ASSESSMENT OF FLORA AND VEGETATION ON WORSLEY MINE EXPANSION AREAS

Prepared for

South32 Worsley Alumina Pty Ltd

Prepared by

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ABBREVIATIONS

The following abbreviations are used throughout this document:

BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity and Conservation Act 2016*
BME	Bauxite Mine Expansion Areas
BOM	Commonwealth Bureau of Meteorology
CBME	Contingency Bauxite Mining Envelope
DAFWA	Department of Agriculture and Food, Western Australia
DBCA	Department of Biodiversity, Conservation and Attractions
DotEE	Department of the Environment and Energy
DPaW	Department of Parks and Wildlife, Western Australia
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Areas
ESCAVI	Executive Steering Committee for Australian Vegetation Information
Mattiske	Mattiske Consulting Pty Ltd
PEC	Priority Ecological Community
South32	South32 Worsley Alumina Pty Ltd
SVT	Site-Vegetation Type
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
WAH	Western Australian Herbarium
WAOL	Western Australian Organism List
WMDE	Worsley Mining Development Envelope
WME	Worsley Mine Expansion

1. SUMMARY

South32 Worsley Alumina Pty Ltd (South32) is proposing an expansion to the mining areas at the Worsley Alumina operation (the Project). The Project area includes the Worsley Mining Development Envelope (WMDE), Bauxite Transport Corridor (BTC), Contingency Bauxite Mining Envelope (CBME) and maintenance within the Refinery Lease Area. The estimated totals for these areas are:

. WMDE covers a land area of 27,796 ha, which includes the Pre-existing Approval Area and an overlapping land area of 3,332 ha within the Bauxite Transport Corridor;

. Bauxite Transport Corridor covers a land area of 4,146 ha (813.5 ha is outside the WMDE); and

. CBME covers a land area of 747 ha and Maintenance within the Refinery Lease Area covers a land area of 5 ha.

The Project area (incorporating the WMDE, BTC, CBME and Maintenance within the Refinery Lease Area) represents a total of 29,362 ha (excluding the overlap area of 3,332 ha) and 32,694 ha (including the overlap area).

Mattiske Consulting Pty Ltd (Mattiske) was commissioned in October 2018 by South32 to undertake a flora and vegetation survey of private properties within the proposed Worsley Mine Expansion (WME) (the Proposal) that had not been previously surveyed. The survey was associated with mining expansion areas within the proposed Worsley Mining Development Envelope (WMDE) and the Bauxite Transport Corridor (Figure 1). Previously unsurveyed areas within the WMDE and Bauxite Transport Corridor (henceforth called "Infill Areas") were surveyed in November 2018 where access was able to be obtained. The Infill Areas covered 3,347.6 ha of the larger WMDE and the Bauxite Transport Corridor. At the same time the background information available on the Contingency Bauxite Mining Envelope (CBME) was updated to align with current taxonomic nomenclature and listings of species and communities.

This report represents a consolidation of recent assessments of the flora and vegetation values on the Infill Areas and the Bauxite Transport Corridor areas and the previous baseline information for the broader WME areas near Boddington and Collie. This assessment supplements earlier baseline flora and vegetation surveys of the Mt Saddleback area since the 1980's (Worsley Alumina Pty Ltd 1985) more recent studies on the Quindanning Timber Reserve (Mattiske Consulting Pty Ltd 1993), Marradong Timber Reserve (Mattiske Consulting Pty Ltd 1990), the Collie Refinery area (1999, 2014) and other areas of agricultural holdings, State Forest and forested areas near the Boddington operations.

Since the early 1980's, a total of 680 plant taxa from 72 families and 260 genera have been recorded in the main baseline studies undertaken on the Worsley lease areas and 289 vascular plant species from 54 plant families and 149 genera have been recorded in the main baseline studies undertaken in the Collie areas.

A total of 149 plant taxa from 42 families and 94 genera were recorded on the Infill Areas. This low level of diversity reflects the largely degraded (64.74% completely degraded and 11.38% degraded) nature of substantial portions of the Infill Areas.

Desktop searches of the EPBC Act Protected Matters database, the DBCA *NatureMap* database, and where available the Western Australian Herbarium (WAH) and Threatened and Priority Flora (TPFL) databases have identified the potential occurrence of 80 conservation significant flora species within 20 km of the WMDE and Bauxite Transport Corridor, and 32 conservation significant flora species within 20 km of the CBME. This information, together with a literature review of all available datasets from previous flora and vegetation surveys for the Project, has formed the basis of a likelihood assessment for conservation significant flora within the proposed expansion areas.

One threatened flora (*Caladenia hopperiana*) pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* and the *Environment Protection and Biodiversity Conservation Act 1999* has been recorded within the WMDE. Currently this species is relatively restricted within the proposed expansion areas to a localised area in the south-eastern section of the WMDE only (i.e. not in the Bauxite Transport Corridor

area). The *Caladenia hopperiana* was formerly recorded as *Caladenia* sp. Quindanning (K. Smith & P. Johns 231) (DBCA 2019a).

Of the identified potential conservation significant species, 15 (one Threatened and 14 Priority flora species) have been recorded within the proposed WMDE and Bauxite Transport Corridor. No threatened or priority flora were recorded within the recent Infill Areas. Two species has been recorded within the proposed CBME and one occurred on the fringes of the CBME. Of the Priority species the most significant species include the *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130) (Priority 1), which is mainly concentrated on the lower slopes near the Hotham River (which overlaps within the Bauxite Transport Corridor and the WMDE) and the eastern anomaly north of the current Boddington Gold Mine camp on the lower valley slopes, and the range of Priority species restricted to the heath communities. The latter group of species in the heath communities occur within the PEC (Priority 1) community – Mt Saddleback Heath Communities. This community was listed after mining commenced within Saddleback Timber Reserve and was initially only associated with Tunnell Road Heath community.

One conservation significant species has been recorded within the proposed CBME and one occurred on the fringes of the CBME.

A total of 28 introduced flora species have been recorded within the Infill Areas. A total of 80 introduced flora species have been recorded in the wider lease areas near Boddington and Collie. A total of 15 introduced flora species have been recorded within the CBME area.

The majority of the weeds are short term annual species that establish on disturbed agricultural lands and although some establish in the early phase of rehabilitation, the majority are quickly outgrown by more perennial and larger native shrub and tree species.

Of the potential introduced flora species the following are Declared Plants under the *Biodiversity and Agricultural Management Act 2007* (BAM Act) (DAFWA 2018), namely:

- **Gomphocarpus fruticosus* (Declared Plant under BAM Act) – near Collie Refinery (DPAW 2019a; DotEE 2019a)
- **Silybum marianum* (Declared Plant under BAM Act) – near Collie Refinery in Phase One (Danes and Moore 1981)
- **Asparagus asparagoides* (Declared Plant under BAM Act) – near Boddington and Collie areas (DotEE 2019a)

None of the Declared Plants were recorded in the recent assessment of the Infill Areas.

At a regional scale Heddle *et al.* (1980) and Mattiske and Havel (1998) defined and mapped a series of vegetation complexes that enabled a refinement of the vegetation mapping of Beard (1979) and Smith (1974) for Pinjarra and Collie areas respectively. The latter work of Beard has been updated recently into Beard *et al.* (2013) for the State of Western Australia. The approach developed by Heddle *et al.* (1980) and Mattiske and Havel (1998) enabled relationships to be defined between the resulting regional patterns of vegetation and the underlying landforms, soils and climatic trends in the southwest forests. In the three areas assessed for the Proposal, the following vegetation complexes were recorded:

Infill Areas - 8 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Swamp, Williams, Yalanbee 5 and Yalanbee 6. Of these complexes the Michibin and Williams complex areas are less represented (<10%) in formal and informal reserves (7.11% and 0.49% respectively), (Conservation Commission 2003). The latter mainly relates to their occurrence in valley systems that have been developed for agriculture on the eastern fringes of the Darling Ranges.

WMDE – 9 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Pindalup, Swamp, Williams, Yalanbee 5 and Yalanbee 6. Of these complexes the Michibin and Williams complex areas are less represented (<10%) in formal and informal reserves (7.11% and 0.49% respectively), (Conservation Commission 2003). The latter mainly relates to their occurrence in valley systems that have been developed for agriculture on the eastern fringes of the Darling Ranges.

Bauxite Transport Corridor - 8 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Pindalup, Swamp, Williams and Yalanbee 6. Of these complexes the Michibin and Williams complex areas are less represented (<10%) in formal and informal reserves (7.11% and 0.49% respectively), (Conservation Commission 2003). The latter mainly relates to their occurrence in valley systems that have been developed for agriculture on the eastern fringes of the Darling Ranges.

CBME – 3 vegetation complexes, Dwellingup 1, Murray 1 and Yarragil 1. All of these complexes are represented in formal and informal reserves in areas >10% (Conservation Commission 2003).

At a finer scale of local mapping the following presents the site-vegetation types for the WMDE, Bauxite Transport Corridor and CBME. This method of mapping was developed based on the earlier ecological studies of Havel (1975a and 1975b) who delineated a series of site-vegetation types that integrated the structural and floristic components (including key indicator species) with the underlying soil and site conditions. This approach was developed further by initially Dames and Moore (1981) and later Mattiske (1985 to 2018).

Infill Areas – 20 site-vegetation types were defined for the WMDE area. The dominant site-vegetation types (>100ha) were H, M and MG. Large sections of the Infill Areas as assessed in 2018 have been cleared for agriculture and plantations. The majority of the Infill Areas are either completely degraded (64.43%) or degraded (0.01%). The restricted site-vegetation types include swamp vegetation types (A), on the lower slopes (DG), on the undulating hills (H1), on the outcropping areas (G2) and on the moister slopes (W).

WMDE – 36 site-vegetation types were defined for the WMDE area. The dominant site-vegetation types (>300ha) were M. P, PS, S, H, H2, ST, Y, Z AY and D. Large sections of the WMDE have been cleared for agriculture and plantations. The majority of the WMDE area is either completely degraded (50.00%) or degraded (11.00%). The restricted site-vegetation types include swamp vegetation types (A1, A2), on the lower slopes (AD, AY/D, DG), on the outcropping areas (G1, G2, G4, R) and on the moister slopes (PW, SW, W).

Bauxite Transport Corridor - 26 site-vegetation types were defined for the Bauxite Transport Corridor area (noting that 80.38% of these areas overlap with the WMDE and 11.99% of the WMDE overlaps with the Transport Bauxite Corridor). The dominant site-vegetation types (>300ha) were H, M, PS and S. Large sections of the Bauxite Transport Corridor have been cleared for agriculture and plantations. A large portion of the Bauxite Transport Corridor is either completely degraded (28.00%) or degraded (2.0%). The restricted site-vegetation types include specific types on the slopes (H2, M2), on the lower slopes (AD, AY/D, DG), on the outcropping areas (G, G3, G4) and on the moister slopes (PW).

CBME – 9 site-vegetation types were defined for the CBME. The dominant site-vegetation types (>100ha) were S and ST. The majority of the CBME was relatively undisturbed with the exception of the dam and completely degraded areas (32.20%). The restricted site-vegetation types include specific types on the lower slopes (CQ) and slopes (SP). All site-vegetation types in the CBME are well represented in nearby state forest areas and conservations areas (e.g. Wellington National Park).

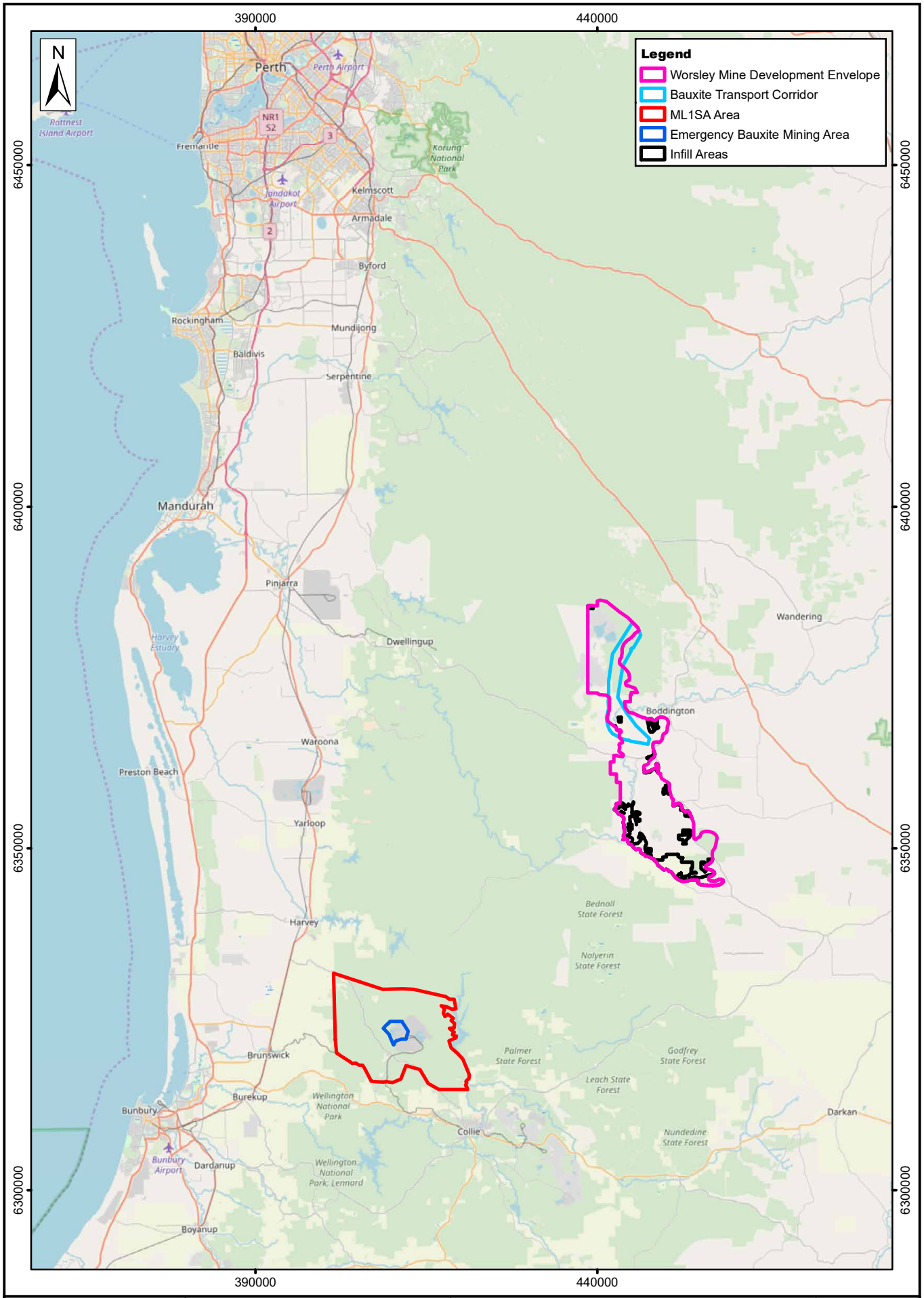
Significant communities within the Infill Areas, WMDE, Bauxite Transport Corridor and CBME areas include the following:

- The Priority 1 PEC - Mt Saddleback Heath Communities as delineated by DBCA occurs in the Saddleback area near Boddington within the WMDE but not within the Bauxite Transport Corridor. Those that overlap the PEC Mt Saddleback Heath Community are highlighted in Figures 5.1 to 5.13 by a different polygon boundary. This PEC community on Mt Saddleback has affinities with components of the heath communities G, G1, G3, G4 and G5 as defined and mapped by Mattiske (Worsley Alumina Pty Ltd 1985 to Mattiske 2018). Some of the latter site-vegetation types extend well beyond the Mt Saddleback area, e.g. north of the Boddington Gold Mine and on the eastern fringes of the State Forest.
- The communities that are a mixture of different site-vegetation types over shallow granites (DG, HG and MG on the Infill Areas) occur in the Infill Areas, the WMDE and the wider mapped areas near Boddington.

- The G2 site-vegetation type that occurs on granite in association with Rock Sheoak (*Allocasuarina huegeliana*), heath communities and lithic complexes occurs the Infill Areas, the WMDE and the wider mapped areas near Boddington.
- The M2 site-vegetation type which supports woodlands of *Eucalyptus accedens*, *Eucalyptus wandoo, Eucalyptus marginata* and *Corymbia calophylla* on eastern breakaways. The M2 site-vegetation type occurs in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington. This site-vegetation type occurs eastwards on the upper slopes and ridges of the Eastern Jarrah forest.
- A, AY, AX, AC Types – Woodlands of *Eucalyptus rudis* and *Melaleuca* species on the swamps and creeklines that provide linkages for fauna species and a variety of plant species on variable soils in the Infill Areas. These site-vegetation types occur in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington
- The restricted L site-vegetation type that supports a woodland of *Eucalyptus patens* and *Eucalyptus wandoo occurs* in the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington.
- The Y site-vegetation types that is often associated with the occurrence of the *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130), particularly on the lower slopes near the Hotham River and north on broader clay loam valley lower slopes. This site-vegetation type is well represented in the wider areas and occurs in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington

The majority of the site-vegetation types that occur on the Collie Refinery lease areas are locally well represented in State forest and conservations areas (e.g. Wellington National Park).

Overall, the vegetation communities mapped and species recorded in the Infill Areas, the WMDE and the Bauxite Transport Corridor were consistent with the historical mapping of Mattiske as reflected in the earlier work of Havel (1975a as and 1975b) in the northern Jarrah forest and also the more recent mapping by Mattiske since the Phase Two studies on the Mt Saddleback area (Worsley Alumina Pty Ltd 1985; E.M. Mattiske and Associates 1986 to 1993; Mattiske Consulting ty Ltd 2012a to 2012c). As sections of the expansion areas are either completely degraded or degraded, the potential impact on local flora values should be minimal providing some of the populations of threatened and priority flora species and the patches of the priority ecological communities are avoided.



Basemap: OpenStreetMap

0 7.5 15 km

Scale: 1:750,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_01

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Locality

Figure: **1**

2. BACKGROUND

Mattiske Consulting Pty Ltd (Mattiske) was commissioned in 2018 by South32 Worsley Alumina Pty Ltd (South32) to undertake a flora and vegetation survey of previously unsurveyed areas (henceforth called "Infill Areas", Figures 1 and Figure 4.0) for the proposed Worsley Mine Expansion (WME) (the Proposal). The WME expansion areas consist of the Worsley Mining Development Envelope (WMDE) and the Bauxite Transport Corridor in the Boddington area and the Contingency Bauxite Mining Envelope (CBME) in the Collie area at the South32 Worsley Refinery. This scope of work also involved a desktop re-assessment of areas in the Boddington and Collie areas that had already been assessed on numerous occasions (see Appendix A). The amalgamation of the previous baseline flora and vegetation surveys was undertaken as part of this reporting to enable an overview and update of the flora and vegetation values to assist in the assessment process.

2.1 Location and Scope of Proposal

The proposed expansion areas included within the WME are located approximately 120 km south east of Perth and are situated across multiple properties located between Boddington, the eastern edge of the Boddington Bauxite Mine (BBM) and just north of Quindanning to the Refinery northwest of Collie, Western Australia, Figure 1.

2.2 Climate

Havel (1975a) characterised the climate of the Northern Jarrah Forest as typically Mediterranean with a predominance of winter rainfall. Beard (1990) subsequently described the climate of the Dale Botanical Subdistrict (within the Northern Jarrah Forest subregion) as somewhat drier than the Southern Jarrah Forest which has an average rainfall of 600 – 1200 mm per annum.

The average maximum and minimum temperature for Wandering and Wokalup (near Collie) generally followed seasonal patterns of cool winters and hot summers. Average rainfall for Marradong and Collie reflected higher rainfalls in the more westerly Collie area when compared with the easterly Marradong/Boddington area. Again there was a seasonal peak of rainfall in the winter months and lower rainfall recordings in the summer months.

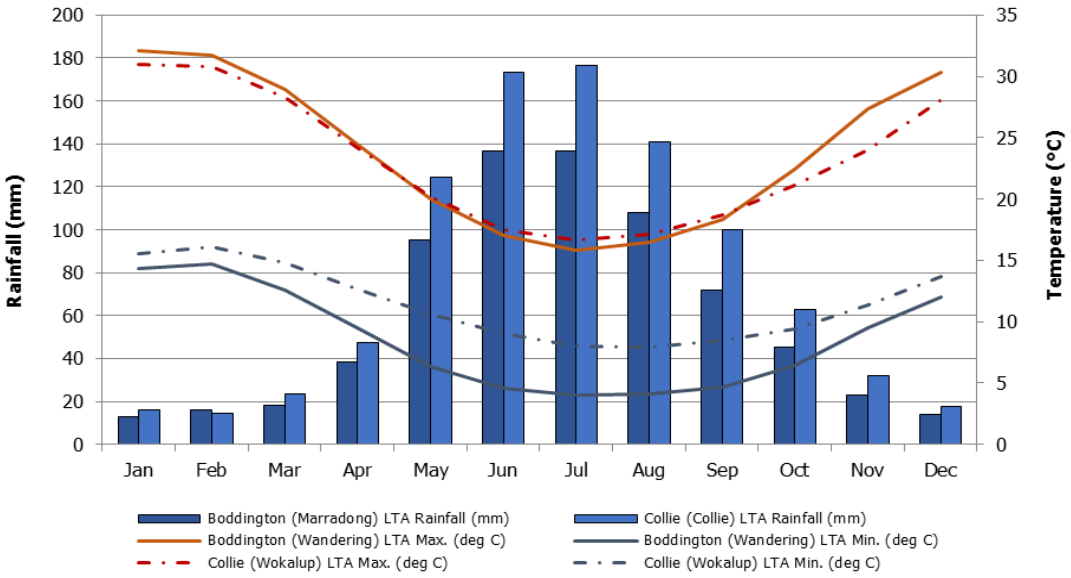


Figure 2: Rainfall (Collie and Marradong) and temperature (Wokalup and Wandering) data for the respective Boddington and Collie areas (Bureau of Meteorology 2018)

2.3 Soils and Topography

The soils of the Dale Botanical Subdistrict can be broadly defined as lateritic gravels consisting of up to 5 m or more of ironstone gravels in a yellow, sandy matrix. Related to these are the lateritic podzolic soils with ironstone gravels in a sandy surface horizon, overlying a mottled yellow-brown clay subsoil (Beard 1990). The region overlies an ancient plateau landform and has an average elevation of 300 m which is broken sporadically by nonconforming monadnocks such as Mt Cooke, Mt Dale and Mt Saddleback which reach up to 582 m (Havel 1975a; Beard 1990).

2.4 Regional Vegetation

The Northern Jarrah Forest, specifically the Dale Botanical Subdistrict has been extensively described over the past 100 years by several authors (Diels 1906; Speck 1958; Havel 1975a; Beard 1979; Beard 1990, Smith 1974). Smith defined and mapped the vegetation on the Collie sheet at a scale of 1:250,000 and Beard defined and mapped the vegetation on the Pinjarra sheet at a scale of 1:250,000.

Havel (1975a, 1975b) summarised a number of the major ecological projects undertaken within the area, from Diels's original plant geography work in 1906 through to Kimber's study of the relationship between the root systems of the Jarrah plant and non-seasonal water loss in 1974. Beard (1990) again built on this framework and further defined the vegetation of this region in his botanical survey of Western Australia.

Diels (1906) and Speck (1958) both recognised that the Eastern range of the Jarrah forest (in which the Boddington Bauxite mine is located) contains a comparatively poorer range of species when compared to the Western reaches of the forest. This poorer range of species across the Eastern range can be related to a decrease in rainfall from West to East. Speck (1958) split the Jarrah forest into two broad vegetation systems; The Darling System and the Bannister System. The Darling System was described as "prime" Jarrah forest which covers the Darling Scarp and contains youthful streams with an average annual rainfall of over 890 mm. The Bannister System which covers the Eastern Jarrah forest, in comparison was associated with a mean annual rainfall of 520 – 1000 mm and no youthful streams.

Comparisons between climatic and edaphic factors and their relationships with trees within the region have been made since Lange (1960) attempted to relate these factors to the distribution of tree species within the Narrogin district. Additional work by Churchill (1961; 1968) addressed the influence of climatic conditions on the distribution of species, also undertaken more recently as part of the regional vegetation mapping program for the Regional Forest Agreement by Mattiske and Havel (1998). The latter studies relied on the conceptual climatic zoning developed by Gentilli (1989) for the Jarrah forest areas.

Beard (1990) described the Jarrah forest as one of only two forest formations in Western Australia. As would be expected, Jarrah (*Eucalyptus marginata*) is the dominant tree species within this area and is commonly found in association with Marri (*Corymbia calophylla*) in varying proportions. Maximum forest heights range from less than 25 m in the Eastern range of the Jarrah forest to heights of greater than 30m in the Western range (Havel 1975a; Abbott & Loneragan 1986). Beard, as well as other researchers noticed that with the exception of creeklines and areas with significantly higher/lower than average rainfall amounts, no other tree species enters the canopy of the forest. Several smaller tree species (10 – 15 m tall) occur in the forest including, Bull Banksia (*Banksia grandis*), Sheoak (*Allocasuarina fraseriana*) and Snottygobble (*Persoonia longifolia*).

The forest understorey is comprised of a variety of shrub species which range from 1 – 2 m in height and have an average density of 185 plants/ha. Commonly occurring species include; *Adenanthos barbiger*, *Grevillea wilsonii*, *Trymalium ledifolium*, *Xanthorrhoea preissii*, *Macrozamia riedlei* and *Hypocalymma angustifolium*. Beard (1990) described the Eastern range of the Jarrah forest as being typically lower and more open woodland, with *Allocasuarina huegeliana* and *Acacia acuminata* occurring amongst the tree species. An association between tree species and the 500 mm isohyet line was also made obvious in this study with Beard noting the absence of Jarrah and the presence of Powderbark Wandoo (*Eucalyptus accedens*) east of this line. Understorey species also vary in these areas with

Gastrolobium spinosum, *Calothamnus quadrifidus* and *Leptospermum erubescens* becoming more common.

Species which occur within the northern Jarrah forest were analysed by Havel (1975a and 1975b) and as a result a range of indicator species were delineated in relationship with particular site parameters that subsequently led to a classification of 21 site-vegetation types which are relevant for the northern Jarrah forest area.

The vegetation occurring within the South32 Worsley Alumina Pty Ltd tenements have been defined at different scales since 1981. The regional scale of definition includes the vegetation complexes as defined by Heddle et al. (1980) and Mattiske and Havel (1998). A range of site-vegetation types have been defined and mapped by Mattiske for Worsley Alumina Pty Ltd (Dames and Moore 1981; Worsley Alumina Pty Ltd 1985; E.M. Mattiske and Associates (1985 to 1993) and Mattiske Consulting Pty Ltd (1994 to 2018). These site-vegetation types have been related to the site-vegetation types as defined by Havel (1975a and 1975b). The majority of the species which occur within the mining areas fall into the Proteaceae, Fabaceae, Myrtaceae and Asteraceae families (Worsley Alumina Pty Ltd 1985). With specific reference to trees, the areas in which the mining areas fall into are expected to have stand densities of approximately 300 trees/ha which increases to 500 – 600 trees/ha if seedlings are included.

2.5 Western Australia's Flora – A Legislative Perspective

Western Australia has a unique and diverse flora, and is recognised as one of the world's 34 biodiversity hotspots (Myers et al. 2000). In this context, Western Australia possesses a high degree of species richness and endemism. This is particularly pronounced in the south-west region of the state. The Department of Biodiversity, Conservation and Attractions (DBCA) flora statistics indicate that there are currently over 12,000 native plant species known to occur within Western Australia (DBCA 2019a). Scientific knowledge of many of these species is limited.

The legislative protection of flora within Western Australia is principally governed by three Acts. These are:

- *The Biodiversity Conservation Act 2016* (replaced *The Wildlife Conservation Act 1950*)*;*
- *The Environmental Protection Act 1986;* and
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The unique flora of Western Australia is potentially under threat due to historical clearing practices associated with agricultural, mining and human habitation activities. As a consequence of these historical clearing practices a number of flora species have become threatened or have the potential to become threatened as their habitat is impacted by human activity. In addition, some areas of the State have been affected by past clearing practices such that entire ecological communities are under threat. The following sections describe these threatened and priority flora and ecological communities, and outline the legislative protection afforded to them.

At the State level, the *Biodiversity Conservation Act 2016* provides for taxa of native flora (and fauna) to be specially protected because they are subject to identifiable threats. Protection of these taxa has been identified as being warranted because they may become extinct, are threatened, or are otherwise in need of special protection. Ecological communities that are deemed to be threatened are afforded protection under the *Environmental Protection Act 1986*. Listings of threatened species and communities are reviewed annually by the Western Australian Threatened Species Scientific Committee (TSSC). The TSSC reviews threatened and specially protected flora (and fauna) listings on an annual basis. Recommendation for additions or deletions to the listings of specially protected flora (and fauna) is made to the Minister for the Environment by the TSSC, via the Director General of the DBCA, and the WA Conservation Commission. Under Schedules 1-3 of the *Biodiversity Conservation Act 2016*, the Minister for the Environment may declare a class or description of flora to be threatened flora throughout the State, by notice published in the *Government Gazette* (DBCA 2019b).

At the Commonwealth level, under the *Environment Protection and Biodiversity Conservation Act 1999*, a nomination process exists to list a threatened species or ecological community. Additions or deletions to the lists of threatened species and communities are made by the Minister for the Environment, on advice from the Federal Threatened Species Scientific Committee. *Environment Protection and Biodiversity Conservation Act 1999* lists of threatened flora and ecological communities are published on the Department of the Environment and Energy (DotEE) website (2019a).

2.6 Threatened and Priority Flora

In December 2016, the new *Biodiversity Conservation Act 2016* was proclaimed and enacted to replace the *Sandalwood Act 1929* and the *Wildlife Conservation Act 1950* in 2019.

Flora within Western Australia that is considered to be under threat may be classed as either threatened flora or priority flora. Where flora has been gazetted as threatened flora under the *Biodiversity Conservation Act 2016*, it is an offence "to take" such flora without the written consent of the Minister. *Biodiversity Conservation Act 2016* states that "to take" flora includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means.

Priority flora constitute species which are considered to be under threat, but where there is insufficient information available concerning their distribution and/or populations to make an evaluation of their conservation status. The DBCA categorises priority flora according to their conservation priority, using four categories, P1 to P4, to denote the conservation priority status of such species, with P1 listed species being the most threatened, and P4 the least. Priority flora species are regularly reviewed, and may have their priority status changed when more information on the species becomes available. Appendices B1.2 and B1.3 sets out definitions of both threatened and priority flora (DBCA 2019a, 2019b).

At the Commonwealth level, under the *Environment Protection and Biodiversity Conservation Act 1999, (EPBC Act)* threatened species can be listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable, or conservation dependent, by the Commonwealth Minister for the Environment and Energy. Refer to Appendix B1.1 for a description of each of these categories of threatened species. Under the EPBC Act, a person must not take an action that has or will have a significant impact on a listed threatened species without approval from the Commonwealth Minister for the Environment and Energy, unless those actions are not prohibited under the Act.

The current *EPBC Act* list of threatened flora may be found on the Department of the Environment and Energy website (DotEE 2019a).

2.7 Threatened and Priority Ecological Communities

An ecological community is defined as a naturally occurring biological assemblage that occurs in a particular type of habitat composed of specific abiotic and biotic factors. At the State level, ecological communities may be considered as threatened once they have been identified as such by the Western Australian Threatened Ecological Communities Scientific Advisory Committee. Threatened Ecological Communities (TEC) are gazetted as such under the *Biodiversity Conservation Act 2016*. There are three State categories of threatened ecological communities, or TECs: critically endangered (CR); endangered (EN); and vulnerable (VU) (DBCA 2019c). A description of each of these categories of TECs is presented in Appendix B2.2. At the Commonwealth level, some Western Australian TECs are listed as threatened, under the *EPBC Act 1999*. Under the *EPBC Act*, a person must not take an action that has or will have a significant impact on a listed TEC without approval from the Commonwealth Minister for the Environment, unless those actions are not prohibited under the Act. A description of each of these categories of TECs is presented in Appendix B2.1. The current *EPBC Act* list of TECs can be located on the DotEE (2019a, 2019b) website.

Ecological communities identified as threatened, but not listed as TECs, can be classified as priority ecological communities (PECs). These communities are under threat, but there is insufficient

information available concerning their distribution to make a proper evaluation of their conservation status. The DBCA categorises PECs according to their conservation priority, using five categories, P1 to P5, to denote the conservation priority status of such ecological communities, with P1 communities being the most threatened and P5 the least. Appendix B2.3 sets out definitions of PECs (DBCA 2019d). A list of current PECs can be viewed at the DBCA (2019d) website.

2.8 Clearing of Native Vegetation

Under the *Environmental Protection Act 1986*, the clearing of native vegetation requires a permit to do so, from the Department of Environment Regulation or the Department of Mines and Petroleum, unless that clearing is exempted under specific provisions listed in Schedule 6 of the Act, or are prescribed in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Under the *Environmental Protection Act 1986*, "native vegetation" means indigenous aquatic or terrestrial vegetation, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation. Under the *Environmental Protection Act 1986*, Section 51A, "clearing" means the killing or destruction of, the removal of, the severing or ringbarking of trunks or stems of, or the doing of any other substantial damage to, some or all of the native vegetation in an area, and includes the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity, that causes any of the aforementioned consequences or results.

Under the *Environmental Protection Act 1986*, ten principles are set out, under which native vegetation should not be cleared. These principles state that native vegetation should not be cleared, if:

a. it comprises a high level of biological diversity;

b. it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia;

c. it includes, or is necessary for the continued existence of, threatened flora;

d. it comprises the whole or a part of, or is necessary for the maintenance of, a TEC;

e. it is significant as a remnant of native vegetation in an area that has been extensively cleared;

f. it is growing in, or in association with, an environment associated with a watercourse or wetland;

g. the clearing of the vegetation is likely to cause appreciable land degradation;

h. the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area;

i. the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or

j. the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, under Regulation 5, sets out prescribed clearing actions that do not require a clearing permit, as defined in Section 51C of the *Environmental Protection Act 1986*. However, exemptions under these Regulations do not apply in Environmentally Sensitive Areas (ESA's).

Under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, under Regulation 6 – "Environmentally sensitive areas" include "the area covered by vegetation within 50 m of threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the threatened flora is located". Similarly, "the area covered by a TEC" is listed as an environmentally sensitive area under Regulation 6.

2.9 Declared (Plant) Pest Organisms

The *Biosecurity and Agriculture Management Act 2007* (BAM Act), Section 22, makes provision for a plant taxon to be listed as a declared pest organism in respect to parts of, or the entire State. According to the BAM Act, a declared pest is defined as a prohibited organism (Section 12), or an organism for which a declaration under section 22 (2) of the Act is in force.

Under section 26 (1) of the BAM Act, a person who finds a declared plant pest must report, in accordance with subsection (2), the presence or suspected presence of the declared pest to the Director General or an inspector of the Department of Agriculture and Food Western Australia.

Under the *Biosecurity and Agriculture Management Regulations 2013*, declared plant pests are placed in one of three control categories, C1 (exclusion), C2 (eradication) or C3 (management), which determines the measures of control which apply to the declared pest (DAFWA 2018). According to section 30 (3) of the BAM Act, the owner or occupier of land, or a person who is conducting an activity on the land, must take the prescribed control measures to control the declared pest if it is present on the land.

The current listing of declared pest organisms and their control category is available on the Western Australian Organism List (WAOL), at the Biosecurity and Agriculture Management website of the Department of Agriculture and Food Western Australia (DAFWA 2018).

2.10 Local and Regional Significance

Flora or vegetation may be locally or regionally significant in addition to statutory listings by the State or Federal Government (EPA 2004, DBCA 2019b, 2019c, 2019d, DotEE 2019a, 2019b). The recent documents published by the EPA (2016a and 2016b) were used in defining factors and values of significance of the findings in 2016.

In regards to flora; species, subspecies, varieties, hybrids and ecotypes may be significant other than as threatened flora or priority flora, for a variety of reasons, including:

- a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species;
- relic status;
- anomalous features that indicate a potential new discovery;
- being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- the presence of restricted subspecies, varieties, or naturally occurring hybrids;
- local endemism/a restricted distribution; and
- being poorly reserved.

Vegetation may be significant because the extent is below a threshold level and a range of other reasons, including:

- scarcity;
- unusual species;
- novel combinations of species;
- a role as a refuge;
- a role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;

- being representative of the range of a unit (particularly, a good local and/or regional example of a unit in "prime" habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- a restricted distribution (Environmental Protection Authority 2004).

Vegetation communities are locally significant if they contain priority flora species or contain a range extension of a particular taxon outside of the normal distribution. They may also be locally significant if they are very restricted to one or two locations or occur as small isolated communities. In addition, vegetation communities that exhibit unusually high structural and species diversity are also locally significant.

Vegetation communities are regionally significant where they are limited to specific landform types, are uncommon or restricted plant community types within the regional context, or support populations of threatened flora.

Determining the significance of flora and vegetation may be applied at various scales, for example, a vegetation community may be nationally significant and governed by statutory protection as well as being locally and regionally significant.

3. OBJECTIVES

The aim of the survey carried out in November 2018 was to define the flora and vegetation values of the private properties located within the proposed expansion areas that had not been previously surveyed (Infill Areas). These survey areas were located immediately north of the Newmont Boddington Gold Mine area to south of Mt Saddleback and near Quindanning Reserve, and all fall within the proposed WMDE and the Bauxite Transport Corridor. These Infill Areas covered 3347.6ha of the larger WMDE and the Bauxite Transport Corridor. Additionally background information available on the Collie Refinery CBME was updated to align with current taxonomic nomenclature and listings of species and communities.

Specifically, the objectives include:

- Undertake a desktop assessment to evaluate the botanical values of the local and broader area associated with the proposed expansion areas to identify any matters of botanical or conservation significance;
- Review previous literature and current databases associated with the proposed expansion areas;
- On the basis of the reviews, provide summaries to assist in the assessment of the potential range of values and the potential for conservation significant species and communities;
- Undertake botanical data collection in quadrats that are representative of all potential vegetation communities within the expansion areas of sufficient detail to permit appropriate statistical analyses;
- Collect and identify the vascular plant species present in vegetation survey quadrats, as well as opportunistically, within the expansion areas;
- Record visual observations on the fire regimes, grazing pressures and overall health of the vegetation to allow for an assessment of the overall condition of the flora and vegetation within the expansion areas;
- Identify and record the locations of any Declared Organisms within the expansion areas;
- Review the conservation status of the vascular plant species recorded by reference to current literature and current listings by the (DPAW 2019a; DBCA 2019b) and plant collections held at the Western Australian State Herbarium, and listed by the Department of the Environment and Energy (DotEE 2019a) under the *EPBC Act 1999;*
- Define and prepare a vegetation map of the vegetation communities within the proposed expansion areas;

- Assess the condition of the vegetation communities within the proposed expansion areas;
- Evaluate the distributions of any conservation significant flora recorded within the proposed expansion areas; and evaluate their regional significance;
- Provide descriptions of the vegetation communities present within the proposed expansion areas; and evaluate their regional significance; and
- Prepare a report summarising the findings.

4. METHODS

4.1 Desktop Survey

The desktop assessment for the proposed expansion areas near Boddington and Collie (WMDE, Bauxite Transport Corridor and CBME) was conducted using the DPAW (2019a), DBCA (2019a), and State Herbarium database searches and DotEE (2019a) databases. A 20 km search radius about the approximate central point near Boddington Mt Saddleback and Collie Refinery were used as search reference points. These databases were utilised to identify the possible occurrence of threatened and priority flora, TECs and PECs and any other significant environmental matters within the vicinity of the expansion areas. In addition to data which was accessed through NatureMap and Protected Matters (DotEE 2019a), results from previous vegetation assessments conducted by Dames and Moore (1981), Bennett Environmental Consulting (2004) and Mattiske (1985 to 2018) were reviewed to provide more detailed information on the local flora and vegetation. The currency of all plant taxa nomenclature was verified using FloraBase (DBCA, 2019a).

The database searches enable updates on the recorded species and communities in the respective WMDE, Bauxite Transport Corridor and the CBME. As indicated in Appendix A, there has been substantial baseline studies undertaken over decades near Boddington and Collie. The vast majority of these were recorded regularly in the control areas at both sites and have been used to refine and update the seeding and planting of native species in the rehabilitation areas since 1986. The Mattiske Consulting teams have been involved with recording of progress on rehabilitation areas in most years since 1987 at 9 months, 15 months and at 2, 4, 7, 10, 15, 20 and 30 years for most years, as well as monitoring of the forest monitoring plots and the Tunnell Road heath communities. The botanical studies have been based on monitoring of 114 control plots on the Mt Saddleback Area, 14 plots on the Quindanning Area and 20 plots on the Marradong Area, as well as plots and transects within the rehabilitation areas that have been assessed at different times during the period from 1981 to 2018.

4.2 Field Survey

The majority of the proposed expansion areas (WMDE, Bauxite Transport Corridor and CBME) have been previously surveyed and assessed over the period from the early 1980's to 2018. Permanent plots have been assessed also as part of ongoing biological monitoring programs. The Boddington and Collie areas have been studied over decades in multiple seasons. These historic survey results and reports were included in the desktop survey process described above. A field survey of the remaining unsurveyed areas (Infill Areas) was conducted where land access was able to be obtained. The assessment of the flora and vegetation of the Infill Areas that were part of the WMDE and Bauxite Transport Corridor (Figure 1) was undertaken by four experienced botanists from Mattiske, from 19th to 22nd November 2018. All botanists held valid collection licences to collect flora for scientific purposes, issued under the *Wildlife Conservation Act 1950*. Aerial photographic maps at a 1:17,500 scale of the Infill Areas were prepared by CAD Resources of Carine, Western Australia. Additional maps and information of local property owners was supplied by South32 Worsley Alumina Pty Ltd.

The location of vegetation survey sites of the proposed expansion areas was selected primarily on the basis of aerial photographic maps and imagery. Additional survey sites were selected *in situ*, based on observations of vegetation types during the field survey. Wherever possible, a minimum of three vegetation survey sites were established in the same, but discontinuous vegetation site type to enable

replication. This enabled the visual confirmation of site type boundaries during the field survey, in addition to providing the opportunity to record species that were not located within established survey sites. The sampling sites were selected to sample all vegetation types within the Infill Areas.

The flora and vegetation was described and sampled systematically at each survey site, and additional opportunistic collecting was undertaken wherever previously unrecorded plants were observed. At each site, the following floristic and environmental parameters were recorded:

- GPS location (GDA94 datum);
- soil type, colour and any additional observations;
- local site topography;
- presence of any outcropping rocks and their type;
- aspect of the hill-slopes;
- percentage of litter cover (logs, twigs and/or leaves);
- percentage of bare ground;
- time since fire;
- dieback presence and impact;
- condition of the vegetation, based on Keighery's (1994) condition ratings;
- alive and dead percentage of foliage cover; and
- average height of each species recorded.

Tree species assessments were undertaken within a 20 m radius from the observation point, with each tree species present being ranked by abundance:

0 absent;
1 one or two trees;
2 three to five trees;
3 more than five trees, but contributing less than one third of the total stand;
4 between one third and one half of the total stand; and
5 more than one half of the total stand.

Understorey species assessments were undertaken within a 5 m radius from the observation point, with each understorey species being ranked by abundance:

0 absent;
1 very rarely seen, only after careful search;
2 present, observable, but in small numbers only;
3 common locally, but not uniformly over the whole area;
4 common over the whole area; and
5 completely dominating the understorey.

The physiological stress was determined for each species within a 5 m and 20 m radius (for understorey and tree species respectively) from the observation point and ranked according to the following scale. This stress assessment system has been previously used in the northern Jarrah forest, with site-vegetation type mapping surveys undertaken in the Boddington bauxite and gold mining leases by E. M Mattiske and Associates (1981 to 1994) and Mattiske Consulting Pty <td (1994 to 2018) (1985 to 2018) (see Appendix A).

0 healthy, no evidence of stress;
1 odd plant showing signs of stress, not dead;
2 one or two stressed plants, near death;
3 scattered stressed, (2 – 4) dead plants around plot;

4 susceptible plants dying or dead (> 4 plants); and
5 "graveyard" death.

The vegetation condition mapping was based on Keighery (1994) vegetation condition categories. The condition of the areas was based on aerial photographic interpretations and field recordings.

All plant specimens collected during the field survey were dried and fumigated in accordance with the requirements of the Western Australian Herbarium. Plant species were identified through comparisons with pressed specimens housed either at the Mattiske Consulting internal herbarium or the Western Australian Herbarium. Where required, specialist plant taxonomists were consulted. Nomenclature of species recorded is in accordance with the Western Australian Herbarium (DBCA 2019a).

4.3 Vegetation Mapping

The site-vegetation types were defined based on key indicator species, overstorey species and local site parameters (i.e. soil, outcropping, landscape position) to minimise confusion caused by the high numbers of introduced species dominating the understorey. The site-vegetation types as defined and mapped in the eastern Jarrah forests near Mt Saddleback by Mattiske based on the earlier studies by Havel (1975a, 1975b).

4.4 Survey Limitations and Constraints

An assessment of the survey against a range of factors which may have had an impact on the outcomes of the present survey is presented in Table 1. Based on this assessment, the Infill Areas have only been subject to minor constraints which would affect the thoroughness of the survey and the conclusions which have been formed. These minor constraints were related to the lack of access to a few properties at the time of the assessments. These constraints are diminished when the extent of baseline studies for South32 over decades is taken into consideration (see Appendix A). The data and interpretations in the areas that were not accessible at the time of the surveys were based on extensive site experience in the area over decades, aerial photographic interpretations and extrapolation from adjacent areas.

Table 1: Potential Flora and Vegetation Survey Limitations for the Bauxite Mine Expansion Areas

Potential Survey Limitation	Impact on Survey
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	**Not a constraint:** Multiple surveys have previously been conducted by Mattiske within the surrounding area. This, together with reference to resources such as Havel (1975a; 1975b), Heddle *et al.* (1980) and Mattiske and Havel (1998), previous mapping of site-vegetation types by Mattiske for the Worsley sites, online flora and vegetation information, has provided an appropriate amount of information for the current survey.
Scope (i.e. what life forms, etc., were sampled).	**Not a constraint:** Due to the timing of the survey, all life forms were sampled adequately during the survey. All site characteristics were adequately sampled during the survey.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Not a constraint:** The survey was conducted during Spring which is considered an appropriate time to assess flora and vegetation within the Jarrah forest due to the flowering period for a large majority of species.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed).	**Minor constraint:** With the exception of a few properties, the rest of the survey area was accessible from roads and tracks and was adequately surveyed by foot traverse. If access conditions change to these few additional properties then ground foot traverses are recommended prior to any disturbance.

Table 1: Potential Flora and Vegetation Survey Limitations for the Bauxite Mine Expansion Areas (continued)

Potential Survey Limitation	Impact on Survey
Mapping reliability.	**Not a constraint:** Supplied aerial photographic maps and outlines of private properties were utilised in the selection of sites to ensure coverage of all perceived vegetation communities.
Timing, weather, season, cycle.	**Not a constraint:** The survey was conducted during Spring which is considered to be the ideal sampling period for the Jarrah Forest as it allows maximum coverage of annual species after winter rains.
Disturbances (fire flood, accidental human intervention, etc.).	**Not a constraint:** No disturbances impacted upon the survey.
Intensity (in retrospect, was the intensity adequate).	**Minor constraint:** With the exception of two small properties, the rest of the survey area was accessible from roads and tracks and was adequately surveyed by foot traverse.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	**Not a constraint:** Adequate resources were provided for the completion of the survey work.
Access problems (i.e. ability to access survey area).	**Minor constraint:** Access was not granted by owners for two properties, however the rest of the survey area was accessible and was surveyed accordingly.
Experience levels (e.g. degree of expertise in plant identification to taxon level).	**Not a constraint:** Both field personnel have the appropriate training in sampling and identifying the flora of the region. Plants not identifiable in the field were collected and identified by specialist Taxonomists.

5. RESULTS

5.1 Flora

Desktop searches of the EPBC Act Protected Matters database, the DPAW *NatureMap* (2019a) and DBCA databases (2019a), the Western Australian Herbarium (WAH) and Threatened and Priority Flora (TPFL) and the Protected Matters search (DotEE 2019a) databases have identified the potential occurrence of 80 conservation significant flora species within 20 km of the WMDE and Bauxite Transport Corridor and 32 conservation significant flora species within 20 km of the CBME, Appendices C to F. This information, together with a literature review of all available datasets from previous flora and vegetation surveys for the Project, has formed the basis of a likelihood assessment for conservation significant flora within the areas the subject of the Proposal. The likelihood of the threatened and priority species for the respective Boddington and Collie areas is summarized in Appendices D and F.

The desktop search also highlighted the presence of the Mt Saddleback Heath Community Priority Ecological Community P1. This community was not defined during the Phase One and Two studies by Worsley Alumina Pty Ltd and was initially assigned to the heath community on Tunnell Road. In recent years it has been extended to the wider Mt Saddleback Heath Community.

A total of 680 plant taxa from 72 families and 260 genera were recorded in the main baseline studies undertaken on the Worsley lease areas. A total of 289 vascular plant species from 54 plant families and 149 genera were recorded in the main baseline studies undertaken on the Collie areas, Appendices G and H.

Since this time various studies have added taxa when additional targeted searches, baseline and monitoring studies have been undertaken. Several of the taxa have undergone taxonomic changes since the earlier studies and several species have been excluded, been changed from introduced to naturalised and been changed from Priority species to non-threatened species.

The recent studies in November 2018 on the Infill Areas and the Bauxite Transport Corridor recorded 149 plant taxa from 42 families and 94 genera and as such reflect the largely degraded and cleared nature of substantial areas of these infill areas. A list of taxa recorded is presented in Appendix G.

5.2 Threatened and Priority Flora

As identified in section 5.1 a number of conservation significant species had the potential to occur within the proposed expansion areas. Of the potential 80 conservation significant species 15 conservation significant species have been recorded within the WMDE and Bauxite Transport Corridor (Table 2, Figure 5.1 to 5.13). No conservation significant species were recorded in the recently surveyed Infill Areas, hence these are not separated in Table 2. There have been three threatened flora recorded in the areas (see Figures 3 (DBCA records) and Figures 5.1. to 5.13). As indicated below and on the site-vegetation type (Figures 5.1 to 5.13) *Caladenia hopperiana* is the only one of the three threatened species recorded in the WMDE (see Table 2 and Appendix K).

- *Caladenia hopperiana* (formerly known as *Caladenia* sp. Quindanning) is Threatened under the *BC Act 2016* and Endangered under the *EPBC Act 1999* – occurs within and outside the WMDE in the south eastern section of the mapping (see Figures 5.12 and 5.13).
- *Caladenia dorrienii* is Threatened under the *BC Act 2016* and Endangered under the *EPBC Act 1999* – occurs outside and to the east of the WMDE (see Figure 5.10).
- *Eleocharis keigheryi* is Threatened under the *BC Act 2016* and Vulnerable under the *EPBC Act 1999* – occurs outside and to the east of the WMDE (see Figure 5.13).

Of the potential 32 conservation significant species within the CBME (see section 5.1), 1 conservation significant species has been recorded (Table 3). The latter species is *Pultenaea skinneri* (P4) that was recorded in the valley systems and lower slopes on the southern fringes of the CBME. In addition,

Stylidium acuminatum subsp*. acuminatum* (P2) occurs on the north-eastern edge of the CBME area (see Figure 3.2).

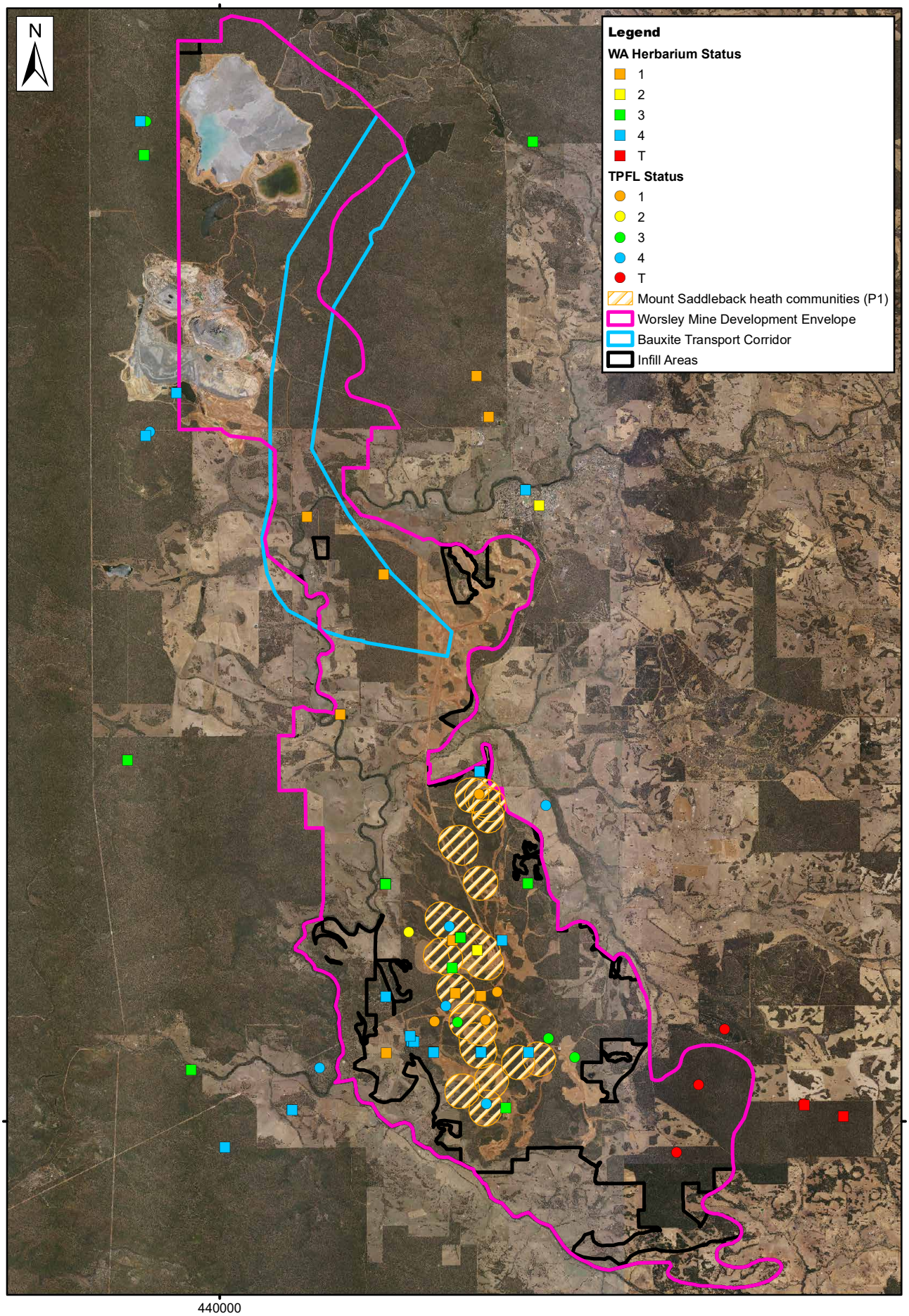
Several other threatened and priority flora species were recorded in Phases One and Two (Worsley Alumina Pty Ltd 1985). The likelihood of these respective species occurring within the proposed expansion areas is summarized in Appendices D and F. The likelihood of the threatened and priority flora species occurring on large sections of the recently assessed Infill Areas was low due to the extent of agricultural activities and past grazing of the understorey species. The exceptions to the latter include the areas of less disturbed forests, heath and valley floors (near the Hotham River), Figures 5.1 to 5.13. The searching in the less disturbed remnants reduced the risk of not locating these species.

Table 2: Conservation Significant Flora located within the WMDE and Bauxite Transport Corridor

Species	Status under EPBC Act	Status under BC Act	Potential Occurrence / Recorded Location
Caladenia hopperiana	E	T	WMDE – 15 inside locations and 159 outside locations of WMDE and Bauxite Transport Corridor; 20 plants inside and 261 outside.
Calytrix simplex subsp. *simplex*		P1	WMDE – 3 inside locations, 1 to 5 plants per location
Gastrolobium sp. Prostrate Boddington (M. Hislop 2130)		P1	WMDE – 86 inside locations and 132 outside locations WMDE and Bauxite Transport Corridor; 499 plants inside and 4424 plants outside WMDE and Bauxite Transport Corridor including 35 plants on Camballing Reserve.
Isopogon sp. Canning Reservoir (M.D. Tindale 121 & B.R. Maslin)		P1	WMDE – 3 inside locations (2 rehabilitation areas and 1 control areas) inside with 1 to 5 plants
Papistylus intropubens		P1	WMDE – 1 inside location (1 to 5 plants)
Banksia subpinnatifida var. subpinnatifida		P2	WMDE – 1 inside location 1 to 5 plants, but within Tunnel Road Heath therefore outside disturbance
Banksia subpinnatifida var. *imberbis*		P3	WMDE - 5 inside locations with 1 to 5 plants, but within Tunnel Road Heath therefore outside disturbance
Acacia deflexa		P3	WMDE – 1 inside location in heath community 1 to 5 plants, therefore outside disturbance
Acacia horridula		P3	WMDE – 1 inside location (within rehabilitation areas), 1 to 5 plants
Goodenia katabudjar		P3	WMDE – 5 inside locations with 1 to 5 plants; 13 locations outside WMDE and Bauxite Transport Corridor with 24 plants.
Halgania corymbosa		P3	WMDE – 19 inside locations with 1 to 5 plants and 3 outside with 1 to 5 plants; including 2 locations within the Bauxite Transport Corridor.
Senecio leucoglossus		P4	WMDE – 51 inside locations 50 to 60 plants) and 17 locations outside (20 to 25 plants)
Stylidium marradongense		P3	WMDE – 17 inside locations (12 in control and 5 in rehabilitation) with 25 to 30 plants and 1 outside with 1 to 5 plants
Calothamnus quadrifidus subsp. *teretifolius*		P4	WMDE - 3 inside locations (within rehabilitation areas), 1 to 5 plants per location
Lasiopetalum cardiophyllum		P4	WMDE – 282 inside locations (37 rehabilitation areas and 245 control areas) with approximately 300 to 400 plants and 152 outside locations with 7662 plants; including 25 locations within the Bauxite Transport Corridor.

Table3: Conservation Significant Flora located within the CBME

Species	Status under EPBC Act	Status under BC Act	Potential Occurrence / Recorded Location
Pultenaea skinneri		P4	Recorded in southern sections of Refinery in CW, D and SW site-vegetation types on lower slopes



Basemap: Landgate (2017)

0 2 4 km

Scale: 1:175,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_03_01

Date: February 2019 | Rev: A | A4

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Worsley Mine Expansion

DBCA Threatened Flora and PEC

Figure: **3.1**

390000 400000 410000 420000 430000

6340000 6330000 6320000 6310000

Legend

TPFL Sites

- Caladenia uliginosa subsp. patulens
- Grevillea prominens
- Grevillea rara
- Grevillea ripicola
- Pultenaea skinneri
- Senecio leucoglossus

WA Herbarium Sites

- Acacia semitrullata
- Adenanthos cygnorum subsp. chamaephyton
- Angianthus drummondii
- Caladenia bryceana subsp. bryceana
- Caladenia speciosa
- Caladenia uliginosa subsp. patulens
- Caladenia validinervia
- Calothamnus graniticus subsp. leptophyllus
- Carex tereticaulis
- Dillwynia dillwynioides
- Eucalyptus rudis subsp. cratyantha
- Grevillea prominens
- Grevillea rara
- Grevillea ripicola
- Hemigenia microphylla
- Hypolaena robusta
- Lomandra whicherensis
- Pultenaea skinneri
- Senecio leucoglossus
- Stylidium acuminatum subsp. acuminatum
- Stylidium korijekup
- Synaphea hians
- Tetratheca parvifolia
- Thysanotus unicupensis
- ML1SA_Areas
- Emergency Bauxite Mining Area

Client: SOUTH32

N

0 3km

Scale: 1:150,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_03_02

Date: Feb 2019 | Rev: B | A3

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Collie Refinery
DBCA Flora

Figure: **3.2**

5.3 Introduced Plant Species

A total of 28 introduced flora species have been recorded within the recently assessed Infill Areas. A total of 80 introduced flora species have been recorded in the WMDE lease areas near Boddington and Collie (Appendices G and H). A total of 15 introduced flora species have been recorded within the CBME area.

The majority of the weeds are short term annual species that establish on disturbed agricultural lands and although some establish in the early phase of rehabilitation, the majority are quickly outgrown by more perennial and larger native shrub and tree species.

Of the potential introduced flora species the following are Declared Plants under the *Biodiversity and Agricultural Management Act 2007* (BAM Act) (DAFWA 2018), namely:

- **Gomphocarpus fruticosus* (Declared Plant under BAM Act) – near Collie Refinery (DPAW 2019a; DotEE 2019a)
- **Silybum marianum* (Declared Plant under BAM Act) – near Collie Refinery in Phase One (Danes and Moore 1981)
- **Asparagus asparagoides* (Declared Plant under BAM Act) – near Boddington and Collie areas (DotEE 2019a)

None of the Declared Plants were recorded in the recent assessment of the Infill Areas.

5.4 Vegetation Complexes

At a regional scale Heddle *et al*. (1980) and Mattiske and Havel (1998) defined and mapped a series of vegetation complexes that enabled a refinement of the vegetation mapping of Beard (1979) and Smith (1974) for Pinjarra and Collie areas respectively (Tables 4, 5, 6 and 7 and Figures 4.1 and 4.2). The latter work of Beard has been updated recently into Beard *et al*. (2013) for the State of Western Australia. The approach developed by Heddle *et al.* (1980) and Mattiske and Havel (1998) enabled relationships to be defined between the resulting regional patterns of vegetation and the underlying landforms, soils and climatic trends in the southwest forests. In the three main areas assessed within this current project the following vegetation complexes were recorded:

Infill Areas - 8 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Swamp, Williams, Yalanbee 5 and Yalanbee 6, Figure 4.1.

WMDE – 9 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Pindalup, Swamp, Williams, Yalanbee 5 and Yalanbee 6, Figure 4.1.

Bauxite Transport Corridor - 8 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Pindalup, Swamp, Williams and Yalanbee 6, Figure 4.1.

Of these complexes the Michibin and Williams complex areas are less represented (<10%) in formal and informal reserves (7.11% and 0.49% respectively), (Conservation Commission 2003). The latter mainly relates to their occurrence in valley systems that have been developed for agriculture on the eastern fringes of the Darling Ranges.

CBME – 3 vegetation complexes, Dwellingup 1, Murray 1 and Yarragil 1, Figure 4.2. All of these complexes are represented in formal and informal reserves in areas >10% (Conservation Commission 2003).

Table 4: Extent of Vegetation Complexes Infill Areas

Vegetation Complex	Description	Pre-European Extent (ha)	Current Extent on Public Lands (ha)	Current Extent in Formal and Informal Reserves (ha) (%)	Extent within Proposal (ha)
Ce	Cooke - Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla* (subhumid zone) and open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* (semiarid and arid zones) and on deeper soils adjacent to outcrops, closed heath of Myrtaceae – Proteaceae species and lithic complex on granite rocks and associated soils in all climatic zones, with some *Eucalyptus laeliae* (semiarid), and *Allocasuarina huegeliana* and *Eucalyptus wandoo* (mainly semiarid and perarid zones).	35311.49	23944.83	11466.9 (34.85%)	45.43
Ck	Coolakin - Woodland of *Eucalyptus wandoo* with mixtures of *Eucalyptus patens, Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones.	133887.40	34491.35	21281.14 (17.5%)	660.67
D4	Dwellingup 4 - Open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands in semiarid and arid zones.	132413.70	98031.36	33945.18 (26.14%)	408.11
Mi	Michibin - Open woodland of *Eucalyptus wandoo* over *Acacia acuminata* with some *Eucalyptus loxophleba* on valley slopes, with low woodland of *Allocasuarina huegeliana* on or near shallow granite outcrops in arid and perarid zones.	134538.90	8850.98	7692.71 (7.11%)	1413.67
S	Swamp - Mosaic of low open woodland of *Melaleuca preissiana – Banksia littoralis,* closed scrub of Myrtaceae spp., closed heath of Myrtaceae spp. and sedgelands of *Baumea* and *Leptocarpus* spp. on seasonally wet or moist sand, peat and clay soils on valley floors in all climatic zones.	53656.45	36097.78	25381.85 (47.5%)	32.93
Wi	*Williams* - Mixture of woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla,* low forest of *Casuarina obesa* and tall shrubland of *Melaleuca* spp. on major valley systems in arid and perarid zones.	23485.85	524.47	105.38 (0.49%)	306.03
Y5	*Yalanbee 5* - Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* and woodland of *Eucalyptus wandoo* on lateritic uplands in semiarid and perarid zones.	124375.00	56414.66	30522.62 (29.6%)	400.38
Y6	*Yalanbee 6* - Woodland of *Eucalyptus wandoo – Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands and breakaway landscapes in arid and perarid zones.	158390.00	47445.98	34464.76 (22.9%)	80.33

Table 5: Extent of Vegetation Complexes WMDE

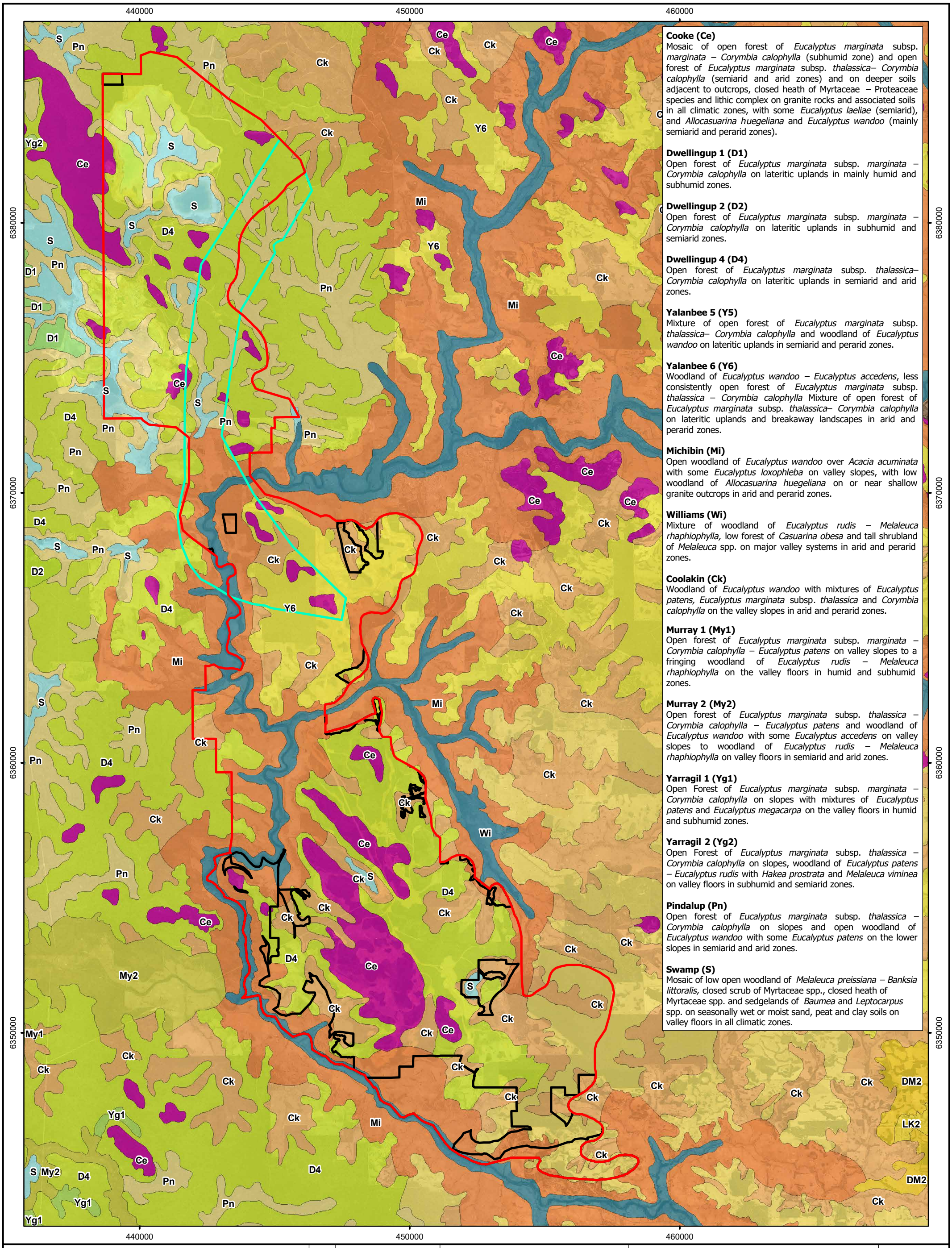
Vegetation Complex	Description	Pre-European Extent (ha)	Current Extent on Public Lands (ha)	Current Extent in Formal and Informal Reserves (ha) (%)	Extent within Proposal (ha)
Ce	Cooke - Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla* (subhumid zone) and open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* (semiarid and arid zones) and on deeper soils adjacent to outcrops, closed heath of Myrtaceae – Proteaceae species and lithic complex on granite rocks and associated soils in all climatic zones, with some *Eucalyptus laeliae* (semiarid), and *Allocasuarina huegeliana* and *Eucalyptus wandoo* (mainly semiarid and perarid zones).	35311.49	23944.83	11466.9 (34.85%)	2595.04
Ck	Coolakin - Woodland of *Eucalyptus wandoo* with mixtures of *Eucalyptus patens, Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones.	133887.40	34491.35	21281.14 (17.5%)	3621.17
D4	Dwellingup 4 - Open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands in semiarid and arid zones.	132413.70	98031.36	33945.18 (26.14%)	9021.16
Mi	Michibin - Open woodland of *Eucalyptus wandoo* over *Acacia acuminata* with some *Eucalyptus loxophleba* on valley slopes, with low woodland of *Allocasuarina huegeliana* on or near shallow granite outcrops in arid and perarid zones.	134538.90	8850.98	7692.71 (7.11%)	4707.45
Pn	Pindalup - Open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* on slopes and open woodland of *Eucalyptus wandoo* with some *Eucalyptus patens* on the lower slopes in semiarid and arid zones.	166693.90	111738.98	57254.77 (35.1%)	1998.16
S	Swamp - Mosaic of low open woodland of *Melaleuca preissiana – Banksia littoralis,* closed scrub of Myrtaceae spp., closed heath of Myrtaceae spp. and sedgelands of *Baumea* and *Leptocarpus* spp. on seasonally wet or moist sand, peat and clay soils on valley floors in all climatic zones.	53656.45	36097.78	25381.85 (47.5%)	872.77
Wi	*Williams* - Mixture of woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla,* low forest of *Casuarina obesa* and tall shrubland of *Melaleuca* spp. on major valley systems in arid and perarid zones.	23485.85	524.47	105.38 (0.49%)	1194.03
Y5	*Yalanbee 5* - Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* and woodland of *Eucalyptus wandoo* on lateritic uplands in semiarid and perarid zones.	124375.00	56414.66	30522.62 (29.6%)	1457.03
Y6	*Yalanbee 6* - Woodland of *Eucalyptus wandoo – Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands and breakaway landscapes in arid and perarid zones.	158390.00	47445.98	34464.76 (22.9%)	2329.39

Table 6: Extent of Vegetation Complexes Bauxite Transport Corridor

Vegetation Complex	Description	Pre-European Extent (ha)	Current Extent on Public Lands (ha)	Current Extent in Formal and Informal Reserves (ha)	Extent within Bauxite Transport Corridor (ha)
Ce	Cooke - Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla* (subhumid zone) and open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* (semiarid and arid zones) and on deeper soils adjacent to outcrops, closed heath of Myrtaceae – Proteaceae species and lithic complex on granite rocks and associated soils in all climatic zones, with some *Eucalyptus laeliae* (semiarid), and *Allocasuarina huegeliana* and *Eucalyptus wandoo* (mainly semiarid and perarid zones).	35311.49	23944.83	11466.9 (34.85%)	189.01
Ck	Coolakin - Woodland of *Eucalyptus wandoo* with mixtures of *Eucalyptus patens, Eucalyptus marginata* subsp*. thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones.	133887.40	34491.35	21281.14 (17.5%)	153.94
D4	Dwellingup 4 - Open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands in semiarid and arid zones.	132413.70	98031.36	33945.18 (26.14%)	1355.99
Mi	Michibin - Open woodland of *Eucalyptus wandoo* over *Acacia acuminata* with some *Eucalyptus loxophleba* on valley slopes, with low woodland of *Allocasuarina huegeliana* on or near shallow granite outcrops in arid and perarid zones.	134538.90	8850.98	7692.71 (7.11%)	885.41
Pn	Pindalup - Open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* on slopes and open woodland of *Eucalyptus wandoo* with some *Eucalyptus patens* on the lower slopes in semiarid and arid zones.	166693.90	111738.98	57254.77 (35.1%)	690.09
S	Swamp - Mosaic of low open woodland of *Melaleuca preissiana – Banksia littoralis,* closed scrub of Myrtaceae spp., closed heath of Myrtaceae spp. and sedgelands of *Baumea* and *Leptocarpus* spp. on seasonally wet or moist sand, peat and clay soils on valley floors in all climatic zones.	53656.45	36097.78	25381.85 (47.5%)	85.69
Wi	*Williams* - Mixture of woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla,* low forest of *Casuarina obesa* and tall shrubland of *Melaleuca* spp. on major valley systems in arid and perarid zones.	23485.85	524.47	105.38 (0.49%)	254.00
Y6	Yalanbee 6 - *Yalanbee 6* - Woodland of *Eucalyptus wandoo – Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands and breakaway landscapes in arid and perarid zones.	158390.00	47445.98	34464.76 (22.9%)	531.57

Table 7: Extent of Vegetation Complexes CBME

Vegetation Complex	Description	Pre-European Extent (ha)	Current Extent on Public Lands (ha)	Current Extent in Formal and Informal Reserves (ha)	Extent within CBME (ha)
D1	Dwellingup 1 - Open forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* on lateritic uplands in mainly humid and subhumid zones.	208270.90 (ha)	172012.1 (ha)	30351.77 (ha) (14.68%)	320.74
My1	Murray 1 - Open forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* – *Eucalyptus patens* on valley slopes to a fringing woodland of *Eucalyptus rudis* – *Melaleuca rhaphiophylla* on the valley floors in humid and subhumid zones.	68617.87 (ha)	43508.75 (ha)	24574.69 (ha) (36.02%)	389.28
Yg1	Yarragil 1 - Open Forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in humid and subhumid zones.	80060.95 (ha)	59058.69 (ha)	23746.40 (ha) (29.86%)	37.21



Cooke (Ce)
Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla* (subhumid zone) and open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* (semiarid and arid zones) and on deeper soils adjacent to outcrops, closed heath of Myrtaceae – Proteaceae species and lithic complex on granite rocks and associated soils in all climatic zones, with some *Eucalyptus laeliae* (semiarid), and *Allocasuarina huegeliana* and *Eucalyptus wandoo* (mainly semiarid and perarid zones).

Dwellingup 1 (D1)
Open forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla* on lateritic uplands in mainly humid and subhumid zones.

Dwellingup 2 (D2)
Open forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla* on lateritic uplands in subhumid and semiarid zones.

Dwellingup 4 (D4)
Open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands in semiarid and arid zones.

Yalanbee 5 (Y5)
Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* and woodland of *Eucalyptus wandoo* on lateritic uplands in semiarid and perarid zones.

Yalanbee 6 (Y6)
Woodland of *Eucalyptus wandoo – Eucalyptus accedens*, less consistently open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* Mixture of open forest of *Eucalyptus marginata* subsp. *thalassica– Corymbia calophylla* on lateritic uplands and breakaway landscapes in arid and perarid zones.

Michibin (Mi)
Open woodland of *Eucalyptus wandoo* over *Acacia acuminata* with some *Eucalyptus loxophleba* on valley slopes, with low woodland of *Allocasuarina huegeliana* on or near shallow granite outcrops in arid and perarid zones.

Williams (Wi)
Mixture of woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla,* low forest of *Casuarina obesa* and tall shrubland of *Melaleuca* spp. on major valley systems in arid and perarid zones.

Coolakin (Ck)
Woodland of *Eucalyptus wandoo* with mixtures of *Eucalyptus patens, Eucalyptus marginata* subsp*. thalassica* and *Corymbia calophylla* on the valley slopes in arid and perarid zones.

Murray 1 (My1)
Open forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla – Eucalyptus patens* on valley slopes to a fringing woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla* on the valley floors in humid and subhumid zones.

Murray 2 (My2)
Open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla – Eucalyptus patens* and woodland of *Eucalyptus wandoo* with some *Eucalyptus accedens* on valley slopes to woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla* on valley floors in semiarid and arid zones.

Yarragil 1 (Yg1)
Open Forest of *Eucalyptus marginata* subsp. *marginata – Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in humid and subhumid zones.

Yarragil 2 (Yg2)
Open Forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* on slopes, woodland of *Eucalyptus patens – Eucalyptus rudis* with *Hakea prostrata* and *Melaleuca viminea* on valley floors in subhumid and semiarid zones.

Pindalup (Pn)
Open forest of *Eucalyptus marginata* subsp. *thalassica – Corymbia calophylla* on slopes and open woodland of *Eucalyptus wandoo* with some *Eucalyptus patens* on the lower slopes in semiarid and arid zones.

Swamp (S)
Mosaic of low open woodland of *Melaleuca preissiana – Banksia littoralis,* closed scrub of Myrtaceae spp., closed heath of Myrtaceae spp. and sedgelands of *Baumea* and *Leptocarpus* spp. on seasonally wet or moist sand, peat and clay soils on valley floors in all climatic zones.

Legend
- Development Envelope
- Bauxite Transport Corridor
- Infill Areas
- Ce , Cooke
- Ck , Coolakin
- D1 , Dwellingup
- D2 , Dwellingup
- D4 , Dwellingup
- DM2 , Dalmore 2
- LK2 , Lukin 2
- Mi , Michibin
- My1 , Murray 1
- My2 , Murray 2
- Pn , Pindalup
- S , Swamp
- Wi , Williams
- Y5 , Yalanbee
- Y6 , Yalanbee
- Yg1 , Yarragil 1
- Yg2 , Yarragil 2

N

0 1 2km
Scale: 1:125,000
MGA94 (Zone 50)
CAD Ref: g1881_Veg_f17_04_01
Date: Feb 2019 | Rev: A | A3

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Worsley Mine Expansion

Vegetation Complexes

Figure: **4.1**

400000 410000 420000

6330000

6320000

Darling Scarp (DS2)
Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla*, with some admixture of *Eucalyptus laeliae* in the north (subhumid zone), with *Corymbia haematoxylon* in the south (humid zone) on deeper soils adjacent to outcrops, woodland of *Eucalyptus wandoo* (subhumid and semiarid zones), low woodland of *Allocasuarina huegeliana* on shallow soils over granite outcrops, closed heath of Myrtaceae – Proteaceae species and lithic complex on or near granite outcrops in all climatic zones.

Dwellingup 1 (D1)
Open forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* on lateritic uplands in mainly humid and subhumid zones.

Yarragil 1 (Yg1)
Open Forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in humid and subhumid zones.

Yarragil 2 (Yg2)
Open Forest of *Eucalyptus marginata* subsp. *thalassica* – *Corymbia calophylla* on slopes, woodland of *Eucalyptus patens* – *Eucalyptus rudis* with *Hakea prostrata* and *Melaleuca viminea* on valley floors in subhumid and semiarid zones.

Murray 1 (My1)
Open forest of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* – *Eucalyptus patens* on valley slopes to a fringing woodland of *Eucalyptus rudis* – *Melaleuca rhaphiophylla* on the valley floors in humid and subhumid zones.

Lowdon (Lo)
Open forest of *Corymbia calophylla* – *Eucalyptus marginata* subsp. *marginata* – *Agonis flexuosa* with some *Eucalyptus wandoo* and occasional *Corymbia haematoxylon* on slopes, and woodland of *Eucalyptus rudis* – *Melaleuca rhaphiophylla* on valley floors in humid zone.

Goonaping (G)
Mosaic of open forest of *Eucalyptus marginata* subsp. *marginata* (humid zones) and *Eucalyptus marginata* subsp. *thalassica* (semiarid and perarid zones) on the sandy -gravels, low woodland of *Banksia attenuata* on the drier sandier soils (humid to perarid zones) with some *Banksia menziesii* (northern arid and perarid zones) and low open woodland of *Melaleuca preissiana* – *Banksia littoralis* on the moister sandy soils (humid to perarid zones).

Swamp (S)
Mosaic of low open woodland of *Melaleuca preissiana* – *Banksia littoralis*, closed scrub of Myrtaceae spp., closed heath of Myrtaceae spp. and sedgelands of *Baumea* and *Leptocarpus* spp. on seasonally wet or moist sand, peat and clay soils on valley floors in all climatic zones.

Legend
- ML1SA Area
- Emergency Bauxite Mining Area
- D1 , Dwellingup
- DS2 , Darling Scarp
- G , Goonaping
- Lo , Lowdon
- My1 , Murray 1
- S , Swamp
- Yg1 , Yarragil 1
- Yg2 , Yarragil 2

Client: SOUTH32

N

0 1.5km
Scale: 1:75,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_04_02
Date: Feb 2019 | Rev: A | A3

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Collie Refinery
Vegetation Complexes

Figure: **4.2**

5.5 Site-Vegetation Types

The field survey consisted of a detailed assessment of all remnant vegetation areas within the Infill Areas near Boddington within the WMDE and Bauxite Transport Corridor. A total of 67 survey quadrats were used to assess the flora and vegetation of the Infill Areas and as such supplement the extensive work in previous decades. At a finer scale of local mapping the site-vegetation types for the WMDE, Bauxite Transport Corridor and CBME by initially Dames and Moore (1981) and later Mattiske (1985 to 2018) were based on the earlier ecological studies of Havel (1975a and 1975b) who delineated a series of site-vegetation types that integrated the structural and floristic components (including key indicator species) with the underlying soil and site conditions (Tables 8, 9 and 10; Figures 5.0 to 5.14).

WMDE – 36 site-vegetation types were defined for the WMDE area. The dominant site-vegetation types (>300ha) were M. P, PS, S, H, H2, ST, Y, Z AY and D. Large sections of the WMDE have been cleared for agriculture and plantations. The majority of the WMDE area is either completely degraded (46.89%) or degraded (14.48%). The restricted site-vegetation types include swamp vegetation types (A1, A2), on the lower slopes (AD, AY/D, DG), on the outcropping areas (G1, G2, G4, R) and on the moister slopes (PW, SW, W). In previous expansions of the South32 Worsley operation, some of the communities G1, G2 and G4 associated with shallow soils have been avoided.

Bauxite Transport Corridor - 26 site-vegetation types were defined for the Bauxite Transport Corridor area (noting that 80.38% of these areas overlap with the WMDE and 11.99% of the WMDE overlaps with the Transport Bauxite Corridor). The dominant site-vegetation types (>300ha) were H, M, PS and S. Large sections of the Bauxite Transport Corridor have been cleared for agriculture and plantations. A large portion of the Bauxite Transport Corridor is either completely degraded (28.42%) or degraded (3.81%). The restricted site-vegetation types include specific types on the slopes (H2, M2), on the lower slopes (AD, AY/D, DG), on the outcropping areas (G, G3, G4) and on the moister slopes (PW). In previous expansions of the South32 Worsley operations the majority of the G, G3 and G4 associated with shallow soils have been avoided.

CBME – 9 site-vegetation types were defined for the CBME. The dominant site-vegetation types (>100ha) were S and ST. The majority of the CBME was relatively undisturbed with the exception of the dam and completely degraded areas (32.20%). The restricted site-vegetation types include specific types on the lower slopes (CQ) and slopes (SP). All site-vegetation types in the CBME are well represented in nearby state forest areas and conservations areas (e.g. Wellington National Park).

Significant communities within the WMDE, Bauxite Transport Corridor and CBME areas include the following:

- The Priority 1 PEC - Mt Saddleback Heath Communities as delineated by DBCA occurs in the Saddleback area near Boddington within the WMDE but not within the Bauxite Transport Corridor. Those that overlap the PEC Mt Saddleback Heath Community are highlighted in Figures 5.1 to 5.13 by a different polygon boundary. This PEC community on Mt Saddleback has affinities with components of the heath communities G, G1, G3, G4 and G5 as defined and mapped by Mattiske (Worsley Alumina Pty Ltd 1985 to Mattiske 2018). Some of the latter site-vegetation types extend well beyond the Mt Saddleback area, e.g. north of the Boddington Gold Mine and on the eastern fringes of the State Forest. Although these PEC communities are delineated in Figure 3 (based on DBCA data supplied) there remain some inconsistencies with the previously mapped areas of the various G communities as mapped by the Mattiske team for South32 in the various phases of detailed site-vegetation mapping since the early 1980's.
- The G, G1, G3, G4 and G5 site-vegetation types as defined by Mattiske in following areas:
    - 37.1ha of type G in the Infill Areas;
    - 6.51ha of G, 3.28ha of G3, 2.07ha of G4 in the Bauxite Transport Corridor, although no PEC locations as defined by the DBCA occurred in the Bauxite Transport Corridor);
    - 66.44ha of G, 1.54ha of G1, 71.72ha of G3, 11.75ha of G4 in the WMDE; and
    - 70.19ha of G, 108.57ha of G1, 140.39ha of G3, 15.34ha of G4 and 5.54ha of G5 in the wider areas mapped.

- The G2 site-vegetation type that occurs on granite in association with Rock Sheoak (*Allocasuarina huegeliana*), heath communities and lithic complexes occurs in the following areas:
    - 1.29ha of type G2 in the Infill Areas;
    - 9.58ha of type G2 in the WMDE area; and
    - 188.50ha of type G2 in the wider areas mapped.
- The communities that are a mixture of different site-vegetation types over shallow granites (DG, HG and MG on the infill areas) occur in the following areas:
    - 2.24ha of DG and 162.49ha of MG in the Infill Areas;
    - 5.06ha of DG and 28.34ha of MG in the Bauxite Transport Corridor;
    - 7.93ha of DG, 50.65ha of HG and 219.79ha of MG in the WMDE; and
    - 51.67ha of DG, 150.40ha of HG and 503.87ha of MG in the wider areas mapped.
- The M2 site-vegetation type which supports woodlands of *Eucalyptus accedens*, *Eucalyptus wandoo, Eucalyptus marginata* and *Corymbia calophylla* on eastern breakaways. The M2 site-vegetation type occurs in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington. This site-vegetation type occurs eastwards on the upper slopes and ridges of the Eastern Jarrah forest. This site-vegetation type occurs in the following areas:
    - 19.87ha of M2 in the Infill Areas;
    - 1.38ha of M2 in the Bauxite Transport Corridor;
    - 45.43ha of M2 in the WMDE; and
    - 545.73ha of M2 in the wider areas mapped.
- A, AY, AX, AC Types – Woodlands of *Eucalyptus rudis* and *Melaleuca* species on the swamps and creeklines that provide linkages for fauna species and a variety of plant species on variable soils in the Infill Areas. These site-vegetation types occur in the following areas:
    - 1.04ha of A, 96.77ha of AY and 29.24ha of AC in the Infill Areas;
    - 39.79ha of A, 153.96ha of AY and 98.18ha of AX in the Bauxite Transport Corridor;
    - 123.36ha of A, 405.55ha of AY, 195.96ha of AX and 34.15ha of AC in the WMDE; and
    - 627.92ha of A, 908.88ha of AY, 516,12ha of AX and 58.52ha of AC in the wider areas mapped.
- The restricted L site-vegetation type that supports a woodland of *Eucalyptus patens* and *Eucalyptus wandoo* on the lower slopes of the valley floors.
    - 27.02ha of L in the Bauxite Transport Corridor;
    - 32.90ha of L in the WMDE; and
    - 265.11ha of L in the wider areas mapped.
- The Y site-vegetation types that is often associated with the occurrence of the *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130), particularly on the lower slopes near the Hotham River and north on broader clay loam valley lower slopes. This site-vegetation type is well represented in the wider areas and occurs in the following areas:
    - 58.65ha of Y in the Infill Areas;
    - 194.59ha of Y in the Bauxite Transport Corridor;
    - 604.03ha of Y in the WMDE; and
    - 2034.42ha of Y in the wider areas mapped.

The majority of the site-vegetation types that occur on the Collie Refinery lease areas are locally well represented in State forest and conservations areas (e.g. Wellington National Park). As the wider forest areas have not been mapped to the same level of detailed mapping the latter interpretation of representation is based on over 40 years of vegetation mapping in the southwest forests.

Table 8: Extent of the Site-Vegetation Types Infill Areas, WMDE and Bauxite Transport Corridor

Site Vegetation Type Code	Description	WMDE (ha)	Bauxite Transport Corridor (ha)	Infill Areas (ha)
A	Tall shrubland of *Melaleuca lateritia, Hakea varia, Melaleuca viminea* and *Melaleuca incana* subsp. *incana* on clay-loams in seasonally wet valley floors.	123.36	39.79	1.04
A1	Mixed tall shrubland of *Melaleuca viminea, Melaleuca lateritia, Taxandria linearifolia, Astartea scoparia* over *Baumea juncea* and *Lepidosperma tetraquetrum* with occasional patches of *Banksia littoralis* and *Melaleuca rhaphiophylla* over low herbs on seasonally water-logged clays and clay loams on valley floors.	2.88	0.00	0.00
A2	Low open woodland of *Melaleuca rhaphiophylla* over *Astartea scoparia* and low herbs on seasonally water-logged clays and clay loams in seasonally wet valley floors.	1.66	0.00	0.00
AC	Open woodland of *Eucalyptus wandoo* and *Eucalyptus rudis* over *Juncus pallidus, Astartea scoparia, Taxandria linearifolia* and *Lepidosperma tetraquetrum* over herbs on clay loams in seasonally wet valley floors.	34.15	0.00	29.24
AD	Low open woodland of *Eucalyptus rudis* and *Eucalyptus marginata* over *Banksia littoralis, Hakea prostrata* and *Pericalymma ellipticum* over low shrubs and herbs on leached sands over sandy-gravel on lower slopes.	4.74	0.89	4.74
AX	Open woodland of *Eucalyptus rudis* over *Acacia saligna, Melaleuca incana* subsp. *incana* and *Hypocalymma angustifolium* on clay- loams on valley floors.	195.96	98.18	0.00
AY	Open woodland of *Eucalyptus rudis* and *Eucalyptus wandoo* over *Acacia saligna, Hakea prostrata* and *Hypocalymma angustifolium* on clay- loams on valley floors.	405.55	153.96	96.77
AY/D	Mosaic of AY and D	5.35	5.35	0.00
D	Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Hakea lissocarpha, Macrozamia riedlei, Acacia alata, Babingtonia camphorosmae, Hypocalymma angustifolium* and *Phyllanthus calycinus* on clay-loams on lower slopes.	382.06	147.36	4.98
DG	Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Hakea lissocarpha, Macrozamia riedlei, Pericalymma ellipticum, Grevillea bipinnatifida, Allocasuarina humilis, Acacia alata, Babingtonia camphorosmae, Hypocalymma angustifolium* and *Phyllanthus calycinus* on clay-loams on lower slopes with localized patches of outcropping.	7.93	5.06	2.25
G	Open Heath of *Grevillea bipinnatifida, Hakea undulata, Banksia squarrosa* subsp. *squarrosa, Hakea incrassata, Hakea undulata* and *Petrophile serruriae* over *Borya sphaerocephala* on shallow soils and outcrops.	66.44	6.51	37.10
G1	Mosaic of open heath of Proteaceae - Myrtaceae spp. with emergent patches of *Eucalyptus drummondii* on shallow soils on slopes.	1.54	0.00	0.00
G2	Mosaic of open woodland of *Allocasuarina huegeliana* and closed heath of Proteaceae Myrtaceae spp. to Lithic Complex on exposed or shallow granite outcrops.	9.58	0.00	1.29
G3	Open heath of *Banksia squarrosa* subsp. *squarrosa, Hakea incrassata, Hakea undulata, Petrophile heterophylla* and *Petrophile serruriae* on shallow soils over granite outcrops on slopes with occasional emergent *Eucalyptus drummondii.*	71.72	3.28	0.00
G4	Open scrub and tall shrubland of *Hakea trifurcata* and *Hakea undulata* with admixtures of mallee species including *Eucalyptus latens* and *Eucalyptus aspersa* on clay to clay-loam soils over outcrops on slopes.	11.75	2.07	0.00

Table 8: Extent of the Site-Vegetation Types Infill Areas, WMDE and Bauxite Transport Corridor (continued)

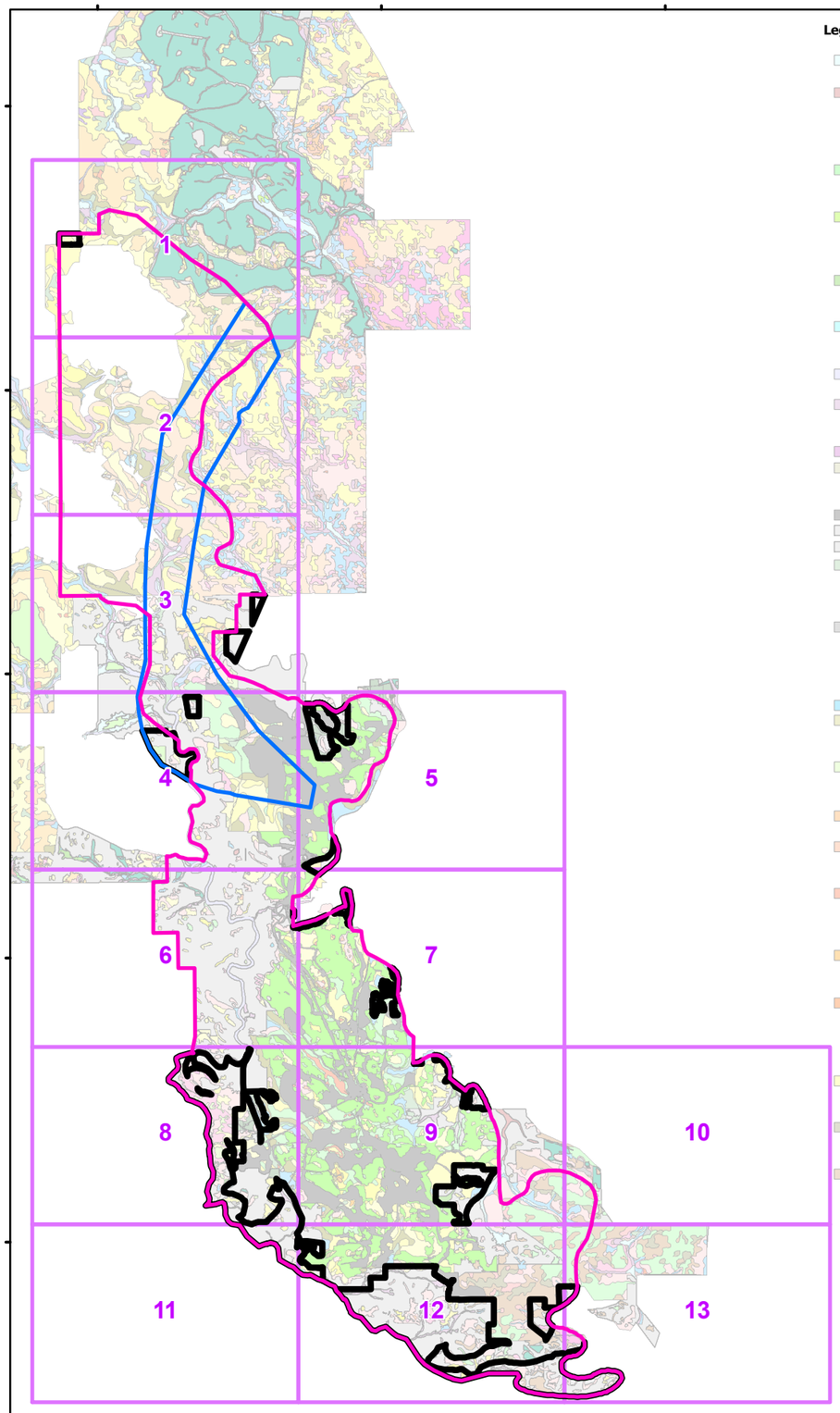
Site Vegetation Type Code	Description	WMDE (ha)	Bauxite Transport Corridor (ha)	Infill Areas (ha)
H	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Petrophile striata, Daviesia decurrens, Daviesia longifolia* and *Daviesia rhombifolia* on sandy loam to sandy gravels on slopes and ridges.	1550.83	503.50	133.67
H1	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Petrophile striata, Daviesia decurrens* and *Daviesia longifolia* on sandy-gravel soils of slopes and less undulating hills.	138.04	0.00	0.98
H2	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* with occasional admixtures of *Banksia grandis* and *Persoonia longifolia* over *Acacia celastrifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on gravel and sandy-gravel soils of slopes and less undulating hills.	577.43	2.21	87.41
HG	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Petrophile striata, Lepidosperma squamatum, Styphelia tenuiflora, Daviesia preissii, and Daviesia decurrens. Grevillea bipinnatifida, Allocasuarina humilis* and *Hakea undulata* on shallower sandy-gravel soils over granites or secondary laterisation areas on slopes and less undulating hills.	50.65	0.00	0.00
L	Open woodland of *Eucalyptus patens* with some *Eucalyptus wandoo* over *Xanthorrhoea preissii, Macrozamia riedlei, Trymalium ledifolium, Acacia saligna* and *Hakea prostrata* on clay and clay loam soils on lower slopes.	32.90	27.02	0.00
M	Open woodland of *Eucalyptus wandoo* over *Trymalium ledifolium, Macrozamia riedlei* and *Hakea lissocarpha* on clay loams with some gravel on mid to upper slopes and ridges.	1545.23	336.01	446.43
M2	Woodland to open woodland of *Eucalyptus accedens*, *Eucalyptus wandoo, Eucalyptus marginata, Corymbia calophylla* over *Hakea lissocarpha, Macrozamia riedlei, Banksia squarrosa* subsp. *squarrosa, Hypocalymma angustifolium, Babingtonia camphorosmae, Grevillea bipinnatifida* and *Allocasuarina humilis* on clay-loams over shallow granites on mid to upper slopes.	45.43	1.38	19.87
MG	Open woodland of *Eucalyptus wandoo* over *Trymalium ledifolium, Macrozamia riedlei, Pericalymma ellipticum, Hypocalymma angustifolium, Grevillea bipinnatifida, Allocasuarina humilis* and *Hakea lissocarpha* on clay-loams over shallow granite on mid to upper slopes and ridges.	219.79	28.34	162.49
P	Open forest of *Eucalyptus marginata* and *Allocasuarina fraseriana with admixtures of Corymbia calophylla* and *Banksia grandis* over *Lasiopetalum cardiophyllum* (P4), *Lasiopetalum floribundum, Lechenaultia biloba* and *Ptilotus drummondii* var. *drummondii* on sandy gravels on slopes and ridges.	1438.92	259.08	19.38
PS	Open forest of *Allocasuarina fraseriana, Eucalyptus marginata, Corymbia calophylla* and *Banksia grandis* over *Adenanthos barbiger, Leucopogon capitellatus* on gravels and sandy gravels on slopes and ridges.	1332.01	501.27	0.00
PW	Open forest of *Allocasuarina fraseriana, Eucalyptus marginata, Corymbia calophylla,* and *Banksia grandis* with scattered understorey, including *Adenanthos barbiger, Leucopogon capitellatus and Hypocalymma angustifolium* on seasonally moister and sandy gravels on slopes.	2.54	2.54	0.00
R	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Trymalium ledifolium, Phyllanthus calycinus* and *Hypocalymma angustifolium* on sandy-gravels associated with nearby shallow outcropping.	1.29	0.00	0.00

Table 8: Extent of the Site-Vegetation Types Infill Areas, WMDE and Bauxite Transport Corridor (continued)

Site Vegetation Type Code	Description	WMDE (ha)	Bauxite Transport Corridor (ha)	Infill Areas (ha)
S	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana, Banksia grandis* and *Persoonia longifolia over Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on sandy-gravels on slopes and ridges.	1694.54	325.71	62.16
SP	Open forest of *Eucalyptus marginata, Corymbia calophylla* and *Allocasuarina fraseriana* with admixtures of *Banksia grandis* over *Lasiopetalum cardiophyllum, Acacia celastrifolia, Styphelia tenuiflora, Daviesia decurrens* and *Trymalium ledifolium* on sandy-gravel to gravel soils on slopes and ridges.	90.59	28.93	0.00
ST	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana, Persoonia longifolia* and *Banksia grandis* over *Stylidium dichotomum, Acacia urophylla, Acacia celastrifolia, Leucopogon verticillatus, Clematis pubescens* and *Leucopogon capitellatus* on sandy-loam gravel soils on slopes and ridges.	386.14	20.65	15.82
SW	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over *Hypocalymma angustifolium, Babingtonia camphorosmae, Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on seasonally moister sandy-gravels on slopes.	9.17	0.00	0.00
W	Open forest of *Corymbia calophylla, Eucalyptus marginata* and *Eucalyptus patens over Hakea lissocarpha, Hypocalymma angustifolium, Acacia extensa* and *Synaphea petiolaris* on loam soils on lower slopes.	0.82	0.00	0.82
Y	Open woodland of *Eucalyptus wandoo* over *Gompholobium marginatum, Acacia nervosa, Babingtonia camphorosmae, Hypocalymma angustifolium, Macrozamia riedlei, Phyllanthus calycinus* and *Gastrolobium calycinum* on clay and clay-loam soils on lower slopes.	604.05	194.60	58.65
YG	Open woodland of *Eucalyptus wandoo* over *Gompholobium marginatum, Acacia nervosa, Babingtonia camphorosmae, Hypocalymma angustifolium, Macrozamia riedlei, Pericalymma ellipticum, Grevillea bipinnatifida, Allocasuarina humilis, Phyllanthus calycinus* and *Gastrolobium calycinum* on clay and clay-loam soils with localized outcropping on lower slopes.	11.95	20.71	0.00
Z	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over *Macrozamia riedlei, Xanthorrhoea preissii, Hakea lissocarpha* and *Phyllanthus calycinus* on sandy-loam to sandy-loam gravel soils on slopes.	832.61	224.28	5.17
CL	Cleared	3013.37	335.83	0.00
CL - Ag	Cleared Agricultural Areas	6378.29	738.66	2054.74
CL- Other	Cleared other areas (e.g. Boddington Gold Mine)	3112.48	60.56	0.00
DAM	Dam	1.43	0.00	0.00
PL	Plantations	177.73	0.00	91.02
PL – Ag	Plantations Agricultural Areas	242.71	1.25	6.75
Rehab	Rehabilitation Areas	2977.00	44.52	0.48
Rehab – Ag	Rehabilitation Areas Agricultural Areas	3.12	26.20	0.00

Table 9: Extent of the Site-Vegetation Types CBME

Site Vegetation Type Code	Description	Extent within the CBME (ha)
CQ	Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* on lower slopes with mixed understorey species, including *Trymalium floribundum, Agonis linearifolia* and *Astartea fascicularis* along the edges of the deeper incised valleys near the creek-lines.	9.62
CW	Woodland to Open Forest of *Eucalyptus patens – Eucalyptus megacarpa - Corymbia calophylla - Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on creek-lines and water-courses.	17.90
Q	Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* with mixed understorey species, including *Trymalium floribundum*, *Acacia extensa* and *Phyllanthus calycinus* on loam soils on lower slopes.	63.64
S	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana, Banksia grandis* and *Persoonia longifolia over Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on sandy-gravels on slopes and ridges.	79.76
SP	Open forest of *Eucalyptus marginata, Corymbia calophylla* and *Allocasuarina fraseriana* with admixtures of *Banksia grandis* over *Lasiopetalum cardiophyllum, Acacia celastrifolia, Styphelia tenuiflora, Daviesia decurrens* and *Trymalium ledifolium* on sandy-gravel to gravel soils on slopes and ridges.	5.72
ST	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana, Persoonia longifolia* and *Banksia grandis* over *Stylidium dichotomum, Acacia urophylla, Acacia celastrifolia, Leucopogon verticillatus, Clematis pubescens* and *Leucopogon capitellatus* on sandy-loam gravel soils on slopes and ridges.	229.31
SW	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over *Hypocalymma angustifolium, Babingtonia camphorosmae, Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on seasonally moister sandy-gravels on slopes.	17.68
T	Open Forest of *Eucalyptus marginata - Corymbia calophylla* with scattered understorey, including *Leucopogon verticillatus, Pteridium esculentum, Clematis pubescens* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravelly soils on slopes and ridges.	14.04
TS	Open Forest of *Eucalyptus marginata - Corymbia calophylla – Banksia grandis* with scattered understorey, including *Leucopogon verticillatus, Pteridium esculentum, Clematis pubescens* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravelly to gravelly soils.	68.94
CL – Other	Cleared	167.63
Dam	Dam	72.81



Legend

Veg unit	Description
A	Tall shrubland of *Melaleuca lateritia, Hakea varia, Melaleuca viminea* and *Melaleuca incana* subsp. *incana* on clay-loams in seasonally wet valley floors.
A1	Mixed tall shrubland of *Melaleuca viminea, Melaleuca lateritia, Taxandria linearifolia, Astartea scoparia* over *Baumea juncea* and *Lepidosperma tetraquetrum* with occasional patches of *Banksia littoralis* and *Melaleuca rhaphiophylla* over low herbs on seasonally water -logged clays and clay loams on valley floors.
A2	Low open woodland of *Melaleuca rhaphiophylla* over *Astartea scoparia* and low herbs on seasonally water -logged clays and clay loams in seasonally wet valley floors.
A3	Open woodland of *Eucalyptus rudis, Eucalyptus patens* and *Eucalyptus wandoo* over *Melaleuca lateriti a, Hakea varia, Taxandria linearifolia* and *Hypocalymma angustifolium* over herbs and sedges on clay -loams in seasonally wetter valley floors.
AC	Open woodland of *Eucalyptus wandoo* and *Eucalyptus rudis* over *Juncus pallidus, Astartea scoparia, Taxandria linearifolia* and *Lepidosperma tetraquetrum* over herbs on clay loams in seasonally wet valley floors.
AD	Low open woodland of *Eucalyptus rudis* and *Eucalyptus marginata* over *Banksia littoralis, Hakea prostrata* and *Pericalymma ellipticum* over low shrubs and herbs on leached sands over sandy -gravel on lower slopes.
AX	Open woodland of *Eucalyptus rudis* over *Acacia saligna, Melaleuca incana* subsp. *incana* and *Hypocalymma angustifolium* on clay- loams on valley floors.
AY	Open woodland of *Eucalyptus rudis* and *Eucalyptus wandoo* over *Acacia saligna, Hakea prostrata* and *Hypocalymma angustifolium* on clay- loams on valley floors.
AY/D	Mosaic of AY and D
B	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Mesomelaena tetragona, Adenanthos obovatus* and *Babingtonia camphorosmae* on lower sandier soils on fringes of swamps and valley floors.
CL	**Cleared Land**
CL - Ag	**Cleared Agricultural Land**
CL – Other	**Cleared Land – Other than Agriculture**
D	Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Hakea lissocarpha, Macrozamia riedlei, Acacia alata, Babingtonia camphorosmae, Hypocalymma angustifolium* and *Phyllanthus calycinus* on clay-loams on lower slopes.
DG	Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Hakea lissocarpha, Macroz amia riedlei, Pericalymma ellipticum, Grevillea bipinnatifida, Allocasuarina humilis, Acacia alata, Babingtonia camphorosmae, Hypocalymma angustifolium* and *Phyllanthus calycinus* on clay-loams on lower slopes with localized patches of outcropping.
Dam	**Dam**
E	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Mesomelaena tetragona, Kingia australis, Leptospermum erubescens* and *Babingtonia camphorosmae* on sandy to sandy -loam soils on slopes.
G	Open Heath of *Grevillea bipinnatifida, Hakea undulata, Banksia squarrosa* subsp. *squarrosa, Hakea incrassata, Hakea undulata* and *Petrophile serruriae* over *Borya sphaerocephala* on shallow soils and outcrops.
G1	Mosaic of open heath of Proteaceae - Myrtaceae spp. with emergent patches of *Eucalyptus drummondii* on shallow soils on slopes.
G2	Mosaic of open woodland of *Allocasuarina huegeliana* and closed heath of Proteaceae Myrtaceae spp. to Lithic Complex on exposed or shallow granite outcrops.
G3	Open heath of *Banksia squarrosa* subsp. *squarrosa, Hakea incrassata, Hakea undulata, Petrophile heterophylla* and *Petrophile serruriae* on shallow soils over granite outcrops on slopes with occasional emergent mallee species including *Eucalyptus drummondii.*
G4	Open scrub and tall shrubland of *Hakea trifurcata* and *Hakea undulata* with admixtures of mallee species including *Eucalyptus latens* and *Eucalyptus aspersa* on clay to clay -loam soils over outcrops on slopes.
G5	Low woodland of Eucalypt mallee species including *Eucalyptus aspersa, Eucalyptus latens, Eucalyptus longicornis* and *Eucalyptus drummondii* with occasional *Eucalyptus wandoo* over low shrubs of *Allocasuarina humilis, Hakea incrassata*, *Synaphea damopsis* and herbs on clay loams and sandy -loams on slopes.
H	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Petrophile striata, Daviesia decurrens, Daviesia longifolia* and *Daviesia rhombifolia* on sandy loam to sandy gravels on slopes and ridges.
H1	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Petrophile striata, Daviesia decurrens* and *Daviesia longifolia* on sandy-gravel soils of slopes and less undulating hills.
H2	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* with occasional admixtures of *Banksia grandis* and *Persoonia longifolia* over *Acacia celastrifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on gravel and sandy -gravel soils of slopes and less undulating hills.
HG	Open forest to woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Petrophile striata, Lepidosperma squamatum, Styphelia tenuiflora, Daviesia preiss ii, Daviesia decurrens. Grevillea bipinnatifida, Allocasuarina humilis* and *Hakea undulata* on shallower sandy -gravel soils over granites or secondary laterisation areas on slopes and less undulating hills.
J	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Conospermum stoechadis, Patersonia rudis* and *Babingtonia camphorosmae* on sandier soils on lower to mid slopes.
L	Open woodland of *Eucalyptus patens* with some *Eucalyptus wandoo* over *Xanthorrhoea preissii, Macrozamia riedlei, Trymalium ledifolium, Acacia saligna* and *Hakea prostrata* on clay and clay loam soils on lower slopes.
LG	Open woodland of *Eucalyptus patens* and *Eucalyptus wandoo* over *Hypocalymma angustifolium, Xanthorrhoea preissii, Grevillea bipinnatifida, Allocasuarina humilis* and *Babingtonia camphorosmae* over herbs and sedges on clay -loams on seasona lly moister lower slopes underlain by outcrops.
M	Open woodland of *Eucalyptus wandoo* over *Trymalium ledifolium, Macrozamia riedlei* and *Hakea lissocarpa* on clay loams with some gravel on mid to upper slopes and ridges.
M2	Woodland to open woodland of *Eucalyptus accedens*, *Eucalyptus wandoo, Eucalyptus marginata, Corymbia calophylla* over *Hakea lissocarpha, Macrozamia riedlei, Banksia squarrosa* subsp. *squarrosa, Hypocalymma angustifolium, Babingtonia camphorosmae, Grevillea bipinnatifida* and *Allocasuarina humilis* on clay-loams over shallow granites on mid to upper slopes.
MG	Open woodland of *Eucalyptus wandoo* over *Trymalium ledifolium, Macrozamia riedlei, Pericalymma ellipticum, Hypocalymma angustifolium, Grevillea bipinnatifida, Allocasuarina humilis* and *Hakea lissocarpha* on clay-loams over shallow granite on mid to upper slopes and ridges.
O	Open forest to woodland *of Eucalyptus marginata* and *Corymbia calophylla over Daviesia decurrens, Daviesia preissii* and *Bossiaea ornata* on sandy-gravels on slopes.
P	Open forest of *Eucalyptus marginata* and *Allocasuarina fraseriana with admixtures of Corymbia calophylla* and *Banksia grandis* over *Lasiopetalum cardiophyllum* (P4), *Lasiopetalum floribundum, Lechenaultia biloba* and *Ptilotus drummondii* var. *drummondii* on sandy gravels on slopes and ridges.
PL	**Plantation and Planted Trees**
PL - Ag	**Plantation and Planted Trees on Agricultural Lands**
PS	Open forest of *Allocasuarina fraseriana, Eucalyptus marginata, Corymbia calophylla* and *Banksia grandis* over *Adenanthos barbiger, Leucopogon capitellatus* on gravels and sandy gravels on slopes and ridges.
PW	Open forest of *Allocasuarina fraseriana*, *Eucalyptus marginata, Corymbia calophylla*, *Banksia grandis* with scattered understorey, includin g *Adenanthos barbiger, Leucopogon capitellatus and Hypocalymma angustifolium* on seasonally moister and sandy gravels on slopes.
R	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Trymalium ledifolium, Phyllanthus calycinus* and *Hypocalymma angustifolium* on sandy-gravels associated with nearby shallow outcropping.
Rehab	**Rehabilitation Areas**
Rehab - Ag	**Rehabilitation on Agricultural Lands**
S	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana, Banksia grandis* and *Persoonia longifolia over Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on sandy-gravels on slopes and ridges.
SP	Open forest of *Eucalyptus marginata, Corymbi a calophylla* and *Allocasuarina fraseriana* with admixtures of *Banksia grandis* over *Lasiopetalum cardiophyllum, Acacia celastrifolia, Styphelia tenuiflora, Daviesia decurrens* and *Trymalium ledifolium* on sandy-gravel to gravel soils on slopes and ridges.
ST	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana, Persoonia longifolia* and *Banksia grandis* over *Stylidium dichotomum, Acacia urophylla, Acacia celastrifolia, Leucopogon verticillatus, Clematis pubescen s* and *Leucopogon capitellatus* on sandy-loam gravel soils on slopes and ridges.
SW	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over *Hypocalymma angustifolium, Babingtonia camphorosmae, Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on seasonally moister sandy -gravels on slopes.
W	Open forest of *Corymbia calophylla, Eucaly ptus marginata* and *Eucalyptus patens over Hakea lissocarpha, Hypocalymma angustifolium, Acacia extensa* and *Synaphea petiolaris* on loam soils on lower slopes.
Y	Open woodland of *Eucalyptus wandoo* over *Gompholobium marginatum, Acacia nervosa, Babingtonia camphorosmae, Hypocalymma angustifolium, Macrozamia riedlei, Phyllanthus calycinus* and *Gastrolobium calycinum* on clay and clay -loam soils on lower slopes.
YG	Open woodland of *Eucalyptus wandoo* over *Gompholobium marginatum, Acacia nervosa, Babingtonia camphor osmae, Hypocalymma angustifolium, Macrozamia riedlei, Pericalymma ellipticum, Grevillea bipinnatifida, Allocasuarina humilis, Phyllanthus calycinus* and *Gastrolobium calycinum* on clay and clay -loam soils with localized outcropping on lower slopes.
Z	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over *Macrozamia riedlei, Xanthorrhoea preissii, Hakea lissocarpha* and *Phyllanthus calycinus* on sandy -loam to sandy -loam gravel soils on slopes.

Legend
- Worsley Mine Development Envelope
- Bauxite Transport Corridor
- Infill Areas
- 1:25,000 A3 Sheet Layout

Client: SOUTH32

N

0 2 4km
Scale: 1:150,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_00
Date: Feb 2019 | Rev: A | A3

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Worsley Mine Expansion
Mining Extension Areas
Vegetation Mapping - Sheet Layout & Legend

Figure: **5.0**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6388000 6387000 6386000 6385000 6384000 6383000 6382000

CL - Other

Lasiopetalum cardiophyllum

Senecio leucoglossus

Legend

- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 1 of 13

Figure: **5.1**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6381000 6380000 6379000 6378000 6377000 6376000

Lasiopetalum cardiophyllum *Senecio leucoglossus* CL - Other CL - Ag

Legend
- Priority 4
- Worsley Mine Development Envelope
- Bauxite Transport Corridor

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)
CAD Ref: g1881_Veg_f17_05_01
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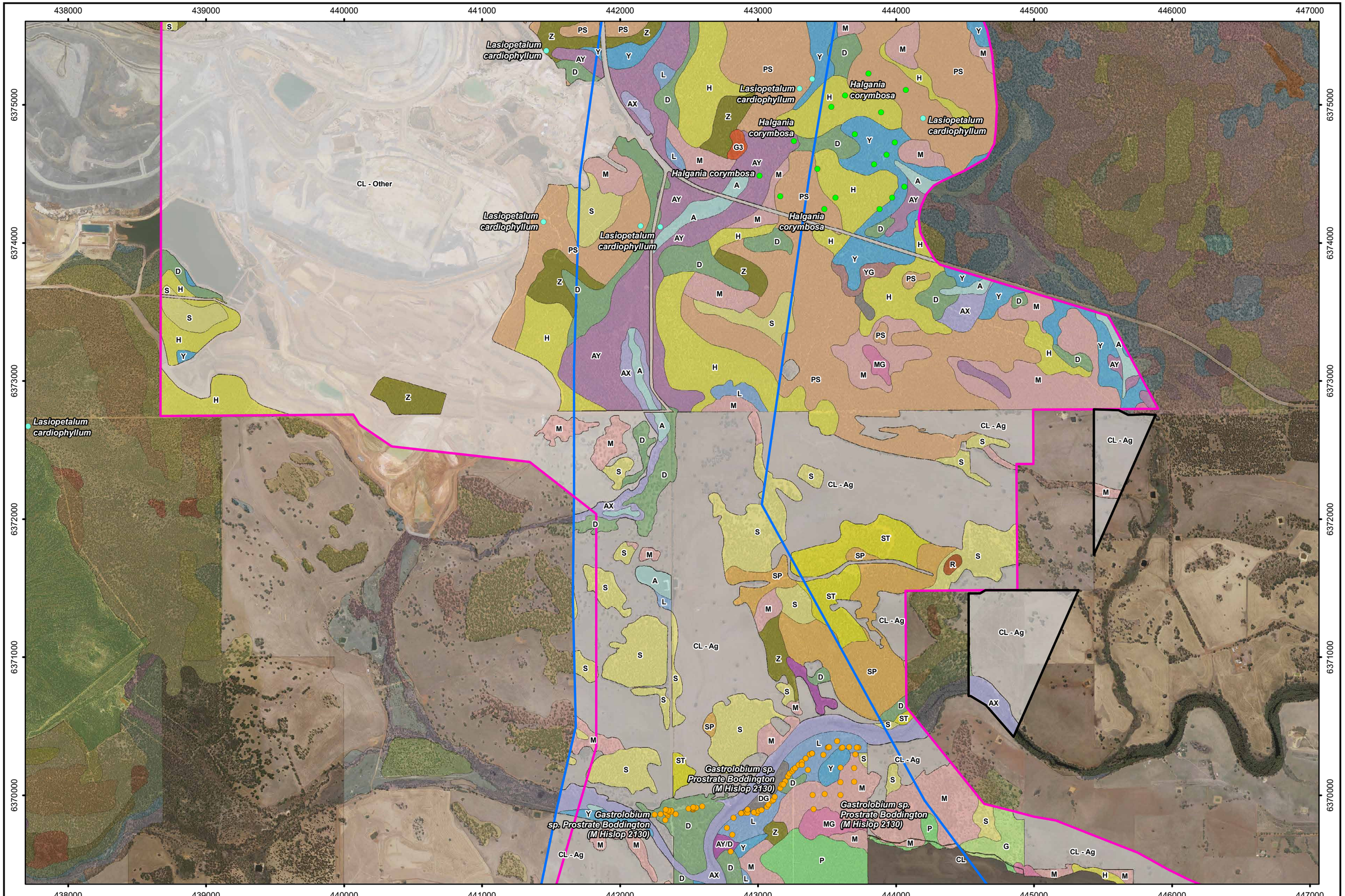
Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 2 of 13

Figure: **5.2**



Legend

- Priority 1
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 3 of 13

Figure: **5.3**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6369000 6368000 6367000 6366000 6365000 6364000

Gastrolobium sp. Prostrate Boddington (M Hislop 2130)

Gastrolobium sp. Prostrate Boddington (M. Hislop 2130)

Gastrolobium sp. Prostrate Boddington (M. Hislop 2130)

Lasiopetalum cardiophyllum

CL - Ag · Rehab - Ag · Rehab · CL

Legend
- Priority 1
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 4 of 13

Figure: **5.4**

Legend

- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
Date: Feb 2019 | Rev: C | A3

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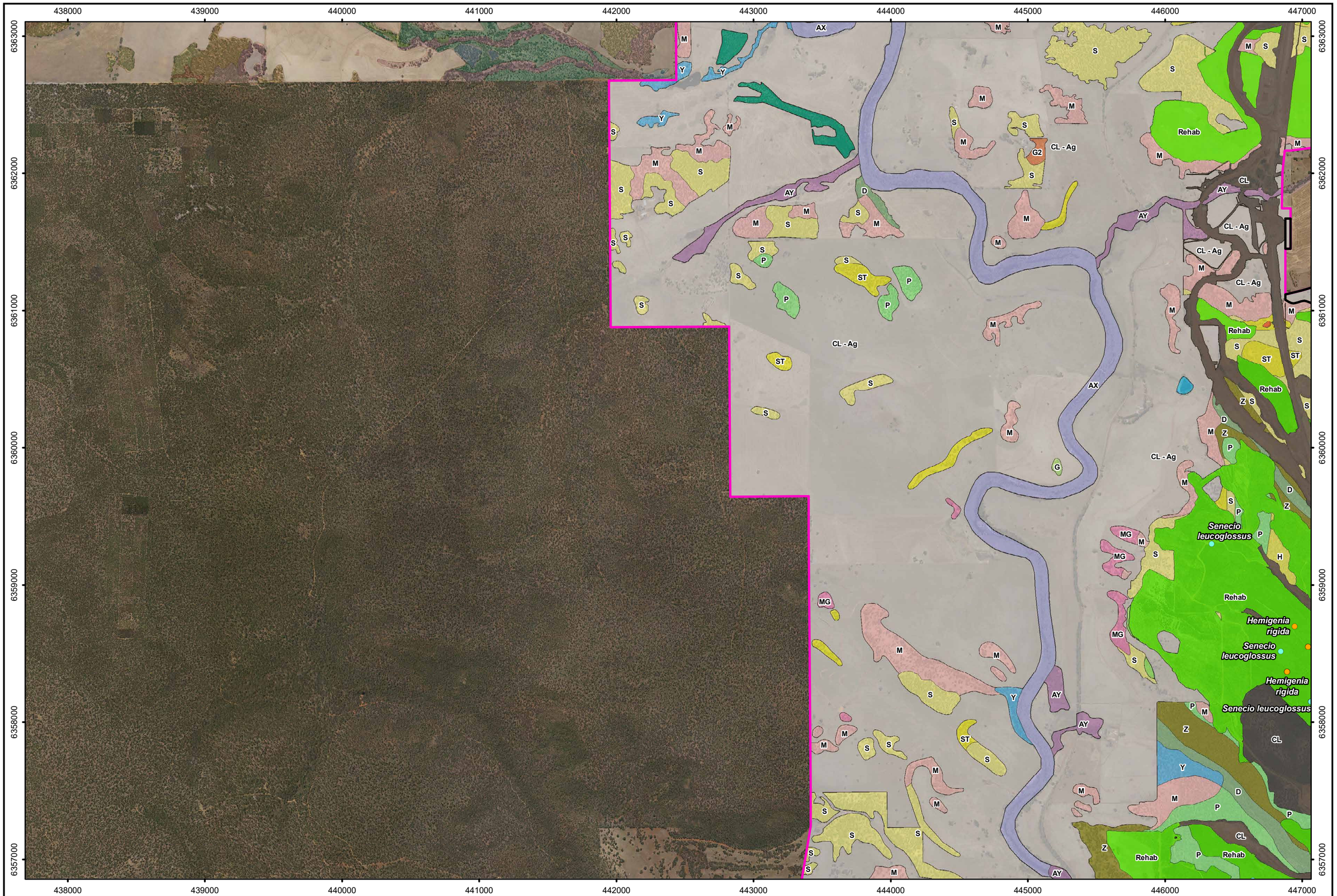
Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 5 of 13

Figure: **5.5**



Legend

- Priority 1
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 6 of 13

Figure: **5.6**

448000 449000 450000 451000 452000 453000 454000 455000 456000

6363000 6362000 6361000 6360000 6359000 6358000 6357000

Rehab
CL - Ag
Lasiopetalum cardiophyllum
Hemigenia rigida
Senecio leucoglossus
Calytrix simplex subsp. simplex
Stylidium marradongense
Halgania corymbosa
Pultenaea pauciflora

Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 7 of 13

Figure: **5.7**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6356000 6355000 6354000 6353000 6352000 6351000

Byblis gigantea

Boronia tenuis

Lasiopetalum cardiophyllum

Hemigenia rigida

Banksia subpinnatifida var. imberbis

Senecio leucoglossus

Legend

- Priority 1
- Priority 2
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 8 of 13

Figure: **5.8**

448000 449000 450000 451000 452000 453000 454000 455000 456000

6356000 6355000 6354000 6353000 6352000 6351000

Stylidium marradongense
Lasiopetalum cardiophyllum
Hemigenia rigida
Senecio leucoglossus
Calothamnus quadrifidus subsp. teretifolius
Banksia subpinnatifida var. subpinnatifida
Papistylus intropubens
Isopogon sp. Canning Reservoir (M.D. Tindale 121 & B.R. Maslin)
Goodenia katabudjar
Calytrix simplex subsp. simplex
Synaphea panhesya
Acacia horridula
Tetratheca pilifera
Caladenia hopperiana
Rehab
CL - Ag
AC
AY

Legend

- Priority T
- Priority 1
- Priority 2
- Priority 3
- Priority 4
- PEC (G1, G3, G4) - Mt Saddleback Heath Communities
- Infill Areas
- Worsley Mine Development Envelope

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)
CAD Ref: g1881_Veg_f17_05_01
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 9 of 13

Figure: **5.9**

457000 458000 459000 460000 461000 462000 463000 464000 465000

6356000 6355000 6354000 6353000 6352000 6351000

Caladenia dorrienii

P M H2 P H1 H2 Y H1 M MG HG H2 M

Caladenia hopperiana

457000 458000 459000 460000 461000 462000 463000 464000 465000

Legend

- Priority T
- Worsley Mine Development Envelope

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 10 of 13

Figure:
5.10

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6350000 6349000 6348000 6347000 6346000 6345000

Boronia tenuis

Senecio leucoglossus

CL - Ag
H
H
M
AY
CL - Ag
M
G
AD

Legend
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
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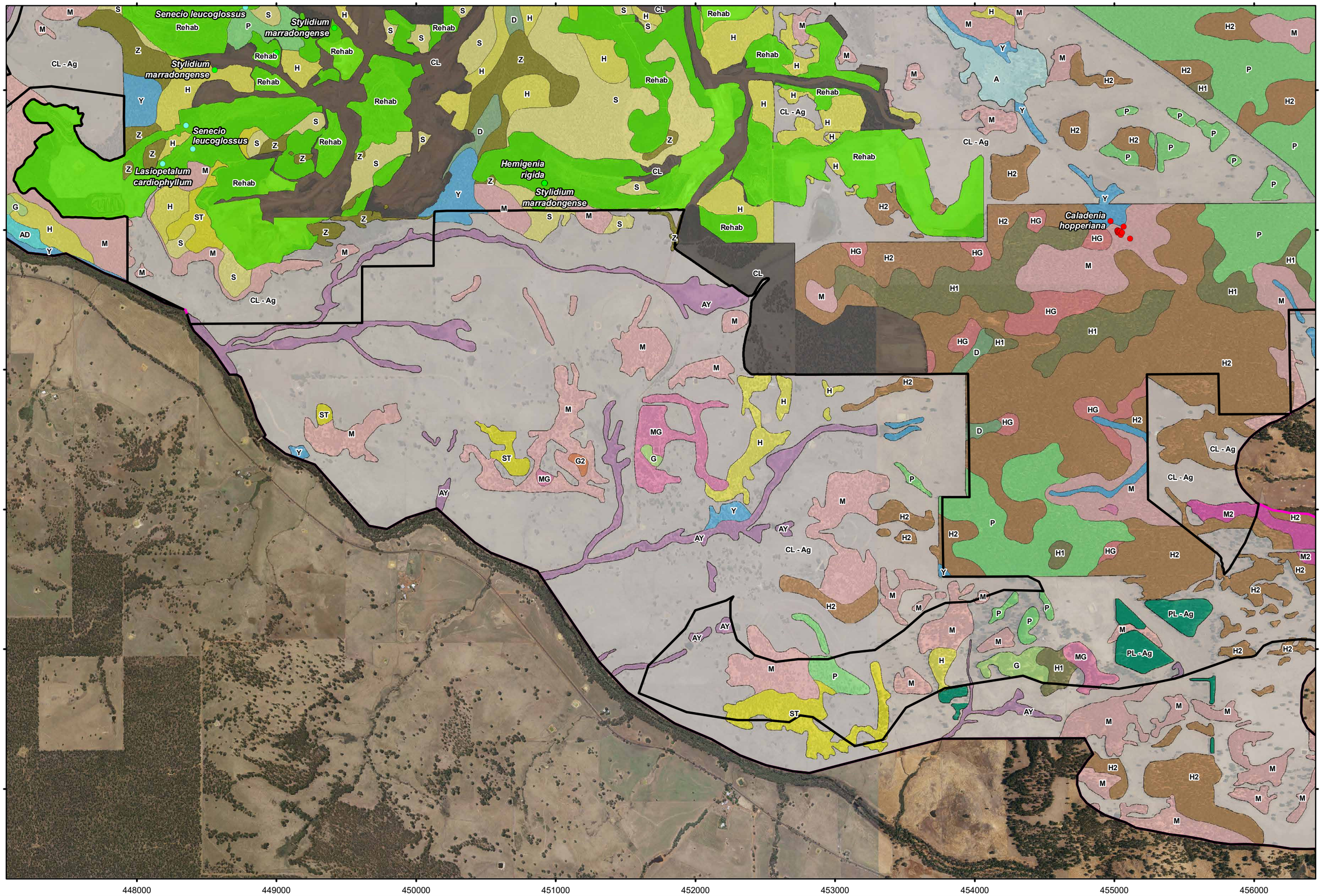
Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 11 of 13

Figure:
5.11

448000 449000 450000 451000 452000 453000 454000 455000 456000

6350000 6349000 6348000 6347000 6346000 6345000

Senecio leucoglossus *Stylidium marradongense* *Lasiopetalum cardiophyllum* *Hemigenia rigida* *Caladenia hopperiana*



448000 449000 450000 451000 452000 453000 454000 455000 456000

Legend

- Priority T
- Priority 1
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 12 of 13

Figure: **5.12**

457000 458000 459000 460000 461000 462000 463000 464000 465000

6350000 6349000 6348000 6347000 6346000 6345000

Caladenia hopperiana

Caladenia hopperiana

Eleocharis keigheryi

Lasiopetalum cardiophyllum

Caladenia hopperiana

Caladenia hopperiana

H1 H2 M P H2 H2 H2 M CL - Ag M Y

H2 M2 M2 H2 H2 CL - Ag MG H2

M M M M H M M M M CL - Ag CL - Ag H2

Legend

- Priority T
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500 m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_01
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Worsley Mine Expansion
Site-vegetation Types and Threatened and Priority Flora
Sheet 13 of 13

Figure: **5.13**

407500 410000 412500 415000

6325000 6322500 6320000

Legend

Veg unit	Description
CL	Cleared Land - Other than Agriculture
CQ	Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* on lower slopes with mixed understorey species, including *Trymalium floribundum, Agonis linearifolia* and *Astartea fascicularis* along the edges of the deeper incised valleys near the creek -lines.
CW	Woodland to Open Forest of *Eucalyptus patens – Eucalyptus megacarpa - Corymbia calophylla - Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on creek-lines and water-courses.
D	Open forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Hakea lissocarpha, Macrozamia riedlei, Acacia alata, Babingtonia camphorosmae, Hypocalymma angustifolium* and *Phyllanthus calycinus* on clay-loams on lower slopes.
E	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Mesomelaena tetragona, Kingia australis, Leptospermum erubescens* and *Babingtonia camphorosmae* on sandy to sandy-loam soils on slopes.
Q	Open Forest of *Eucalyptus marginata - Corymbia calophylla - Eucalyptus patens* with mixed understorey species, including *Trymalium floribundum*, *Acacia extensa* and *Phyllanthus calycinus* on loam soils on lower slopes.
R	Open woodland of *Eucalyptus marginata* and *Corymbia calophylla* over *Trymalium ledifolium, Phyllanthus calycinus* and *Hypocalymma angustifolium* on sandy-gravels associated with nearby shallow outcropping.
RE	Rehabilitation Areas
S	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana*, *Banksia grandis* and *Persoonia longifolia over Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on sandy-gravels on slopes and ridges.
SP	Open forest of *Eucalyptus marginata, Corymbia calophyl la* and *Allocasuarina fraseriana* with admixtures of *Banksia grandis* over *Lasiopetalum cardiophyllum, Acacia celastrifolia, Styphelia tenuiflora, Daviesia decurrens* and *Trymalium ledifolium* on sandy-gravel to gravel soils on slopes and ridges.
ST	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* with admixtures of *Allocasuarina fraseriana, Persoonia longifolia* and *Banksia grandis* over *Stylidium dichotomum, Acacia urophylla, Acacia celastrifolia, Leucopogon verticillatus, Clematis pubescens* and *Leucopogon capitellatus* on sandy-loam gravel soils on slopes and ridges.
SW	Open forest of *Eucalyptus marginata* and *Corymbia calophylla* over *Hypocalymma angustifolium, Babingtonia camphorosmae, Acacia celastrifolia, Hovea chorizemifolia, Daviesia preissii, Leucopogon capitellatus* and *Styphelia tenuiflora* on seasonally moister sandy-gravels on slopes.
T	Open Forest of *Eucalyptus marginata - Corymbia calophylla* with scattered understorey, including *Leucopogon verticillatus, Pteridium esculentum, Clematis pubescen s* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravelly soils on slopes and ridges.
TS	Open Forest of *Eucalyptus marginata - Corymbia calophylla – Banksia grandis* with scattered understorey, including *Leucopogon verticillatus, Pteridium esculentum, Clematis pubescens* and *Bossiaea aquifolium* subsp. *aquifolium* on sandy-loam gravelly to gravelly soils.
W	Open forest of *Corymbia calophylla, Eucalyptus marginata* and *Eucalyptus patens over Hakea lissocarpha, Hypocalymma angustifolium, Acacia extensa* and *Synaphea petiolaris* on loam soils on lower slopes.

CL - Other

Legend

Contingency Bauxite Mining Area, CL - Other, CQ, CW, D, DAM, E, PL - Ag, Q, R, S, SP, ST, SW, T, TS, W

Client: SOUTH32

N

0 500 m

Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_05_02

Date: Feb 2019 | Rev: B | A3

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Collie Refinery
Vegetation Communities

Figure: **5.14**

5.6 Condition of the Vegetation

The condition of the vegetation in the respective areas (see Table 10) ranges from Excellent to Completely Degraded based on the Keighery (1994) vegetation condition scale (Figures 6.1 to 6.13 for Boddington area and Figure 5.14 for Collie area).

The results presented in Table 10 reflect the degraded condition of areas within the Infill Areas, the WMDE, the Bauxite Transport Corridor and the CBME, as follows:

- 64.74%, 46.89%, 28.42% and 32.20% completely degraded areas respectively within the Infill Areas, the WMDE, the Bauxite Transport Corridor and the CBME areas; and
- 11.37%, 14.48% and 3.81% degraded areas respectively within the Infill Areas, the WMDE and the Bauxite Transport Corridor areas.

The latter condition results reflect the degree of clearing already undertaken for a range of activities, such as agricultural activities, mining, rehabilitation and dams.

Table 10: Vegetation Condition Infill Areas, WMDE, Bauxite Transport Corridor and CBME

Vegetation Condition	Extent within Infill Areas (ha)	Extent within Infill Areas (%)	Extent within WMDE (ha)	Extent within WMDE (%)	Extent within Bauxite Transport Corridor (ha)	Extent within Bauxite Transport Corridor (%)	Extent within CBME (ha)	Extent within CBME (%)
Excellent	536.78	16.04	9889.68	35.58	2625.40	63.33	506.61	67.90
Very Good	185.71	5.55	729.25	2.62	179.52	4.33	0.00	0.00
Good	77.41	2.32	119.59	0.43	4.50	0.11	0.00	0.00
Degraded	380.53	11.37	4024.13	14.48	157.95	3.81	0.00	0.00
Completely Degraded	2167.13	64.74	13033.55	46.89	1178.33	28.42	240.45	32.20
Total	3347.55	100	27796.20	100.00	4145.70	100.00	747.06^^	100.00

Note: ^^ - 747.06 ha includes 4.5 ha Maintenance for the Refinery Lease Area.

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6388000 6387000 6386000 6385000 6384000 6383000 6382000

Lasiopetalum cardiophyllum

Senecio leucoglossus

Legend

- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor
- Excellent
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06

Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 1 of 13

Figure: **6.1**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6381000 6380000 6379000 6378000 6377000 6376000

Lasiopetalum cardiophyllum *Senecio leucoglossus*

Legend
- Priority 4
- Worsley Mine Development Envelope
- Bauxite Transport Corridor
- Excellent
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06
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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 2 of 13

Figure: **6.2**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6375000 6374000 6373000 6372000 6371000 6370000

Lasiopetalum cardiophyllum
Halgania corymbosa
Gastrolobium sp. Prostrate Boddington (M Hislop 2130)

Legend

- Priority 1
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 3 of 13

Figure: **6.3**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6369000 6368000 6367000 6366000 6365000 6364000

Gastrolobium sp. Prostrate Boddington (M Hislop 2130)

Gastrolobium sp. Prostrate Boddington (M. Hislop 2130)

Lasiopetalum cardiophyllum

Gastrolobium sp. Prostrate Boddington (M. Hislop 2130)

Legend

- Priority 1
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor
- Excellent
- Very Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

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Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06

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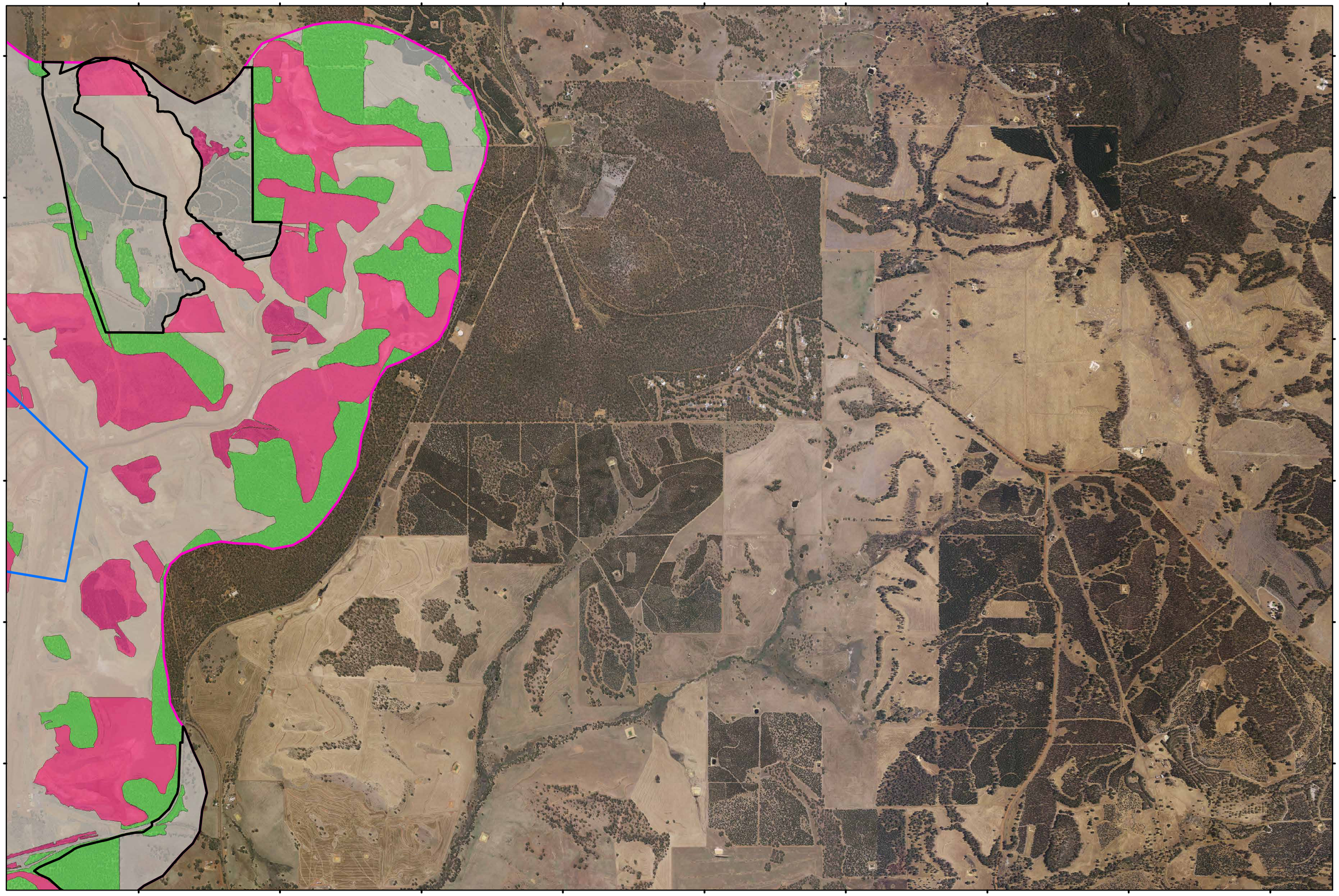
Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 4 of 13

Figure: **6.4**

448000 449000 450000 451000 452000 453000 454000 455000 456000

6369000 6368000 6367000 6366000 6365000 6364000



448000 449000 450000 451000 452000 453000 454000 455000 456000

Legend

- Infill Areas
- Worsley Mine Development Envelope
- Bauxite Transport Corridor
- Excellent
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 5 of 13

Figure: **6.5**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6363000 6362000 6361000 6360000 6359000 6358000 6357000

Senecio leucoglossus

Hemigenia rigida

Senecio leucoglossus

Hemigenia rigida

Senecio leucoglossus

Legend

- Priority 1
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Excellent
- Very Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

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Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 6 of 13

Figure: **6.6**

448000 449000 450000 451000 452000 453000 454000 455000 456000

6363000 6362000 6361000 6360000 6359000 6358000 6357000

Lasiopetalum cardiophyllum
Hemigenia rigida
Senecio leucoglossus
Calytrix simplex subsp. simplex
Hemigenia rigida
Stylidium marradongense
Hemigenia rigida
Hemigenia rigida
Senecio leucoglossus
Pultenaea pauciflora
Stylidium marradongense
Lasiopetalum cardiophyllum
Halgania corymbosa
Hemigenia rigida
Senecio leucoglossus
Stylidium marradongense
Hemigenia rigida
Hemigenia rigida
Stylidium marradongense
Stylidium marradongense
Hemigenia rigida
Hemigenia rigida
Lasiopetalum cardiophyllum
Stylidium marradongense
Hemigenia rigida
Hemigenia rigida
Stylidium marradongense
Senecio leucoglossus
Lasiopetalum cardiophyllum
Hemigenia rigida
Lasiopetalum cardiophyllum

448000 449000 450000 451000 452000 453000 454000 455000 456000

Legend

- Priority T
- Priority 1
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Excellent
- Very Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06
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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 7 of 13

Figure: **6.7**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6356000 6355000 6354000 6353000 6352000 6351000

Lasiopetalum cardiophyllum
Hemigenia rigida
Banksia subpinnatifida var. imberbis
Senecio leucoglossus
Hemigenia rigida
Lasiopetalum cardiophyllum
Stylidium marradongense
Lasiopetalum cardiophyllum
Byblis gigantea
Boronia tenuis

Legend

- Priority 1
- Priority 2
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Excellent
- Very Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06
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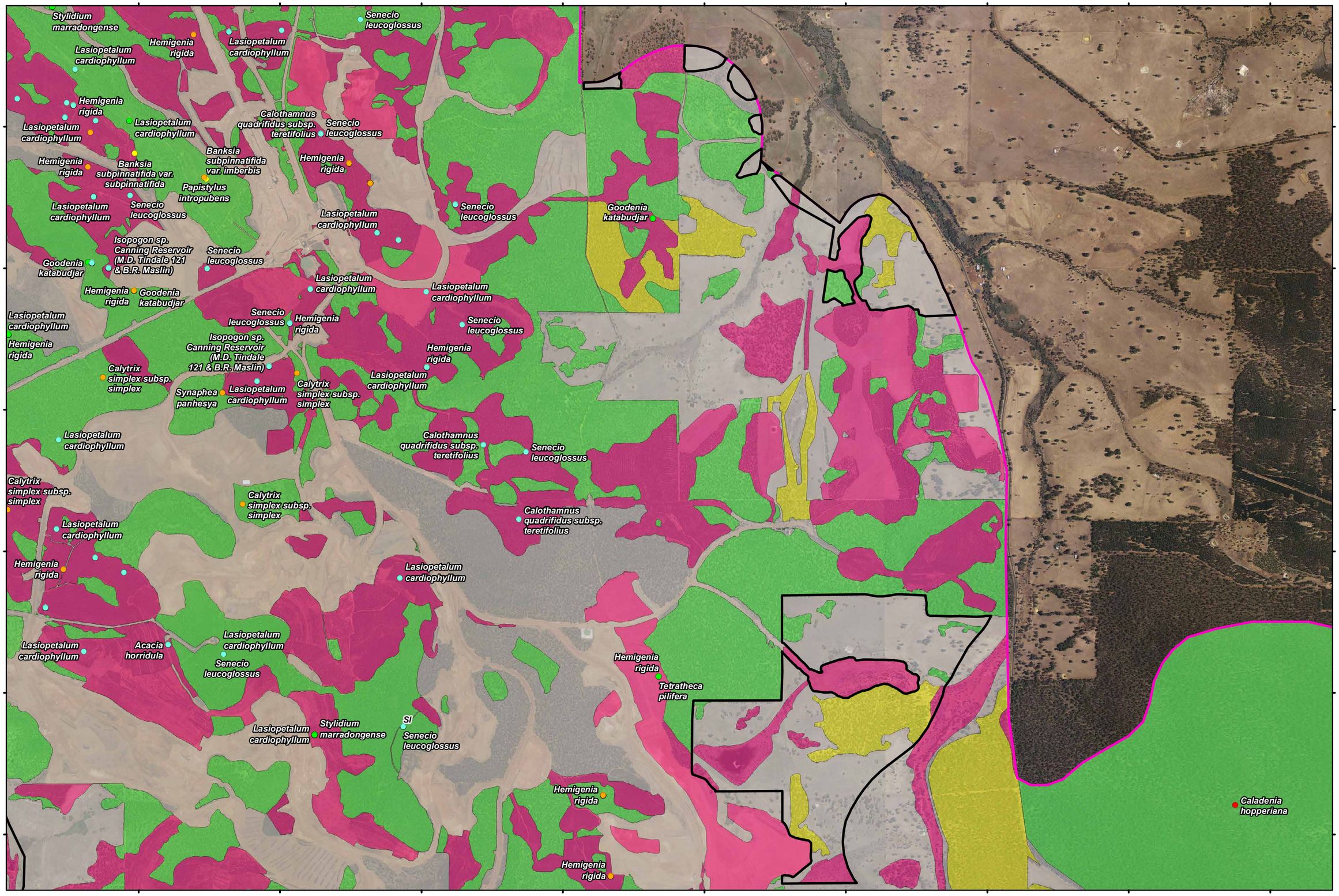
Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 8 of 13

Figure: **6.8**

448000 449000 450000 451000 452000 453000 454000 455000 456000

6356000 6355000 6354000 6353000 6352000 6351000

Stylidium marradongense
Senecio leucoglossus
Hemigenia rigida
Lasiopetalum cardiophyllum
Calothamnus quadrifidus subsp. teretifolius
Banksia subpinnatifida var. imberbis
Banksia subpinnatifida var. subpinnatifida
Papistylus intropubens
Goodenia katabudjar
Isopogon sp. Canning Reservoir (M.D. Tindale 121 & B.R. Maslin)
Calytrix simplex subsp. simplex
Synaphea panhesya
Acacia horridula
Tetratheca pilifera
Caladenia hopperiana
SI



Legend

- Priority T
- Priority 1
- Priority 2
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Excellent
- Very Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 9 of 13

Figure: **6.9**

457000 458000 459000 460000 461000 462000 463000 464000 465000

6356000 6355000 6354000 6353000 6352000 6351000

Caladenia dorrienii

Caladenia hopperiana

Legend
- Priority T
- Worsley Mine Development Envelope
- Excellent
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)
CAD Ref: g1881_Veg_f17_06
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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 10 of 13

Figure: **6.10**

438000 439000 440000 441000 442000 443000 444000 445000 446000 447000

6350000 6349000 6348000 6347000 6346000 6345000

Boronia tenuis

Senecio leucoglossus

Legend

- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Excellent
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 11 of 13

Figure:
6.11

448000 449000 450000 451000 452000 453000 454000 455000 456000

6350000 6349000 6348000 6347000 6346000 6345000

Senecio leucoglossus
Stylidium marradongense
Stylidium marradongense
Senecio leucoglossus
Lasiopetalum cardiophyllum
Stylidium marradongense
Hemigenia rigida
Caladenia hopperiana

Legend

- Priority T
- Priority 1
- Priority 3
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 12 of 13

Figure: **6.12**

457000 458000 459000 460000 461000 462000 463000 464000 465000

6350000 6349000 6348000 6347000 6346000 6345000

Caladenia hopperiana
Caladenia hopperiana
Caladenia hopperiana
Eleocharis keigheryi
Lasiopetalum cardiophyllum
Caladenia hopperiana
Caladenia hopperiana

Legend

- Priority T
- Priority 4
- Infill Areas
- Worsley Mine Development Envelope
- Excellent
- Good
- Degraded
- Completely Degraded

Note
Aerial photography: Landgate (2017)

Client: SOUTH32

N

0 250 500m
Scale: 1:25,000
MGA94 (Zone 50)

CAD Ref: g1881_Veg_f17_06
Date: Feb 2019 | Rev: C | A3

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Worsley Mine Expansion
Site-vegetation Condition and Threatened and Priority Flora
Sheet 13 of 13

Figure: **6.13**

5.7 Threatened and Priority Ecological Communities

No Threatened Ecological Communities (TECs) are known to occur within the areas the subject of the Proposal. It is recognized from database searches that the TEC –"Eucalypt Woodlands of the Western Australian Wheatbelt" has the potential to occur near the WMDE and Bauxite Transport Corridor – it has been mapped to the east and northeast of the WMDE and Bauxite Transport Corridor areas, however not within them (Appendix K). The TEC "Banksia Woodlands of the Swan Coastal Plain" has been mapped in the vicinity of the CBME (Department of Biodiversity, Conservation and Attractions 2019c, Department of the Environment and Energy 2019b), however as the CBME is located within the Darling Ranges there is no expectation that this TEC will occur within the CBME (Appendix K). One Priority Ecological Community (PEC) occurs within the WMDE, namely - The *Mount Saddleback Heath Communities* (PEC - P1) (Department of Biodiversity, Conservation and Attractions 2019d). The PEC as defined by DBCA has affinities with the site-vegetation types within the areas of heath on the Mt Saddleback area as defined and mapped by Mattiske (i.e. G, G1, G3 and G4). This PEC formerly was aligned with the larger area of heath communities on the Tunnell Road area, however now includes the Mount Saddleback Heath Communities covering some of the G1, G3 and G4 occurrences (see Figures 5.1 to 5.13 as highlighted). The heath communities within the northern and eastern Jarrah forests extend well beyond those defined and mapped in the Mt Saddleback area; however the PEC as defined by DBCA relates to the heath communities in the Mt Saddleback area (Figure 3).

The heath communities include:

- Site-vegetation Type G: Open Heath of *Grevillea bipinnatifida, Hakea undulata, Banksia squarrosa* subsp. *squarrosa, Hakea incrassata, Hakea undulata* and *Petrophile serruriae* over *Borya sphaerocephala* on shallow soils and outcrops.

- Site-vegetation Type G1: Mosaic of open heath of Proteaceae – Myrtaceae spp. with emergent patches of *Eucalyptus drummondii* on shallow soils on slopes.

- Site-vegetation Type G3: Open heath of *Banksia squarrosa* subsp. *squarrosa, Hakea incrassata, Hakea undulata, Petrophile heterophylla* and *Petrophile serruriae* on shallow soils over granite outcrops on slopes with occasional emergent *Eucalyptus drummondii.*

- Site-vegetation Type G4: Open scrub and tall shrubland of *Hakea trifurcata* and *Hakea undulata* with admixtures of mallee species including *Eucalyptus latens* and *Eucalyptus aspersa* on clay to clay-loam soils over outcrops on slopes.

- Site-vegetation Type G5: Low woodland of Eucalypt mallee species including *Eucalyptus aspersa, Eucalyptus latens, Eucalyptus longicornis* and *Eucalyptus drummondii* with occasional *Eucalyptus wandoo* over low shrubs of *Allocasuarina humilis, Hakea incrassata*, *Synaphea damopsis* and herbs on clay loams and sandy-loams on slopes.

These site-vegetation types are variants of the site-vegetation type G as defined by Havel (1975a and 1975b) and areas associated with shallow soils and granite outcrops. Several have some low mallee *Eucalyptus* species (G3, G4 and G5 as components) which provides patches of low woodlands.

The heath communities as defined and mapped are managed by South32 Worsley through the existing Protected Areas Procedure.

5.8 Significant Vegetation Communities

The following vegetation complexes and site-vegetation types are considered to be significant for their restricted representation in the conservation estate (less than 10% representation in formal and informal reserves) and also as potential wildlife corridors along creeklines.

Vegetation Complexes

- Williams – Along the major creeklines and rivers – less than 0.45% in formal and informal reserves, provides corridors and protects riparian areas (Conservation Commission 2003)
- Michibin – On Valley slopes in eastern areas of Jarrah forest – less than 7.11% in formal and informal reserves (Conservation Commission 2003).

Site-Vegetation Types

- G Types (G1, G2, G3, and G4) – lithic complexes, heath, shrublands open scrubs and woodland communities associated with shallow soils over granite and exposed granite outcrop areas. Some of these areas (G1, G3 and G4 near Mt Saddleback) overlap with the PEC (Priority 1) Mt Saddleback Heath Communities (DBCA 2019d and as supplied by DBCA – Figure 3).
- Types DG, HG and MG that are a mixture of different site-vegetation types over shallow granites in the Infill Areas, the WMDE and the wider mapped areas near Boddington.
- L Type – Open woodland of *Eucalyptus patens* with some *Eucalyptus wandoo* on lower slopes. This site-vegetation type has been cleared in sections of the eastern Jarrah forest for agriculture activities as the earlier land holders recognized the alluvial soils associated with the occurrence of the *Eucalyptus patens* communities.
- The M2 site-vegetation type which supports woodlands of *Eucalyptus accedens*, *Eucalyptus wandoo, Eucalyptus marginata* and *Corymbia calophylla* on eastern breakaways. The M2 site-vegetation type occurs in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington. This site-vegetation type occurs eastwards on the upper slopes and ridges of the Eastern Jarrah forest.
- A, AY, AX, AC Types – Woodlands of *Eucalyptus rudis* and *Melaleuca* species on the swamps and creeklines that provide linkages for fauna species and also for variety of plant species on variable soils.

Other communities are significant as they support threatened and priority species. The main communities that support threatened and priority flora species include the Jarrah – Sheoak communities supporting *Lasiopetalum cardiophyllum* (P4), the lower slopes near the Hotham River and swamps (site-vegetation types A, AY, AX, AC, CW, SW and Y), the heath communities (G, G1 and G3) and open forests of *Eucalyptus marginata* subsp*. thalassica – Corymbia calophylla – Allocasuarina fraseriana* (site-vegetation types P and PS), see Figures 5.1 to 5.14.

6. DISCUSSION

This report represents a consolidation of recent assessments of the flora and vegetation values on the Infill Areas and the Bauxite Transport Corridor areas and the previous baseline information for the broader WME areas near Boddington and Collie. This assessment supplements earlier baseline flora and vegetation surveys of the Mt Saddleback area since the 1980's (Worsley Alumina Pty Ltd 1985) more recent studies on the Quindanning Timber Reserve (Mattiske Consulting Pty Ltd 1993), Marradong Timber Reserve (Mattiske Consulting Pty Ltd 1990), the Collie Refinery area (1999, 2014) and other areas of agricultural holdings, State Forest and forested areas near the Boddington operations.

6.1 Flora

Desktop searches of the EPBC Act Protected Matters database, the DBCA *NatureMap* database, and where available the Western Australian Herbarium (WAH) and Threatened and Priority Flora (TPFL) databases have identified the potential occurrence of 80 conservation significant flora species within 20 km of the WMDE and Bauxite Transport Corridor, and 32 conservation significant flora species within 20 km of the CBME. This information, together with a literature review of all available datasets from previous flora and vegetation surveys for the Project, has formed the basis of a likelihood assessment for conservation significant flora within the proposed expansion areas.

Since the early 1980's, a total of 680 plant taxa from 72 families and 260 genera have been recorded in the main baseline studies undertaken on the Worsley lease areas and 289 vascular plant species from 54 plant families and 149 genera have been recorded in the main baseline studies undertaken in the Collie areas.

A total of 149 plant taxa from 42 families and 94 genera were recorded in recently assessed areas on the Infill Areas. This low level of diversity reflects the largely degraded (64.74% completely degraded and 11.38% degraded) nature of substantial portions of the Infill Areas.

One threatened flora (*Caladenia hopperiana*) pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* and the *Environment Protection and Biodiversity Conservation Act 1999* has been recorded within the WMDE. Currently this species is relatively restricted within the proposed expansion areas to a localised area in the south-eastern section of the WMDE. The *Caladenia hopperiana* was formerly recorded as *Caladenia* sp. Quindanning (K. Smith & P. Johns 231) (DBCA 2019a). Two other threatened flora species (*Caladenia dorrienii* and *Eleocharis keigheryi*) were recorded to the east of the WMDE and Infill Areas, Figures 5.1 to 5.13. South32 has a Protected Areas Procedure to manage by avoidance the threatened flora.

Of the identified potential conservation significant species, 15 (one Threatened and 14 Priority flora species) have been recorded within the proposed WMDE and Bauxite Transport Corridor. No threatened or priority flora were recorded within the recent Infill Areas.

One conservation significant species has been recorded within the proposed CBME and one occurred on the fringes of the CBME. Of the Priority species the most significant species include the *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130) (Priority 1), which is mainly concentrated on the lower slopes near the Hotham River (which overlaps within the Bauxite Transport Corridor and the WMDE) and the eastern anomaly north of the current Boddington Gold Mine camp on the lower valley slopes, and the range of Priority species restricted to the heath communities. The latter group of species in the heath communities are to some degree protected from clearing as their occurrences overlap with the PEC community – Mt Saddleback Heath Communities. This community was listed after mining commenced within Saddleback Timber Reserve and was initially only associated with Tunnell Road Heath community.

A total of 28 introduced flora species have been recorded within the Infill Areas. A total of 80 introduced flora species have been recorded in the wider lease areas near Boddington and Collie. A total of 15 introduced flora species have been recorded within the CBME area.

The majority of the weeds are short term annual species that establish on disturbed agricultural lands and although some establish in the early phase of rehabilitation, the majority are quickly outgrown by more perennial and larger native shrub and tree species.

Of the potential introduced flora species the following are Declared Plants under the *Biodiversity and Agricultural Management Act 2007* (BAM Act) (DAFWA 2018), namely:

- **Gomphocarpus fruticosus* (Declared Plant under BAM Act) – near Collie Refinery (DPAW 2019a; DotEE 2019a)
- **Silybum marianum* (Declared Plant under BAM Act) – near Collie Refinery in Phase One (Danes and Moore 1981)
- **Asparagus asparagoides* (Declared Plant under BAM Act) – near Boddington and Collie areas (DotEE 2019a)

None of the Declared Plants were recorded in the recent assessment of the Infill Areas.

6.2 Vegetation

At a regional scale Heddle *et al.* (1980) and Mattiske and Havel (1998) defined and mapped a series of vegetation complexes that enabled a refinement of the vegetation mapping of Beard (1979) and Smith (1974) for Pinjarra and Collie areas respectively. The latter work of Beard has been updated recently into Beard *et al.* (2013) for the State of Western Australia. The approach developed by Heddle *et al.* (1980) and Mattiske and Havel (1998) enabled relationships to be defined between the resulting regional patterns of vegetation and the underlying landforms, soils and climatic trends in the southwest forests. In the three areas assessed for the Proposal, the following vegetation complexes were recorded:

Infill Areas - 8 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Swamp, Williams, Yalanbee 5 and Yalanbee 6.

WMDE – 9 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Pindalup, Swamp, Williams, Yalanbee 5 and Yalanbee 6.

Bauxite Transport Corridor - 8 vegetation complexes, Cooke, Coolakin, Dwellingup 4, Michibin, Pindalup, Swamp, Williams and Yalanbee 6.

CBME – 3 vegetation complexes, Dwellingup 1, Murray 1 and Yarragil 1.

Significant vegetation complexes within the Infill Areas, WMDE, Bauxite Transport Corridor and CBME areas include the following:

- Within the Boddington lease areas, the Michibin and Williams vegetation complexes are less well represented (<10%) in formal and informal reserves (7.11% and 0.49% respectively), (Conservation Commission 2003). The latter mainly relates to their occurrence in valley systems that have been developed for agriculture on the eastern fringes of the Darling Ranges.
- All of the vegetation complexes associated with the CBME are well represented in formal and informal reserves in areas >10% (Conservation Commission 2003).

6.3 Site-Vegetation Types

At a finer scale of local mapping the following presents the site-vegetation types for the Infill Areas, WMDE, Bauxite Transport Corridor and CBME. This method of mapping was developed based on the earlier ecological studies of Havel (1975a and 1975b) who delineated a series of site-vegetation types that integrated the structural and floristic components (including key indicator species) with the underlying soil and site conditions. This approach was developed further by initially Dames and Moore (1981) and later Mattiske (1985 to 2018).

Infill Areas – 20 site-vegetation types were defined for the WMDE area. The dominant site-vegetation types (>100ha) were H, M and MG. Large sections of the Infill Areas as assessed in 2018 have been cleared for agriculture and plantations. The majority of the Infill Areas are either completely degraded (64.74%) or degraded (11.37%). The restricted site-vegetation types include swamp vegetation types (A), on the lower slopes (DG), on the undulating hills (H1), on the outcropping areas (G2) and on the moister slopes (W).

WMDE – 36 site-vegetation types were defined for the WMDE area. The dominant site-vegetation types (>300ha) were M. P, PS, S, H, H2, ST, Y, Z AY and D. Large sections of the WMDE have been cleared for agriculture and plantations. The majority of the WMDE area is either completely degraded (46.87%) or degraded (14.48%). The restricted site-vegetation types include swamp vegetation types (A1, A2), on the lower slopes (AD, AY/D, DG), on the outcropping areas (G1, G2, G4, R) and on the moister slopes (PW, SW, W).

Bauxite Transport Corridor - 26 site-vegetation types were defined for the Bauxite Transport Corridor area (noting that 80.38% of these areas overlap with the WMDE and 11.99% of the WMDE overlaps with the Transport Bauxite Corridor). The dominant site-vegetation types (>300ha) were H, M, PS and S. Large sections of the Bauxite Transport Corridor have been cleared for agriculture and plantations. A large portion of the Bauxite Transport Corridor is either completely degraded (28.42%) or degraded (3.81%). The restricted site-vegetation types include specific types on the slopes (H2, M2), on the lower slopes (AD, AY/D, DG), on the outcropping areas (G, G3, G4) and on the moister slopes (PW).

CBME – 9 site-vegetation types were defined for the CBME. The dominant site-vegetation types (>100ha) were S and ST. The majority of the CBME was relatively undisturbed with the exception of the dam and completely degraded areas (32.20%). The restricted site-vegetation types include specific types on the lower slopes (CQ) and slopes (SP). All site-vegetation types in the CBME are well represented in nearby state forest areas and conservations areas (e.g. Wellington National Park).

Significant site-vegetation types within the Infill Areas, WMDE, Bauxite Transport Corridor and CBME areas include the following:

- The Priority 1 PEC - Mt Saddleback Heath Communities as delineated by DBCA occurs in the Saddleback area near Boddington within the WMDE but not within the Bauxite Transport Corridor and overlaps with site-vegetation types G1, G3 and G4 as defined and mapped for the Mt Saddleback area by Mattiske (Worsley Alumina Pty Ltd 1985 to Mattiske 2018), Figures 5.1 to 5.13. Some of the latter site-vegetation types extend well beyond the Mt Saddleback area, e.g. within the Bauxite Transport Corridor, north of the Boddington Gold Mine and on the eastern fringes of the State Forest.

  Although these PEC communities are delineated in Figure 3 (based on DBCA data supplied) there remain some inconsistencies with the previously mapped areas of the various G communities as mapped by the Mattiske team for South32 in the various phases of detailed site-vegetation mapping since the early 1980's. The latter is illustrated by the G3 and G4 communities within the Bauxite Transport Corridor that were not included in the Mt Saddleback Heath Communities as supplied by DBCA for the area (see Figure 3).

- The G2 site-vegetation type that occurs on granite in association with Rock Sheoak (*Allocasuarina huegeliana*), heath communities and lithic complexes occurs the Infill Areas, the WMDE and the wider mapped areas near Boddington.

- The communities that are a mixture of different site-vegetation types over shallow granites (DG, HG and MG on the infill areas) occur in the Infill Areas, the WMDE and the wider mapped areas near Boddington.

- The M2 site-vegetation type which supports woodlands of *Eucalyptus accedens*, *Eucalyptus wandoo, Eucalyptus marginata* and *Corymbia calophylla* on eastern breakaways. The M2 site-vegetation type occurs in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington. This site-vegetation type occurs eastwards on the upper slopes and ridges of the Eastern Jarrah forest.

- A, AY, AX, AC Types – Woodlands of *Eucalyptus rudis* and *Melaleuca* species on the swamps and creeklines that provide linkages for fauna species and a variety of plant species on variable soils in the infill areas. These site-vegetation types occur in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington.

- The restricted L site-vegetation type that supports a woodland of *Eucalyptus patens* and *Eucalyptus wandoo occurs* in the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington.

- The Y site-vegetation types that is often associated with the occurrence of the *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130), particularly on the lower slopes near the Hotham River and north on broader clay loam valley lower slopes. This site-vegetation type is well represented in the wider areas and occurs in the Infill Areas, the Bauxite Transport Corridor, the WMDE and the wider mapped areas near Boddington

The majority of the site-vegetation types that occur on the Collie Refinery lease areas are locally well represented in State forest and conservations areas (e.g. Wellington National Park).

Overall, the vegetation communities mapped and species recorded in the Infill Areas, the WMDE and the Bauxite Transport Corridor were consistent with the historical mapping of Mattiske as reflected in the earlier work of Havel (1975a as and 1975b) in the northern Jarrah forest and also the more recent mapping by Mattiske since the Phase Two studies on the Mt Saddleback area (Worsley Alumina Pty Ltd 1985; E.M. Mattiske and Associates 1986 to 1993; Mattiske Consulting ty Ltd 2012a to 2012c). As sections of the expansion areas are either completely degraded or degraded, the potential impact on local flora values should be minimal providing some of the populations of threatened and priority flora species and the patches of the priority ecological communities are avoided.

7. CONCLUSIONS AND RECOMMENDATIONS

Under the *Environmental Protection Act 1986*, ten principles for clearing native vegetation are set out in Schedule 5, under which native vegetation should not be cleared. The review of the Ten Clearing Principles relating to the key flora and vegetation values (Principles 1, 3, 4, 5 and 6) are summarized in Table 11.

Table 11: Assessment of proposal against Clearing Principles

No.	Principle / Assessment
1	**Clearing principle** Native vegetation should not be cleared if it comprises a high level of biological diversity. **Assessment:** Proposal may be at variance to this principle in selected areas. The area under application is a mosaic of forest, heath and woodland communities. As large sections of the proposed WMDE and Bauxite Transport Corridor have already been impacted by agricultural activities and previous mining activities the potential variance to this principle is related to selected less disturbed areas and in particular the creeklines, the heath communities (PEC Priority 1) and selected forest and woodland communities that are less disturbed. The condition mapping as supplied in Figures 5.1 to 5.19 will assist in the delineation of the less disturbed communities and Figures 4.1 to 4.19 will assist in the delineation of complexes and site-vegetation types and location of threatened flora on the WMDE and Bauxite Transport Corridor. The vegetation in the CBME is either degraded, dam areas or less disturbed forested areas (Figure 4.20).
3	**Clearing principle** Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora. **Assessment** Proposal may be at variance to this principle in selected areas. Figures 4.1 to 4.19 will assist in the delineation of the location of Threatened and Priority flora on the proposed WMDE and Bauxite Transport Corridor. Foremost amongst the flora species is the Threatened *Caladenia hopperiana* (T) and the Priority 1 flora species – *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130) which are both relatively restricted. In addition, some of the Priority flora species occur in the Mt Saddleback Heath Communities (PEC P1) which are avoided during mining activities. The vegetation in the CBME is either degraded, dam areas or less disturbed forested areas (Figure 4.20) and the Priority flora species *Pultenaea skinneri* (P4) recorded historically in the Collie area was restricted to the southern valley floors and slopes and is less geographically restricted than others in the WMDE and Bauxite Transport Corridor.
4	**Clearing principle** (d) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community. **Assessment** Proposal is not at variance to this principle No Threatened Ecological Communities, pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* and as listed by the DBCA (2019c) were recorded within the survey area. No Threatened Ecological Communities, pursuant to the *EPBC Act* and as listed by the Department of the Environment and Energy (2019b) were recorded within the survey area.

Table 11: Assessment of proposal against Clearing Principles (continued)

No.	Principle / Assessment
5	**Clearing principle** (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared. **Assessment** Proposal may be at variance to this principle Some of the defined and mapped vegetation complexes and site-vegetation types have been extensively cleared for agricultural activities and therefore the Proposal may be at variance (see Sections 5.7 and 6).
6	**Clearing principle** (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland. **Assessment** Proposal may be at variance to this principle The Proposal in sections does occur near watercourses (e.g. Hotham River) and therefore the proposed clearing activities may be at variance to this principle.

In response to the proposed expansion areas in the Boddington and Collie areas, it is recommended to:

- Avoid the location of the Threatened flora species (e.g. *Caladenia hopperiana* (T));
- Avoid wherever possible the Priority flora species and in particular the priority species *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130) (P1) which is geographically restricted to the Boddington area and those Priority flora species associated with restricted communities (e.g. the heath PEC communities);
- Develop a management plan for all Threatened and Priority Flora species that have the potential to occur in the vicinity of the proposed expansion areas or that have been recorded within and near the expansion areas at Boddington (Infill Areas, WMDE and Bauxite Transport Corridor) and Collie (CBME);
- Manage direct and indirect impacts on the Priority 1 PEC - Mt Saddleback Heath Communities in the Boddington area. Management of these areas area undertaken through the South32 Protected Areas Procedure.
- Maintain existing drainage systems where feasible, ensuring tracks and other infrastructure areas do not disrupt or divert historic water flow patterns; and
- Remove and stockpile topsoil, log debris and leaf litter where possible for use in future rehabilitation programs; particularly in the areas where the vegetation is less disturbed. If possible, stockpiled topsoil should be treated for introduced species before being directly replaced on disturbed areas.

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9. PERSONNEL

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Mr A. Barrett	Experienced Botanist	Fieldwork	SL012280
Mr B. Ellery	Senior Botanist	Plant identification	N/A
Ms K. Lambert	Botanist	Fieldwork	SL012313
Ms E. Chetwin	Botanist	Fieldwork	SL012294
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APPENDIX A: SUMMARY OF KEY BASELINE ASSESSMENTS OF THE SOUTH32 LEASE AREAS, 1980 TO 2018

Report	Consultant	Survey Area	Survey Date	Purpose of Survey/Study and Details
Assessment of Flora and Vegetation within Expansion Survey Areas (Mattiske Consulting Pty Ltd 2018)	Mattiske	WMDE 27793.27ha, Transport Corridor 4145.69ha and CBME 730.28ha	19th – 22nd November 2018	Define the flora and vegetation values of the private properties located within proposed expansion areas. The survey included sampling from 67 vegetation sites in the Mt Saddleback and Boddington areas with infill areas (3347.55ha). The work also entailed an update of flora and vegetation values on these expansion areas and the Collie Refinery.
Assessment of Flora and Vegetation of Private Properties within the Extension Survey Areas (Mattiske Consulting Pty Ltd 2017)	Mattiske	Bauxite Mine Expansion Area totalling 6,317.71 ha. Equivalent to the HME	15th – 18th November 2016	Define the flora and vegetation values of the private properties located within proposed expansion areas. The survey included sampling from 25 vegetation sites.
Assessment of Flora and Vegetation of Private Properties within the Extension Survey Areas (Mattiske Consulting Pty Ltd 2014)	Mattiske	PBA Extension Survey Areas totalling 3,144.56 ha. Within PBA.	30th September to 9th October 2014	Define the flora and vegetation values of the private properties located within PBA Extension Area. The survey included sampling from 207 sites to sample all vegetation types within the PBA Extension Areas.
Vegetation Monitoring Plots Sotico Property (Mattiske Consulting Pty Ltd 2013)	Mattiske	Sotico, north of Boddington Gold Mine	November 2013	Re-assessment of nine permanent plots and an additional 12 permanent plots established in representative site-vegetation types on Sotico property.
Flora and Vegetation Survey of Hotham Farm Survey Area (Mattiske Consulting Pty Ltd 2013)	Mattiske	Hotham Farm totalling 196.71 ha.	30th October to 1st November 2012	Define the flora and vegetation values of Hotham Farm. Specifically, characterise the vegetation communities, their condition and vascular flora present, provide counts and locations of any Threatened and Priority flora, review the local and regional significance of the vegetation communities identified and review the conservation status of the flora. The survey included sampling from 22 sites to sample all vegetation types within the area.
Flora and Vegetation Survey of Nullaga Property Adjacent to Marradong Section of the Boddington Bauxite Mine (Mattiske Consulting Pty Ltd 2012)	Mattiske	Nullaga Property totalling 721.12 ha Intersects the PBA	30th October to 1st November 2012	Define the flora and vegetation values of Nullaga Property. Specifically, characterise the vegetation communities, their condition and vascular flora present and review the conservation status of the flora. The survey included sampling from 55 sites to sample all vegetation types within the area.
Flora and Vegetation of the Sotico Survey Area (Mattiske Consulting Pty Ltd 2012)	Mattiske	Sotico, north of Boddington Gold Mine	January 2012 to July 2012	Site Vegetation Type classification, description and mapping, Threatened and Priority flora. Recordings at 5847 sites.

APPENDIX A: SUMMARY OF KEY BASELINE ASSESSMENTS OF THE SOUTH32 LEASE AREAS, 1980 TO 2018

Report	Consultant	Survey Area	Survey Date	Purpose of Survey/Study and Details
Vegetation Monitoring Plots Sotico Property (Mattiske Consulting Pty Ltd 2012)	Mattiske	Sotico, north of Boddington Gold Mine	November 2011	Nine permanent plots established in representative site-vegetation types on Sotico property.
Flora and Vegetation of Littleton's Cut Area (Mattiske Consulting Pty Ltd 2010)	Mattiske	Littleton's Cut Area	2010	Site Vegetation Type classification, description and mapping, Threatened and Priority flora
Flora and Vegetation Survey of Dobrowolskyi, Farmer, Hulls 1, Hulls 2, Nullaga, Pringles, Robins, Nichols, Salmeri and Spencer properties, Boddington (Mattiske Consulting Pty Ltd 2010)	Mattiske	Dobrowolskyi, Farmer, Hulls 1, Hulls 2, Nullaga, Pringles, Robins, Nichols, Salmeri and Spencer properties, Boddington	2010	Site Vegetation Type classification, description and mapping, Threatened and Priority flora
Flora and Vegetation Survey of Nichols, Black, Gibbs, Karafils, Nichols and Veitch properties, Boddington (Mattiske Consulting Pty Ltd 2010)	Mattiske	Dobrowolskyi, Farmer, Hulls 1, Hulls 2, Nullaga, Pringles, Robins, Nichols, Salmeri and Spencer properties, Boddington	2007	Site Vegetation Type classification, description and mapping, Threatened and Priority flora
Flora and Vegetation on Marradong Forest Block Boddington (Mattiske Consulting Pty Ltd 2008)	Mattiske	Marradong Timber Reserve Within the PBA	2007	Update earlier botanical studies on the Marradong Timber Reserve as undertaken Mattiske (1990). Specifically, update flora records with recent taxonomic name changes, establish vegetation monitoring sites and extend the vegetation mapping program to include nearby and adjacent private land holdings.
Flora and Vegetation on the Collie refinery lease area (Mattiske Consulting Pty Ltd 2007)	Mattiske	Collie Refinery	2007	Update earlier botanical studies on the Collie Refinery.
Review of Flora and Vegetation located in the Boddington Gold Mine and Hedges lease areas (Mattiske Consulting Pty Ltd 2005)	Mattiske	Boddington Gold Mine and Hedges Lease areas	2005	Extension and update of earlier Flora and Vegetation Studies on the Boddington Gold Mine and Hedges areas. Recording on grids and in plots and targeted flora searches.
Assessment of Tunnell Road heath communities, Boddington Bauxite Mine (Mattiske Consulting Pty Ltd 2004)	Mattiske	Tunnell Road heath, Mt Saddleback operations	2004	Assessment of heath communities, monitoring of quadrats in plots and transects.
Bennett Environmental Consulting (2004)	Bennett	Brookton and Central mining envelopes	August 2004	Define the flora and vegetation values of Brookton and Central mining envelopes.
Review of declared rare and priority flora species located in the Worsley Alumina Boddington Bauxite Mine lease areas (Mattiske Consulting Pty Ltd 2003)	Mattiske	Boddington lease areas	2003	Review of threatened and priority flora status and taxonomy.

APPENDIX A: SUMMARY OF KEY BASELINE ASSESSMENTS OF THE SOUTH32 LEASE AREAS, 1980 TO 2018

Report	Consultant	Survey Area	Survey Date	Purpose of Survey/Study and Details
Assessment of Flora and Vegetation Values on the Proposed WRL, the Potential Land Swap Area and the Southern Section of Hotham Farm, Boddington Gold Mine (Mattiske Consulting Pty Ltd 2013)	Mattiske	Newmont Boddington Gold Mine	2013	Site Vegetation Type classification, description and mapping, Threatened and Priority flora
Threatened and Priority Flora Assessment of the Hotham Pipeline and Hedges Dam, Newmont Boddington Gold Mine (Mattiske Consulting Pty Ltd 2012)	Mattiske	Newmont Boddington Gold Mine	2012	Threatened and Priority Flora Assessment
Review of Flora and Vegetation located in the Boddington Gold Mine and Hedges Lease Areas (Mattiske Consulting Pty Ltd 2005)	Mattiske	Newmont Boddington Gold Mine	2005	Flora and Vegetation Review of Boddington Gold Mine and Hedges Lease Area
Flora and Vegetation Survey Remnant Vegetation Devereux, Nichols and Veitch Properties - Boddington Bauxite Mine (Mattiske Consulting Pty Ltd 2002)	Mattiske	Devereux, Nichols and Veitch properties, Boddington	2002	Site Vegetation Type classification, description and mapping, Threatened and Priority flora
Flora and Vegetation of the Quindanning Timber Reserve (E.M. Mattiske and & Associates 1993a, 1993b, 1999)	Mattiske	Quindanning Timber Reserve	1993a, 1993b, 1999	Site Vegetation Type classification, description and mapping, Threatened and Priority flora based on gridding of areas and regular recordings and plots and targeted searching for flora.
Flora and Vegetation component (Mattiske Consulting Pty Ltd) in Worsley Alumina Boddington Gold Mine Project Flora and Fauna studies (Worsley Alumina Pty Ltd, 1999)	Mattiske	Hotham North	Surveyed in 1999 Further studies proposed prior to mining operations	Site Vegetation Type classification, description and mapping, Threatened and Priority flora
Flora and Vegetation Flora and Vegetation Survey of the Collie Refinery Lease Area Unpublished report prepared for Worsley Alumina Pty Ltd, 1999.	Mattiske	Collie Refinery	1999	Site Vegetation Type classification, description and mapping, Threatened and Priority flora

APPENDIX A: SUMMARY OF KEY BASELINE ASSESSMENTS OF THE SOUTH32 LEASE AREAS, 1980 TO 2018

Report	Consultant	Survey Area	Survey Date	Purpose of Survey/Study and Details
Vegetation Complexes of the Darling System, Western Australia. Regional Forest Agreement (RFA) Vegetation Complexes, Pinjarra, Western Australia. (Mattiske and Havel 1998)	Mattiske and Havel	Pinjarra component of RFA Vegetation Mapping	1998	Vegetation Complexes of the Darling System, based on broad relationships with underling geology, landforms and soils and climatic zones with reference to key structural and floristic components of regional vegetation patterns.
Assessment of Tunnell Road heath communities, Boddington Bauxite Mine (Mattiske Consulting Pty Ltd 1998)	Mattiske	Tunnell Road heath, Mt Saddleback operations	1998	Assessment of heath communities, monitoring of quadrats in plots and transects.
Flora and Vegetation Studies on the Mount Saddleback Survey Area (E.M. Mattiske and Associates 1993)	Mattiske	Mount Saddleback	1993	Site Vegetation Type classification, description and mapping
Flora and vegetation studies on the southern Mount Saddleback survey area (E.M. Mattiske and Associates 1993)	Mattiske	Mount Saddleback	1993	Site Vegetation Type classification, description and mapping
Flora and Vegetation, Eastern Anomaly, Boddington Gold Mine (E.M. Mattiske and Associates 1992)	Mattiske	Boddington Gold Mine	1992	Site Vegetation Type classification, description and mapping based on grid mapping and also plots. Also extensive targeted searching for Threatened and Priority Flora species (in particular *Gastrolobium* sp. Prostrate Boddington (M. Hislop 2130))
Flora and Vegetation Marradong Timber Reserve (E.M. Mattiske and Associates 1990)	Mattiske	Marradong Timber Reserve	Spring 1989	Botanical survey to characterise the vegetation and flora of the Marradong Timber Reserve. Specifically, review the local and regional significance of the vegetation communities identified, review the conservation status of the flora, record a range of botanical and physical parameters, and establish and monitor a series of permanent vegetation plots.
Mattiske Consulting Pty Ltd Flora and Vegetation Studies in Worsley Alumina Project, Flora and Fauna studies, Phase Two (Worsley Alumina Pty Ltd, 1985)	Mattiske	Mt Saddleback and surrounds	1985	Site Vegetation Type classification, description and mapping based on grid mapping and also plots. Undertaken in early 1980's. Also extensive targeted searching for Threatened and Priority Flora species. Supplemented earlier studies by by Worsley Alumina Pty Ltd and Dames and Moore (1981) for Phase One areas.
Vegetation Complexes of the Darling System, Western Australia. In: Atlas of Natural Resources of the Darling System, Western Australia, Chapter 3, Department of Conservation and Environment, Perth (Heddle *et al*. 1980)	(Mattiske (nee Heddle))	Darling System	1980	Vegetation Complexes of the Darling System, based on broad relationships with underling geology, landforms and soils and climatic zones with reference to key structural and floristic components of regional vegetation patterns.

APPENDIX B1: THREATENED AND PRIORITY FLORA DEFINITIONS

Under section 179 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), **threatened flora** are categorised as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent (Table B1.1).

Table B1.1 Federal definition of threatened flora species

Note: Adapted from section 179 of the EPBC Act.

CODE	CATEGORY	DEFINITION
Ex	**Extinct**	Species which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild**	Species which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered**	Species which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered**	Species which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable**	Species which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent**	Species which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

The *Biodiversity Conservation Act 2016* (*BC Act*) provides for (amongst other things) the protection of flora likely to become extinct or are otherwise in need of special protection in Western Australia under Part 10 (Division 2).

Threatened flora are listed in the *Wildlife Conservation (Rare Flora) Notice 2018* (under Part 2 of the BC Act; Department of Biodiversity, Conservation and Attractions (DBCA 2019b) and are categorised under Schedules 1-3**.** A flora species is defined as **threatened** if it is facing an extremely high risk of extinction in the wild in the immediate, near or medium-term future, pursuant to sections 20, 21 and 22 of the *BC Act* (Department of Biodiversity, Conservation and Attractions 2019b). Threatened species are categorised as critically endangered, endangered, and vulnerable (Table B1.2).

Table B1.2 State definition of threatened flora species

Note: Adapted from Department of Biodiversity, Conservation and Attractions (2019b).

CODE	CATEGORY	DEFINITION
CR	**Critically endangered**	Species considered to be facing an extremely high risk of becoming extinct in the wild (listed under Schedule 1 of the *Wildlife Conservation (Rare Flora) Notice 2018*).
EN	**Endangered**	Species considered to be facing a very high risk of becoming extinct in the wild (listed under Schedule 2 of the *Wildlife Conservation (Rare Flora) Notice 2018*).
VU	**Vulnerable**	Species considered to be facing a high risk of becoming extinct in the wild (listed under Schedule 3 of the *Wildlife Conservation (Rare Flora) Notice 2018*).

Priority flora species are defined as "possibly threatened species that do not meet the survey criteria, or are otherwise data deficient" or species that are "adequately known, are rare but not threatened, meet criteria for near threatened or have recently been removed from the threatened species list" for other than taxonomic reasons" (Department of Biodiversity, Conservation and Attractions 2019b). **Priority species are** considered significant under the Environmental Protection Authority's *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a). The Department of Biodiversity, Conservation and Attractions categorises priority flora into four categories: Priority 1; Priority 2, Priority 3 and Priority 4 (Table B1.3).

Table B1.3: State definition of priority flora species

Note: Adapted from Department of Biodiversity, Conservation and Attractions (2019b).

CODE	CATEGORY	DEFINITION
P1	**Priority 1:** Poorly-known species	Known from one or a few locations (< 5) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation; or are otherwise under threat of habitat destruction or degradation. In urgent need of further survey.
P2	**Priority 2:** Poorly-known species	Known from one or a few locations (< 5). Some occurrences are on lands managed primarily for nature conservation. In urgent need of further survey.
P3	**Priority 3:** Poorly-known species	Known from several locations and the species does not appear to be under imminent threat; or from few but widespread locations with either a large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. In need of further survey.
P4	**Priority 4:** Rare, Near Threatened, and other species in need of monitoring	**a) Rare -** Species 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 species are usually represented on conservation lands. **b) Near Threatened -** Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. **c) Other -** Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

APPENDIX B2: THREATENED AND PRIORITY ECOLOGICAL COMMUNITY DEFINITIONS

Under section 181 of the EPBC Act, **threatened ecological communities** are categorised as critically endangered, endangered and vulnerable (Table B2.1).

Table B2.1 Federal definition of threatened ecological communities

Note: Adapted from section 181 and section 182 of the EPBC Act.

CATEGORY	DEFINITION
Critically Endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

The *Biodiversity Conservation Act 2016* (BC Act) provides for (amongst other things) some protection of ecological communities at risk of collapse in Western Australia under Part 3 (Division 2).

Threatened ecological communities (TECs) are listed in the *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment (28 June 2018)* (under Part 2 of the *BC Act*; Department of Biodiversity, Conservation and Attractions 2019c). An ecological community is defined as **threatened** if it is facing an extremely high risk of collapse in the immediate, near or medium-term future, pursuant to sections 28, 29 and 30 of the BC Act. Threatened ecological communities are categorised as critically endangered, endangered, and vulnerable (Table B2.2). Some of these TECs are also endorsed by the Federal Minister as threatened, and some of these are listed under the *EPBC Act* and therefore afforded legislative protection at the Commonwealth level.

Table B2.2 State definition of threatened ecological communities

Note: Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
CR	**Critically Endangered**	An ecological community will be listed as CR when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting **any one or more of** the following criteria: **1.** The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification; **2.** The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or **3.** The ecological community is highly modified with potential of being rehabilitated in the immediate future.
EN	**Endangered**	An ecological community will be listed as EN when it has been adequately surveyed and is not CR, but is facing a very high risk of total destruction in the near future. The ecological community must meet **any one or more of** the following criteria: **1.** The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification; **2.** The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or **3.** The ecological community is highly modified with potential of being rehabilitated in the short term future.
VU	**Vulnerable**	An ecological community will be listed as VU when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet **any one or more of** the following criteria: **1.** The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated; **2.** The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; or **3.** The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.

Priority ecological communities (PECs) are defined as possible threatened ecological communities that do not meet the stringent survey criteria for the assessment of threatened ecological communities, and are listed by the Department of Biodiversity, Conservation and Attractions (2019d) in the *Priority Ecological Communities for Western Australia – Version 28 (17 January 2019)*. Priority ecological communities are considered significant under the Environmental Protection Authority's (2016a) *Environmental Factor Guideline: Flora and Vegetation*. The Department of Biodiversity, Conservation and Attractions categorises priority ecological communities into five categories: Priority 1; Priority 2, Priority 3, Priority 4 and Priority 5 (Table B2.3).

Table B2.3 State definition of priority ecological communities

Note: Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
P1	**Priority 1** (Poorly known ecological communities)	Ecological communities that are known from very few, restricted occurrences (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Most of these occurrences are not actively managed for conservation (e.g. located within agricultural or pastoral lands, urban areas, or active mineral leases) and for which immediate threats exist.
P2	**Priority 2** (Poorly known ecological communities)	Communities that are known from few small occurrences (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation.
P3	**Priority 3** (Poorly known ecological communities)	**1.** 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; **2.** Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat; or **3.** Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	**Priority 4** (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)	**1.** Rare – Communities known from few occurrences that are considered to have been adequately surveyed, sufficient knowledge is available, and are considered not to be currently threatened. **2.** Near Threatened – Communities considered to have been adequately surveyed and do not qualify for Conservation Dependent, but are close to qualifying for Vulnerable. **3.** Communities that have been removed from the list of threatened communities during the past five years.
P5	**Priority 5** (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.

APPENDIX B3: CATEGORIES AND CONTROL MEASURES OF DECLARED PEST (PLANT) ORGANISMS IN WESTERN AUSTRALIA

Section 22 of Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act) makes provision for a plant taxon to be listed as a declared pest organism in respect to parts of, or the entire State. According to the BAM Act, a declared pest is defined as a prohibited organism (section 12), or an organism for which a declaration under section 22 (2) of the Act is in force.

Under the *Biosecurity and Agriculture Management Regulations 2013* (WA), declared pest plants are placed in one of three control categories, C1 (exclusion), C2 (eradication) or C3 (management), which determines the measures of control which apply to the declared pest (Table B3.1). The current listing of declared pest organisms and their control category is through the Western Australian Organism List (Department of Primary Industries and Regional Development 2019).

Table B3.1 Categories and control measures of declared pest (plant) organisms

Note: Adapted from *Biosecurity and Agriculture Management Regulations 2013*.

CONTROL CATEGORY	CONTROL MEASURES
C1 (Exclusion) '(a) Category 1 (C1) — Exclusion: if in the opinion of the Minister introduction of the declared pest into an area or part of an area for which it is declared should be prevented.' Pests will be assigned to this category if they are 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.	In relation to a category 1 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.
C2 (Eradication) '(b) Category 2 (C2) — Eradication: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is feasible.' Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.	In relation to a category 2 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.
C3 (Management) '(c) Category 3 (C3) — Management: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is not feasible but that it is necessary to: **(i)** alleviate the harmful impact of the declared pest in the area; or **(ii)** reduce the number or distribution of the declared pest in the area; or **(iii)** prevent or contain the spread of the declared pest in the area.' Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.	In relation to a category 3 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to: **(a)** alleviate the harmful impact of the declared pest in the area for which it is declared; or **(b)** reduce the number or distribution of the declared pest in the area for which it is declared; or **(c)** prevent or contain the spread of the declared pest in the area for which it is declared.

APPENDIX B4: OTHER DEFINITIONS

Environmentally sensitive areas

Environmentally sensitive areas are declared by the State Minister under section 51B of the *Environmental Protection Act 1986* (EP Act) and are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, gazetted 8 April 2005. Specific environmentally sensitive areas relevant to this report include: a defined wetland and the area within 50 metres of the wetland; the area covered by vegetation within 50 metres of rare flora; the area covered by a threatened ecological community; a Bush Forever site – further areas and information are described in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

Conservation significant flora

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), flora may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority species;
- locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or anomalous features that indicate a potential new species;
- representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; or
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Conservation significant vegetation

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), vegetation may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority ecological communities;
- restricted distribution;
- degree of historical impact from threatening processes;
- a role as a refuge; or
- providing an important function required to maintain ecological integrity of a significant ecosystem.

APPENDIX C: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR ON WMDE AND BAUXITE TRANSPORT CORRIDOR AREAS NEAR BODDINGTON

Note: * denotes introduced species; T denotes threatened flora and P1-P4 denote priority flora species (DBCA 2018a). SCC = State conservation code; FCC = Federal conservation code; E = Endangered, V = Vulnerable (EPBC Act).

Family	Species	SCC	FCC	Nature Map	EPBC
Pteridaceae	*Cheilanthes austrotenuifolia*			x	
Dennstaedtiaceae	*Pteridium esculentum* subsp. *esculentum*			x	
Zamiaceae	*Macrozamia riedlei*			x	
Pinaceae	* *Pinus radiata*				x
Poaceae	* *Aira caryophyllea*			x	
	Austrostipa flavescens			x	
	Austrostipa variabilis			x	
	Austrostipa sp. Marchagee (B.R. Maslin 1407)			x	
	Austrostipa sp.			x	
	* *Briza minor*			x	
	* *Cortaderia selloana* subsp. *selloana*			x	
	* *Digitaria sanguinalis*			x	
	Neurachne alopecuroidea			x	
	Poa drummondiana			x	
	Poa homomalla			x	
	Poa porphyroclados			x	
	Rytidosperma caespitosum			x	
	Rytidosperma setaceum			x	
	Tetrarrhena laevis			x	
	Themeda triandra			x	
Cyperaceae	*Baumea juncea*			x	
	Carex fascicularis			x	
	Chorizandra enodis			x	
	Cyathochaeta avenacea			x	
	Eleocharis acuta			x	
	Eleocharis keigheryi	T	V	x	x
	Gahnia aristata			x	
	Isolepis producta			x	
	Lepidosperma apricola			x	
	Lepidosperma asperatum			x	
	Lepidosperma leptostachyum			x	
	Lepidosperma pruinosum			x	
	Lepidosperma pubisquameum			x	
	Lepidosperma squamatum			x	
	Lepidosperma sp.			x	
	Mesomelaena tetragona			x	
	Schoenus armeria			x	
	Schoenus bifidus			x	
	Tetraria octandra			x	
	Tetraria sp. Jarrah Forest (R. Davis 7391)			x	
Restionaceae	*Chaetanthus leptocarpoides*			x	
	Chordifex stenandrus			x	
	Desmocladus asper			x	

APPENDIX C: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR ON WMDE AND BAUXITE TRANSPORT CORRIDOR AREAS NEAR BODDINGTON

Note: * denotes introduced species; T denotes threatened flora and P1-P4 denote priority flora species (DBCA 2018a). SCC = State conservation code; FCC = Federal conservation code; E = Endangered, V = Vulnerable (EPBC Act).

Family	Species	SCC	FCC	Nature Map	EPBC
Restionaceae (cont.)	*Desmocladus fasciculatus*			x	
	Desmocladus flexuosus			x	
	Hypolaena exsulca			x	
	Leptocarpus laxus			x	
	Leptocarpus tenax			x	
	Lepyrodia glauca			x	
	Loxocarya striata			x	
Centrolepidaceae	*Centrolepis aristata*			x	
	Centrolepis glabra			x	
Hydatellaceae	*Trithuria bibracteata*			x	
Juncaceae	* *Juncus acutus* subsp. *acutus*			x	
Asparagaceae	* *Asparagus asparagoides*				x
	Chamaescilla corymbosa			x	
	Chamaescilla corymbosa var. *corymbosa*			x	
	Dichopogon capillipes			x	
	Laxmannia squarrosa			x	
	Lomandra brittanii			x	
	Lomandra caespitosa			x	
	Lomandra micrantha			x	
	Lomandra micrantha subsp. *micrantha*			x	
	Lomandra preissii			x	
	Lomandra purpurea			x	
	Lomandra sericea			x	
	Lomandra spartea			x	
	Lomandra suaveolens			x	
	Lomandra sp.			x	
	Sowerbaea laxiflora			x	
	Thysanotus manglesianus			x	
	Thysanotus patersonii			x	
	Thysanotus sparteus			x	
	Thysanotus tenellus			x	
	Thysanotus thyrsoideus			x	
	Thysanotus sp.			x	
Xanthorrhoeaceae	*Xanthorrhoea preissii*			x	
Colchicaceae	*Burchardia monantha*			x	
	Burchardia multiflora			x	
	Wurmbea dioica subsp. *alba*			x	
	Wurmbea tenella			x	
Boryaceae	*Borya scirpoidea*			x	
	Borya sphaerocephala			x	
Hemerocallidaceae	*Agrostocrinum hirsutum*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Hemerocallidaceae (cont.)	*Caesia micrantha*			x	
	Dianella revoluta			x	
	Dianella revoluta var. *divaricata*			x	
	Tricoryne elatior			x	
	Tricoryne humilis			x	
Haemodoraceae	*Anigozanthos bicolor*			x	
	Anigozanthos manglesii subsp. *manglesii*			x	
	Conostylis aculeata subsp. *aculeata*			x	
	Conostylis caricina subsp. *caricina*			x	
	Conostylis pusilla			x	
	Conostylis setigera			x	
	Conostylis setigera subsp. *setigera*			x	
	Haemodorum laxum			x	
	Haemodorum paniculatum			x	
	Haemodorum simplex			x	
	Tribonanthes longipetala			x	
Amaryllidaceae	* *Leucojum aestivum*			x	
	* *Narcissus tazetta* subsp. *aureus*			x	
	* *Narcissus tazetta* subsp. *tazetta*			x	
Hypoxidaceae	*Pauridia gardneri*			x	
	Pauridia occidentalis var. *occidentalis*			x	
Iridaceae	* *Gladiolus tristis*			x	
	Patersonia juncea			x	
	Patersonia occidentalis			x	
	Patersonia pygmaea			x	
	Patersonia rudis			x	
Orchidaceae	*Caladenia dorrienii*	T	E	x	
	Caladenia falcata			x	
	Caladenia flava			x	
	Caladenia flava subsp. *flava*			x	
	Caladenia fluvialis			x	
	Caladenia hopperiana	T	E	x	x
	Caladenia longicauda			x	
	Caladenia longicauda subsp. *eminens*			x	
	Caladenia nana subsp. *nana*			x	
	Caladenia polychroma			x	
	Caladenia reptans subsp. *reptans*			x	
	Caladenia sp.			x	
	Cyanicula gemmata			x	
	Cyanicula sericea			x	
	Cyrtostylis huegelii			x	
	Diuris decrementa			x	
	Diuris longifolia			x	
	Diuris micrantha	T	V		x

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Orchidaceae (cont.)	*Diuris porrifolia*			x	
	Diuris purdiei	T	E		x
	Elythranthera brunonis			x	
	Elythranthera emarginata			x	
	Eriochilus dilatatus subsp. *multiflorus*			x	
	Eriochilus scaber subsp. *scaber*			x	
	Microtis orbicularis			x	
	Prasophyllum fimbria			x	
	Prasophyllum hians			x	
	Pterostylis barbata			x	
	Pterostylis concava			x	
	Pterostylis glebosa			x	
	Pterostylis recurva			x	
	Pterostylis vittata			x	
	Pterostylis sp. crinkled leaf (G.J. Keighery 13426)			x	
	Pterostylis sp.			x	
	Pyrorchis nigricans			x	
	Thelymitra antennifera			x	
	Thelymitra crinita			x	
Casuarinaceae	*Allocasuarina fraseriana*			x	
	Allocasuarina huegeliana			x	
	Allocasuarina humilis			x	
	Allocasuarina microstachya			x	
Proteaceae	*Adenanthos cygnorum* subsp. *cygnorum*			x	
	Banksia bipinnatifida subsp. *bipinnatifida*			x	
	Banksia dallanneyi subsp. *sylvestris*			x	
	Banksia dallanneyi var. *dallanneyi*			x	
	Banksia fraseri var. *fraseri*			x	
	Banksia grandis			x	
	Banksia littoralis			x	
	Banksia nivea subsp. *nivea*			x	
	Banksia sessilis var. *sessilis*			x	
	Banksia sphaerocarpa			x	
	Banksia sphaerocarpa var. *sphaerocarpa*			x	
	Banksia squarrosa subsp. *squarrosa*			x	
	Banksia subpinnatifida var. *imberbis*	P3		x	
	Banksia subpinnatifida var. *subpinnatifida*	P2		x	
	Banksia undata var. *splendens*			x	
	Conospermum amoenum subsp. *amoenum*			x	
	Conospermum caeruleum			x	
	Conospermum filifolium subsp. *filifolium*			x	
	Grevillea bipinnatifida subsp. *bipinnatifida*			x	
	Grevillea cirsiifolia			x	
	Grevillea monticola			x	
	Grevillea quercifolia			x	
	Grevillea tenuiflora			x	
	Grevillea trifida			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Proteaceae (cont.)	*Hakea gilbertii*			x	
	Hakea incrassata			x	
	Hakea lissocarpha			x	
	Hakea petiolaris subsp. *petiolaris*			x	
	Hakea prostrata			x	
	Hakea ruscifolia			x	
	Hakea trifurcata			x	
	Hakea undulata			x	
	Hakea varia			x	
	Isopogon crithmifolius			x	
	Isopogon sp. Canning Reservoir (M.D. Tindale 121 &	P1		x	
	Isopogon teretifolius			x	
	Persoonia longifolia			x	
	Persoonia quinquenervis			x	
	Petrophile antecedens			x	
	Petrophile heterophylla			x	
	Petrophile imbricata			x	
	Petrophile seminuda			x	
	Petrophile serruriae			x	
	Petrophile squamata subsp. *squamata*			x	
	Petrophile striata			x	
	Stirlingia simplex			x	
	Synaphea cuneata			x	
	Synaphea damopsis			x	
	Synaphea decorticans			x	
	Synaphea gracillima			x	
	Synaphea obtusata			x	
	Synaphea panhesya	P1		x	
	Xylomelum occidentale			x	
Santalaceae	*Leptomeria cunninghamii*			x	
Olacaceae	*Olax benthamiana*			x	
Apodanthaceae	*Pilostyles hamiltonii*			x	
Polygonaceae	*Persicaria prostrata*			x	
Chenopodiaceae	* *Atriplex prostrata*			x	
	* *Chenopodium glaucum*			x	
Amaranthaceae	*Ptilotus declinatus*			x	
	Ptilotus drummondii var. *drummondii*			x	
	Ptilotus gaudichaudii			x	
	Ptilotus manglesii			x	
	Ptilotus sp. Beaufort River (G.J. Keighery 16554)			x	
Caryophyllaceae	* *Cerastium glomeratum*			x	

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Ranunculaceae	*Clematis pubescens*			x	
	Ranunculus colonorum			x	
Lauraceae	*Cassytha glabella* forma *glabella*			x	
Resedaceae	* *Reseda luteola*			x	
Droseraceae	*Drosera barbigera*			x	
	Drosera bulbosa			x	
	Drosera bulbosa subsp. *bulbosa*			x	
	Drosera erythrorhiza			x	
	Drosera gigantea			x	
	Drosera hyperostigma			x	
	Drosera macrantha			x	
	Drosera menziesii			x	
	Drosera pallida			x	
	Drosera platystigma			x	
	Drosera subhirtella			x	
Pittosporaceae	*Billardiera fusiformis*			x	
	Billardiera variifolia			x	
	Marianthus bicolor			x	
	Marianthus drummondianus			x	
Byblidaceae	*Byblis gigantea*	P3		x	
Rosaceae	*Acaena echinata*			x	
	* *Rubus fruticosus*				x
Fabaceae	*Acacia alata* var. *platyptera*	P4		x	
	Acacia barbinervis subsp. *barbinervis*			x	
	Acacia browniana var. *endlicheri*			x	
	Acacia celastrifolia			x	
	Acacia dentifera			x	
	Acacia drummondii subsp. *candolleana*			x	
	Acacia drummondii subsp. *drummondii*			x	
	Acacia extensa			x	
	Acacia gemina			x	
	Acacia gilbertii			x	
	Acacia incurva			x	
	Acacia insolita subsp. *insolita*			x	
	Acacia leptospermoides subsp. *leptospermoides*			x	
	Acacia microbotrya			x	
	Acacia nervosa			x	
	Acacia preissiana			x	
	Acacia pulchella			x	
	Acacia pulchella var. *glaberrima*			x	
	Acacia pulchella var. *pulchella*			x	
	Acacia pycnocephala			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Fabaceae (cont.)	*Acacia saligna*			x	
	Acacia saligna subsp. *lindleyi*			x	
	Acacia saligna subsp. *stolonifera*			x	
	Acacia spathulifolia			x	
	Acacia stenoptera			x	
	Acacia varia var. *crassinervis*			x	
	Bossiaea angustifolia			x	
	Bossiaea disticha			x	
	Bossiaea ornata			x	
	Chorizema aciculare subsp. *laxum*			x	
	Chorizema dicksonii			x	
	Daviesia cordata			x	
	Daviesia costata			x	
	Daviesia decurrens subsp. *decurrens*			x	
	Daviesia hakeoides subsp. *subnuda*			x	
	Daviesia incrassata			x	
	Daviesia incrassata subsp. *incrassata*			x	
	Daviesia longifolia			x	
	Daviesia preissii			x	
	Daviesia rhombifolia			x	
	Dillwynia laxiflora			x	
	Gastrolobium asperum			x	
	Gastrolobium bilobum			x	
	Gastrolobium calycinum			x	
	Gastrolobium glabratum			x	
	Gastrolobium hookeri			x	
	Gastrolobium parviflorum			x	
	Gastrolobium spinosum			x	
	Gastrolobium sp. Prostrate Boddington (M. Hislop 21	P1		x	
	* *Genista monspessulana*				x
	Gompholobium burtonioides			x	
	Gompholobium confertum			x	
	Gompholobium cyaninum			x	
	Gompholobium marginatum			x	
	Gompholobium polymorphum			x	
	Gompholobium preissii			x	
	Hovea chorizemifolia			x	
	Hovea trisperma			x	
	Isotropis cuneifolia			x	
	Isotropis cuneifolia subsp. *cuneifolia*			x	
	Jacksonia alata			x	
	Jacksonia furcellata			x	
	Kennedia coccinea			x	
	Kennedia prostrata			x	
	Labichea punctata			x	
	Mirbelia dilatata			x	
	Mirbelia floribunda			x	
	Phyllota gracilis			x	
	Pultenaea ericifolia			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Fabaceae (cont.)	*Pultenaea pauciflora*	T	V	x	x
	Pultenaea reticulata			x	
	Sphaerolobium medium			x	
	Templetonia drummondii			x	
	Viminaria juncea			x	
Geraniaceae	*Geranium solanderi*			x	
	Pelargonium littorale			x	
Oxalidaceae	*Oxalis exilis*			x	
Linaceae	*Linum marginale*			x	
Rutaceae	*Boronia busselliana*			x	
	Boronia crenulata			x	
	Boronia crenulata var. *crenulata*			x	
	Boronia fastigiata			x	
	Boronia ovata			x	
	Boronia ramosa subsp. *anethifolia*			x	
	Boronia tenuis	P4		x	
Polygalaceae	*Comesperma virgatum*			x	
	Comesperma volubile			x	
Phyllanthaceae	*Phyllanthus calycinus*			x	
	Poranthera huegelii			x	
	Poranthera microphylla			x	
Celastraceae	*Stackhousia pubescens*			x	
	Stackhousia scoparia			x	
	Tripterococcus brunonis			x	
Sapindaceae	*Dodonaea ceratocarpa*			x	
Rhamnaceae	*Cryptandra arbutiflora* var. *arbutiflora*			x	
	Cryptandra nutans			x	
	Papistylus intropubens	P1		x	
	Stenanthemum coronatum			x	
	Stenanthemum nanum			x	
	Stenanthemum pumilum subsp. *majus*			x	
	Trymalium angustifolium			x	
	Trymalium ledifolium var. *rosmarinifolium*			x	
	Trymalium odoratissimum subsp. *odoratissimum*			x	
	Trymalium odoratissimum subsp. *trifidum*			x	
Elaeocarpaceae	*Platytheca galioides*			x	
	Tetratheca hirsuta			x	
	Tetratheca hirsuta subsp. *hirsuta*			x	
	Tetratheca hirsuta subsp. *viminea*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Elaeocarpaceae (cont.)	*Tetratheca setigera*			x	
	Tetratheca virgata			x	
Malvaceae	*Lasiopetalum cardiophyllum*	P4		x	
	Lasiopetalum floribundum			x	
	Lasiopetalum glutinosum subsp. *latifolium*			x	
	Lasiopetalum pterocarpum	T	E		x
	Thomasia foliosa			x	
Dilleniaceae	*Hibbertia acerosa*			x	
	Hibbertia amplexicaulis			x	
	Hibbertia commutata			x	
	Hibbertia diamesogenos			x	
	Hibbertia glomerata subsp. *darlingensis*			x	
	Hibbertia hypericoides subsp. *hypericoides*			x	
	Hibbertia microphylla			x	
	Hibbertia quadricolor			x	
	Hibbertia serrata			x	
	Hibbertia spicata			x	
	Hibbertia stellaris			x	
	Hibbertia sp.			x	
Tamaricaceae	* *Tamarix aphylla*				x
Violaceae	*Hybanthus floribundus* subsp. *floribundus*			x	
Thymelaeaceae	*Pimelea argentea*			x	
	Pimelea ciliata subsp. *ciliata*			x	
	Pimelea imbricata var. *piligera*			x	
	Pimelea preissii			x	
Myrtaceae	*Babingtonia camphorosmae*			x	
	Beaufortia macrostemon			x	
	Calothamnus planifolius var. *planifolius*			x	
	Calothamnus quadrifidus subsp. *quadrifidus*			x	
	Calothamnus quadrifidus subsp. *teretifolius*	P4		x	
	Calothamnus sanguineus			x	
	Calytrix simplex subsp. *simplex*	P1		x	
	Calytrix simplex subsp. *suboppositifolia*			x	
	Corymbia calophylla			x	
	Darwinia citriodora			x	
	Darwinia pimelioides	P4		x	
	Darwinia thymoides			x	
	Eucalyptus aspersa			x	
	Eucalyptus decurva			x	
	Eucalyptus drummondii			x	
	Eucalyptus latens			x	
	Eucalyptus marginata			x	
	Eucalyptus patens			x	

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Myrtaceae (cont.)	*Eucalyptus rudis*			x	
	Eucalyptus rudis subsp. *rudis*			x	
	Eucalyptus wandoo subsp. *wandoo*			x	
	Hypocalymma angustifolium			x	
	Kunzea preissiana			x	
	Kunzea recurva			x	
	Leptospermum erubescens			x	
	Melaleuca incana subsp. *incana*			x	
	Melaleuca lecanantha			x	
	Melaleuca tuberculata var. *tuberculata*			x	
	Rinzia fumana			x	
	Taxandria linearifolia			x	
	Verticordia densiflora var. *cespitosa*			x	
	Verticordia huegelii var. *decumbens*			x	
	Verticordia picta			x	
	Verticordia plumosa var. *brachyphylla*			x	
	Verticordia serrata var. *serrata*			x	
Haloragaceae	*Glischrocaryon aureum*			x	
	Gonocarpus cordiger			x	
	Meionectes tenuifolia	P3		x	
Araliaceae	*Hydrocotyle diantha*			x	
	Trachymene pilosa			x	
Apiaceae	*Daucus glochidiatus*			x	
	Pentapeltis peltigera			x	
	Platysace juncea			x	
	Xanthosia atkinsoniana			x	
	Xanthosia candida			x	
	Xanthosia huegelii			x	
	Xanthosia singuliflora			x	
Ericaceae	*Andersonia latiflora*			x	
	Astroloma acervatum			x	
	Astroloma ciliatum			x	
	Astroloma compactum			x	
	Astroloma epacridis			x	
	Astroloma glaucescens			x	
	Astroloma pallidum			x	
	Astroloma serratifolium			x	
	Astroloma sp. Narrogin (R.D. Royce 8158)			x	
	Leucopogon capitellatus			x	
	Leucopogon cordatus			x	
	Leucopogon glabellus			x	
	Leucopogon nutans			x	
	Leucopogon obtusatus			x	
	Leucopogon propinquus			x	
	Leucopogon pubescens			x	

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Ericaceae (cont.)	*Leucopogon pulchellus*			x	
	Leucopogon sp. Boddington (D. Halford 80746)			x	
	Leucopogon verticillatus			x	
	Lysinema pentapetalum			x	
	Styphelia tenuiflora			x	
Primulaceae	* *Lysimachia arvensis*			x	
	Samolus junceus			x	
Loganiaceae	*Logania sylvicola*	P2		x	
Gentianaceae	*Schenkia australis*			x	
Menyanthaceae	*Ornduffia albiflora*			x	
Boraginaceae	*Halgania cyanea*			x	
Lamiaceae	*Hemiandra pungens*			x	
	Hemigenia argentea			x	
	Hemigenia humilis			x	
	Hemigenia pritzelii			x	
	Hemigenia viscida			x	
	Hemigenia wandooana			x	
Solanaceae	*Anthocercis gracilis*	T	V		x
Lentibulariaceae	*Utricularia multifida*			x	
Plantaginaceae	*Plantago exilis*			x	
Rubiaceae	* *Galium divaricatum*			x	
	* *Galium tricornutum*			x	
	Opercularia apiciflora			x	
	Opercularia echinocephala			x	
	Opercularia hispidula			x	
	Opercularia vaginata			x	
Caprifoliaceae	* *Centranthus ruber* subsp. *ruber*			x	
Campanulaceae	*Lobelia heterophylla*			x	
	* *Monopsis debilis* var. *depressa*			x	
Goodeniaceae	*Dampiera alata*			x	
	Dampiera lavandulacea			x	
	Dampiera linearis			x	
	Goodenia coerulea			x	
	Goodenia convexa			x	
	Goodenia katabudjar	P3		x	
	Goodenia pusilla			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Goodeniaceae (cont.)	*Lechenaultia biloba*			x	
	Scaevola calliptera			x	
	Scaevola glandulifera			x	
	Scaevola platyphylla			x	
Stylidiaceae	*Levenhookia pusilla*			x	
	Stylidium affine			x	
	Stylidium amoenum			x	
	Stylidium androsaceum			x	
	Stylidium brunonianum			x	
	Stylidium caricifolium			x	
	Stylidium carnosum			x	
	Stylidium ciliatum			x	
	Stylidium crassifolium			x	
	Stylidium junceum			x	
	Stylidium lateriticola			x	
	Stylidium lineatum			x	
	Stylidium marradongense	P3		x	
	Stylidium paulineae			x	
	Stylidium petiolare			x	
	Stylidium uniflorum subsp. *uniflorum*			x	
	Stylidium sp. Boulder Rock (A.H. Burbidge 2536)			x	
Asteraceae	*Asteridea gracilis*	P3		x	
	Asteridea pulverulenta			x	
	* *Chrysanthemoides monilifera*				x
	* *Chrysanthemoides monilifera* subsp. *monilifera*			x	x
	* *Conyza sumatrensis*			x	
	Craspedia variabilis			x	
	* *Crepis foetida* subsp. *foetida*			x	
	Gnephosis drummondii			x	
	* *Hypochaeris glabra*			x	
	* *Hypochaeris radicata*			x	
	Lagenophora huegelii			x	
	Millotia tenuifolia			x	
	Myriocephalus occidentalis			x	
	Olearia paucidentata			x	
	Podotheca angustifolia			x	
	Pseudognaphalium luteoalbum			x	
	Pterochaeta paniculata			x	
	Rhodanthe manglesii			x	
	Senecio glossanthus			x	
	Senecio leucoglossus	P4		x	
	Senecio multicaulis subsp. *multicaulis*			x	
	Senecio multicaulis subsp. *stirlingensis*			x	
	Senecio pinnatifolius var. *pinnatifolius*			x	
	Trichocline spathulata			x	
	Waitzia suaveolens var. *suaveolens*			x	

APPENDIX D: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR ON WMDE AND BAUXITE TRANSPORT CORRIDOR AREAS

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Species	Family	SCC	FCC	Description and Habitat		Likelihood of Occurrence
Acacia brachypoda	Fabaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Dense, rounded, slightly aromatic shrub, 1-3 m high, 1-4 m wide Yellow May to Jul Sandy clay or loam. Low-lying seasonal swampy areas AVW 9	Low
Anthocercis gracilis	Solanaceae	T	Vulnerable	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect, spindly shrub, to 0.6(-1) meters high Yellow-green Sep to Oct Sandy or loamy soils. Granite outcrops AVW, JAF 29	Medium
Caladenia dorrienii	Orchidaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Tuberous, perennial, herb, 0.1-0.2 m high white- -cream-yellow Sep to Nov Clayey loam, Moist sites adjacent to rivers and seasonal creeks AVW, JAF 16	Medium
Caladenia hopperiana	Orchidaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect herb Cream Oct Low lying, winter wet impassable swampland JAF 4	High
Diuris micrantha	Orchidaceae	T	Vulnerable	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Tuberous, perennial, herb, 0.3-0.6 meters high yellow & brown Sep to Oct Brown loamy clay. Winter-wet swamps, in shallow water JAF,SWA 6	Low
Diuris purdiei	Orchidaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Tuberous, perennial, herb, 0.15-0.35 meters high Yellow Sep to Oct Grey-black sand, moist. Winter-wet swamps. JAF, SWA 23	Low

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Species	Family	SCC	FCC	Description and Habitat		Likelihood of Occurrence
Eleocharis keigheryi	Cyperaceae	T	Vulnerable	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 meters high Green Aug to Nov Clay, sandy loam. Emergent in freshwater: creeks, clay pans AVW, GES, JAF, SWA 54	Low
Grevillea thelemanniana	Proteaceae	T	Critically Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Spreading, lignotuberous shrub, 0.3-1.5 meters high Pink/red May to Nov Sand, sandy clay. Winter-wet low-lying flats JAF, SWA 37	Low
Lasiopetalum pterocarpum	Malvaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Open, multi-stemmed shrub (with distinctly winged fruit), to 1.2 meters high Pink Aug to Dec Dark red-brown loam or clayey sand over granite. On sloping banks near creeklines JAF 11	Low
Lechenaultia laricina	Goodeniaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Diffuse, ascending shrub, 0.15-0.7 m high Red/red-orange Sep to Dec or Jan Sand, gravelly loam AVW, JAF, MAL 20	Low
Pultenaea pauciflora	Fabaceae	T	Vulnerable	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Dense, much-branched shrub, to 0.8 m high Yellow Oct to Nov Sandy & clay lateritic soils. Undulating country AVW, JAF 50	Medium

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Species	Family	SCC	FCC	Description and Habitat		Likelihood of Occurrence
Tetraria australiensis	Cyperaceae	T	Vulnerable	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Rhizomatous, tufted perennial, grass-like or herb (sedge), to 1 meters high Brown Nov to Dec Sandy clay or loam. Low-lying seasonal swampy areas JAF, SWA 34	Low
Thelymitra stellata	Orchidaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Tuberous, perennial, herb, 0.15-0.25 meters high. Yellow and brown Oct to Nov Sand, gravel, lateritic loam. GES, JAF, SWA 20	Medium
Tribonanthes purpurea	Haemodoraceae	T	Vulnerable	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Dense, rounded, slightly aromatic shrub, 1-3 meters high, 1-4 m wide Yellow May to Jul Sandy clay or loam. Low-lying seasonal swampy areas AVW, ESP, JAF, MAL 21	Low
Verticordia fimbrilepis subsp. *fimbrilepis*	Myrtaceae	T	Endangered	Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Shrub, 0.3-0.7 meters high. Pink white Oct to Dec or Jan Gravelly sandy or clayey soils. Flats, road verges AVW, JAF 39	Medium
Andersonia sp. Saxatilis (F. & J. Hort 3324)	Ericaceae	P1		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect, single stemmed shrub 15-60 cm high Pink white Sep, Oct Slope. Outcrop. Moist/dry brown sand/loam. Sheet/boulder JAF 6	Medium
Calytrix simplex subsp. *simplex*	Myrtaceae	P1		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Shrub, ca 0.2 meters high Purple Oct to Nov Flat and slope on laterite on red-brown gravelly loam , well drained. AVW, JAF 5	High

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Species	Family	SCC	FCC	Description and Habitat		Likelihood of Occurrence
Gastrolobium sp. Prostrate Boddington (M. Hislop 2130)	Fabaceae	P1		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Prostrate, mat-like shrub, to 0.05 meters high Yellow/red Oct Littered brown loam, clay, laterite. Lower slopes and rises, valley bottoms JAF 5	High
Hemigenia rigida	Lamiaceae	P1		Habit: Flower colour: Flower period: Soils: IBRA Distribution: Florabase records:	Upright or spreading shrub, 0.1-0.6(-1) meter s high. blue-purple/violet Aug to Dec or Jan Sandy soils, lateritic gravelly soils. Hillslopes, granite outcrops, flats, ironstone ridges AVW 4	High
Isopogon sp. Canning Reservoir (M.D. Tindale 121 & B.R. Maslin)	Proteaceae	P1		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect, spreading, single-stemmed shrub, to 1.2 m high cream-pink Jun Brown, yellow or grey sand over laterite. Flats and low plains JAF 7	High
Papistylus intropubens	Rhamnaceae	P1		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect, slender shrub, to 0.5 m high - - - JAF 1	Low
Synaphea panhesya	Proteaceae	P1		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect shrub, 0.3-0.6 m high yellow Aug to Sep Gravelly loam & sandy gravel JAF, SWA 15	Medium
Banksia subpinnatifida var. *imberbis*	Proteaceae	P3		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect or straggling, non-lignotuberous shrub, 0.3-1.5 m high yellow Sep to Oct Laterite AVW, JAF 16	High

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Species	Family	SCC	FCC	Description and Habitat		Likelihood of Occurrence
Banksia subpinnatifida var. *subpinnatifida*	Proteaceae	P2		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect or straggling, non-lignotuberous shrub, 0.3-1.5 m high yellow Sep to Oct Gravelly loam AVW, JAF 21	High
Bossiaea modesta	Fabaceae	P2		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Slender, trailing & twining shrub yellow & red Oct to Dec Soils derived from granite. Damp areas close to stream JAF, SWA 21	Low
Darwinia sp. Westdale (F. Hort 864)	Myrtaceae	P2		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Decumbent to prostrate shrub, 0.5-1.2 m high red Dec Dry lateritic soils. High on steep slopes JAF 2	Medium
Grevillea crowleyae	Proteaceae	P2		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Dense & spreading shrub, 0.5-1.5 m high - Aug to Nov Gravel JAF 9	Medium
Haloragis aculeolata	Haloragaceae	P2		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Slender, erect perennial, herb, to 0.4 m high green Sep or Dec Black sand or clay over limestone. Winter-wet areas JAF, SWA 6	Low
Logania sylvicola	Loganiaceae	P2		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	shrub to 0.3 m high, 0.4 m wide white-cream Aug, Sep silty loam, gravelly clay, clayey sand. Low-mid slopes, flats, winter-wet areas JAF 7	Low

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Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Synaphea boyaginensis	Proteaceae	P2		Habit: Shrub, to 0.25 m high Flower colour: yellow Flowering period: Sep to Oct Soils: Gravelly clay-loam IBRA Distribution: AVW, JAF, MAL Florabase records: 22	Medium
Acacia adjutrices	Fabaceae	P3		Habit: Sub-shrub 0.3-0.7 m high Flower colour: yellow/golden Flowering period: Jul to Aug Soils: Loam, clay on laterite hills, sandplains IBRA Distribution: AVW, JAF Florabase records: 23	Medium
Acacia horridula	Fabaceae	P3		Habit: Harsh, slender, single-stemmed shrub, 0.3-0.6(-1) m high Flower colour: yellow Flowering period: May to Aug Soils: Gravelly soils over granite, sand. Rocky hillsides IBRA Distribution: JAF, SWA Florabase records: 32	High
Asteridea gracilis	Asteraceae	P3		Habit: Annual, herb, 0.15-0.35 m high Flower colour: white-pink Flowering period: Sep to Dec Soils: Sand, clay, gravelly soils IBRA Distribution: ESP, JAF, SWA Florabase records: 11	Medium
Banksia meganotia	Proteaceae	P3		Habit: Straggly or erect, prickly, lignotuberous shrub, 0.3-1 m high Flower colour: yellow Flowering period: Oct Soils: Sand, sandy loam or clay loam over laterite IBRA Distribution: AVW, MAL Florabase records: 37	Medium
Byblis gigantea	Byblidaceae	P3		Habit: Small, branched perennial, herb (or sub-shrub), to 0.45 m high Flower colour: pink-purple/white Flowering period: Sep to Dec or Jan Soils: Sandy-peat swamps. Seasonally wet areas IBRA Distribution: JAF, SWA Florabase records: 40	Low

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Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Chordifex gracilior	Restionaceae	P3		Habit: Rhizomatous, erect perennial, herb, 0.3-0.5 m high Flower colour: brown Flowering period: Sep to Dec Soils: Peaty sand. Swamps IBRA Distribution: JAF, SWA, WAR Florabase records: 31	Low
Conospermum scaposum	Proteaceae	P3		Habit: Erect shrub, 0.2-0.45(-0.75) m high Flower colour: blue Flowering period: Oct to Dec or Jan to Feb Soils: White-grey sand, sandy clay. Low swampy areas, road verges IBRA Distribution: AVW, GES, JAF, SWA Florabase records: 43	Medium
Goodenia katabudjar	Goodeniaceae	P3		Habit: Shrub (subshrub), 0.1-0.2 m high Flower colour: blue-pink/white Flowering period: Dec Soils: Sandy gravel. Upland areas of open wandoo woodland IBRA Distribution: JAF Florabase records: 11	High
Grevillea manglesii subsp. *dissectifolia*	Proteaceae	P3		Habit: Spreading, virgate shrub, 1.5-3(-5) m high, up to 3 m wide Flower colour: white & red & brown Flowering period: Jun or Sep or Nov Soils: Gravelly loam, moist. Roadsides IBRA Distribution: JAF Florabase records: 27	High
Hakea oldfieldii	Proteaceae	P3		Habit: Open, straggling shrub, up to 2.5 m high Flower colour: white-cream/yellow Flowering period: Aug to Oct Soils: Red clay or sand over laterite. Seasonally wet flats IBRA Distribution: AVW, ESP, JAF, MAL, SWA Florabase records: 57	Low
Halgania corymbosa	Boraginaceae	P3		Habit: Erect shrub, 0.35-1 m high Flower colour: blue-purple Flowering period: Aug to Nov Soils: Gravelly soils, soils over granite IBRA Distribution: JAF, SWA Florabase records: 18	High

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Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Hemigenia microphylla	Lamiaceae	P3		Habit: Slender shrub, 0.4-1.8 m high Flower colour: blue-purple Flowering period: Sep to Dec Soils: Sandy clay, peaty clay, granite. Winter-wet depressions IBRA Distribution: JAF, SWA, WAR Florabase records: 25	Medium
Hibbertia glomerata subsp. *wandoo*	Dilleniaceae	P3		Habit: Erect, much-branched shrub, to 0.6 m high Flower colour: yellow Flowering period: Feb or Apr or Aug or Oct Soils: Lateritic soils IBRA Distribution: AVW, JAF Florabase records: 17	Medium
Lasiopetalum caroliae	Malvaceae	P3		Habit: Procumbent, sprawling subshrub, 0.08–0.4 m high, 0.15–0.2 m wide Flower colour: pale to bright mauve-pink & dark red Flowering period: Sep to Nov Soils: yellow-brown, sandy loam and lateritic gravel soils, mid-slope IBRA Distribution: JAF, SWA Florabase records: 17	Medium
Leucopogon florulentus	Ericaceae	P3		Habit: Erect slender shrub, 0.3-0.8 m high Flower colour: white Flowering period: Jun to Nov Soils: White/grey or yellow sand, sandy clay, gravelly lateritic soils. Sandplains, gentle slopes IBRA Distribution: AVW, ESP, MAL Florabase records: 31	Medium
Meionectes tenuifolia	Haloragaceae	P3		Habit: Erect or prostrate annual, herb, 0.05-0.5 m high Flower colour: brown-red period: Sep or Nov to Dec Soils: Grey sand, clay. Winter wet flats IBRA Distribution: JAF, SWA Florabase records: 24	Low
Stylidium marradongense	Stylidiaceae	P3		Habit: Erect perennial, herb, 0.15-0.5 m high Flower colour: white/pink Flowering period: Sep to Nov Soils: Sand over laterite. Jarrah-Marri forest IBRA Distribution: JAF Florabase records: 12	High

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Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Tetratheca similis	Elaeocarpaceae	P3		Habit: Spreading shrub, to 0.3 m high Flower colour: pink Flowering period: Aug to Sep Soils: Sandy clay with lateritic boulders IBRA Distribution: AVW, JAF Florabase records: 20	Medium
Thysanotus anceps	Asparagaceae	P3		Habit: Rhizomatous, leafless perennial, herb, to 0.4 m high Flower colour: purple Flowering period: Oct to Dec Soils: White or grey sand, lateritic gravel, laterite IBRA Distribution: GES, JAF, SWA Florabase records: 17	Medium
Acacia alata var. *platyptera*	Fabaceae	P4		Habit: Dense shrub, 0.5-1 m high Flower colour: yellow Flowering period: Jun to Aug Soils: Clay, gravelly sandy clay. Lateritic ridges, clay flats. IBRA Distribution: AVW, JAF, SWA Florabase records: 31	Medium
Acacia cuneifolia	Fabaceae	P4		Habit: Erect or straggly shrub, 1-3 m high Flower colour: yellow Flowering period: Jul to Oct Soils: Sand, clay or loam over granite. Granite outcrops & hills, rocky watercourses IBRA Distribution: AVW, JAF Florabase records: 40	High
Acacia oncinophylla subsp. *patulifolia*	Fabaceae	P4		Habit: Shrub, 0.5-2.5(-3) m high, 'minni-ritchi' bark, phyllodes 4-9 cm long, 3-6 mm wide Flower colour: yellow Flowering period: Aug to Nov or Nov to Dec Soils: Granitic soils, occasionally on laterite IBRA Distribution: JAF, SWA Florabase records: 31	Medium
Banksia insulanemorecincta	Proteaceae	P4		Habit: Non-lignotuberous shrub, to 1 m high Flower colour: cream Flowering period: Jun to Sep Soils: Yellow sand, clay, gravel, laterite, granite. Open scrubby flat, slopes, low heath. IBRA Distribution: JAF Florabase records: 19	Medium

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Species	Family	SCC	FCC	Description and Habitat		Likelihood of Occurrence
Boronia tenuis	Rutaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Procumbent or erect & slender shrub, 0.1-0.5 m high blue/pink-white Aug to Nov Laterite, stony soils, granite JAF, SWA 43	Medium
Caladenia integra	Orchidaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Tuberous, perennial, herb, 0.2-0.5 m high green & red Sep to Oct Clayey loam. Granite outcrops, rocky slopes. AVW, ESP, GES, JAF, MAL 46	Medium
Caladenia speciosa	Orchidaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Tuberous, perennial, herb, 0.35-0.6 meters high White-pink September to October White, grey or black sand. Loam flat swampy terrain JAF, SWA 59	Low
Calothamnus graniticus subsp. *leptophyllus*	Myrtaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect, multi-stemmed shrub, 1-2 m high Red June to August Clay over granite, lateritic soils. Hillsides. JAF, SWA 27	Medium
Chorizema ulotropis	Fabaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Sprawling, open, semi-prostrate shrub, to 0.45 m high orange-yellow Jul to Sep Moist to dry soils, white sand with gravel, laterite, granite. Outcrops, winter damp to dry areas, flats. ESP, JAF, MAL 24	Medium
Darwinia pimelioides	Myrtaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect shrub, 0.25-0.5(-1) m high red/pink & green Sep to Oct Loam, sandy loam. Granite outcrops JAF, SWA 25	Medium

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Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Darwinia sp. Dryandra (G.J. Keighery 9295)	Myrtaceae	P4		Habit: Dense shrub, 0.1-0.45 m high Flower colour: white Flowering period: May or Jul or Nov Soils: Gravelly clay. Lateritic ridges. IBRA Distribution: AVW, JAF Florabase records: 16	Medium
Darwinia thymoides subsp. St Ronans (J.J. Alford & G.J. Keighery 64)	Myrtaceae	P4		Habit: Low shrub, 0.3-0.6 m high, 0.2-1 m wide Flower colour: Orange-red, red Flowering period: Oct to Dec or Jan Soils: sandy or gravelly clay-loam soils. Slopes and Flats. Granite outcrops. IBRA Distribution: AVW, JAF Florabase records: 21	High
Drosera occidentalis	Droseraceae	P4		Habit: Fibrous-rooted, rosetted perennial, herb, to 0.025 m high. Flower colour: White-pink Flowering period: October to December or January Soils: Swampy flats, grey clayey sand IBRA Distribution: JAF, SWA Florabase records: 19	Medium
Eucalyptus exilis	Myrtaceae	P4		Habit: (Whipstick mallee), 2-6 m high, bark smooth Flower colour: white Flowering period: Aug to Oct Soils: Grey sand, gravelly loam. Lateritic ridges. IBRA Distribution: AVW, GES, JAF Florabase records: 45	Medium
Gastrolobium ovalifolium	Fabaceae	P4		Habit: Prostrate, spreading shrub, to 0.1 m high Flower colour: orange & purple & yellow & red Flowering period: Aug to Sep Soils: Sandy clay. Gravelly hills. IBRA Distribution: AVW, JAF Florabase records: 26	Medium
Grevillea pimeleoides	Proteaceae	P4		Habit: Non-lignotuberous shrub, 0.4-2.4 m high Flower colour: yellow-orange Flowering period: May to Nov Soils: Gravelly soils over granite. Rocky hillsides. IBRA Distribution: JAF Florabase records: 36	Medium

APPENDIX D: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR ON WMDE AND BAUXITE TRANSPORT CORRIDOR AREAS

Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Hemigenia platyphylla	Lamiaceae	P4		Habit: Spreading shrub, 0.2-1.5 m high Flower colour: blue-purple Flowering period: Sep to Nov Soils: Sandy & loamy soils. Granite rocks, slopes. IBRA Distribution: AVW, ESP, JAF, MAL Florabase records: 19	Medium
Hibbertia montana	Dilleniaceae	P4		Habit: Erect, straggling or sprawling shrub, 0.1-0.7 m high Flower colour: yellow Flowering period: Jul to Oct Soils: Loam over granite, lateritic soils, gravel. Granite rocks, lateritic ridges & boulders, hills. IBRA Distribution: AVW, JAF, SWA Florabase records: 93	Medium
Hydrocotyle lemnoides	Araliaceae	P4		Habit: Aquatic, floating annual, herb Flower colour: purple Flowering period: Aug to Oct Soils: Swamps IBRA Distribution: AVW, GES, JAF, SWA Florabase records: 26	Low
Lasiopetalum cardiophyllum	Malvaceae	P4		Habit: Erect, multi-stemmed shrub, 0.2-0.5 m high Flower colour: pink Flowering period: Aug to Dec or Jan Soils: Lateritic gravelly soils, sandy clay. Flats, hillslopes IBRA Distribution: AVW, JAF Florabase records: 33	High
Lechenaultia pulvinaris	Goodeniaceae	P4		Habit: Hemispherical, procumbent shrub, 0.03-0.2 m high Flower colour: blue Flowering period: Oct to Dec Soils: White/grey sand. IBRA Distribution: AVW, JAF Florabase records: 35	Low
Microtis quadrata	Orchidaceae	P4		Habit: Herb to 0.4 m high Flower colour: cream/white-green Flowering period: Oct to Dec Soils: Sand, sandy clay-loam, peaty soil. Lower slope, flat, swamp IBRA Distribution: COO, ESP, JAF, SWA, WAR Florabase records: 8	Medium

APPENDIX D: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR ON WMDE AND BAUXITE TRANSPORT CORRIDOR AREAS

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Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Ornduffia submersa	Menyanthaceae	P4		Habit: Aquatic herb Flower colour: white Flowering period: Aug to Oct Soils: claypan, wet sandy clay. seasonally inundated wetland IBRA Distribution: AVW, ESP, JAF, SWA, WAR Florabase records: 60	Low
Pimelea rara	Thymelaeaceae	P4		Habit: Shrub, 0.2-0.35 m high Flower colour: White Flowering period: Dec or Jan Soils: Lateritic soils IBRA Distribution: JAF Florabase records: 52	Medium
Schoenus natans	Cyperaceae	P4		Habit: Aquatic annual, grass-like or herb (sedge), 0.3 m high Flower colour: brown Flowering period: Oct Soils: Winter-wet depressions IBRA Distribution: AVW, JAF, SWA, WAR Florabase records: 61	Low
Senecio leucoglossus	Asteraceae	P4		Habit: Erect annual, herb, to 1.3 meters high Flower colour: White Flowering period: August to December Soils: Gravelly lateritic or granitic soils. Granite outcrops, slopes IBRA Distribution: JAF, SWA, WAR Florabase records: 41	High
Stylidium leptocalyx	Stylidiaceae	P4		Habit: Rosetted perennial, herb, 0.08-0.4 m high Flower colour: pink Flowering period: Oct to Nov Soils: Laterite soils. Upland, breakaways. Eucalypt woodland or shrubland IBRA Distribution: JAF Florabase records: 14	Medium
Stylidium longitubum	Stylidiaceae	P4		Habit: Erect annual (ephemeral), herb, 0.05-0.12 m high Flower colour: pink Flowering period: Oct to Dec Soils: Sandy clay, clay. Seasonal wetlands IBRA Distribution: GES, JAF, SWA Florabase records: 43	Low

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Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat		Likelihood of Occurrence
Stylidium striatum	Stylidiaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Rosetted perennial, herb, 0.15-0.55 m high yellow Oct to Nov Brown clay loam over laterite. Hill slopes JAF 28	Medium
Verreauxia verreauxii	Goodeniaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Perennial, herb, to 0.5 m high yellow Nov to Dec or Jan White/grey or yellow sand. Flats AVW, JAF 44	Low
Verticordia lindleyi subsp. *lindleyi*	Myrtaceae	P4		Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records:	Erect shrub, 0.2-0.75 m high pink May or Nov to Dec or Jan Sand, sandy clay. Winter-wet depressions AVW, GES, JAF, SWA 81	Low

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

Note: * denotes introduced species; T denotes threatened flora and P1-P4 denote priority flora species (DBCA 2018a). Scc = State conservation code; FCC = Federal conservation code; E = Endangered, V = Vulnerable.

Family	Species	SCC	FCC	Nature Map	EPBC
Pteridaceae	*Adiantum aethiopicum*			x	
	Cheilanthes austrotenuifolia			x	
Dennstaedtiaceae	*Pteridium esculentum* subsp. *esculentum*			x	
Aspleniaceae	*Asplenium aethiopicum*			x	
Marsileaceae	*Marsilea mutica*			x	
Salviniaceae	*Azolla rubra*			x	
Zamiaceae	*Macrozamia riedlei*			x	
Pinaceae	* *Pinus radiata*				x
Cupressaceae	*Callitris pyramidalis*			x	
Typhaceae	*Typha orientalis*			x	
Ruppiaceae	*Ruppia polycarpa*			x	
Juncaginaceae	*Cycnogeton lineare*			x	
Hydrocharitaceae	*Ottelia ovalifolia*			x	
Poaceae	* *Aira cupaniana*			x	
	* *Aira elegantissima*			x	
	Amphibromus nervosus			x	
	Amphipogon amphipogonoides			x	
	Amphipogon laguroides			x	
	Amphipogon laguroides subsp. *laguroides*			x	
	Austrostipa elegantissima			x	
	Austrostipa mollis			x	
	* *Briza maxima*			x	
	* *Briza minor*			x	
	* *Bromus hordeaceus*			x	
	* *Cortaderia selloana* subsp. *selloana*			x	
	Deyeuxia quadriseta			x	
	* *Holcus lanatus*			x	
	* *Hordeum leporinum*			x	
	Lachnagrostis filiformis			x	
	* *Lolium perenne*			x	
	* *Lolium rigidum*			x	
	Neurachne alopecuroidea			x	
	* *Phalaris aquatica*			x	
	* *Phalaris minor*			x	
	Poa porphyroclados			x	
	* *Polypogon monspeliensis*			x	
	* *Rostraria cristata*			x	
	Rytidosperma acerosum			x	
	Rytidosperma caespitosum			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Poaceae (continued)	* *Sporobolus africanus*			x	
	Tetrarrhena laevis			x	
	* *Vulpia muralis*			x	
	* *Vulpia myuros* forma *megalura*			x	
Cyperaceae	*Baumea vaginalis*			x	
	Bolboschoenus caldwellii			x	
	Carex tereticaulis	P3			
	Cyathochaeta avenacea			x	
	* *Cyperus congestus*			x	
	Eleocharis keigheryi	T	V		x
	Gahnia decomposita			x	
	Isolepis cyperoides			x	
	Isolepis marginata			x	
	Lepidosperma leptostachyum			x	
	Lepidosperma persecans			x	
	Lepidosperma pubisquameum			x	
	Lepidosperma scabrum			x	
	Lepidosperma squamatum			x	
	Lepidosperma tenue			x	
	Lepidosperma tetraquetrum			x	
	Lepidosperma tuberculatum			x	
	Lepidosperma sp. Margaret River (B.J. Lepschi 1841)			x	
	Lepidosperma sp.			x	
	Mesomelaena graciliceps			x	
	Mesomelaena tetragona			x	
	Schoenus bifidus			x	
	Schoenus curvifolius			x	
	Schoenus nanus			x	
	Schoenus subbulbosus			x	
	Tetraria capillaris			x	
	Tetraria octandra			x	
	Tetraria sp. Jarrah Forest (R. Davis 7391)			x	
Restionaceae	*Cytogonidium leptocarpoides*			x	
	Desmocladus fasciculatus			x	
	Desmocladus flexuosus			x	
	Hypolaena exsulca			x	
	Hypolaena robusta	P4		x	
	Leptocarpus laxus			x	
	Leptocarpus roycei			x	
	Leptocarpus thysananthus			x	
	Lepyrodia macra			x	
	Lepyrodia riparia			x	
	Loxocarya cinerea			x	
	Tremulina tremula			x	
	Tyrbastes glaucescens			x	
Anarthriaceae	*Lyginia imberbis*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Centrolepidaceae	*Aphelia cyperoides*			x	
	Aphelia drummondii			x	
	Aphelia sp. Albany (B.G. Briggs 596)			x	
	Centrolepis aristata			x	
	Centrolepis glabra			x	
	Centrolepis pilosa			x	
Philydraceae	*Philydrella pygmaea*			x	
Juncaceae	* *Juncus bufonius*			x	
	* *Juncus capitatus*			x	
	Juncus gregiflorus			x	
	Juncus holoschoenus			x	
	Juncus meianthus	P3		x	
	* *Juncus microcephalus*			x	
	Juncus pallidus			x	
	* *Juncus usitatus*			x	
	Luzula meridionalis			x	
Asparagaceae	* *Asparagus asparagoides*				x
	Chamaescilla corymbosa			x	
	Chamaescilla corymbosa var. *corymbosa*			x	
	Laxmannia ramosa subsp. *ramosa*			x	
	Laxmannia squarrosa			x	
	Lomandra brittanii			x	
	Lomandra caespitosa			x	
	Lomandra drummondii			x	
	Lomandra integra			x	
	Lomandra micrantha subsp. *micrantha*			x	
	Lomandra nigricans			x	
	Lomandra odora			x	
	Lomandra pauciflora			x	
	Lomandra preissii			x	
	Lomandra purpurea			x	
	Lomandra sericea			x	
	Lomandra sonderi			x	
	Lomandra whicherensis	P3		x	
	Lomandra sp.			x	
	Sowerbaea laxiflora			x	
	Thysanotus dichotomus			x	
	Thysanotus multiflorus			x	
	Thysanotus patersonii			x	
	Thysanotus sparteus			x	
	Thysanotus tenellus			x	
	Thysanotus thyrsoideus			x	
	Thysanotus unicupensis	P3		x	
	Thysanotus sp.			x	
Dasypogonaceae	*Calectasia demarzii*			x	
	Kingia australis			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Xanthorrhoeaceae	*Xanthorrhoea acanthostachya*			x	
	Xanthorrhoea gracilis			x	
	Xanthorrhoea nana			x	
	Xanthorrhoea preissii			x	
Colchicaceae	*Burchardia congesta*			x	
	Wurmbea dioica subsp. *alba*			x	
Hemerocallidaceae	*Agrostocrinum hirsutum*			x	
	Caesia micrantha			x	
	Caesia occidentalis			x	
	Dianella revoluta			x	
	Dianella revoluta var. *divaricata*			x	
	Johnsonia lupulina			x	
	Tricoryne elatior			x	
	Tricoryne humilis			x	
	Tricoryne tenella			x	
Haemodoraceae	*Anigozanthos manglesii* subsp. *manglesii*			x	
	Conostylis aculeata			x	
	Conostylis aculeata subsp. *aculeata*			x	
	Conostylis laxiflora			x	
	Conostylis pusilla			x	
	Conostylis serrulata			x	
	Conostylis setigera subsp. *setigera*			x	
	Haemodorum laxum			x	
	Haemodorum paniculatum			x	
	Haemodorum simplex			x	
	Haemodorum sparsiflorum			x	
	Haemodorum spicatum			x	
	Phlebocarya ciliata			x	
	Tribonanthes australis			x	
	Tribonanthes violacea			x	
Amaryllidaceae	* *Crinum moorei*			x	
Iridaceae	* *Ixia polystachya*			x	
	Patersonia babianoides			x	
	Patersonia occidentalis			x	
	Patersonia occidentalis var. *occidentalis*			x	
	Patersonia pygmaea			x	
	Patersonia rudis			x	
	Patersonia umbrosa			x	
	Patersonia umbrosa var. *xanthina*			x	
Orchidaceae	*Caladenia attingens* subsp. *attingens*			x	
	Caladenia bryceana subsp. *bryceana*	T	E	x	
	Caladenia cairnsiana			x	
	Caladenia discoidea			x	
	Caladenia flava subsp. *flava*			x	
	Caladenia flava subsp. *sylvestris*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Orchidaceae (continued)	*Caladenia leucochila*	T	E		x
	Caladenia longiclavata			x	
	Caladenia macrostylis			x	
	Caladenia marginata			x	
	Caladenia nana subsp. *nana*			x	
	Caladenia nana subsp. *unita*			x	
	Caladenia pectinata			x	
	Caladenia reptans			x	
	Caladenia reptans subsp. *reptans*			x	
	Caladenia speciosa	P4		x	
	Caladenia splendens			x	
	Caladenia straminichila			x	
	Caladenia uliginosa subsp. *patulens*	P1			
	Caladenia uliginosa subsp. *uliginosa*			x	
	Caladenia validinervia	P1		x	
	Caladenia sp.			x	
	Corybas recurvus			x	
	Cyanicula gemmata			x	
	Cyanicula sericea			x	
	Cyrtostylis huegelii			x	
	* *Disa bracteata*			x	
	Diuris carinata			x	
	Diuris longifolia			x	
	Diuris micrantha	T	V		x
	Diuris porrifolia			x	
	Drakaea glyptodon			x	
	Drakaea livida			x	
	Elythranthera brunonis			x	
	Elythranthera emarginata			x	
	Eriochilus dilatatus subsp. *multiflorus*			x	
	Eriochilus dilatatus subsp. *undulatus*			x	
	Eriochilus scaber			x	
	Eriochilus scaber subsp. *scaber*			x	
	Leporella fimbriata			x	
	Leptoceras menziesii			x	
	Lyperanthus serratus			x	
	Microtis alboviridis			x	
	Microtis media subsp. *media*			x	
	Paracaleana nigrita			x	
	Praecoxanthus aphyllus			x	
	Prasophyllum hians			x	
	Pterostylis barbata			x	
	Pterostylis recurva			x	
	Pterostylis vittata			x	
	Pterostylis sp. crinkled leaf (G.J. Keighery 13426)			x	
	Pterostylis sp.			x	
	Pyrorchis nigricans			x	
	Thelymitra antennifera			x	
	Thelymitra crinita			x	
	Thelymitra fuscolutea			x	
	Thelymitra graminea			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Orchidaceae (continued)	*Thelymitra villosa*			x	
	Thelymitra sp.			x	
Casuarinaceae	*Allocasuarina fraseriana*			x	
	Allocasuarina humilis			x	
	* *Casuarina equisetifolia*			x	
Proteaceae	*Adenanthos cygnorum* subsp. *chamaephyton*	P3		x	
	Adenanthos obovatus			x	
	Banksia bipinnatifida subsp. *bipinnatifida*			x	
	Banksia dallanneyi			x	
	Banksia dallanneyi subsp. *sylvestris*			x	
	Banksia dallanneyi var. *dallanneyi*			x	
	Banksia dallanneyi var. *mellicula*			x	
	Banksia grandis			x	
	Banksia littoralis			x	
	Banksia meisneri subsp. *meisneri*			x	
	Banksia sessilis var. *sessilis*			x	
	Banksia sphaerocarpa var. *sphaerocarpa*			x	
	Conospermum capitatum subsp. *capitatum*			x	
	Conospermum capitatum subsp. *glabratum*			x	
	Conospermum flexuosum subsp. *laevigatum*			x	
	Grevillea bipinnatifida			x	
	Grevillea bipinnatifida subsp. *bipinnatifida*			x	
	Grevillea centristigma			x	
	Grevillea diversifolia subsp. *diversifolia*			x	
	Grevillea manglesioides subsp. *manglesioides*			x	
	Grevillea pilulifera			x	
	Grevillea prominens	P3		x	
	Grevillea quercifolia			x	
	Grevillea rara	T	E	x	x
	Grevillea ripicola	P4		x	
	Hakea amplexicaulis			x	
	Hakea ceratophylla			x	
	Hakea cyclocarpa			x	
	Hakea lasianthoides			x	
	Hakea lissocarpha			x	
	Hakea ruscifolia			x	
	Hakea trifurcata			x	
	Isopogon crithmifolius			x	
	Isopogon spathulatus			x	
	Isopogon sphaerocephalus			x	
	Isopogon teretifolius			x	
	Persoonia elliptica			x	
	Persoonia longifolia			x	
	Petrophile linearis			x	
	Petrophile seminuda			x	
	Stirlingia simplex			x	
	Synaphea decumbens	P3		x	
	Synaphea floribunda			x	
	Synaphea gracillima			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Proteaceae (continued)	*Synaphea hians*	P3		x	
	Synaphea obtusata			x	
	Synaphea petiolaris			x	
	Xylomelum occidentale			x	
Santalaceae	*Choretrum lateriflorum*			x	
	Leptomeria cunninghamii			x	
Olacaceae	*Olax benthamiana*			x	
Loranthaceae	*Nuytsia floribunda*			x	
Polygonaceae	*Persicaria prostrata*			x	
	* *Rumex brownii*			x	
	* *Rumex conglomeratus*			x	
	* *Rumex crispus*			x	
Amaranthaceae	*Alternanthera denticulata*			x	
	Alternanthera nodiflora			x	
	Ptilotus esquamatus			x	
	Ptilotus manglesii			x	
Phytolaccaceae	* *Phytolacca octandra*			x	
Portulacaceae	*Portulaca oleracea*			x	
Basellaceae	* *Anredera cordifolia*				x
Caryophyllaceae	* *Gypsophila vaccaria*			x	
Ranunculaceae	*Clematis pubescens*			x	
	Ranunculus colonorum			x	
Lauraceae	*Cassytha glabella*			x	
	Cassytha pomiformis			x	
	Cassytha racemosa			x	
Brassicaceae	* *Lepidium africanum*			x	
Droseraceae	*Drosera bulbosa*			x	
	Drosera bulbosa subsp. *bulbosa*			x	
	Drosera collina			x	
	Drosera glanduligera			x	
	Drosera huegelii			x	
	Drosera marchantii			x	
	Drosera menziesii			x	
	Drosera modesta			x	
	Drosera occidentalis	P4		x	
	Drosera pallida			x	
	Drosera pulchella			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Droseraceae (continued)	*Drosera rosulata*			x	
	Drosera stolonifera			x	
Crassulaceae	*Crassula decumbens*			x	
	* *Crassula natans*			x	
	* *Crassula natans* var. *minus*			x	
Pittosporaceae	*Billardiera floribunda*			x	
	Billardiera fraseri			x	
	Billardiera fusiformis			x	
	Billardiera variifolia			x	
	Cheiranthera preissiana			x	
	Marianthus drummondianus			x	
Rosaceae	*Acaena echinata*			x	
	* *Rosa rubiginosa*			x	
	* *Rubus anglocandicans*			x	
	* *Rubus laudatus*			x	
	* *Rubus loganobaccus*			x	
Fabaceae	*Acacia alata*			x	
	Acacia alata var. *alata*			x	
	Acacia applanata			x	
	Acacia celastrifolia			x	
	* *Acacia decurrens*			x	
	Acacia dentifera			x	
	Acacia divergens			x	
	Acacia drummondii subsp. *candolleana*			x	
	Acacia drummondii subsp. *elegans*			x	
	Acacia extensa			x	
	Acacia huegelii			x	
	Acacia incurva			x	
	Acacia insolita subsp. *insolita*			x	
	Acacia lateriticola			x	
	Acacia nervosa			x	
	Acacia obovata			x	
	* *Acacia podalyriifolia*			x	
	Acacia preissiana			x	
	Acacia pulchella			x	
	Acacia pulchella var. *pulchella*			x	
	* *Acacia pycnantha*			x	
	Acacia saligna			x	
	Acacia saligna subsp. *pruinescens*			x	
	Acacia saligna subsp. *saligna*			x	
	Acacia saligna subsp. *stolonifera*			x	
	Acacia semitrullata	P4		x	
	Acacia squamata			x	
	Acacia stenoptera			x	
	Acacia teretifolia			x	
	Acacia urophylla			x	
	Acacia varia var. *crassinervis*			x	

APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

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Family	Species	SCC	FCC	Nature Map	EPBC
Fabaceae (continued)	*Aotus cordifolia*			x	
	Aotus gracillima			x	
	Aotus sp. Diffusa (W.E. Blackall & C.A. Gardner 1739)			x	
	Bossiaea angustifolia			x	
	Bossiaea aquifolium subsp. *aquifolium*			x	
	Bossiaea eriocarpa			x	
	Bossiaea linophylla			x	
	Bossiaea ornata			x	
	Bossiaea rufa			x	
	Callistachys lanceolata			x	
*	*Chamaecytisus palmensis*			x	
	Chorizema aciculare			x	
	Chorizema cordatum			x	
	Chorizema nanum			x	
	Chorizema retrorsum			x	
	Chorizema rhombeum			x	
*	*Cytisus scoparius*				x
	Daviesia cordata			x	
	Daviesia costata			x	
	Daviesia decurrens subsp. *decurrens*			x	
	Daviesia horrida			x	
	Daviesia incrassata subsp. *incrassata*			x	
	Daviesia preissii			x	
	Daviesia rhombifolia			x	
	Dillwynia dillwynioides	P3			
*	*Dipogon lignosus*			x	
	Eutaxia virgata			x	
	Gastrolobium bilobum			x	
	Gastrolobium capitatum			x	
	Gastrolobium ebracteolatum			x	
	Gastrolobium spinosum			x	
*	*Genista linifolia*				x
*	*Gleditsia triacanthos*			x	
	Gompholobium burtonioides			x	
	Gompholobium capitatum			x	
	Gompholobium knightianum			x	
	Gompholobium marginatum			x	
	Gompholobium ovatum			x	
	Gompholobium polymorphum			x	
	Gompholobium preissii			x	
	Gompholobium scabrum			x	
	Gompholobium tomentosum			x	
	Hovea chorizemifolia			x	
	Hovea trisperma			x	
	Isotropis cuneifolia			x	
	Isotropis cuneifolia subsp. *cuneifolia*			x	
	Jacksonia capitata			x	
	Jacksonia furcellata			x	
	Kennedia carinata			x	
	Kennedia coccinea			x	
	Kennedia prostrata			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Fabaceae (continued)	*Labichea punctata*			x	
	* *Lathyrus latifolius*			x	
	* *Lathyrus tingitanus*			x	
	* *Lotus angustissimus*			x	
	* *Lotus subbiflorus*			x	
	* *Lupinus albus*			x	
	* *Medicago polymorpha*			x	
	Mirbelia dilatata			x	
	* *Ornithopus compressus*			x	
	* *Ornithopus sativus*			x	
	Paraserianthes lophantha			x	
	Paraserianthes lophantha subsp. *lophantha*			x	
	Phyllota gracilis			x	
	Pultenaea ochreata			x	
	Pultenaea skinneri	P4		x	
	Sphaerolobium drummondii			x	
	Sphaerolobium medium			x	
	* *Trifolium dubium*			x	
	* *Trifolium subterraneum*			x	
	Viminaria juncea			x	
Geraniaceae	* *Erodium botrys*			x	
	Geranium retrorsum			x	
	Pelargonium littorale			x	
Oxalidaceae	*Oxalis exilis*			x	
Rutaceae	*Asterolasia pallida*			x	
	Boronia crenulata			x	
	Boronia crenulata var. *crenulata*			x	
	Boronia dichotoma			x	
	Boronia fastigiata			x	
	Boronia megastigma			x	
	Boronia molloyae			x	
	Boronia nematophylla			x	
	Boronia ramosa subsp. *anethifolia*			x	
	Boronia spathulata			x	
	Boronia tenuis	P4		x	
	Diplolaena dampieri			x	
	Diplolaena drummondii			x	
	Diplolaena graniticola			x	
	Diplolaena microcephala			x	
	Philotheca nodiflora subsp. *lasiocalyx*			x	
	Philotheca spicata			x	
Polygalaceae	*Comesperma confertum*			x	
	Comesperma virgatum			x	
Euphorbiaceae	*Amperea simulans*			x	
	Calycopeplus oligandrus			x	
	* *Euphorbia dendroides*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Euphorbiaceae (continued)	*Monotaxis occidentalis*			x	
	Stachystemon vermicularis			x	
Phyllanthaceae	*Phyllanthus calycinus*			x	
	Poranthera huegelii			x	
	Poranthera microphylla			x	
Celastraceae	*Stackhousia huegelii*			x	
	Stackhousia pubescens			x	
	Tripterococcus brunonis			x	
Rhamnaceae	*Cryptandra arbutiflora* var. *arbutiflora*			x	
	Cryptandra arbutiflora var. *tubulosa*			x	
	Trymalium ledifolium			x	
	Trymalium ledifolium var. *rosmarinifolium*			x	
	Trymalium odoratissimum subsp. *trifidum*			x	
Elaeocarpaceae	*Platytheca galioides*			x	
	Tetratheca hirsuta subsp. *hirsuta*			x	
	Tetratheca hirsuta subsp. *viminea*			x	
	Tetratheca parvifolia	P3		x	
	Tremandra stelligera			x	
Malvaceae	*Lasiopetalum floribundum*			x	
	Thomasia grandiflora			x	
	Thomasia macrocarpa			x	
	Thomasia paniculata			x	
	Thomasia pauciflora			x	
	Thomasia sp. Big Brook (M. Koch 2373)			x	
Dilleniaceae	*Hibbertia amplexicaulis*			x	
	Hibbertia commutata			x	
	Hibbertia cunninghamii			x	
	Hibbertia depilipes			x	
	Hibbertia diamesogenos			x	
	Hibbertia ferruginea			x	
	Hibbertia hemignosta			x	
	Hibbertia hypericoides subsp. *hypericoides*			x	
	Hibbertia pilosa			x	
	Hibbertia pulchra var. *pulchra*			x	
	Hibbertia racemosa			x	
	Hibbertia serrata			x	
	Hibbertia silvestris			x	
	Hibbertia stellaris			x	
	Hibbertia vaginata			x	
	Hibbertia sp.			x	
Hypericaceae	*Hypericum gramineum*			x	
	* *Hypericum perforatum*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Violaceae	*Hybanthus calycinus*			x	
	Hybanthus debilissimus			x	
	Hybanthus floribundus subsp. *floribundus*			x	
Thymelaeaceae	*Pimelea angustifolia*			x	
	Pimelea ciliata subsp. *ciliata*			x	
	Pimelea imbricata var. *piligera*			x	
	Pimelea lehmanniana subsp. *nervosa*			x	
	Pimelea preissii			x	
	Pimelea suaveolens subsp. *suaveolens*			x	
	Pimelea sylvestris			x	
Lythraceae	* *Lythrum hyssopifolia*			x	
Myrtaceae	*Agonis flexuosa* var. *flexuosa*			x	
	Astartea scoparia			x	
	Babingtonia camphorosmae			x	
	Callistemon glaucus			x	
	Calothamnus graniticus subsp. *leptophyllus*	P4		x	
	Calothamnus lateralis			x	
	Calothamnus lehmannii			x	
	Calothamnus rupestris			x	
	Calytrix cravenii			x	
	Calytrix flavescens			x	
	Calytrix glutinosa			x	
	Calytrix leschenaultii			x	
	Calytrix tetragona			x	
	Calytrix variabilis			x	
	Corymbia calophylla			x	
	Darwinia citriodora			x	
	Eremaea pauciflora var. *pauciflora*			x	
	Ericomyrtus parviflora			x	
	Eucalyptus drummondii			x	
	Eucalyptus laeliae			x	
	Eucalyptus marginata subsp. *marginata*			x	
	Eucalyptus megacarpa			x	
	Eucalyptus patens			x	
	Eucalyptus rudis			x	
	Eucalyptus rudis subsp. *cratyantha*	P4			
	Eucalyptus rudis subsp. *rudis*			x	
	Homalospermum firmum			x	
	Hypocalymma angustifolium			x	
	Hypocalymma cordifolium			x	
	Hypocalymma robustum			x	
	Kunzea ericifolia			x	
	Kunzea glabrescens			x	
	Kunzea recurva			x	
	Leptospermum erubescens			x	
	Melaleuca acutifolia			x	
	Melaleuca incana			x	
	Melaleuca incana subsp. *incana*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Myrtaceae (continued)	*Melaleuca lateritia*			x	
	Melaleuca microphylla			x	
	Melaleuca parviceps			x	
	Melaleuca pauciflora			x	
	Melaleuca preissiana			x	
	Melaleuca rhaphiophylla			x	
	Melaleuca trichophylla			x	
	Melaleuca viminea			x	
	Melaleuca viminea subsp. *viminea*			x	
	Paragonis grandiflora			x	
	Pericalymma ellipticum var. *floridum*			x	
	Pericalymma spongiocaule			x	
	Rinzia fumana			x	
	Taxandria linearifolia			x	
	Tetrapora glomerata			x	
	Verticordia densiflora var. *cespitosa*			x	
Onagraceae	*Epilobium billardiereanum* subsp. *cinereum*			x	
	* *Oenothera glazioviana*			x	
	* *Oenothera stricta* subsp. *stricta*			x	
Haloragaceae	*Glischrocaryon angustifolium*			x	
	Gonocarpus benthamii			x	
	Gonocarpus benthamii subsp. *benthamii*			x	
	Myriophyllum crispatum			x	
	Myriophyllum drummondii			x	
	Myriophyllum limnophilum			x	
	Myriophyllum tillaeoides			x	
	Myriophyllum verrucosum			x	
	Trihaloragis hexandra subsp. *hexandra*			x	
	Trihaloragis hexandra subsp. *integrifolia*			x	
Araliaceae	*Hydrocotyle alata*			x	
	Hydrocotyle callicarpa			x	
	Trachymene pilosa			x	
Apiaceae	*Actinotus glomeratus*			x	
	Apium prostratum var. *prostratum*			x	
	Daucus glochidiatus			x	
	Homalosciadium homalocarpum			x	
	Pentapeltis peltigera			x	
	Pentapeltis silvatica			x	
	Platysace compressa			x	
	Platysace filiformis			x	
	Xanthosia atkinsoniana			x	
	Xanthosia candida			x	
	Xanthosia huegelii			x	
	Xanthosia tasmanica			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Ericaceae	*Andersonia aristata*			x	
	Andersonia caerulea			x	
	Andersonia involucrata			x	
	Andersonia lehmanniana			x	
	Astroloma acervatum			x	
	Astroloma ciliatum			x	
	Astroloma drummondii			x	
	Astroloma pallidum			x	
	Conostephium minus			x	
	Conostephium pendulum			x	
	Leucopogon australis			x	
	Leucopogon capitellatus			x	
	Leucopogon conostephioides			x	
	Leucopogon extremus	P2		x	
	Leucopogon glabellus			x	
	Leucopogon gracillimus			x	
	Leucopogon nutans			x	
	Leucopogon oxycedrus			x	
	Leucopogon pendulus			x	
	Leucopogon propinquus			x	
	Leucopogon pulchellus			x	
	Leucopogon reflexus			x	
	Leucopogon sprengelioides			x	
	Leucopogon strictus			x	
	Leucopogon verticillatus			x	
	Lysinema pentapetalum			x	
	Sphenotoma capitata			x	
	Sphenotoma gracilis			x	
	Styphelia tenuiflora			x	
Primulaceae	* *Lysimachia arvensis*			x	
Loganiaceae	*Orianthera serpyllifolia* subsp. *angustifolia*			x	
	Orianthera serpyllifolia subsp. *serpyllifolia*			x	
	Phyllangium paradoxum			x	
Menyanthaceae	*Liparophyllum latifolium*			x	
	Ornduffia albiflora			x	
	Ornduffia parnassifolia			x	
Apocynaceae	* *Asclepias curassavica*			x	
	* *Gomphocarpus fruticosus*			x	
Verbenaceae	* *Verbena rigida* var. *rigida*			x	
Lamiaceae	*Hemiandra pungens*			x	
	Hemigenia argentea			x	
	Hemigenia incana			x	
	Hemigenia microphylla	P3			
	Hemigenia pritzelii			x	
	Lachnostachys albicans			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Lamiaceae (continued)	* *Lavandula stoechas* subsp. *stoechas*			x	
	* *Mentha pulegium*			x	
Solanaceae	* *Lycium ferocissimum*				x
Orobanchaceae	* *Bellardia viscosa*			x	
	* *Orobanche minor*			x	
	* *Parentucellia latifolia*			x	
Lentibulariaceae	*Utricularia multifida*			x	
Plantaginaceae	* *Callitriche brutia* subsp. *brutia*			x	
	Gratiola pubescens			x	
Rubiaceae	*Opercularia apiciflora*			x	
	Opercularia echinocephala			x	
	Opercularia hispidula			x	
	* *Sherardia arvensis*			x	
Caprifoliaceae	* *Centranthus macrosiphon*			x	
	* *Centranthus ruber* subsp. *ruber*			x	
	* *Lonicera japonica*			x	
Campanulaceae	* *Grammatotheca bergiana* var. *bergiana*			x	
	Isotoma hypocrateriformis			x	
	Lobelia anceps			x	
	Lobelia heterophylla			x	
	Lobelia rhombifolia			x	
	* *Monopsis debilis* var. *depressa*			x	
	Wahlenbergia multicaulis			x	
	Wahlenbergia preissii			x	
	Wahlenbergia sp.			x	
Goodeniaceae	*Dampiera alata*			x	
	Dampiera hederacea			x	
	Dampiera linearis			x	
	Dampiera pedunculata			x	
	Dampiera trigona			x	
	Goodenia coerulea			x	
	Goodenia eatoniana			x	
	Goodenia fasciculata			x	
	Goodenia pulchella			x	
	Goodenia pulchella subsp. Coastal Plain A (M. Hislop 634)			x	
	Goodenia pusilla			x	
	Lechenaultia biloba			x	
	Lechenaultia expansa			x	
	Scaevola calliptera			x	
	Scaevola glandulifera			x	
	Scaevola striata			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Goodeniaceae (continued)	*Scaevola striata* var. *striata*			x	
	Velleia trinervis			x	
Stylidiaceae	*Levenhookia dubia*			x	
	Levenhookia pusilla			x	
	Levenhookia stipitata			x	
	Stylidium acuminatum subsp. *acuminatum*	P2		x	
	Stylidium adnatum			x	
	Stylidium amoenum			x	
	Stylidium amoenum var. *amoenum*			x	
	Stylidium androsaceum			x	
	Stylidium brunonianum			x	
	Stylidium caespitosum			x	
	Stylidium ciliatum			x	
	Stylidium crassifolium			x	
	Stylidium diversifolium			x	
	Stylidium guttatum			x	
	Stylidium inundatum			x	
	Stylidium korijekup	P2			
	Stylidium lineatum			x	
	Stylidium piliferum			x	
	Stylidium plantagineum			x	
	Stylidium pulchellum			x	
	Stylidium recurvum			x	
	Stylidium rhynchocarpum			x	
	Stylidium schoenoides			x	
	Stylidium spathulatum			x	
	Stylidium tenue subsp. *majusculum*			x	
	Stylidium tenue subsp. *tenue*			x	
	Stylidium thesioides			x	
	Stylidium uniflorum subsp. *uniflorum*			x	
	Stylidium violaceum			x	
	Stylidium sp.			x	
Asteraceae	*Angianthus drummondii*	P3			
	* *Arctotheca calendula*			x	
	Brachyscome iberidifolia			x	
	Centipeda cunninghamii			x	
	* *Chrysanthemoides monilifera*				x
	* *Conyza bonariensis*			x	
	* *Cotula coronopifolia*			x	
	Craspedia variabilis			x	
	* *Dittrichia graveolens*			x	
	Euchiton sphaericus			x	
	* *Galinsoga parviflora*			x	
	* *Glebionis segetum*			x	
	Hyalosperma cotula			x	
	Hyalosperma demissum			x	
	Hyalosperma simplex subsp. *simplex*			x	
	* *Hypochaeris glabra*			x	
	* *Lactuca saligna*			x	

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Family	Species	SCC	FCC	Nature Map	EPBC
Asteraceae (continued)	*Lagenophora huegelii*			x	
	* *Leontodon saxatilis*			x	
	Millotia tenuifolia			x	
	Millotia tenuifolia var. *tenuifolia*			x	
	Olearia axillaris			x	
	Olearia paucidentata			x	
	Pithocarpa ramosa			x	
	Podolepis gracilis			x	
	Podotheca angustifolia			x	
	Pseudognaphalium luteoalbum			x	
	Rhodanthe citrina			x	
	Senecio diaschides			x	
	Senecio leucoglossus	P4		x	
	Senecio multicaulis subsp. *multicaulis*			x	
	Siloxerus filifolius			x	
	Siloxerus humifusus			x	
	* *Soliva sessilis*			x	
	* *Sonchus asper*			x	
	* *Sonchus oleraceus*			x	
	* *Tolpis barbata*			x	
	* *Vellereophyton dealbatum*			x	
	Waitzia suaveolens			x	
	Waitzia suaveolens var. *suaveolens*			x	

APPENDIX F: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Caladenia bryceana subsp. *bryceana*	Orchidaceae	T	Endangered	Habit: Tuberous, perennial, herb, 0.05-0.1 m high Flower colour: green-yellow Flowering period: Aug to Oct Soils: Sand, loam. Adjacent to watercourses, winter-wet sites IBRA Distribution: ESP, JAF, MAL Florabase records: 16	Low
Caladenia leucochila	Orchidaceae	T	Endangered	Habit: Leaf 12-20 cm long, scape to 40 cm high Flower colour: pale yellow to greenish cream and white with faint to prominent dull red stripes Flowering period: Sep to Oct Soils: Dry sand/ laterite IBRA Distribution: JAF, SWA Florabase records: 7	Medium
Diuris micrantha	Orchidaceae	T	Vulnerable	Habit: Tuberous, perennial, herb, 0.3-0.6 meters high Flower colour: Yellow/brown Flowering period: September to October Soils: Brown loamy clay. Winter-wet swamps, in shallow water IBRA Distribution: JAF, SWA Florabase records: 6	Low
Eleocharis keigheryi	Cyperaceae	T	Vulnerable	Habit: Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 meters high Flower colour: Green Flowering period: August to November Soils: Clay, sandy loam. Emergent in freshwater: creeks, clay pans IBRA Distribution: AVW, GES, JAF, SWA Florabase records: 54	Low
Grevillea rara	Proteaceae	T	Endangered	Habit: Dense, prickly shrub, to 2 meters high. Flower colour: White-pink Flowering period: October Soils: Lateritic loam and creeklines. IBRA Distribution: JAF Florabase records: 11	Medium

APPENDIX F: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Caladenia uliginosa subsp. *patulens*	Orchidaceae	P1		Habit: Tuberous, perennial, herb, 0.2-0.35 m high Flower colour: Green-cream Flowering period: September to October Soils: Clay loam and gravel. Well drained soils amongst dense shrubs. IBRA Distribution: JAF, SWA Florabase records: 4	Medium
Caladenia validinervia	Orchidaceae	P1		Habit: Rhizomatous, flowers white-maroon. Upright single stem herb 15-30 cm high, scattered and clumping Flower colour: White-pink-purple Flowering period: September to November Soils: Undulating, brown-black laterite sand over laterite IBRA Distribution: AVW, SWA Florabase records: 8	Medium
Leucopogon extremus	Ericaceae	P2		Habit: Low spreading shrub Flower colour: - Flowering period: - Soils: Dark grey sandy loam. IBRA Distribution: JAF Florabase records: 5	Medium
Stylidium korijekup	Stylidiaceae	P2		Habit: Perennial, herb, 0.18-0.34 m high Flower colour: - Flowering period: - Soils: Well-drained grey-brown sandy loam with laterite. Upland ridges. IBRA Distribution: JAF, SWA Florabase records: 3	Medium
Stylidium acuminatum subsp. *acuminatum*	Stylidiaceae	P2		Habit: Basally rosetted. Scape to 40 cm long. Short stem below rosette. Flower colour: Pale yellow Flowering period: - Soils: Brown gravelly clay/loam IBRA Distribution: JAF Florabase records: 8	Medium

APPENDIX F: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Adenanthos cygnorum subsp. *chamaephyton*	Proteaceae	P3		Habit: Prostrate, mat-forming, non-lignotuberous shrub, to 0.3 m high Flower colour: White-cream-pink-green/green Flowering period: July or September to December or January Soils: Grey sand, lateritic gravel. IBRA Distribution: AVW, JAF, SWA Florabase records: 21	Medium
Angianthus drummondii	Asteraceae	P3		Habit: Erect annual, herb, to 0.1 m high Flower colour: Yellow Flowering period: October to December Soils: Grey or brown clays soils, ironstone. Seasonally wet flats. IBRA Distribution: JAF, SWA Florabase records: 18	Medium
Carex tereticaulis	Cyperaceae	P3		Habit: Monoecious, rhizomatous, tufted perennial, grass-like or herb (sedge), 0.7 m high Flower colour: Brown Flowering period: September to October Soils: Black peaty sand. IBRA Distribution: JAF, SWA, WAR Florabase records: 18	Low
Dillwynia dillwynioides	Fabaceae	P3		Habit: Decumbent or erect, slender shrub, 0.3-1.2 m high Flower colour: Red & yellow/orange Flowering period: August to December Soils: Sandy soils. Winter-wet depressions. IBRA Distribution: SWA Florabase records: 38	Low
Grevillea prominens	Proteaceae	P3		Habit: Spreading shrub, 0.5-1.7 meters high, 0.3-1 meters wide Flower colour: cream-white Flowering period: September to October Soils: Gravelly loam. Along creeklines IBRA Distribution: JAF Florabase records: 9	Low
Hemigenia microphylla	Lamiaceae	P3		Habit: Slender shrub, 0.4-1.8 m high Flower colour: blue-purple Flowering period: September to December Soils: Sandy clay, peaty clay, granite. Winter-wet depressions. IBRA Distribution: JAF, SWA, WAR Florabase records: 25	Low

APPENDIX F: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Juncus meianthus	Juncaceae	P3		Habit: Tufted perennial, herb, 0.05-0.2 meters high, to 0.4 meters wide Flower colour: Brown Flowering period: November to December or January Soils: Wetland, black clay-loam, saturated soils. IBRA Distribution: ESP, JAF, WAR Florabase records: 23	Low
Lomandra whicherensis	Asparagaceae	P3		Habit: Tufted rhizomatous erect herb, 20 - 40 cm high. Female inflorescence very short compared to male. Flower colour: purple Soils: Lateritic sandy clay. IBRA Distribution: JAF Florabase records: 16	Medium
Synaphea decumbens	Proteaceae	P3		Habit: slender erect or open straggly shrub to 0.5 metres high Flower colour: Yellow Flowering period: September or October Soils: Grey-brown loam/clayey sand over laterite IBRA Distribution: JAF Florabase records: 28	Medium
Synaphea hians	Proteaceae	P3		Habit: Prostrate or decumbent shrub Flower colour: Yellow Flowering period: July or September to November Soils: Sandy soils. Rises IBRA Distribution: JAF, SWA Florabase records: 52	Low
Tetratheca parvifolia	Elaeocarpaceae	P3		Habit: Small shrub, 0.2-0.3 meters high Flower colour: Pink Flowering period: October Soils: Dry, shallow, pale brown sandy-loam over granite IBRA Distribution: JAF, SWA Florabase records: 15	Low
Thysanotus unicupensis	Asparagaceae	P3		Habit: Erect herb Flower colour: Purple Soils: Grey sandy loam over laterite IBRA Distribution: JAF Florabase records: 14	Low

APPENDIX F: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Acacia semitrullata	Fabaceae	P4		Habit: Slender, erect, pungent shrub, (0.1-)0.2-0.7(-1.5) meters high Flower colour: Cream/white Flowering period: May to October Soils: White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas. IBRA Distribution: JAF, SWA, WAR Florabase records: 86	Low
Boronia tenuis	Rutaceae	P4		Habit: Procumbent or erect & slender shrub, 0.1-0.5 meters high Flower colour: blue/pink-white Flowering period: August to November Soils: Laterite, stony soils, granite. IBRA Distribution: JAF, SWA Florabase records: 43	Medium
Caladenia speciosa	Orchidaceae	P4		Habit: Tuberous, perennial, herb, 0.35-0.6 meters high Flower colour: White-pink Flowering period: September to October Soils: White, grey or black sand. Loam flat swampy terrain IBRA Distribution: JAF, SWA Florabase records: 59	Low
Calothamnus graniticus subsp. *leptophyllus*	Myrtaceae	P4		Habit: Erect, multi-stemmed shrub, 1-2 m high Flower colour: Red Flowering period: June to August Soils: Clay over granite, lateritic soils. Hillsides IBRA Distribution: JAF, SWA Florabase records: 27	Medium
Drosera occidentalis	Droseraceae	P4		Habit: Fibrous-rooted, rosetted perennial, herb, to 0.025 m high. Flower colour: White-pink Flowering period: October to December or January Soils: Swampy flats, grey clayey sand IBRA Distribution: JAF, SWA Florabase records: 19	Low
Eucalyptus rudis subsp. *cratyantha*	Myrtaceae	P4		Habit: Tree, 5-20 m high, bark rough, box-type Flower colour: White Flowering period: July to September Soils: Loam. Flats, hillsides. IBRA Distribution: JAF, SWA, WAR Florabase records: 17	Medium

APPENDIX F: LIKELIHOOD OF VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR AT COLLIE REFINERY

Note: Refer to Appendix A for State (SCC; Department of Biodiversity, Conservation and Attractions 2018a) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AVW – Avon Wheatbelt; ESP – Esperance Plains; GES – Geraldton Sandplains; JAF – Jarrah Forest; MAL – Mallee; SWA – Swan Coastal Plain; WAR – Warren. Likelihood of occurrence in survey area is based on a Low, Medium or High ranking.

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
Grevillea ripicola	Proteaceae	P4		Habit: Spreading, much-branched, non-lignotuberous shrub, 0.6-2(-3) meters high, to 4 meters wide Flower colour: Red/red-orange Flowering period: Jan or Mar to Apr or Nov to Dec Soils: Sandy clay, clay or gravelly loam. Swampy flats, granite outcrops, along watercourses IBRA Distribution: JAF Florabase records: 22	Low
Hypolaena robusta	Restionaceae	P4		Habit: Dioecious rhizomatous, perennial, herb, ca 0.5 m high Flowering period: September to October Soils: White sand, laterite granite IBRA Distribution: GES, JAF,SWA Florabase records: 46	Medium
Pultenaea skinneri	Fabaceae	P4		Habit: Slender shrub, 1-2 m high Flower colour: Yellow/orange & red Flowering period: Jul to Sep Soils: Sandy or clayey soils. Winter-wet depressions IBRA Distribution: JAF, SWA, WAR Florabase records: 38	High
Senecio leucoglossus	Asteraceae	P4		Habit: Erect annual, herb, to 1.3 meters high Flower colour: White Flowering period: August to December Soils: Gravelly lateritic or granitic soils. Granite outcrops, slopes IBRA Distribution: JAF, SWA, WAR Florabase records: 41	High

APPENDIX G: VASCULAR PLANT SPECIES RECORDED ON SOUTH32 LEASES AND DURING THE RECENT ASSESSMENT OF WMDE INFILL AREAS AND BAUXITE TRANSPORT CORRIDOR, 2018

Note: * denotes introduced species;
Note: T denotes threatened and P1 to P4 denotes Priority flora species (DBCA 2018a, 2018b)

Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
PTERIDACEAE	*Adiantum aethiopicum*	x	
	Cheilanthes austrotenuifolia	x	
	Cheilanthes sieberi		x
	Cheilanthes sp.	x	
DENNSTAEDTIACEAE	*Pteridium esculentum*	x	x
LINDSAEACEAE	*Lindsaea linearis*	x	
ZAMIACEAE	*Macrozamia riedlei*	x	x
PODOCARPACEAE	*Podocarpus drouynianus*	x	
TYPHACEAE	*Typha orientalis*		x
JUNCAGINACEAE	*Triglochin centrocarpa*	x	
POACEAE	* *Aira caryophyllea*	x	x
	* *Aira cupaniana*	x	
	Amphibromus nervosus		x
	Amphipogon amphipogonoides	x	
	Amphipogon laguroides	x	
	Austrostipa campylachne		x
	Austrostipa hemipogon	x	
	Austrostipa tenuifolia	x	
	Austrostipa trichophylla	x	x
	Austrostipa elegantissima	x	x
	Austrostipa sp.	x	
	* *Avena barbata*	x	x
	* *Avena fatua*	x	
	* *Avena* sp.	x	
	* *Brachypodium distachyon*	x	x
	* *Briza maxima*	x	x
	* *Briza minor*	x	x
	* *Bromus diandrus*	x	x
	* *Bromus madritensis*		x
	* *Bromus* sp.	x	
	* *Cynodon dactylon*	x	
	* *Ehrharta calycina*	x	x
	* *Ehrharta longiflora*	x	x
	* *Eragrostis curvula*	x	
	* *Holcus setiger*	x	
	* *Hordeum hystrix*		x
	* *Hordeum leporinum*	x	
	* *Lolium perenne*	x	x
	* *Lolium rigidum*		x
	* *Lolium* sp.	x	
	Neurachne alopecuroidea	x	x
	* *Pentameris airoides*	x	
	Poa drummondiana	x	
	* *Polypogon monspeliensis*		x
	Rytidosperma caespitosum	x	x
	Rytidosperma sp.	x	
	Sporobolus virginicus	x	
	Tetrarrhena laevis	x	x
	Themeda triandra	x	
	* *Triticum aestivum*	x	
	* *Vulpia bromoides*	x	
	* *Vulpia myuros*	x	x

APPENDIX G: VASCULAR PLANT SPECIES RECORDED ON SOUTH32 LEASES AND DURING THE RECENT ASSESSMENT OF WMDE INFILL AREAS AND BAUXITE TRANSPORT CORRIDOR, 2018

Note: * denotes introduced species;
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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
POACEAE	* *Vulpia myuros forma megalura*	x	
(continued)	* *Vulpia myuros forma myuros*	x	
	* *Vulpia sp.*	x	
	Poaceae sp.	x	x
CYPERACEAE	*Baumea juncea*	x	
	Baumea rubiginosa	x	
	Baumea vaginalis	x	
	Bolboschoenus caldwellii	x	
	Carex fascicularis	x	
	Chorizandra enodis	x	
	Cyathochaeta avenacea	x	
	Gahnia ancistrophylla	x	
	Gahnia decomposita	x	
	Gahnia trifida	x	
	Gahnia sp.	x	
	Isolepis cernua var. *setiformis*	x	
	* *Isolepis marginata*	x	
	Lepidosperma angustatum	x	
	Lepidosperma gracile	x	
	Lepidosperma aff. *gracile*	x	
	Lepidosperma leptostachyum	x	x
	Lepidosperma leptostachyum sens. Lat.		x
	Lepidosperma scabrum	x	
	Lepidosperma squamatum	x	x
	Lepidosperma tenue	x	
	Lepidosperma tetraquetrum	x	
	Lepidosperma tuberculatum	x	
	Lepidosperma sp.	x	x
	Mesomelaena graciliceps	x	
	Mesomelaena tetragona	x	
	Schoenus armeria	x	
	Tetraria capillaris	x	
	Tetraria octandra	x	x
	Tetraria sp. Jarrah Forest (R. Davis 7391)	x	
	Cyperaceae sp.	x	
RESTIONACEAE	*Desmocladus asper*	x	
	Desmocladus fasciculatus	x	x
	Desmocladus flexuosus	x	x
	Empodisma gracillimum	x	
	Hypolaena exsulca	x	
	Lepidobolus preissianus	x	
	Leptocarpus coangustatus	x	
	Leptocarpus tenax	x	
	Lepyrodia macra	x	
	Loxocarya cinerea	x	
	Loxocarya striata	x	
ANARTHRIACEAE	*Lyginia barbata*	x	
CENTROLEPIDACEAE	*Centrolepis inconspicua*	x	
PHILYDRACEAE	*Philydrella pygmaea*	x	
JUNCACEAE	* *Juncus acutus* subsp. *acutus*	x	
	* *Juncus bufonius*	x	
	Juncus pallidus	x	
	* *Juncus usitatus*	x	
	Luzula meridionalis	x	

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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
ASPARAGACEAE	* *Asparagus asparagoides*	x	
	Chamaescilla corymbosa	x	x
	Dichopogon capillipes	x	
	Laxmannia sessiliflora	x	
	Laxmannia squarrosa	x	
	Lomandra brittanii	x	
	Lomandra caespitosa	x	
	Lomandra drummondii	x	
	Lomandra hermaphrodita	x	x
	Lomandra integra	x	
	Lomandra micrantha	x	
	Lomandra pauciflora	x	
	Lomandra preissii	x	x
	Lomandra purpurea	x	
	Lomandra sericea	x	x
	Lomandra sp. (JK12)	x	
	Lomandra sp. (JK122)	x	
	Lomandra sonderi	x	
	Lomandra spartea	x	x
	Lomandra suaveolens	x	
	Sowerbaea laxiflora	x	
	Thysanotus dichotomus	x	x
	Thysanotus fastigiatus	x	
	Thysanotus manglesianus	x	
	Thysanotus multiflorus	x	
	Thysanotus patersonii	x	
	Thysanotus tenellus	x	
	Thysanotus thyrsoideus	x	
DASYPOGONACEAE	*Dasypogon bromeliifolius*	x	
	Kingia australis	x	
XANTHORRHOEACEAE	*Xanthorrhoea gracilis*	x	x
	Xanthorrhoea preissii	x	x
COLCHICACEAE	*Burchardia multiflora*	x	
	Wurmbea dioica	x	
	Wurmbea tenella	x	
BORYACEAE	*Borya sphaerocephala*	x	
HEMEROCALLIDACEAE	*Agrostocrinum scabrum*	x	x
	Caesia micrantha	x	
	Dianella revoluta	x	
	Johnsonia lupulina	x	
	Stypandra glauca	x	
	Tricoryne elatior	x	
	Tricoryne humilis	x	
HAEMODORACEAE	*Anigozanthos flavidus*	x	
	Anigozanthos manglesii	x	
	Conostylis aculeata	x	
	Conostylis aculeata subsp. *aculeata*	x	
	Conostylis pusilla	x	
	Conostylis seminuda	x	
	Conostylis serrulata	x	
	Conostylis setigera	x	x
	Conostylis setigera subsp. *setigera*	x	
	Conostylis setosa	x	
	Conostylis sp.	x	
	Haemodorum laxum	x	x

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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
HAEMODORACEAE	*Haemodorum simplex*		x
(continued)	*Haemodorum spicatum*	x	
	Haemodorum sp.	x	x
	Phlebocarya ciliata	x	
	Tribonanthes longipetala	x	
HYPOXIDACEAE	*Pauridia occidentalis*	x	
IRIDACEAE	*Patersonia babianoides*	x	
	Patersonia juncea	x	
	Patersonia occidentalis	x	
	Patersonia pygmaea	x	
	Patersonia rudis	x	
	Patersonia sp.	x	
ORCHIDACEAE	*Caladenia dorrienii* (T)	x	
	Caladenia flava	x	
	Caladenia hopperiana (T)	x	
	Caladenia latifolia	x	
	Caladenia longicauda	x	
	Caladenia macrostylis	x	
	Caladenia nana	x	
	Caladenia reptans	x	
	Caladenia reptans subsp. *reptans*	x	
	Caladenia sp.	x	
	Cryptostylis ovata	x	
	Cyanicula gemmata	x	
	Cyanicula sericea	x	
	Cyrtostylis robusta	x	
	* *Disa bracteata*	x	x
	Diuris longifolia	x	
	Diuris sp.	x	
	Drakaea elastica (T)	x	
	Elythranthera brunonis	x	
	Eriochilus dilatatus	x	
	Paracaleana nigrita	x	
	Pheladenia deformis	x	
	Prasophyllum hians	x	
	Prasophyllum parvifolium	x	
	Pterostylis barbata	x	
	Pterostylis pyramidalis	x	
	Pterostylis recurva	x	
	Pterostylis vittata	x	
	Pyrorchis nigricans	x	
	Thelymitra antennifera	x	
	Thelymitra crinita	x	
	Thelymitra sp.	x	
	Orchidaceae sp.	x	x
CASUARINACEAE	*Allocasuarina fraseriana*	x	x
	Allocasuarina huegeliana	x	x
	Allocasuarina humilis	x	
	Allocasuarina microstachya	x	
	Allocasuarina sp.	x	
PROTEACEAE	*Adenanthos barbiger*		x
	Adenanthos cygnorum	x	
	Adenanthos obovatus	x	
	Banksia armata	x	
	Banksia bipinnatifida	x	
	Banksia dallanneyi	x	
	Banksia dallanneyi var. *dallanneyi*	x	x

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Familiy	Species	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
PROTEACEAE (continued)	*Banksia grandis*	x	x
	Banksia littoralis	x	
	Banksia seminuda	x	
	Banksia sessilis	x	x
	Banksia sphaerocarpa	x	
	Banksia squarrosa subsp. *squarrosa*	x	
	Banksia subpinnatifida var. *imberbis* (P3)	x	
	Banksia subpinnatifida var. *subpinnatifida* (P2)	x	
	Conospermum amoenum	x	
	Conospermum capitatum	x	
	Conospermum capitatum subsp. *capitatum*	x	
	Grevillea bipinnatifida	x	
	Grevillea quercifolia	x	
	Grevillea trifida	x	
	Hakea amplexicaulis	x	
	Hakea cyclocarpa	x	
	Hakea gilbertii	x	
	Hakea incrassata	x	
	Hakea lissocarpha	x	x
	Hakea prostrata	x	x
	Hakea ruscifolia	x	
	Hakea trifurcata	x	
	Hakea undulata	x	
	Hakea varia	x	
	Isopogon formosus	x	
	Persoonia angustiflora	x	
	Persoonia elliptica	x	
	Persoonia longifolia	x	x
	Persoonia quinquenervis	x	
	Petrophile ?seminuda	x	
	Petrophile ericifolia	x	
	Petrophile heterophylla	x	
	Petrophile serruriae	x	
	Petrophile squamata	x	
	Petrophile striata	x	
	Synaphea aff. *petiolaris*	x	
	Synaphea petiolaris	x	
SANTALACEAE	*Leptomeria cunninghamii*	x	
	Santalum acuminatum	x	
OLACACEAE	*Olax benthamiana*	x	
POLYGONACEAE	*Muehlenbeckia adpressa*	x	
	* *Rumex acetosella*	x	
	* *Rumex crispus*	x	
CHENOPODIACEAE	* *Chenopodium glaucum*	x	
AMARANTHACEAE	*Ptilotus drummondii*	x	
	Ptilotus manglesii	x	x
MONTIACEAE	*Calandrinia sp.*	x	
CARYOPHYLLACEAE	* *Cerastium glomeratum*	x	
	* *Petrorhagia dubia*	x	x
RANUNCULACEAE	*Clematis pubescens*	x	x
	Ranunculus colonorum		x
	* *Ranunculus muricatus*	x	

APPENDIX G: VASCULAR PLANT SPECIES RECORDED ON SOUTH32 LEASES AND DURING THE RECENT ASSESSMENT OF WMDE INFILL AREAS AND BAUXITE TRANSPORT CORRIDOR, 2018

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Familiy		*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
LAURACEAE		*Cassytha glabella*	x	
		Cassytha racemosa	x	
		Cassytha sp.	x	
PAPAVERACEAE	*	*Fumaria capreolata*	x	
DROSERACEAE		*Drosera barbigera*	x	
		Drosera bulbosa	x	
		Drosera erythrorhiza	x	
		Drosera gigantea	x	
		Drosera glanduligera	x	
		Drosera heterophylla	x	
		Drosera leucoblasta	x	
		Drosera macrantha	x	
		Drosera menziesii	x	
		Drosera pallida	x	
		Drosera platystigma	x	
		Drosera pulchella	x	
		Drosera stolonifera	x	
		Drosera stricticaulis	x	
		Drosera sp.	x	x
CRASSULACEAE		*Crassula colorata*	x	
		Crassula decumbens var. *decumbens*	x	
PITTOSPORACEAE		*Billardiera floribunda*	x	
		Billardiera fusiformis		x
		Billardiera heterophylla	x	
		Billardiera variifolia	x	
		Marianthus bicolor	x	
		Marianthus drummondianus	x	
ROSACEAE		*Acaena echinata*	x	x
FABACEAE		*Acacia alata*	x	
		Acacia browniana	x	x
		Acacia celastrifolia	x	x
		Acacia deflexa (P3)	x	
		Acacia dentifera	x	
		Acacia divergens	x	
		Acacia drummondii	x	
		Acacia drummondii subsp. *candolleana*	x	
		Acacia drummondii subsp. *drummondii*	x	x
		Acacia ericifolia	x	
		Acacia extensa	x	
		Acacia gilbertii	x	
		Acacia incurva	x	
	*	*Acacia iteaphylla*	x	
		Acacia lateriticola	x	x
		Acacia leptospermoides	x	
		Acacia microbotrya	x	
		Acacia myrtifolia	x	
		Acacia nervosa	x	
		Acacia obovata	x	
		Acacia preissiana	x	
		Acacia pulchella	x	x
	*	*Acacia pycnantha*	x	
		Acacia saligna	x	x
		Acacia stenoptera	x	
		Acacia urophylla	x	
		Acacia willdenowiana	x	
		Acacia sp.	x	

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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
FABACEAE (continued)	*Bossiaea aquifolium*	x	
	Bossiaea aquifolium subsp. aquifolium	x	
	Bossiaea eriocarpa	x	
	Bossiaea linophylla	x	
	Bossiaea ornata	x	x
	Bossiaea rufa	x	
	Callistachys lanceolata	x	
	Chorizema aciculare	x	
	Chorizema rhombeum	x	
	Chorizema sp.	x	
	Daviesia cordata	x	
	Daviesia costata	x	
	Daviesia decurrens	x	
	Daviesia divaricata	x	
	Daviesia incrassata	x	
	Daviesia incrassata subsp. *incrassata*	x	
	Daviesia longifolia	x	
	Daviesia physodes	x	
	Daviesia polyphylla	x	
	Daviesia preissii	x	x
	Daviesia rhombifolia	x	
	Daviesia sp.	x	
	Gastrolobium bilobum	x	
	Gastrolobium sp. Prostrate Boddington (M. Hislop 2130) (P1)		x
	Gastrolobium spinosum	x	x
	Gompholobium capitatum	x	
	Gompholobium marginatum	x	x
	Gompholobium ovatum	x	
	Gompholobium polymorphum	x	x
	Gompholobium preissii	x	x
	Gompholobium tomentosum	x	
	Gompholobium sp.	x	
	Hardenbergia comptoniana	x	x
	Hovea chorizemifolia	x	x
	Hovea elliptica	x	
	Hovea trisperma	x	x
	Isotropis cuneifolia	x	
	Isotropis cuneifolia subsp. *cuneifolia*	x	
	Jacksonia alata	x	
	Jacksonia furcellata	x	
	Jacksonia racemosa	x	
	Kennedia coccinea	x	
	Kennedia microphylla	x	
	Kennedia prostrata	x	x
	Labichea punctata	x	x
	* *Lotus angustissimus*	x	
	* *Lotus subbiflorus*	x	x
	* *Lotus uliginosus*	x	
	* *Lotus* sp.	x	
	Mirbelia dilatata	x	
	Mirbelia floribunda	x	
	Paraserianthes lophantha	x	
	Pultenaea skinneri (P4)	x	
	Sphaerolobium medium	x	
	Sphaerolobium vimineum	x	
	Templetonia drummondii	x	
	* *Trifolium ?incarnatum*	x	
	* *Trifolium angustifolium*	x	x

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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
FABACEAE (continued)	* *Trifolium arvense* var. *arvense*	x	x
	* *Trifolium campestre* var. *campestre*	x	x
	* *Trifolium hirtum*	x	
	* *Trifolium subterraneum*	x	
	* *Trifolium* sp.	x	x
	Viminaria juncea	x	
GERANIACEAE	* *Erodium botrys*	x	
	Erodium cygnorum	x	
	* *Erodium moschatum*	x	
	* *Geranium molle*	x	x
	Geranium retrorsum	x	
	Geranium solanderi	x	
	Pelargonium littorale	x	
OXALIDACEAE	*Oxalis corniculata*	x	
	* *Oxalis pes-caprae*	x	
	Oxalis sp.	x	x
LINACEAE	*Linum marginale*	x	
RUTACEAE	*Boronia* aff. *busselliana*	x	
	Boronia crenulata	x	
	Boronia crenulata var. *crenulata*	x	
	Boronia aff. *defoliata*	x	
	Boronia fastigiata	x	
	Boronia molloyae	x	
	Boronia ovata	x	
	Boronia tenuis (P4)	x	
	Diplolaena drummondii	x	
	Diplolaena microcephala	x	
	Philotheca spicata	x	
POLYGALACEAE	*Comesperma calymega*	x	
	Comesperma virgatum	x	
	Comesperma volubile	x	
	Comesperma sp.	x	
EUPHORBIACEAE	*Amperea ericoides*	x	
	Monotaxis occidentalis	x	
PHYLLANTHACEAE	*Phyllanthus calycinus*	x	x
	Poranthera huegelii	x	
	Poranthera microphylla	x	
CELASTRACEAE	*Stackhousia huegelii*	x	
	Stackhousia monogyna	x	x
	Stackhousia pubescens	x	
	Stackhousia scoparia	x	
	Stackhousia sp.	x	
	Tripterococcus brunonis	x	
SAPINDACEAE	*Dodonaea viscosa*	x	
	Dodonaea ceratocarpa	x	
	Dodonaea pinifolia	x	
RHAMNACEAE	*Cryptandra arbutiflora*	x	
	Cryptandra nutans	x	
	Cryptandra aff. *polyclada*	x	
	Trymalium odoratissimum subsp. *odoratissimum*	x	x
	Trymalium ledifolium	x	x

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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
ELAEOCARPACEAE	*Platytheca galioides*	x	
	Tetratheca hirsuta	x	x
	Tetratheca virgata	x	
	Tremandra diffusa	x	
	Tremandra stelligera	x	
MALVACEAE	*Lasiopetalum cardiophyllum* (P4)	x	
	Lasiopetalum floribundum	x	x
	Lasiopetalum glabratum	x	
	Lasiopetalum glutinosum	x	
	Thomasia foliosa	x	
	Thomasia grandiflora	x	
	Thomasia paniculata	x	
	Thomasia pauciflora	x	
DILLENIACEAE	*Hibbertia acerosa*	x	
	Hibbertia amplexicaulis	x	x
	Hibbertia commutata	x	x
	Hibbertia aff. *commutata*	x	
	Hibbertia cunninghamii	x	
	Hibbertia diamesogenos		x
	Hibbertia glomerata	x	
	Hibbertia hypericoides	x	x
	Hibbertia lasiopus	x	
	Hibbertia perfoliata	x	
	Hibbertia pilosa	x	x
	Hibbertia polystachya	x	
	Hibbertia diamesogenos	x	
	Hibbertia serrata	x	
	Hibbertia silvestris	x	
	Hibbertia spicata	x	
	Hibbertia subvaginata	x	
	Hibbertia vaginata	x	
	Hibbertia sp.	x	
	Hibbertia sp. 2	x	
VIOLACEAE	*Hybanthus floribundus*	x	
THYMELAEACEAE	*Pimelea argentea*	x	
	Pimelea ciliata	x	x
	Pimelea imbricata	x	x
	Pimelea rosea	x	
	Pimelea suaveolens	x	x
	Pimelea sylvestris	x	
	Pimelea sp.		x
MYRTACEAE	*Agonis flexuosa*	x	
	Astartea fascicularis	x	
	Babingtonia camphorosmae	x	
	Beaufortia macrostemon	x	
	Calothamnus planifolius	x	
	Calothamnus quadrifidus	x	
	Calothamnus quadrifidus subsp. *angustifolius*	x	
	Calothamnus sanguineus	x	
	Calytrix flavescens	x	
	Calytrix leschenaultii	x	
	Calytrix simplex subsp. *simplex* (P1)	x	
	Corymbia calophylla	x	x
	* *Corymbia maculata*	x	
	Darwinia citriodora	x	

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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
MYRTACEAE (continued)	*Darwinia thymoides*	x	
	Ericomyrtus serpyllifolia	x	
	Eucalyptus accedens	x	x
	* *Eucalyptus diversicolor*	x	
	Eucalyptus drummondii	x	
	Eucalyptus marginata	x	x
	Eucalyptus megacarpa	x	
	Eucalyptus patens	x	x
	Eucalyptus rudis	x	x
	Eucalyptus aspersa	x	
	Eucalyptus wandoo	x	x
	Hypocalymma angustifolium	x	
	Hypocalymma cordifolium	x	
	Kunzea ericifolia	x	
	Kunzea recurva	x	
	Leptospermum erubescens	x	x
	Leptospermum sp.	x	
	Melaleuca holosericea	x	
	Melaleuca incana subsp. *incana*	x	
	Melaleuca lateritia		x
	Melaleuca preissiana	x	
	Melaleuca radula	x	
	Melaleuca rhaphiophylla	x	x
	Melaleuca viminea	x	
	Melaleuca sp.	x	
	Taxandria linearifolia	x	
	Verticordia densiflora	x	
	Verticordia huegelii	x	
	Verticordia pennigera	x	
	Verticordia picta	x	
	Verticordia plumosa	x	
	Verticordia serrata	x	
HALORAGACEAE	*Glischrocaryon aureum*	x	x
	Gonocarpus benthamii	x	
	Gonocarpus cordiger	x	
	Gonocarpus diffusus	x	
ARALIACEAE	*Trachymene ornata*	x	
	Trachymene pilosa	x	x
APIACEAE	*Apium prostratum*	x	
	Daucus glochidiatus	x	x
	Eryngium pinnatifidum	x	
	Pentapeltis peltigera	x	
	Pentapeltis silvatica	x	
	Platysace compressa	x	
	Platysace filiformis	x	
	Platysace juncea	x	
	Platysace tenuissima	x	
	Platysace teres	x	
	Platysace sp.	x	
	Trachymene pilosa	x	
	Xanthosia atkinsoniana	x	
	Xanthosia candida	x	x
	Xanthosia huegelii	x	
	Xanthosia sp. (KA257)	x	
ERICACEAE	*Andersonia involucrata*	x	
	Andersonia lehmanniana	x	
	Andersonia sp. (DAH80131)	x	
	Astroloma ciliatum	x	

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Familiy		*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
ERICACEAE (continued)		*Astroloma compactum*	x	
		Astroloma drummondii	x	
		Astroloma epacridis	x	
		Astroloma pallidum	x	x
		Astroloma aff. *pallidum* (ASW 12516)	x	
		Astroloma sp.		x
		Leucopogon australis	x	
		Leucopogon capitellatus	x	x
		Leucopogon conostephioides	x	
		Leucopogon cordatus	x	
		Leucopogon hirsutus	x	
		Leucopogon nutans	x	x
		Leucopogon oxycedrus	x	
		Leucopogon propinquus	x	x
		Leucopogon pubescens	x	
		Leucopogon sp. Boddington (D. Halford 80746)	x	
		Leucopogon verticillatus	x	
		Leucopogon sp. (ASW 12691)	x	
		Leucopogon sp. (ASW 12539a)	x	
		Leucopogon sp. (JK 10)	x	x
		Lysinema ciliatum	x	
		Styphelia tenuiflora	x	
PRIMULACEAE	*	*Lysimachia arvensis*	x	x
		Samolus junceus	x	
LOGANIACEAE		*Orianthera campanulata*	x	
		Orianthera serpyllifolia	x	
		Phyllangium divergens	x	
		Phyllangium paradoxum	x	x
GENTIANACEAE	*	*Centaurium erythraea*	x	
APOCYNACEAE	*	*Gomphocarpus fruticosus*	x	
BORAGINACEAE		*Halgania anagalloides* var. Southern (A.E. Orchard 1609)	x	
LAMIACEAE		*Hemiandra pungens*	x	
		Hemigenia pritzelii	x	
		Hemigenia sericea	x	
		Hemiandra sp. (DAH 808167)	x	
	*	*Mentha suaveolens*	x	
	*	*Stachys arvensis*	x	
OROBANCHACEAE	*	*Bellardia viscosa*	x	
	*	*Orobanche minor*	x	
	*	*Parentucellia latifolia*	x	
LENTIBULARIACEAE		*Utricularia multifida*	x	
		Utricularia menziesii	x	
RUBIACEAE	*	*Galium murale*	x	
		Opercularia apiciflora	x	
		Opercularia echinocephala	x	x
		Opercularia hispidula	x	
		Opercularia vaginata	x	
CAMPANULACEAE		*Wahlenbergia multicaulis*	x	
		Isotoma hypocrateriformis	x	x
		Lobelia anceps	x	
		Lobelia gibbosa	x	

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Familiy	*Species*	WME Boddington & Collie Pre 2018	WMDE Infill Areas & Bauxite Transport Corridor 2018
CAMPANULACEAE (continued)	*Lobelia heterophylla*	x	
	Lobelia rhombifolia	x	
	Lobelia sp. (DAH 80593)	x	
GOODENIACEAE	*Dampiera alata*	x	x
	Dampiera eriocephala	x	
	Dampiera hederacea	x	
	Dampiera linearis	x	
	Dampiera lavandulacea	x	
	Goodenia convexa	x	
	Goodenia eatoniana	x	
	Goodenia aff. *hassallii* (JK 36)	x	
	Goodenia incana	x	
	Goodenia pusilla	x	
	Goodenia sp. (DAH 810182)	x	
	Goodenia sp. (DAH 808129)	x	
	Lechenaultia biloba	x	x
	Lechenaultia expansa	x	
	Scaevola calliptera	x	x
	Scaevola glandulifera	x	
	Scaevola platyphylla	x	
	Scaevola striata	x	
	Velleia trinervis	x	
STYLIDIACEAE	*Levenhookia pusilla*	x	x
	Levenhookia stipitata	x	
	Stylidium adnatum	x	
	Stylidium affine	x	x
	Stylidium amoenum	x	x
	Stylidium brunonianum	x	
	Stylidium bulbiferum	x	
	Stylidium calcaratum	x	
	Stylidium caricifolium	x	
	Stylidium ciliatum	x	x
	Stylidium crassifolium	x	
	Stylidium dichotomum	x	
	Stylidium diversifolium	x	
	Stylidium glaucum	x	
	Stylidium hispidum	x	
	Stylidium imbricatum	x	
	Stylidium junceum	x	
	Stylidium lateriticola	x	
	Stylidium lineatum	x	
	Stylidium petiolare	x	
	Stylidium piliferum	x	x
	Stylidium pulchellum	x	
	Stylidium repens	x	
	Stylidium rhynchocarpum	x	
	Stylidium schoenoides	x	
	Stylidium spathulatum	x	
	Stylidium uniflorum	x	
	Stylidium sp.		x
ASTERACEAE	* *Arctotheca calendula*	x	x
	Asteridea gracilis (P3)	x	
	Blennospora drummondii	x	
	Brachyscome iberidifolia	x	
	* *Carduus pycnocephalus*	x	
	* *Carduus* sp.	x	
	* *Cirsium vulgare*	x	
	* *Conyza bonariensis*	x	
	* *Conyza sumatrensis*	x	

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Familiy		***Species***	**WME Boddington & Collie Pre 2018**	**WMDE Infill Areas & Bauxite Transport Corridor 2018**
ASTERACEAE (continued)	*	*Cotula coronopifolia*	x	
		Craspedia variabilis	x	
	*	*Dittrichia graveolens*	x	
		Euchiton sphaericus	x	
		Gnephosis drummondii	x	
		Hyalosperma cotula	x	x
		Hyalosperma demissum	x	
	*	*Hypochaeris glabra*	x	x
	*	*Hypochaeris radicata*		x
		Lagenophora huegelii	x	x
		Millotia tenuifolia	x	
		Millotia tenuifolia var. *tenuifolia*	x	
		Olearia paucidentata	x	
		Pithocarpa ramosa	x	
		Podolepis gracilis	x	x
		Podolepis lessonii		x
		Pseudognaphalium luteoalbum		x
		Pterochaeta paniculata	x	
		Quinetia urvillei	x	
		Rhodanthe citrina	x	
		Rhodanthe corymbosa	x	
		Rhodanthe manglesii	x	
		Senecio diaschides	x	x
		Senecio hispidulus	x	
		Senecio leucoglossus (P4)	x	
		Senecio sp. (ASW 12618)	x	
		Senecio sp. (JK 163)	x	
		Siloxerus filifolius	x	
	*	*Silybum marianum*	x	
	*	*Sonchus asper*	x	
	*	*Sonchus oleraceus*	x	x
	*	*Sonchus* sp.	x	
	*	*Symphyotrichum squamatum*	x	
		Trichocline spathulata	x	x
	*	*Ursinia anthemoides* subsp. *anthemoides*	x	x
		Waitzia nitida	x	
		Waitzia suaveolens		x
		Asteraceae sp.	x	

APPENDIX H: VASCULAR PLANT SPECIES RECORDED ON THE COLLIE REFINERY LEASE

Note: Species listed were extracted from previous baseline studies within the Refinery Lease Area
(Mattiske Consulting Pty Ltd 1999, 2014)
* denotes introduced species and ^ denotes planted species

Family	Species	genus	WAR0701 1999	WOR1403 2014
DENNSTAEDTIACEAE	*Pteridium*	*esculentum*	x	x
LINDSAEACEAE	*Lindsaea*	*linearis*	x	x
ZAMIACEAE	*Macrozamia*	*riedlei*	x	x
PODOCARPACEAE	*Podocarpus*	*drouynianus*	x	x
POACEAE	* *Aira*	*caryophyllea*	x	
	Amphipogon	*amphipogonoides*	x	
	* *Briza*	*maxima*	x	
	Neurachne	*alopecuroidea*	x	x
	* *Pentameris*	*airoides*	x	
	Rytidosperma	*caespitosum*	x	
	Rytidosperma	sp.	x	
	Tetrarrhena	*laevis*	x	x
CYPERACEAE	*Baumea*	*rubiginosa*		x
	Cyathochaeta	*avenacea*	x	x
	Gahnia	*decomposita*	x	x
	Gahnia	*trifida*	x	
	Lepidosperma	*squamatum*	x	
	Lepidosperma	*tenue*	x	
	Lepidosperma	*tetraquetrum*	x	
	Lepidosperma	*tuberculatum*	x	
	Mesomelaena	*tetragona*	x	
	Tetraria	*capillaris*	x	
	Tetraria	*octandra*	x	x
	Tetraria	sp. Jarrah Forest (R Davis 7391)		x
RESTIONACEAE	*Desmocladus*	*fasciculatus*	x	x
	Hypolaena	*exsulca*	x	x
	Leptocarpus	*tenax*	x	
	Lepyrodia	*macra*	x	
	Loxocarya	*cinerea*	x	
ANARTHRIACEAE	*Lyginia*	*barbata*	x	
JUNCACEAE	*Juncus*	*pallidus*	x	
ASPARAGACEAE	*Chamaescilla*	*corymbosa*	x	x
	Laxmannia	*squarrosa*	x	
	Lomandra	*caespitosa*	x	x
	Lomandra	*drummondii*	x	
	Lomandra	*hermaphrodita*	x	
	Lomandra	*integra*		x
	Lomandra	*micrantha*	x	
	Lomandra	*preissii*	x	x
	Lomandra	? *preissii*	x	
	Lomandra	*purpurea*	x	
	Lomandra	*sericea*	x	x
	Lomandra	*sonderi*	x	
	Lomandra	spartea		x
	Lomandra	sp.	x	x
	Thysanotus	*dichotomus*	x	x
	Thysanotus	*fastigiatus*		x
	Thysanotus	*multiflorus*	x	x
	Thysanotus	*tenellus*	x	
	Thysanotus	*thyrsoideus*	x	

APPENDIX H: VASCULAR PLANT SPECIES RECORDED ON THE COLLIE REFINERY LEASE

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Family	Species	genus	WAR0701 1999	WOR1403 2014
DASYPOGONACEAE	*Dasypogon*	*bromeliifolius*	x	
	Kingia	*australis*	x	
XANTHORRHOEACEAE	*Xanthorrhoea*	*gracilis*	x	x
	Xanthorrhoea	*preissii*	x	x
HEMEROCALLIDACEAE	*Agrostocrinum*	*scabrum*	x	
	Dianella	*revoluta*	x	
	Johnsonia	*lupulina*	x	
	Tricoryne	*elatior*	x	
HAEMODORACEAE	*Conostylis*	*aculeata*	x	
	Conostylis	*aculeata* subsp. *aculeata*		x
	Conostylis	*seminuda*	x	
	Conostylis	*serrulata*	x	x
	Conostylis	*setigera*	x	x
	Conostylis	*setosa*	x	x
	Haemodorum	*spicatum*	x	
	Haemodorum	sp.	x	
HYPOXIDACEAE	*Pauridia*	*glabella*	x	
IRIDACEAE	*Patersonia*	*babianoides*	x	
	Patersonia	*occidentalis*	x	x
	Patersonia	*pygmaea*	x	
	Patersonia	*rudis*	x	
ORCHIDACEAE	*Caladenia*	*flava*	x	x
	Caladenia	*macrostylis*	x	
	Caladenia	*reptans*		x
	Caladenia	*reptans* subsp. *reptans*	x	
	Caladenia	sp.	x	x
	Cyanicula	*sericea*	x	
	Elythranthera	*brunonis*	x	
	Pterostylis	*pyramidalis*	x	x
	Pterostylis	*recurva*	x	x
	Pterostylis	*vittata*	x	x
	Pyrorchis	*nigricans*	x	x
	Thelymitra	? *crinita*	x	
	Thelymitra	sp.	x	x
	Orchidaceae	sp.	x	x
CASUARINACEAE	*Allocasuarina*	*fraseriana*	x	x
	Allocasuarina	*humilis*	x	
PROTEACEAE	*Adenanthos*	*obovatus*	x	
	Banksia	*dallanneyi*	x	
	Banksia	*dallanneyi* var. *dallanneyi*		x
	Banksia	*grandis*	x	x
	Banksia	*littoralis*	x	x
	Banksia	*seminuda*	x	
	Banksia	*sessilis*	x	
	Banksia	*squarrosa* subsp. *squarrosa*	x	
	Conospermum	*capitatum*	x	
	Conospermum	*capitatum* subsp. *capitatum*		x
	Grevillea	*quercifolia*	x	
	Hakea	*amplexicaulis*	x	x
	Hakea	*cyclocarpa*	x	

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Family		Species	genus	WAR0701 1999	WOR1403 2014
PROTEACEAE (continued)		*Hakea*	*incrassata*	x	
		Hakea	*lissocarpha*	x	x
		Hakea	*prostrata*	x	
		Hakea	*ruscifolia*	x	
		Persoonia	*elliptica*	x	
		Persoonia	*longifolia*	x	x
		Synaphea	*petiolaris*	x	
SANTALACEAE		*Leptomeria*	*cunninghamii*	x	
POLYGONACEAE	*	*Rumex*	*crispus*	x	
CHENOPODIACEAE	*	*Chenopodium*	*glaucum*	x	
AMARANTHACEAE		*Ptilotus*	*manglesii*	x	
MONTIACEAE		*Calandrinia*	*quadrivalvis*	x	
RANUNCULACEAE		*Clematis*	*pubescens*	x	x
		Ranunculus	*colonorum*	x	
LAURACEAE		*Cassytha*	sp.	x	
DROSERACEAE		*Drosera*	*erythrorhiza*	x	
		Drosera	*macrantha*	x	x
		Drosera	*pallida*	x	
		Drosera	*stolonifera*	x	x
		Drosera	sp.	x	x
PITTOSPORACEAE		*Billardiera*	*floribunda*	x	
		Billardiera	*heterophylla*	x	
		Billardiera	*variifolia*	x	
		Marianthus	*drummondianus*	x	x
FABACEAE		*Acacia*	*alata*	x	x
		Acacia	*browniana*	x	
		Acacia	*celastrifolia*	x	x
		Acacia	*divergens*	x	x
		Acacia	*drummondii*	x	
		Acacia	*drummondii* subsp. *candolleana*	x	
		Acacia	*drummondii* subsp. *drummondii*	x	
		Acacia	*extensa*	x	x
		Acacia	*incurva*	x	
		Acacia	*lateriticola*	x	x
		Acacia	*microbotrya*	x	
		Acacia	*myrtifolia*	x	
		Acacia	*obovata*	x	
		Acacia	*pulchella*	x	x
	*	*Acacia*	*pycnantha*		x
		Acacia	*saligna*	x	x
		Acacia	*stenoptera*	x	
		Acacia	*willdenowiana*		x
		Acacia	sp.	x	
		Bossiaea	*aquifolium*		x
		Bossiaea	*aquifolium* subsp. *aquifolium*	x	
		Bossiaea	*eriocarpa*	x	
		Bossiaea	*linophylla*	x	
		Bossiaea	*ornata*	x	x
		Callistachys	*lanceolata*	x	

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Family	Species	genus	WAR0701 1999	WOR1403 2014
FABACEAE	*Chorizema*	*ilicifolium*	x	
(continued)	*Chorizema*	*rhombeum*	x	x
	Daviesia	*cordata*	x	
	Daviesia	*decurrens*	x	
	Daviesia	*divaricata*	x	
	Daviesia	*incrassata*	x	
	Daviesia	*physodes*	x	
	Daviesia	*preissii*	x	
	Gastrolobium	*bilobum*		x
	Gompholobium	*capitatum*	x	
	Gompholobium	*marginatum*	x	
	Gompholobium	*ovatum*	x	
	Hardenbergia	*comptoniana*	x	
	Hovea	*chorizemifolia*	x	
	Hovea	*elliptica*	x	
	Hovea	*trisperma*	x	x
	Isotropis	*cuneifolia*	x	
	Kennedia	*coccinea*	x	
	Kennedia	*prostrata*	x	
	Labichea	*punctata*	x	x
	Mirbelia	*dilatata*	x	x
	Paraserianthes	*lophantha*	x	
	Pultenaea	*skinneri* (P4)	x	
	Sphaerolobium	*medium*	x	x
	* *Trifolium*	*angustifolium*	x	
RUTACEAE	? *Boronia*	aff. *busselliana*	x	
	Boronia	*crenulata*	x	
	Boronia	*fastigiata*	x	x
	Diplolaena	*drummondii*	x	
	Philotheca	*spicata*	x	
POLYGALACEAE	*Comesperma*	*virgatum*	x	x
PHYLLANTHACEAE	*Phyllanthus*	*calycinus*	x	
CELASTRACEAE	*Tripterococcus*	*brunonis*	x	
RHAMNACEAE	*Trymalium*	*ledifolium*	x	x
	Trymalium	*odoratissimum* subsp. *odoratissimum*	x	x
ELAEOCARPACEAE	*Tetratheca*	*hirsuta*	x	x
	Tremandra	*diffusa*	x	
	Tremandra	*stelligera*	x	
MALVACEAE	*Lasiopetalum*	*floribundum*	x	x
	Lasiopetalum	*glabratum*		x
	Thomasia	*grandiflora*	x	
	Thomasia	*paniculata*	x	
DILLENIACEAE	*Hibbertia*	*acerosa*	x	
	Hibbertia	*amplexicaulis*	x	x
	Hibbertia	*commutata*	x	x
	Hibbertia	*cunninghamii*		x
	Hibbertia	*glomerata*	x	
	Hibbertia	*hypericoides*	x	x
	Hibbertia	*lasiopus*	x	
	Hibbertia	*perfoliata*	x	x
	Hibbertia	*silvestris*	x	

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Family	Species	genus	WAR0701 1999	WOR1403 2014
VIOLACEAE	*Hybanthus*	*debilissimus*	x	
THYMELAEACEAE	*Pimelea*	*ciliata*	x	
	Pimelea	*suaveolens*	x	
	Pimelea	*sylvestris*	x	
MYRTACEAE	*Agonis*	*flexuosa*		x
	Astartea	*scoparia*	x	x
	Babingtonia	*camphorosmae*	x	
	Calothamnus	*quadrifidus*	x	
	Calothamnus	*quadrifidus* subsp. *angustifolius*		x
	Corymbia	*calophylla*	x	x
	Darwinia	*citriodora*		x
	Eucalyptus	*accedens*	x	
	^ *Eucalyptus*	*diversicolor*	x	
	Eucalyptus	*marginata*	x	x
	Eucalyptus	*megacarpa*	x	
	Eucalyptus	*patens*	x	x
	Eucalyptus	*rudis*	x	
	Eucalyptus	*wandoo*	x	
	Hypocalymma	*angustifolium*	x	x
	Hypocalymma	*cordifolium*	x	x
	Kunzea	*ericifolia*	x	
	Melaleuca	*preissiana*	x	
	Melaleuca	*rhaphiophylla*	x	
	Taxandria	*linearifolia*	x	x
HALORAGACEAE	*Gonocarpus*	*benthamii*	x	
	Gonocarpus	*diffusus*	x	
ARALIACEAE	*Trachymene*	*pilosa*	x	x
APIACEAE	*Apium*	*prostratum*	x	
	Daucus	*glochidiatus*	x	
	Pentapeltis	*peltigera*	x	x
	Pentapeltis	*silvatica*	x	
	Platysace	*commutata*	x	
	Platysace	*compressa*	x	
	Platysace	*filiformis*		x
	Platysace	*tenuissima*	x	
	Xanthosia	*atkinsoniana*	x	
	Xanthosia	*candida*	x	x
	Xanthosia	*huegelii*	x	
ERICACEAE	*Andersonia*	*lehmanniana*	x	
	Astroloma	*ciliatum*	x	
	Astroloma	*pallidum*	x	
	Leucopogon	*australis*	x	
	Leucopogon	*capitellatus*	x	x
	Leucopogon	*nutans*	x	
	Leucopogon	*propinquus*	x	x
	Leucopogon	*pubescens*	x	
	Leucopogon	*verticillatus*	x	x
	Styphelia	*tenuiflora*	x	
PRIMULACEAE	* *Lysimachia*	*arvensis*	x	x
LOGANIACEAE	*Orianthera*	*serpyllifolia*	x	x

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Family	Species	genus	WAR0701 1999	WOR1403 2014
LAMIACEAE	*Hemigenia*	*pritzelii*	x	
RUBIACEAE	*Opercularia*	*apiciflora*	x	
	Opercularia	*echinocephala*	x	x
	Opercularia	*hispidula*	x	
CAMPANULACEAE	*Isotoma*	*hypocrateriformis*	x	
GOODENIACEAE	*Dampiera*	*hederacea*	x	
	Dampiera	*linearis*	x	
	Goodenia	*eatoniana*	x	
	Goodenia	*pusilla*	x	
	Lechenaultia	*biloba*	x	
	Scaevola	*calliptera*	x	x
STYLIDIACEAE	*Levenhookia*	*pusilla*	x	x
	Stylidium	*adnatum*	x	
	Stylidium	*amoenum*	x	
	Stylidium	*calcaratum*	x	
	Stylidium	*hispidum*	x	x
	Stylidium	*piliferum*	x	x
	Stylidium	*rhynchocarpum*	x	x
	Stylidium	*schoenoides*	x	
ASTERACEAE	* *Arctotheca*	*calendula*	x	
	Brachyscome	*iberidifolia*	x	
	* *Carduus*	*sp.*		x
	* *Conyza*	*bonariensis*	x	
	* *Conyza*	*sumatrensis*	x	x
	Craspedia	*variabilis*	x	x
	Euchiton	*sphaericus*	x	
	Hyalosperma	*cotula*	x	
	* *Hypochaeris*	*glabra*	x	x
	Lagenophora	*huegelii*	x	x
	Millotia	*tenuifolia*	x	
	Pithocarpa	*ramosa*	x	
	Pterochaeta	*paniculata*		x
	Rhodanthe	*citrina*	x	
	Senecio	*diaschides*	x	
	Senecio	*hispidulus*	x	x
	Siloxerus	*filifolius*	x	
	* *Symphyotrichum*	*squamatum*	x	
	Trichocline	*spathulata*	x	x
	* *Ursinia*	*anthemoides*	x	
	Waitzia	*nitida*		x

APPENDIX I: VASCULAR PLANT SPECIES RECORDED IN INFILL AREAS ON WMDE AND BAUXITE TRANSPORT CORRIDOR, 2018

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	Site -Vegetation Types on Infll Areas on WMDE and Bauxite Transport Corridor															
Species	**AC**	**AD**	**AY**	**DG**	**G**	**G2**	**H**	**H2**	**M**	**M2**	**MG**	**P**	**PL**	**S**	**ST**	**Y**
Acacia browniana								x								
Acacia celastrifolia									x			x		x		
Acacia drummondii subsp. drummondii									x		x			x		
Acacia lateriticola									x					x		
Acacia pulchella		x			x		x	x	x	x	x	x		x	x	x
Acacia saligna	x	x					x				x					
Acaena echinata							x		x							
Adenanthos barbiger							x									
Agrostocrinum scabrum					x			x	x			x				
* *Aira caryophyllea*								x	x		x			x		
Allocasuarina fraseriana		x					x	x	x			x		x		
Allocasuarina huegeliana					x	x			x		x					
Amphibromus nervosus	x															
* *Arctotheca calendula*								x	x							
Astroloma pallidum							x		x					x		
Astroloma sp.					x						x					
Austrostipa campylachne					x		x		x			x		x	x	
Austrostipa elegantissima		x		x			x		x	x	x	x		x		
Austrostipa trichophylla									x					x		
* *Avena barbata*	x		x		x	x	x	x	x	x	x	x	x	x	x	
Banksia dallanneyi var. dallanneyi									x					x		
Banksia grandis														x		
Banksia sessilis							x		x			x		x		x
Billardiera fusiformis							x		x							x
Bossiaea ornata							x	x	x					x		
* *Brachypodium distachyon*		x		x	x		x	x	x		x			x	x	
* *Briza maxima*		x		x	x	x	x		x		x			x	x	
* *Briza minor*		x		x	x		x	x			x			x		
* *Bromus diandrus*					x		x									
* *Bromus madritensis*								x	x		x		x		x	
Chamaescilla corymbosa									x		x					
Cheilanthes sieberi						x	x				x				x	
Clematis pubescens							x		x		x			x	x	

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Species	**AC**	**AD**	**AY**	**DG**	**G**	**G2**	**H**	**H2**	**M**	**M2**	**MG**	**P**	**PL**	**S**	**ST**	**Y**
Conostylis setigera									x					x		
Corymbia calophylla		x		x	x	x	x	x	x	x	x	x		x	x	x
Dampiera alata	x															
Daucus glochidiatus								x	x		x			x		
Daviesia preissii									x					x		
Desmocladus fasciculatus									x							
Desmocladus flexuosus					x	x		x	x		x			x		
* *Disa bracteata*									x							
Drosera sp.		x					x									
* *Ehrharta calycina*					x	x			x							
* *Ehrharta longiflora*		x	x		x		x		x		x			x	x	
Eucalyptus accedens										x						
Eucalyptus marginata		x		x	x		x	x	x	x	x	x		x	x	
Eucalyptus patens				x												
Eucalyptus rudis	x	x	x													
Eucalyptus wandoo			x		x		x		x	x	x					x
Gastrolobium sp. Prostrate Boddington (M. Hislop 2130) (P1)																
Gastrolobium spinosum					x											
* *Geranium molle*					x		x							x	x	
Glischrocaryon aureum									x					x		
Gompholobium marginatum					x				x		x			x		x
Gompholobium polymorphum									x							
Gompholobium preissii														x		
Haemodorum laxum					x	x	x									
Haemodorum simplex						x			x		x				x	
Haemodorum sp.		x														
Hakea lissocarpha								x	x		x			x		
Hakea prostrata		x														
Hardenbergia comptoniana									x							
Hibbertia amplexicaulis									x			x		x		
Hibbertia commutata							x			x						
Hibbertia diamesogenos									x			x		x	x	
Hibbertia hypericoides									x							

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	Species	**AC**	**AD**	**AY**	**DG**	**G**	**G2**	**H**	**H2**	**M**	**M2**	**MG**	**P**	**PL**	**S**	**ST**	**Y**
	Hibbertia pilosa		x			x		x		x		x	x		x		
	Hibbertia trisperma							x									
*	*Hordeum hystrix*	x															
	Hovea chorizemifolia														x		
	Hyalosperma cotula							x		x							
*	*Hypochaeris glabra*	x	x			x		x	x	x	x	x			x	x	
*	*Hypochaeris radicata*									x							
	Isotoma hypocrateriformis														x		
	Kennedia prostrata		x					x		x	x	x			x	x	
	Labichea punctata														x		
	Lagenophora huegelii							x		x					x		x
	Lasiopetalum floribundum											x					
	Lechenaultia biloba									x					x		
	Lepidosperma leptostachyum							x				x					
	Lepidosperma leptostachyum sens. Lat.		x					x				x					
	Lepidosperma sp.							x	x	x					x	x	
	Lepidosperma squamatum						x									x	
	Leptospermum erubescens														x		
	Leucopogon capitellatus								x	x					x		
	Leucopogon nutans							x		x					x		
	Leucopogon propinquus		x					x		x					x	x	x
	Leucopogon sp. (JK 10)																x
	Levehookia pusilla									x							
*	*Lolium perenne*	x				x		x		x							
*	*Lolium rigidum*			x		x			x	x				x	x	x	
	Lomandra hermaphrodita														x		
	Lomandra preissii									x			x		x		
	Lomandra sericea									x							
	Lomandra spartea							x					x				
*	*Lotus subbiflorus*	x								x							
*	*Lysimachia arvensis*	x			x	x				x		x	x				
	Macrozamia riedlei		x			x		x	x	x		x	x		x	x	x
	Melaleuca lateritia	x															

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	Species	**AC**	**AD**	**AY**	**DG**	**G**	**G2**	**H**	**H2**	**M**	**M2**	**MG**	**P**	**PL**	**S**	**ST**	**Y**
	Melaleuca rhaphiophylla	x															
	Neurachne alopecuroidea					x		x		x		x	x		x		
	Opercularia echinocephala														x		
	Orchidaceae sp.		x					x									
	Oxalis sp.			x	x			x	x	x		x			x	x	
	Persoonia longifolia									x							
*	*Petrorhagia dubia*											x	x		x		
	Phyllangium paradoxum									x							
	Phyllanthus calycinus					x	x	x	x	x	x	x			x	x	
	Pimelea ciliata									x							
	Pimelea imbricata									x							
	Pimelea sp.														x		
	Pimelea suaveolens									x							
	Poaceae sp.		x					x	x	x	x						
	Podolepis gracilis														x		
	Podolepis lessonii																x
*	*Polypogon monspeliensis*			x					x								
	Pseudognaphalium luteoalbum	x															
	Pteridium esculentum									x							
	Ptilotus manglesii							x		x							
	Ranunculus colonorum												x				
	Rytidosperma caespitosum	x						x		x							x
	Scaevola calliptera							x	x	x							
	Senecio diaschides							x									
*	*Sonchus oleraceus*	x						x	x				x	x			
	Stackhousia monogyna							x		x			x		x		
	Stylidium affine									x		x					
	Stylidium amoenum												x		x		
	Stylidium ciliatum							x		x					x		
	Stylidium piliferum									x			x		x		
	Stylidium sp.									x			x		x		
	Tetraria octandra		x					x		x		x			x		
	Tetrarrhena laevis			x				x		x		x			x		

APPENDIX I: VASCULAR PLANT SPECIES RECORDED IN INFILL AREAS ON WMDE AND BAUXITE TRANSPORT CORRIDOR, 2018

Note: * denotes introduced species;
Note: T denotes threatened and P1 to P4 denotes Priority flora species (DBCA 2018a, 2018b)

	Site -Vegetation Types on Infll Areas on WMDE and Bauxite Transport Corridor															
Species	**AC**	**AD**	**AY**	**DG**	**G**	**G2**	**H**	**H2**	**M**	**M2**	**MG**	**P**	**PL**	**S**	**ST**	**Y**
Tetratheca hirsuta									x					x		
Thysanotus dichotomus											x			x		
Trachymene pilosa									x					x		
Trichocline spathulata							x							x		
* *Trifolium angustifolium*									x							
* *Trifolium arvense* var. *arvense*														x		
* *Trifolium campestre* var. *campestre*														x		
* *Trifolium* sp.	x						x	x	x							
Trymalium ledifolium					x		x	x	x		x	x		x	x	
Trymalium odoratissimum subsp. odoratissimum					x				x		x	x		x		
Typha orientalis	x															
* *Ursinia anthemoides subsp. anthemoides*		x			x	x	x		x		x	x		x		
* *Vulpia myuros*					x		x		x			x		x		x
Waitzia suaveolens									x							
Xanthorrhoea gracilis									x							
Xanthorrhoea preissii					x		x		x		x	x		x	x	
Xanthosia candida									x							

APPENDIX J: VASCULAR PLANT SPECIES BY SITE-VEGETATION TYPE FOR THE COLLIE REFINERY SURVEY AREA, 1999 AND 2014

Note: * denotes introduced species (DBCA 2018a, DBCA 2018b)

SPECIES	Site-Vegetation Type						
	CQ	CW	SP	ST	SW	TS	W
Acacia alata	x						
Acacia celastrifolia				x	x		
Acacia divergens	x						
Acacia extensa				x			
Acacia lateriticola	x			x	x		
Acacia pulchella		x		x			x
**Acacia pycnantha*					x		
Acacia saligna		x		x	x		
Acacia willdenowiana	x						
Agonis flexuosa			x		x		
Allocasuarina fraseriana			x	x	x		
Astartea scoparia	x						
Banksia dallanneyi var. *dallanneyi*	x				x		x
Banksia grandis			x	x	x		x
Banksia littoralis	x						
Baumea rubiginosa	x						
Boronia fastigiata		x	x	x	x		
Bossiaea aquifolium	x			x	x		x
Bossiaea ornata				x			
Caladenia flava	x			x			
Caladenia reptans				x	x		x
Caladenia sp.					x		
Calothamnus quadrifidus subsp. *angustifolius*				x			x
**Carduus* sp.							x
Chamaescilla corymbosa				x	x		x
Chorizema rhombeum				x			
Clematis pubescens				x	x		x
Comesperma virgatum				x			
Conospermum capitatum subsp. *capitatum*	x						
Conostylis aculeata subsp. *aculeata*						x	
Conostylis serrulata				x			
Conostylis setigera					x		
Conostylis setosa				x			
**Conyza sumatrensis*							x
Corymbia calophylla	x	x	x	x	x		x
Craspedia variabilis				x			
Cyathochaeta avenacea				x			
Darwinia citriodora		x					
Desmocladus fasciculatus				x	x		
Drosera macrantha					x		
Drosera sp.				x	x		
Drosera stolonifera				x			
Eucalyptus marginata	x		x	x	x		x
Eucalyptus patens	x				x		x
Gahnia decomposita	x						
Gastrolobium bilobum					x		x
Hakea amplexicaulis				x			
Hakea lissocarpha				x	x		x
Hibbertia amplexicaulis				x	x		
Hibbertia commutata	x				x		x
Hibbertia cunninghamii	x						
Hibbertia hypericoides	x		x	x	x		
Hibbertia perfoliata	x			x	x		x

APPENDIX J: VASCULAR PLANT SPECIES BY SITE-VEGETATION TYPE FOR THE COLLIE REFINERY SURVEY AREA, 1999 AND 2014

Note: * denotes introduced species (DBCA 2018a, DBCA 2018b)

SPECIES	Site-Vegetation Type						
	CQ	CW	SP	ST	SW	TS	W
Hovea trisperma				x			
Hypocalymma angustifolium	x			x	x		x
Hypocalymma cordifolium	x						
**Hypochaeris glabra*				x			
Hypolaena exsulca				x			
Labichea punctata	x				x		
Lagenophora huegelii	x			x	x		x
Lasiopetalum floribundum	x			x	x		x
Lasiopetalum glabratum					x		
Leucopogon capitellatus	x			x	x		x
Leucopogon propinquus	x			x	x		
Leucopogon verticillatus				x	x		x
Levenhookia pusilla							x
Lindsaea linearis	x				x		
Logania serpyllifolia				x	x		
Lomandra caespitosa	x				x		
Lomandra integra				x			x
Lomandra preissii	x			x			
Lomandra sericea			x	x	x		
Lomandra sp.					x		
Lomandra spartea					x		x
**Lysimachia arvensis*					x		x
Macrozamia riedlei	x			x	x		x
Marianthus drummondianus					x		
Mirbelia dilatata	x			x	x		x
Neurachne alopecuroidea	x			x	x		x
Opercularia echinocephala				x	x		x
Orchidaceae sp.				x			
Patersonia occidentalis				x	x		
Pentapeltis peltigera	x			x	x		
Persoonia longifolia		x		x	x		x
Platysace filiformis				x	x		x
Podocarpus drouynianus				x			
Pteridium esculentum				x	x		
Pterochaeta paniculata				x			
Pterostylis nana sens. lat.					x		x
Pterostylis recurva	x				x		
Pterostylis vittata					x		
Pyrorchis nigricans					x		
Scaevola calliptera					x		
Senecio hispidulus				x			
Sphaerolobium medium							x
Stylidium hispidum					x		
Stylidium piliferum				x	x		
Stylidium rhynchocarpum				x	x		
Taxandria linearifolia	x	x					
Tetraria octandra				x			
Tetraria sp. Jarrah Forest (R Davis 7391)	x		x	x	x		x
Tetrarrhena laevis	x			x	x		x
Tetratheca hirsuta				x			x
Thelymitra sp.			x	x	x		x
Thysanotus dichotomus	x						
Thysanotus fastigiatus	x						

APPENDIX J: VASCULAR PLANT SPECIES BY SITE-VEGETATION TYPE FOR THE COLLIE REFINERY SURVEY AREA, 1999 AND 2014

Note: * denotes introduced species (DBCA 2018a, DBCA 2018b)

SPECIES	Site-Vegetation Type						
	CQ	CW	SP	ST	SW	TS	W
Thysanotus multiflorus			x	x	x		
Trachymene pilosa	x			x	x		x
Trichocline spathulata				x			
Trymalium ledifolium					x		
Trymalium odoratissimum subsp. odoratissimum							x
Waitzia nitida				x			
Xanthorrhoea gracilis				x	x		
Xanthorrhoea preissii	x			x	x		
Xanthosia candida	x						x

APPENDIX K: SUMMARY OF POTENTIAL MATTERS OF ENVIRONMENTAL SIGNIFICANCE UNDER EPBC ACT 1999

K1. SUMMARY OF LIKELIHOOD OF OCCURRENCE OF MNES

A search using the *EPBC Act* Protected Matters Search Tool (PMST) identified 1 Listed Threatened Ecological Community (the "Eucalypt Woodlands of the Western Australian Wheatbelt") and 9 Listed Threatened Flora Species as occurring, or potentially occurring within a 20km radius of the WMDE, the Bauxite Transport Corridor.

A search using the *EPBC Act* Protected Matters Search Tool (PMST) identified 1 Listed Threatened Ecological Community (the "Banksia Woodlands of the Swan Coastal Plain ecological community") and 4 Listed Threatened Flora Species as occurring, or potentially occurring within a 20km radius of the CBME (collectively referred to as the Assessment Area).

A likelihood of occurrence assessment was undertaken for each of the potential listed threatened ecological community and threatened flora species potentially occurring within the WMDE and the Bauxite Transport Corridor, and the CBME. The assessment was based on nearby records and habitat availability.

The likelihood of occurrence of each of these threatened communities and species was assessed based on previous flora surveys since the early 1980's (see Appendix A) for a range of clients (although primarily the Newmont Boddington Gold Mine and South32 Worsley Alumina Pty Ltd) and an understanding of the likelihood of the communities is discussed in Section 5.7 of the report and of the species in Section 5.2 of the report and Appendices D and F). The following tables summarize the threatened communities and threatened flora species that have been recorded, Tables K1 and K2.

Table K1: MNES Threatened Ecological Communities recorded near or within the Assessment Area

Threatened Ecological Community	Status: EPBC Act	WMDE and Bauxite Transport Corridor	CBME
Eucalypt Woodlands of the Western Australian Wheatbelt	Critically Endangered	**Potential** on eastern fringes of northern Jarrah Forest and does overlap with South32 leases, but was not in the proposed expansion areas of the WMDE and Bauxite Transport Corridor	**Unlikely** as not near Western Australian Wheatbelt.
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	**Unlikely** as expansion areas occur on eastern sections of the northern Jarrah Forest (not the Swan Coastal Plain and therefore not in expansion areas	**Unlikely** as expansion areas occur on eastern sections of the northern Jarrah Forest (not the Swan Coastal Plain and therefore not in expansion areas)

APPENDIX K: SUMMARY OF POTENTIAL MATTERS OF ENVIRONMENTAL SIGNIFICANCE UNDER EPBC ACT 1999

One threatened flora (*Caladenia hopperiana*) pursuant to the *EPBC Act 1999* has been recorded within the WMDE and two threatened flora (*Caladenia dorrienii* and *Eleocharis keigheryi*) pursant to the *EPBC Act 1999* were recorded east of the southeastern expansion areas; but not within the WMDE or Bauxite Transport Corridor. *Caladenia hopperiana* is the only one of the three threatened species recorded in the WMDE.

- *Caladenia hopperiana* (formerly known as *Caladenia* sp. Quindanning) is Threatened under the *BC Act 2016* and Endangered under the *EPBC Act 1999* – occurs within and outside the WMDE in the south eastern section of the mapping (see Figures 5.12 and 5.13).
- *Caladenia dorrienii* is Threatened under the *BC Act 2016* and Endangered under the *EPBC Act 1999* – occurs outside and to the east of the WMDE (see Figure 5.10).
- *Eleocharis keigheryi* is Threatened under the *BC Act 2016* and Vulnerable under the *EPBC Act 1999* – occurs outside and to the east of the WMDE (see Figure 5.13).

No threatened flora species pursuant to the *EPBC Act 1999* have been recorded in the CBME area.

Table K2: MNES Threatened Flora recorded within the WMDE and Bauxite Transport Corridor

Species	Status under EPBC Act	Potential Occurrence / Recorded Location
Caladenia hopperiana	E	WMDE – 15 inside locations and 159 outside locations of WMDE and Transport Corridor; 20 plants inside and 261 outside.

The following text provides a summary of the three potential threatened flora species (sections K2.1 to K2.3).

APPENDIX K: SUMMARY OF POTENTIAL MATTERS OF ENVIRONMENTAL SIGNIFICANCE UNDER EPBC ACT 1999

K2. RECORDED THREATENED FLORA

K2.1 *CALADENIA DORRIENII* (T AND E)

Caladenia dorrienii is listed as a Threatened Flora under the State *Biodiversity Conservation Act 2016* and as Endangered under the Federal *Environmental Protection and Biodiversity Conservation Act 1999*.

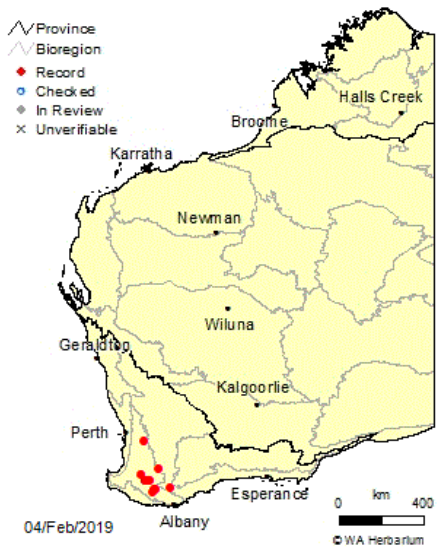
Family: ORCHIDACEAE **Common Name:** Cossack Spider-orchid
Habit: Tuberous, perennial, herb, 0.1-0.2 m high.
Flower colour: white-cream-yellow
Flowering period: Sept to Nov.
Soils: Clayey loam. Moist sites adjacent to rivers and seasonal creeks.
IBRA Distribution: Avon Wheatbelt and Jarrah Forest
Florabase records: 16

Description:
This is a small orchid producing 1—3 distinctive flowers with narrow linear greenish-white sepals (modified leaves), and petals with longitudinal red veins and dark glandular hairy tips. The erect dorsal sepal (top 'petal') is 25—30 mm in length. The labellum (lower 'lip' petal) has a few irregular marginal teeth and two rows of closely set glands (7—8 in each row) along the middle. The flowers are produced on a slender, erect, hairy stem, up to 20 cm high. A narrow, linear leaf clasps this stem near its base and there is a short bract midway along its length. The plant is dormant between December and late April.

Number of Plants and Potential Populations
The results from previous data searches reflect the presence of some 14 plants on an area of private property outside the proposed Worsley Mining Development Envelope (WMDE) (Mattiske Consulting Pty Ltd 2019 – Flora and Vegetation report). Data sourced from Department of Biodiversity, Conservation and Attractions in 2018.

Associated vegetation communities:
Open Wandoo (*Eucalyptus wandoo*) or Jarrah (*E. marginata*) woodland. The species grows amongst low, scattered shrubs, annuals and dense low herbs, often on slopes and near streams. The occurrence at Boddington occurs at the current northern extent of its range according to the distribution available from the Florabase (WAH 1998-).

Caladenia dorrienii



APPENDIX K: SUMMARY OF POTENTIAL MATTERS OF ENVIRONMENTAL SIGNIFICANCE UNDER EPBC ACT 1999

References:
Western Australian Herbarium (1998–). FloraBase—the Western Australian Flora. *Caladenia dorrienii.* Department of Biodiversity, Conservation and Attractions. Available from: https://florabase.dpaw.wa.gov.au/browse/profile/10850

Department of the Environment, Water, Heritage and the Arts (2008). Approved Conservation Advice for Caladenia dorrienii (Cossack Spider-orchid). Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/78672-conservation-advice.pdf

K2.2 *CALADENIA HOPPERIANA* (T AND E)

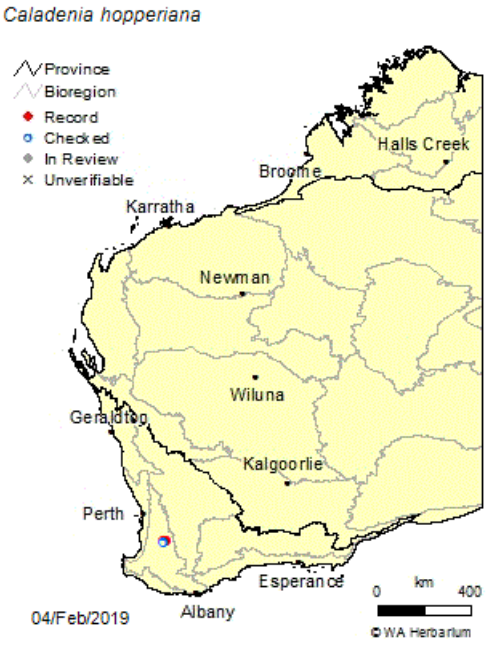
Caladenia hopperiana is listed as a Threatened Flora under the State *Biodiversity Conservation Act 2016* and as Endangered under the Federal *Environmental Protection and Biodiversity Conservation Act 1999*.

Family: ORCHIDACEAE **Common Name:** Quindanning Spider Orchid, Boddington spider orchid
Habit: Erect herb, grows to 35cm high
Flower colour: one to four yellowish to creamy-white flowers to 6cm across.
Flowering period: Late Sept to Oct.
Soils: seasonal creeks and swamps.
IBRA Distribution: Jarrah Forest
Florabase records: 4

Number of Plants and Potential Populations
The results from previous data searches reflect the presence of some 200 to 280 plants (in some instances plant numbers were not recorded as historical records) in 6 to 7 locations; with the majority of records collected by South32 site environmental team members in the one valley system. This orchid has been recorded on the Mooradung Nature Reserve 32448, near tracks off the Pinjarra to Williams Road, near the Williams to Quindanning Road and on Timber Reserve 17125. These plants occur within and outside the Worsley Mining Development Envelope (WMDE) in the south eastern section of the mapping areas (Mattiske Consulting Pty Ltd 2019 Flora and Vegetation report). Data sourced from Department of Biodiversity, Conservation and Attractions in 2018 and South32 records.

Associated vegetation community:
Eucalyptus wandoo woodland on the margins of seasonal creeks and swamps with *Melaleuca viminea*, *Chorizandra enodis*, *Craspedia variabilis* and other orchid species including *Caladenia longicauda subsp. redacta*, *Diuris laxiflora* and *Prasophyllum gracile*. The occurrence at Boddington, within and near the Quindanning Timber Reserve, is relatively restricted to a local area, according to the distribution available from the Florabase (WAH 1998-)

APPENDIX K: SUMMARY OF POTENTIAL MATTERS OF ENVIRONMENTAL SIGNIFICANCE UNDER EPBC ACT 1999



References:

Western Australian Herbarium (1998–). FloraBase—the Western Australian Flora. *Caladenia hopperiana.* Department of Biodiversity, Conservation and Attractions. Available from: https://florabase.dpaw.wa.gov.au/browse/profile/44901

Department of Environment and Conservation (2013). *Boddington Spider Orchid (Caladenia sp. Quindanning) interim recovery plan 2013-2017*. Available from: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/recovery_plans/Approved_interim_recovery_plans_/Caladenia_sp._Quindanning_332.pdf

Threatened Species Scientific Committee (2018). Conservation Advice Caladenia hopperiana Quindanning spider orchid. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/88195-conservation-advice-15022018.pdf

APPENDIX K: SUMMARY OF POTENTIAL MATTERS OF ENVIRONMENTAL SIGNIFICANCE UNDER EPBC ACT 1999

K2.3 *ELEOCHARIS KEIGHERYI* (T AND V)

Eleocharis keigheryi is listed as a Threatened Flora under the State *Biodiversity Conservation Act 2016* and as Vulnerable under the Federal *Environmental Protection and Biodiversity Conservation Act 1999*.

Family: CYPERACEAE **Common Name:** Keigheryi's *Eleocharis*

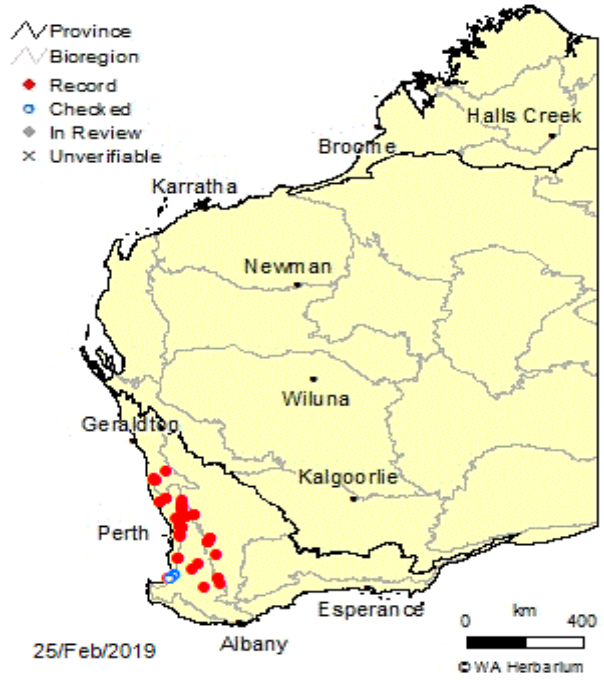
Habit: Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 meters high. Semi-aquatic
Inflorescence: 4-6mm long, 1-2mm wide, colorless or pale green. Flower spike slightly broader than stem with spirally arranged, oblong to narrow ovate bracts. Flowers consist of three stamen and feathery stigma that divides into three.
Flowering period: August to November or December.
Soils: Clay, sandy loam. Emergent in freshwater: creeks, clay pans
IBRA Distribution: Avon Wheatbelt P2, Dandaragan Plateau, Lesueur Sandplain, Northern Jarrah Forest, Perth, Southern Jarrah Forest
Florabase records: 54

Number of Plants and Potential Populations
The results from previous data searches reflect the presence of 1 plant from the Deefor Wetland, Wandoo National Park, near York. This is outside the proposed Worsley Mining Development Envelope (WMDE) (data sourced from Department of Biodiversity, Conservation and Attractions in 2018). This plant occurs in a range of IBRA regions and as such is not restricted to the eastern areas of the northern Jarrah Forest.

Associated Vegetation: *Melaleuca teretifolia, Melaleuca lateritia* over *Leptocarpus canus, Chorizandra enodis* over *Villarsia capitata* and herbs. *Melaleuca lateritia* shrubland over aquatic herbs. Low open woodland of *Eucalyptus rudis*, over sedgeland, over herbs. *Melaleuca rhaphiophylla* trees over *Cyperus* sedgeland.

Associated species: *Melaleuca lateritia, Wurmbea spp., Tribonanthes spp., Leptocarpus spp., Chorizandra enodis, Stylidium asymmetricum, Myriocephalus occidentalis, Amphibromus nervosus, Gratiola pubescens, Myriophyllum limnophyllum.*

Eleocharis keigheryi



APPENDIX K: SUMMARY OF POTENTIAL MATTERS OF ENVIRONMENTAL SIGNIFICANCE UNDER EPBC ACT 1999

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Department of the Environment 2008, *'Approved Conservation Advice for Eleocharis keigheryi (Keighery's Eleocharis)'.* [15 February 2019].

Western Australia Herbarium 1998-, Eleocharis keigheryi.
Available from: https://florabase.dpaw.wa.gov.au/browse/profile/17605 [18/02/2019]