BRABHAM
FL-4 21a
BULLER-3 21c
KEME-3 21c
LOW01 21c
LOW06A 21c
LOW04 21a
LOW06B 21c
LOW07 21c
LOW13A 21a
LOW10A 21a
LOW12A 21a
LOW12B 21a
MILT-6 21a
PLINE-3 21a
KOOLJ-2 21a
KOOLJ-3 21a
KOOLJ-4 21a
MANEA-2 21a
CARB-3 21b
RIVD-2 21a
Samples
46
44
42
40
Similarity
FCT
1a
3a
3c
1b
20b
23b
2
9
18
4
8
30a
20a
28
10b
7
21c
30b
11
29a
26b
5
3b
30c
21a
10a
14
15
25
16
22
12
29b
13
6
27
23a
26a
20c
24
17
21b
19