Level 2 Flora and Vegetation Survey – Lot 4580, Panizza Road, Dardanup

Prepared for Cristal Pigment Australia Ltd

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Executive Summary

Ecoedge was engaged by Cristal Pigment Australia Ltd in October 2014 to undertake a Level 2 flora and vegetation survey of remnant vegetation along Panizza Road (east of Depiazzi Road to the boundary of Lot 4577), and also Lot 4580 Panizza Road, Dardanup in the Shire of Dardanup. Cristal Pigment Australia Ltd are investigating the potential use of Lot 4580 for residue disposal and the use of Panizza Road for access to the site, which will require widening to accommodate trucks.

The Survey Area was visited on 16th and 30th October 2014 to carry out the assessment. The assessment was undertaken in accordance with the Environmental Protection Authority (EPA) Guidance Statement 51, "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia" (EPA, 2004).

The survey, which was carried out over approximately 4.5 ha of remnant vegetation, resulted in the identification of 115 species of vascular flora, about a quarter of which are introduced species. No Declared Rare Flora was found in the Survey Area. Five plants of one species of Priority Flora, *Acacia semitrullata* (P3), were found on the southern road reserve of Panizza Road.

No other Priority Flora (*Wildlife Conservation Act 1950*), or flora listed under the *Environment Protection and Biodiversity Conservation Act 1999*, or species otherwise of conservation significance were found. One of the introduced species, *Moraea flaccida* (One-leaf Cape Tulip) is listed as a C3 (management) species under the *Biosecurity and Agriculture Management Act 2007*.

Three vegetation units were identified within the Survey Area. Because of the high level of degradation by grazing of most of the remnant vegetation, many understorey species are no longer present. Therefore, vegetation units identified may have originally comprised a number of plant communities that are no longer recognisable because of species loss. Most of the remnant vegetation appears to belong to floristic community types that are not threatened or priority ecological communities. A small area of vegetation in the south east corner of Lot 4580 was possibly originally FCT C5 (Dardanup Jarrah and Mountain Marri woodland on laterite). FCT C5 is a Priority 1 ecological community but because of its high degree of degradation, this area of vegetation within the Survey Area could no longer be regarded as representing this community.

Apart from the presence of *Acacia semitrullata* (Priority 3) in vegetation on the southern road reserve of Panizza Road that was rated as 'Good' condition, remnant vegetation in the Survey Area has low conservation significance.

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Statement of limitations

Reliance on Data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction

Ecoedge was engaged by Cristal Pigment Australia Ltd in October 2014 to undertake a Level 2 flora and vegetation survey along Panizza Road (east of Depiazzi Road to the boundary of Lot 4577) and also Lot 4580 Panizza Road, Dardanup in the Shire of Dardanup. Cristal Pigment Australia Ltd are investigating the potential use of the Lot 4580 for residue disposal and the use of Panizza Road for access to the site, which will require widening to accommodate trucks.

Ecoedge previously surveyed the vegetation in a portion of Lot 4580 Panizza Road in 2013 (Ecoedge, 2013). This survey recorded that two thirds of the vegetation on site had similarities to the vegetation community FCT C2 "Whicher Scarp Jarrah woodland of deep coloured sands", a Priority 1 ecological community. No Declared Rare Flora or Priority Flora were recorded within the Survey Area.

The Survey Area was visited on 16th and 30th October 2014 to carry out the assessment. The assessment was undertaken in accordance with the Environmental Protection Authority (EPA) Guidance Statement 51, "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia" (EPA, 2004).

This report compiles findings of the field survey.

1.1 Scope and objectives

The scope and objectives of the flora survey for the study area were to carry out a Level 2 flora and vegetation assessment to determine whether there are any significant flora values within the Survey Area. The survey scope specified the following requirements:

- Conduct an assessment of flora and vegetation values within the study area;
- Conduct a review of other literature to summarise the values of flora and vegetation significance in the project area;
- Review the documented flora and vegetation of significance, based on Department of Parks and Wildlife (DPaW) records (databases);
- Conduct a field assessment to:
    - Identify the vascular flora species present;
    - Determine the presence or absence of Declared Rare Flora (DRF), Priority or Significant Species;
    - Assess conservation significance of vegetation and flora;
    - Define and spatially map vegetation condition;
    - Define and spatially map vegetation communities; (achieved through the installation of two x 100 m^2 floristic quadrats and a number of floristic relevés)
    - Define and map threatened and priority ecological communities

1.2 Biogeographic region

The Study Area is situated within the transition zone of the Southern Jarrah Forest (JF2) sub-region between the Jarrah Forest biogeographic region and the Perth Coastal Plain (SWA2) sub-region of the Swan Coastal Plain biogeographic region, as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Australian Government, 2009).

1.3 Site location and features

The Study Area is situated approximately 2.5 km south south-east of the Dardanup town site (**Figure 1**). Elevation falls from 106 m above sea level (ASL) in the east to 32 m in the west.

The Study Area is located on privately owned land (Lot 4580) and along Panizza Road, which is vested in the Shire of Dardanup. Lot 4580 has been cleared in the past for agricultural use and there is evidence of recent grazing. According to the Greater Bunbury Region Scheme and the Shire of Dardanup Town Planning Scheme 3, Lot 4580 is currently zoned as "rural and general farming".

1.4 Geology

The majority of the Panizza Road portion of the Survey Area is situated within the Pinjarra Zone (213) geomorphological and geological unit. According to Schoknecht, *et al*. (2004) the Pinjarra Zone can be defined as alluvial deposits occurring between the Bassendean Dune Zone and the Darling Scarp, and colluvial and shelf deposits adjacent to the Darling Scarp. The soils are clayey to sandy alluvial with wet areas (Schoknecht, *et al*., 2004).

Four soil-landscape systems have been identified and mapped within the Pinjarra Zone (213); the Abba System (Ab), the Forrestfield System (Fo), the Pinjarra System (Pj) and the Yanga System (Ya) (Churchward, *et al.*, 1988; McArthur and Clifton, 1975). The western portion of the Panizza Road part of the Survey Area is situated on soils of the Forrestfield System (Fo) (**Figure 2**) which is described below.

Forrestfield System (213Fo): Undulating foot slopes of the Darling and Whicher Scarps. This system is colluvium over granitic and sedimentary rocks and has duplex sandy gravels, pale deep sands and grey deep sandy duplexes.

Both the eastern most portion of Panizza Road and all of Lot 4580 are situated within the Donnybrook Sunkland Zone (214) geomorphological and geological unit. According to Schoknecht, et al. (2004) the Donnybrook Sunkland Zone can be defined as a moderately dissected lateritic plateau on Perth basin sedimentary rocks. The soils are formed in lateritic colluvium, sedimentary rocks weathered *in-situ* and alluvium (poorly drained alluvial plain in the south) (Schoknecht, et al., 2004).

Five soil-landscape systems have been identified and mapped within the Donnybrook Sunkland Zone (214); the Blackwood Plateau System (Bp), the Goodwood Valleys System (Gv), the Nillup Plain System (Np), the Treeton Hills System (Th) and the Whicher Scarp

System (Ws) (Churchward, *et al.*, 1988; McArthur and Clifton, 1975). The Survey Area is situated on soils of the Whicher Scarp System (Ws) (**Figure 2**) which is described below.

Whicher Scarp System (214Ws): Low scarp and raised platform, on the northern edge of the Donnybrook Sunkland. This system has sandy gravel and pale deep sands, loamy gravel and non-saline wet soils.

Soil-landscape systems have been further divided into soil phases or mapping units. Soil Mapping Units occurring within the Survey Area are presented in **Table 1.**

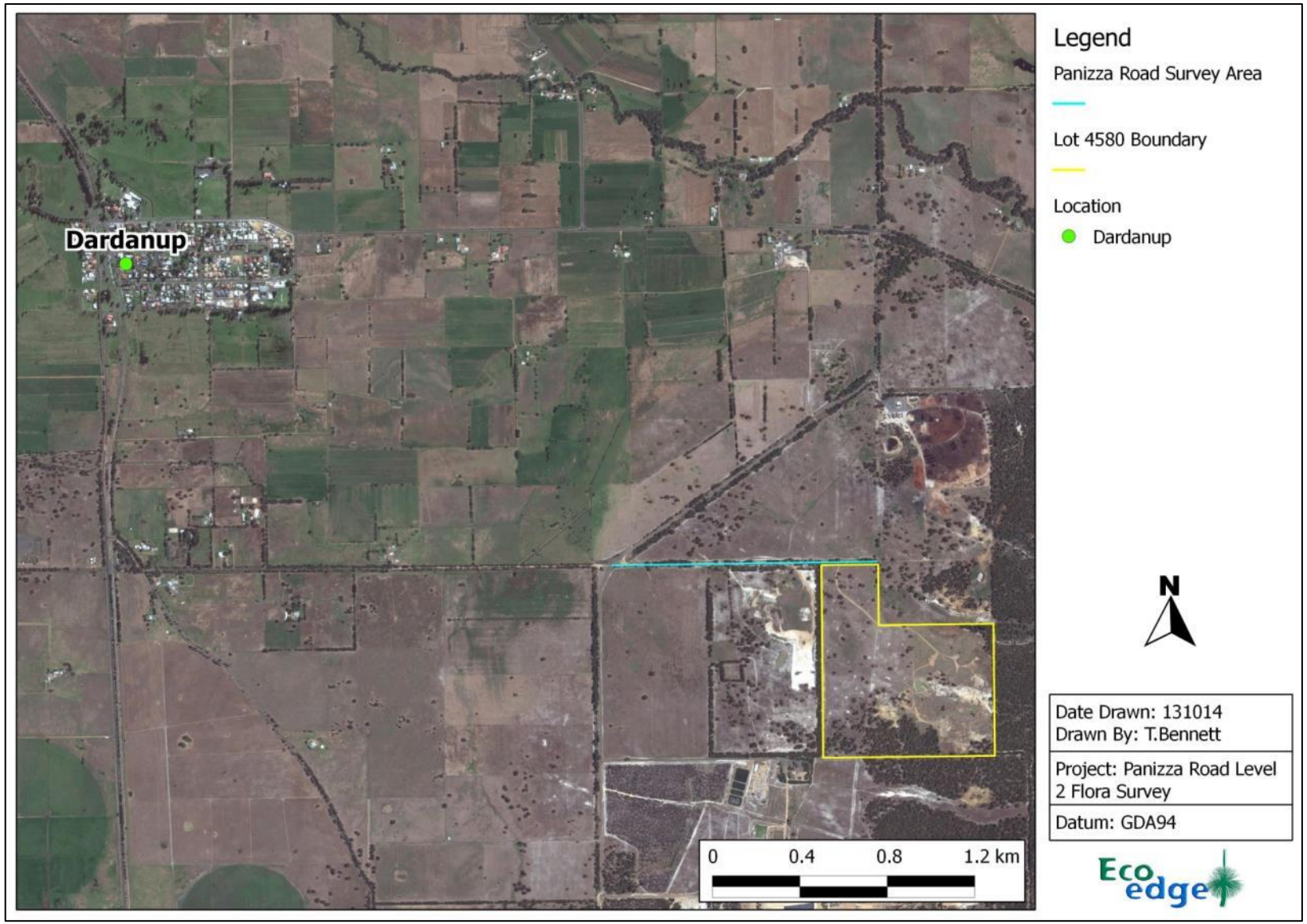

Figure 1. Aerial Photograph showing location of Survey Area in relation to the Dardanup townsite.

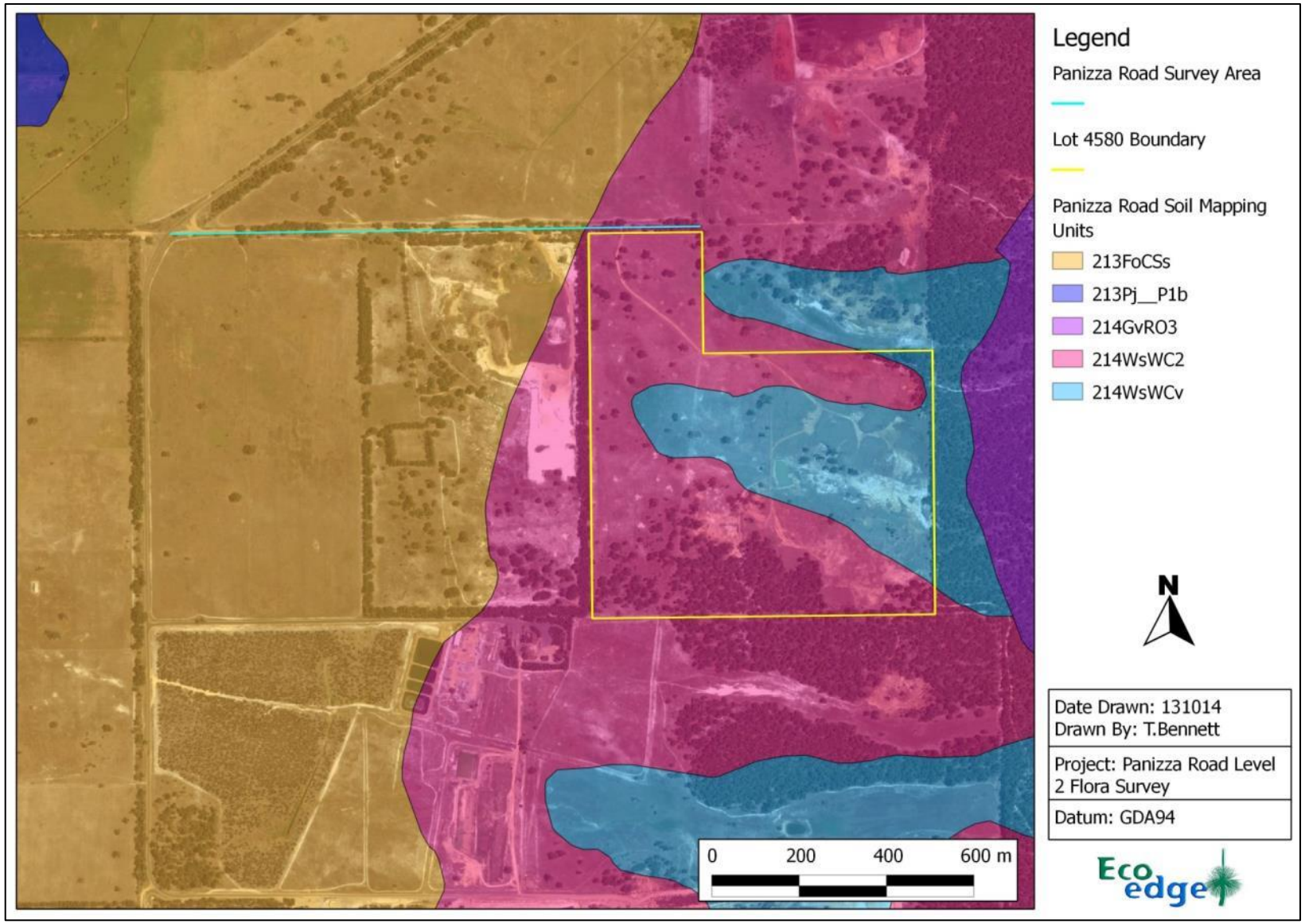

Figure 2. Soil landscapes occurring within the Survey Area.

Soil Mapping Unit	Description
213FoCSs	Very low relief (1-5%) foot slopes with rapidly drained deep bleached grey sands and occasionally deep yellow brown sands. Minor occurrence of gravels.
214WsWC2	Whicher gentle slopes phase. Duplex sandy gravels and shallow gravels on laterite duricrust typical of a laterite profile of the region, comprising of sandy/gravelly topsoil. Overlying duricrust (indurated to nodular) overlying sandy clay to clay
214WsWCv	Whicher valleys. Minor valleys cutting through the Whicher gentle slopes. Relief is 10 – 40 m and slope gradients are 5 – 15%, occasionally to 25%.

Table 1. Soil Mapping Units occurring within the Survey Area

1.5 Vegetation

The Survey Area supports approximately 4.5 ha of remnant native vegetation.

The South West Biodiversity Project Mapping and Information Installment 2 (South West Biodiversity Project, 2007) provides a map of the vegetation complexes in the South West region. This mapping utilises the Regional Forest Agreement (RFA) mapping of Mattiske and Havel (1998) as well as the Swan Coastal Plain (SCP) mapping of Heddle *et al.* (1980).

As shown **in Figure 3**, the Survey Area was mapped by Heddle *et al.* (1980) as originally being comprised of vegetation belonging to the Cartis Complex, Kingia Complex and Guildford Complex (**Table 2**).

Vegetation Complex	Description
Guildford	A mixture of open forest to tall open forest of *Corymbia calophylla*, *Eucalyptus wandoo* and *Eucalyptus marginata* and woodland of *Eucalyptus wandoo* (with rare occurrences of *Eucalyptus lane-poolei*). Minor components include *Eucalyptus rudis* and *Melaleuca rhaphiophylla*.
Kingia Complex	Open forest of *Eucalyptus marginata* subsp. *marginata* - *Corymbia calophylla -Allocasuarina fraseriana-Banksia grandis - Xylomelum occidentale* on lateritic uplands in perhumid and humid zones. The Kingia Complex is an upland vegetation complex of the Blackwood Plateau and Plain.
Cartis Complex	Low open-forest of *Eucalyptus marginata* (Jarrah), *Corymbia calophylla* (Marri) and *C. haemotoxylon* (Mountain Gum) with a definite second storey of *Banksia* species. Common species found in the understorey include *Xylomelum occidentale, Allocasurina fraseriana, Melaleuca thymoides, Pityrodia bartlingii, Pultenaea reticulata, Podocarpus drouynianus, Leucopogon glabellus, Hibbertia subvaginata, Hakea ruscifolia and Calothamnus* species. The Cartis complex is an upland vegetation complex of the Blackwood Plateau and Plain.

Table 2. Vegetation complexes within the Survey Area

In 2001, the Commonwealth of Australia stated National Targets and Objectives for Biodiversity Conservation, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community was necessary if Australia's biological diversity was to be protected (Environment Australia, 2001). This level of recognition is in keeping with the targets set in the EPA's Position Statement on the 'Environmental protection of native vegetation in Western Australia: clearing of native vegetation, with particular reference to the agricultural area' (EPA, 2000). With regard to conservation status, the EPA has set a target of 15% of pre-European extent for each ecological community to be protected in a comprehensive, adequate and representative reserve system (EPA, 2006).

Table 3 lists the percentage remaining of each vegetation complex and the percentage of each vegetation complex in formal and formal plus informal reserves. It also lists whether each vegetation complex meets the Commonwealth's 30% target (Environment Australia, 2001) and the EPA's 15% target (EPA, 2006). As is evident in **Table 3**, none of the vegetation complexes present within the Study Area meet the Commonwealth's 30% target or the EPA's 15% target.

Vegetation Complex	% Remaining of pre-European	Is the 30% Target Met?	% in Formal Reserves	% in Formal + All Informal Reserves	Is the 15% Target Met?
Cartis	17.9%	No	5.0%	6.1%	No
Kingia	21.4%	No	9.7%	10.7%	No
Guildford	4.1%	No	0.1%	0.2%	No

Table 3. Vegetation Complexes with regard to the EPA and Commonwealth retention targets (DEC, 2007).

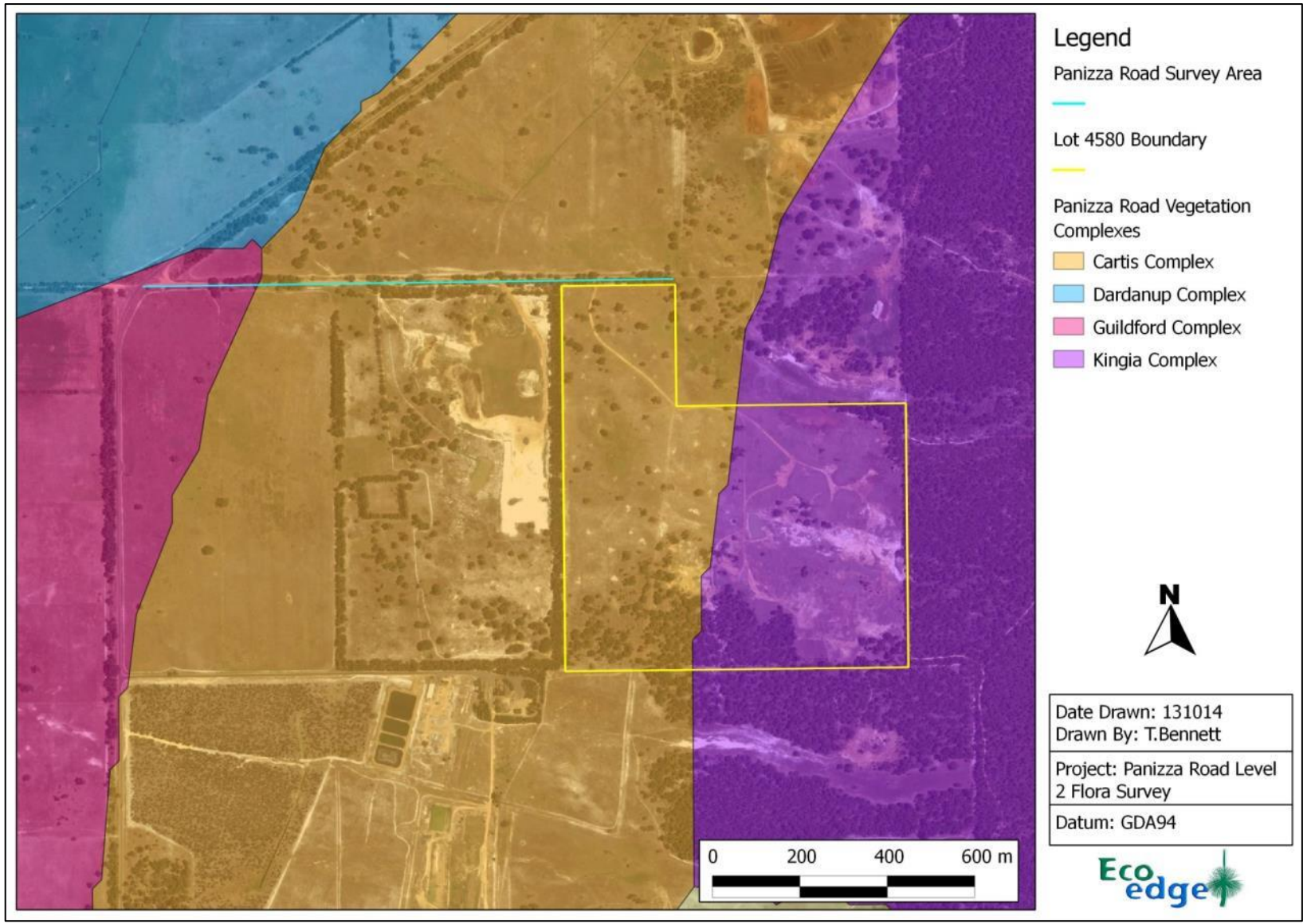

Figure 3. Vegetation complexes mapped as occurring within the Survey Area.

1.6 Threatened and Priority Ecological Communities

Ecological communities are defined by Western Australia's Department of Parks and Wildlife (DPaW, previously the Department of Environment and Conservation (DEC)) as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC, 2010).

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; 'presumed totally destroyed', 'critically endangered', 'endangered' or 'vulnerable' (DEC, 2010). Possible threatened ecological communities that do not meet survey criteria are added to DPaW's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (DEC, 2010). The current listing of Threatened and Priority Ecological Communities is specified in DPaW 2014a and 2014b. Threatened Ecological Communities can also be listed under the *Environment Protection and Biodiversity Conservation Act* (1999) (*EPBC Act*) (Department of the Environment (DotE, 2014a); Department of Environment, Water, Heritage and the Arts (DEWHA, 1999)).

A Protected Matters Search Tool query for communities listed under the *EPBC Act* occurring within a 10 km radius of the Study Area was undertaken (DotE, 2014b). Threatened ecological communities known to occur within 10 km of the Survey Area are presented in **Table 4**. The complete Protected Matters Search Tool results are included in **Appendix 1.**

Community Name	Community Description	Status (*WC Act*)	Status (*EPBC Act*)
Corymbia calophylla - *Kingia australis* woodlands on heavy soils, Swan Coastal Plain - SCP3a	Situated on heavy soils and considered to have been one of the most extensive communities on the eastern side of the coastal plain but due to clearing is now regionally rare (Keighery and Trudgen 1992). This subgroup occupies the wettest sites and has high frequencies of *Corymbia calophylla* and *Kingia australis*.	CR	EN
Corymbia calophylla - *Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain - SCP3c	Situated on heavy soils and considered to have been one of the most extensive communities on the eastern side of the coastal plain but due to clearing is now regionally rare (Keighery and Trudgen 1992). This community is dominated by *Corymbia calophylla – Xanthorrhoea preissii* woodlands, with *Eucalyptus wandoo* as an occasional dominant.	CR	EN
Corymbia calophylla - *Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain SCP3c	Situated on heavy soils and considered to have been one of the most extensive communities on the eastern side of the coastal plain (Keighery and Trudgen 1992) but due to clearing is now regionally rare (Keighery and Trudgen 1992). This community is dominated by *Eucalyptus calophylla – Xanthorrhoea preissii* woodlands, with *Eucalyptus wandoo* as an occasional dominant.	CR	EN
Shrublands on dry clay flats SCP10a	Rapidly drying clay flats that generally have shallower microtopography than other clay pan community types or else have thin skeletal soils.	EN	CR
Herb rich saline shrublands in clay pans - SCP07	Community occurs on heavy clay soils that are generally inundated from winter into mid-summer. This community is dominated by either *Melaleuca viminea*, *Melaleuca uncinata, Melaleuca cuticularis* or *Casuarina obesa* or a mixture of these species.	VU	CR
Herb rich shrublands in clay pans - SCP08	Situated on heavy soils, this community type is the clay pan communities which can be dominated by *Viminaria juncea*, *Melaleuca viminea*, *M. lateritia* or *M. uncinata* but also occasionally by *Eucalyptus wandoo*.	VU	CR
Dense shrublands on clay flats - SCP09	Shrublands or open woodlands of clay flats that are inundated for long periods.	VU	CR

Community Name	Community Description	Status (WA)	Status (*EPBC Act*)
Corymbia calophylla woodlands on heavy soils of the southern Swan Coastal Plain SCP1b	Consists largely of *Corymbia* forests and woodlands of bushland remnants on the plain south of Capel.	VU	
Swan Coastal Plain Paluslope Wetlands	These wetlands are very wet all year round and are associated with areas of groundwater seepage from the sandy low hills at the base of the Whicher Scarp. At times these wetlands are contiguous with areas of Pinjarra Plain wetlands, and the wetlands of the two landforms merge. Combinations of the following species are typically found in the type: *Melaleuca preissiana*, *Taxandria linearifolia*, *Taxandria fragrans*, *Melaleuca incana*, and *Cyathochaeta teretifolia*. Other species include: *Eucalyptus patens*, *Homalospermum firmum*, *Gahnia decomposita*, *Callistachys lanceolata*, *Hakea linearis*, *Melanostachya ustulata*, *Evandra aristata*, *Beaufortia sparsa*, *Callistemon glaucus* and *Pultenaea pinifolia*.	P1	
Dardanup Jarrah and Mountain Marri woodland on laterite (Whicher Scarp woodlands of coloured sands and laterites community C5)	This community is located on unusual surface of quartzite and laterite in Dardanup forest which is an area where the Whicher Scarp, Blackwood Plateau and Darling Scarp interface. It is notable in the presence of uncommonly encountered laterite taxa including: *Lomandra* sp. Dardanup, *Lomandra spartea, Olax benthamiana, Andersonia heterophylla, Hemigenia incana, Acacia varia* var. *varia, Daviesia angulata, Pimelea preissii,* and also *Lomandra brittanii, Xanthorrhoea acanthostachya, Dryandra armata* var. *armata*, *Hakea stenocarpa, Stachystemon vermicularis, Lambertia multiflora* var *darlingensis, Petrophile striata* and *Pimelea sulphurea.*	P1	

Community Name	Community Description	Status (WA)	Status (*EPBC Act*)
Whicher Scarp Jarrah woodland of deep coloured sands (Whicher Scarp woodlands of coloured sands and laterites community C2)	Community is found scattered through the Central and North Whicher Scarp on midslopes on deep, generally coloured sands rarely associated with laterites. Community has a strongest representation of common sand taxa especially *Hypolaena exsulca*, *Dasypogon bromeliifolius*, *Stirlingia latifolia*, *Petrophile linearis*, *Melaleuca thymoides* and *Adenanthos meisneri*. Note: This community should be cross-referenced with *Eucalyptus haematoxylon* - *Eucalyptus marginata* woodlands on Whicher foothills (Swan Coastal Plain community type 1a).	P 1	
Corymbia haematoxylon - *E. marginata* woodlands on Whicher foothills ('community type 1a')	Community occurs along the northern edge of State Forest along the base of the Whicher Range and is composed of *Corymbia haematoxylon – Corymbia calophylla* - *Eucalyptus marginata* forests and woodlands. Taxa virtually restricted to the type include *Acacia varia* subsp. *varia*, *Agonis grandiflora* and *Xanthosia pusilla*.	P3	
Southern *Banksia attenuata* woodlands ('community type 21b')	This community is restricted to sand sheets at the base of the Whicher Scarp, the sand sheets on elevated ridges or the sand plain south of Bunbury. Structurally, this community type is normally *Banksia attenuata* or *Eucalyptus marginata – B. attenuata* woodlands. Common taxa include *Acacia extensa, Jacksonia* sp. Busselton, *Laxmannia sessiliflora, Lysinema ciliatum* and *Johnsonia acaulis*.	P3	

Table 4. Threatened and Priority ecological communities occurring within 10 km of the Survey Area (Gibson et al., 1994; DPaW, 2014a; DotE, 2014b).

1.7 Threatened and Priority Flora

Species of flora and fauna are defined as having Declared Rare (Threatened) or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Environment Regulation recognises these threats of extinction and consequently applies regulations towards population and species protection.

Declared Rare (Threatened) Flora species are gazetted under Subsection 2 of Section 23F of the *Wildlife Conservation Act* (1950) (*WC Act*) and therefore it is an offence to 'take' or damage rare flora without Ministerial approval. Section 23F of the *WC Act* 1950-1980 defines 'to take' as "… to gather, pick, 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 are under consideration for declaration as 'rare flora', but are in need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). **Table 5** presents the categories of Declared Rare and Priority Flora as defined by the *WC Act* (DPaW, 2013).

Conservation code	Category
R	Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such.
P1	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3	Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
P4	Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Table 5. Definitions of Declared Rare and Priority List flora (DPaW, 2013).

Under the *EPBC Act,* a species may be listed in one of six categories; the definitions of these categories are summarised in **Table 6** (DotE, 2014c).

Threatened or Priority flora occurring within 10 km of the Survey Area generated by DPaW data search (DEC, 2012) and 10 km of the Survey Area generated from a Naturemap data search (DPaW 2014c) are listed in **Table 7**. Taxa listed under the *EPBC Act* (based on results of the Protected Matters Search Tool query (DotE, 2014b)) are listed in **Appendix 1**.

Category	Definition
Extinct (Ex)	A native species is eligible to be included in the ***extinct*** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (ExW)	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) 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.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category 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.
Endangered (E)	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (V)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent (CD)	A native species is eligible to be included in the conservation dependent category 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.

Table 6. Categories of Threatened Species under the *EPBC Act* (DotE, 2014c).

Species	Cons status	Flowering	Habitat	Likelihood of occurrence
Acacia drummondii subsp. *affinis*	P3	Jul - Aug	Lateritic gravelly soils	Low
Acacia flagelliformis	P4	Jul – Sep	Sandy soils. Winter-wet areas	Low
Acacia semitrullata	P4	May – Oct	White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas	High
Adelphacme minima	P3			Low
Aponogeton hexatepalus	P4	Aug – Sep	Mud. Freshwater: ponds, rivers, claypans	Low
Boronia humifusa	P1	Jun or Sept	Gravelly clay loam over laterite. Jarrah-marri open forest	Moderate
Carex tereticaulis	P1	Sep - Oct	Black peaty sand	Low
Caustis sp. Boyanup (G.S. McCutcheon 1706)	P3	-	White or grey sand	Moderate
Chamaescilla gibsonii	P3	Sep	Clay to sandy clay. Winter-wet flats, shallow water-filled claypans	Low
Chamelaucium sp. Yoongarillup (G.J. Keighery 3635)	P4		Clay loams, alluvial soils, sand over laterite	Low
Darwinia whicherensis	T (E)	Nov	Swamps, on clays and loams.	Low
Diuris drummondii	T (V)	Nov - Dec	Low-lying depressions, swamps	Low
Drakaea elastica	T (CE)	Oct-Nov	White or grey sand. Low-lying situations adjoining winter-wet swamps	Low/moderate
Drakaea micrantha	T (E)	Sep-Oct	White-grey sand	Low/moderate
Eleocharis keigheryi	T (V)	-	Clay, sandy loam. Emergent in freshwater: creeks, claypans	Low

Species	Cons status	Flowering	Habitat	Likelihood of occurrence
Franklandia triaristata	P4	Aug-Oct	White or grey sand	Low/moderate
Gastrolobium sp. Yoongarillup (S.Dilkes s.n. 1/9/1969)	P1	Aug - Oct	Jarrah-Marri forest, white sand, gravel	Low/moderate
Gastrolobium whicherense	P2	Oct	Red-grey sandy clay over quartzite. Steep westerly slopes	Low
Grevillea rosieri	P2	Jul - Sep	Gravelly soil, or sand; sandplains; gravel pits	Low/moderate
Leptomeria furtiva	P2	Aug - Oct	Grey or black peaty sand. Winter-wet flats	Low
Logania wendyae	P1	Oct	Brown clay to sandy clay, laterite gravel	Low
Lomandra whicherensis	P1	Nov - Dec	Jarrah-marri forest, lateritic soils, sandy clay	Low/moderate
Ornduffia submersa	P4	Sep - Oct		Low
Pithocarpa corymbulosa	P3	Jan - Apr	Gravelly or sandy loam. Amongst granite outcrops	Low
Pultenaea skinneri	P4	Jul - Jan	Sandy or clayey soils. Winter-wet depressions	Low/moderate
Schoenus capillifolius	P3	Oct - Nov	Brown mud. Claypans	Low
Stylidium paludicola	P3	Oct - Dec	Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	Low
Stylidium perplexum	P1	Dec	Brown lateritic sands	Low/moderate
Synaphea hians	P3	Sep - Oct	Sandy soils. Rises.	Low/moderate
Synaphea odocoileops	P1	Aug - Oct	Brown-orange loam & sandy clay, granite. Swamps, winter-wet areas.	Low

Species	Cons status	Flowering	Habitat	Likelihood of occurrence
Synaphea polypodioides	P3	Sep - Oct	Light brown loam, red-brown sandy loam, gravelly, brown sandy clay over laterite. In undulating areas.	Low
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	T (CE)	Oct	Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Low
Thelymitra variegata	P3	Jun - Sep	Sandy clay, sand, laterite	Low
Thomasia laxiflora	P3	Oct - Nov	Gravelly soils.	Low
Trichocline sp. Treeton (B.J. Keighery & N. Gibson 564)	P2	Nov - Jan	Sand over limestone, sandy clay over ironstone. Seasonally wet flats.	Low

Table 7. List of Declared Rare and Priority List flora known to occur within 10 km of the survey area.
(The *WC Act* Conservation Status is shown*, EPBC Act* status is in brackets.)

All species listed except for *Acacia drummondii* subsp. *affinis, Acacia flagelliformis*, *Aponogeton hexatepalus*, *Boronia humifusa*, Chamaescilla *gibsonii*, *Darwinia whicherensis*, *Diuris drummondii*, *Grevillea rosieri*, *Lomandra whicherensis*, *Pithocarpa corymbulosa*, *Stylidium perplexum*, *Thelymitra variegata* and *Trichocline* sp. Treeton (B.J. Keighery and N. Gibson 564) would have either been flowering at the time of survey or could be identified in the field without flowers.

1.8 Ecological Linkages

Ecological linkages were defined in Molloy *et al*. (2009) in their report on the South West Regional Ecological Linkages (SWREL) Project as;

"*A series of (both contiguous and non-contiguous) patches which, by virtue of their proximity to each other, act as stepping stones of habitat which facilitate the maintenance of ecological processes and the movement of organisms within, and across, a landscape*."

The Molloy *et al*. (2009) report is the result of collaboration between the Western Australian Local Government Association's *South West Biodiversity Project* and the DEC's *Swan Bioplan* to provide a tool for the identification of ecological linkages and guidance for the protection of linkages through planning policy documents.

It is stressed in the above report, however, that the proximity value of an ecological linkage is not intended to replace the need to consider the other biodiversity conservation values of a patch of remnant vegetation. Regional Ecological Linkages link protected patches of regional significance by retaining the best (condition) patches available as stepping stones for flora and fauna between regionally significant areas. This increases the long-term viability of all the constituent areas (Molloy *et al*., 2009).

The *South West Regional Ecological Linkages Technical Report* (Molloy *et al*., 2009) identifies a regional ecological linkage axis line 1.5 km southeast of the Survey Area (**Figure 4**). As a result of the location of the axis lines, patches of remnant vegetation within the Survey Area are assigned to the proximity categories '1b', '2c' and '3b' which are the second highest, sixth highest and eighth highest categories. The vegetation onsite assigned to category 1b is contiguous with a large area of remnant vegetation that directly forms part of a regional ecological linkage (the Dardanup Conservation Park). This increases the conservation value of the remnant vegetation assigned to the 1b category.

The proximity values of Molloy *et al.* (2009) are defined in **Figure 5**.

While there is no statutory basis for regional ecological linkages identified through the SWREL project, the importance of ecological linkages have been recognised as an environmental policy consideration in EPA and Planning policy over the last decade (EPA, 2009 and references therein). In its statement regarding the SWREL Project, the EPA stated

that even though Ecological Linkages are just one measure of the conservation values of a patch of remnant vegetation it expected that:

> *In preparing plans and proposals for development, consideration will be given to both the site-specific biodiversity conservation values of patches of native vegetation, as well as the landscape function and core linkage significance of a patch in supporting the maintenance of ecological linkage* (EPA, 2009).

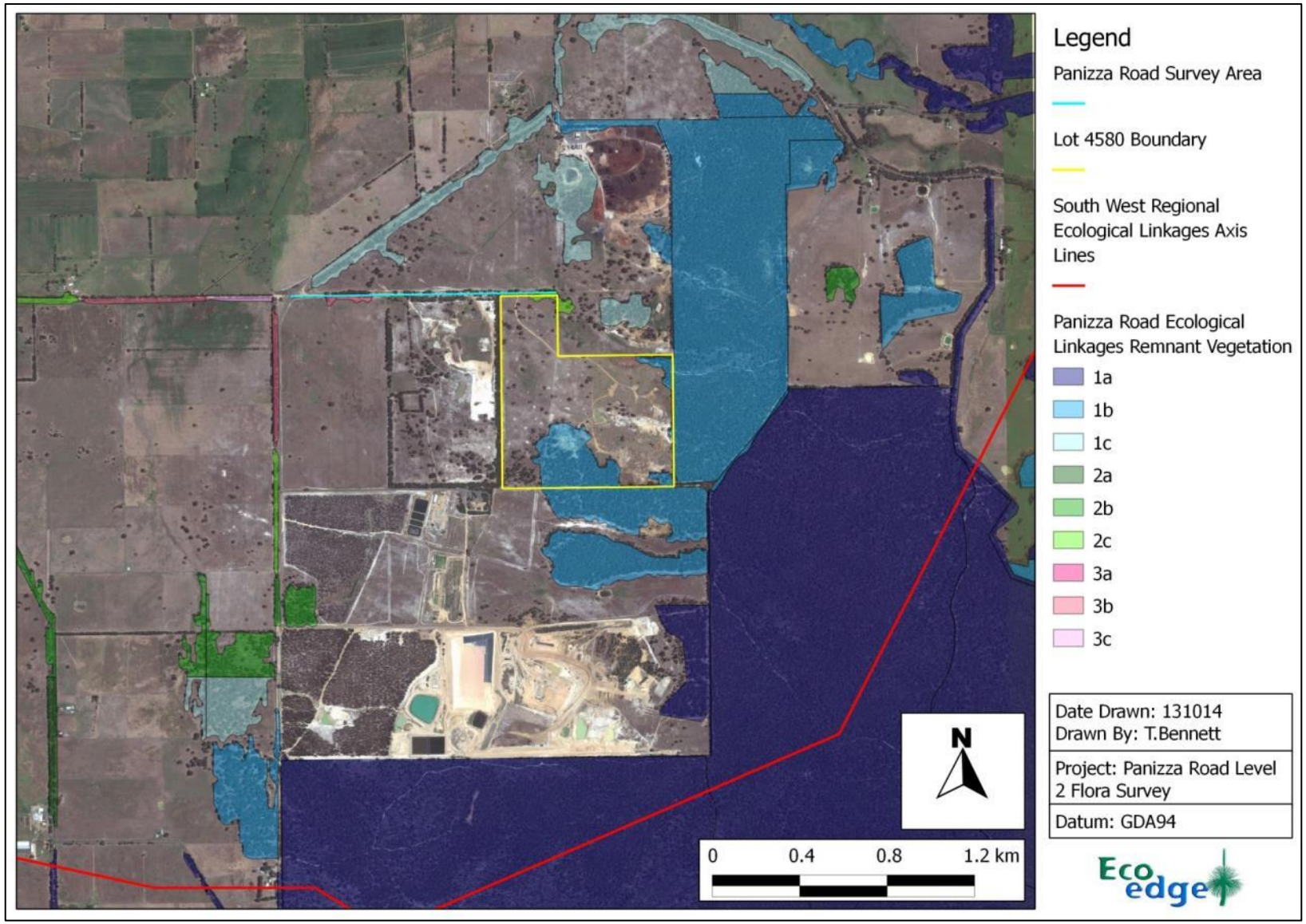

Figure 4. The Survey Area in relation to the nearby regional ecological linkage.

Figure 5. Linkage proximity values assigned to patches of remnant vegetation within a landscape (from Molloy *et al*., 2009).
Note: in Figure 5, 'linkage' refers to the linkage axis line

2 Survey limitations

Aspect	Constraint?	Comment
Scope	No	The survey scope was prepared in consultation with the stakeholders and was designed to comply with EPA requirements.
Proportion of flora identified	Negligible	The survey was carried out in October – a month which experience has shown to be the prime flowering time for flora in high rainfall areas of the south west of Western Australia. It is estimated that 90-95% of species in the remnant vegetation were identified.
Availability of contextual information	Minor	Comprehensive regional surveys of remnant vegetation, as well as more localised surveys, have been carried out on the Swan Coastal Plain and Whicher Scarp.
Completeness of the survey	Minor	All areas of remnant vegetation were visited. Further assessments outside the spring season would add to the completeness of the survey but probably only marginally affect the conclusions presented.
Climate	Negligible	Winter/spring rainfall for the survey areas was in the range of 80-100% of the long-term mean and it is considered that rainfall had negligible effect on flowering in the survey area.
Access Problems	No	Access was available to all parts of the survey
Competency and experience of consultants	No	The senior botanist Russell Smith has 20 years' experience of flora surveys in the south west of Western Australia

Table 8. Limitations with regard to assessment adequacy and accuracy.

3 Methods

3.1 Survey Methodology

The study area was visited on two occasions and traversed on foot by two botanists (Russell Smith and Tiffany Bennett), viz., 16th October and 30th October 2014. The vegetation survey was undertaken in accordance with EPA Guidance Statement 51 "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia" (EPA, 2004). Methods used for the four main components of the field assessment are described below.

During the visits to the study area, a comprehensive list of native and many non-native vascular flora was compiled. Taxa not able to be identified with certainty in the field were photographed, and in a few cases collected, for later identification. Taxonomy and conservation status was checked against the WA Herbarium Census of WA Plants Database (WACENSUS) (DPaW, 2014d). The Declared Rare Flora and Priority Flora known to occur within a 10 km distance of the study area (Table 7) was targeted during the search.

In order to determine the relationships between remnant vegetation within the study area to other plant communities in the surrounding area, two 10m x 10m floristic quadrats were installed then recorded and monitored using methods consistent with those used in the Swan Coastal Plain Survey (Gibson *et al*. 1994). The quadrats were placed in patches of the vegetation on Lot 4580 so as to sample the range of different communities or soil-landforms, and were visited twice.

In addition to the floristic quadrats, the dominant species, vegetation structure and vegetation condition was recorded at 8 unmarked assessment points or relevés situated in remnant vegetation in the study area. Vegetation condition was scored according to the method of Keighery (1994) (**Table 9**). Using both the quadrat data and information from the relevés together with recent aerial photography, vegetation units were determined and subsequently described using a structural method based on that used by Muir (1977) and Aplin (1979). These vegetation community types and vegetation condition were mapped over the study area.

Score	Description
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Table 9. Vegetation Scale from Keighery (1994).

4 Results

4.1 Flora

A total of 115 species of vascular flora were identified within the Survey Area; 47 taxa occurred within the road reserve of Panizza Road and 90 species on Lot 4590 (22 taxa were found both within the road reserve and on Lot 4580). There were 28 naturalised (exotic) species (24% of the total).

No Declared Rare Flora was found in the Survey Area. Five plants of one species of Priority Flora, *Acacia semitrullata* (P3), was found on the southern road reserve of Panizza Road. The location of the *A. semitrullata* plants is provided in **Table 10** and **Figure 6**.

No other Priority Flora (*Wildlife Conservation Act*), or flora listed under the *EPBC Act*, or species otherwise of conservation significance were found. One of the introduced species, *Moraea flaccida* (One-leaf Cape Tulip) is listed as a C3 (management) species under the *Biosecurity and Agriculture Management Act 2007* (DAF, 2014).

Easting	Northing
387081.99 E	6302321.28 N
387052.76 E	6302319.03 N

Table 10. GPS Coordinates of *Acacia semitrulata*

4.2 Vegetation Units

Three vegetation units were identified within the Survey Area. Because of the high level of degradation by grazing of most of the remnant vegetation many understorey species are no longer present. Therefore the vegetation units as mapped **(Figure 7)** may have originally comprised a number of plant communities that are no longer recognisable because of species loss. Descriptions of the three vegetation units are given below and descriptions of the two floristic quadrats is provided in **Appendix 3**.

4.2.1 Vegetation Unit A

Site 1. *Eucalyptus marginata*, *Corymbia calophylla* Open Forest over *Jacksonia furcellata*, *Xanthorrhoea preissii* Open Shrubland over *Adenanthos obovatus*, *Dasypogon bromeliifolius*, *Eremaea pauciflora*, *Hibbertia hypericoides*, *Hypocalymma robustum*, *Macrozamia riedlei*, *Melaleuca thymoides* Low Open Shrubland over *Burchardia congesta*, *Chamaescilla corymbosa*, *Phlebocarya ciliata* Open Herbs, **Eragrostis curvula* Open Grassland and *Lepidosperma squamatum* Open Sedges on grey sand. (Relevé 1)

Site 2. *Eucalyptus marginata*, *Corymbia calophylla* Open Forest over *Kunzea recurva*, *Xanthorrhoea preissii* Open Shrubland over *Hibbertia vaginata*, *Melaleuca thymoides, Stirlingia latifolia* Low Open Shrubland over *Conostylis aculeata*, *Thelymitra cornicina*, **Ursinia anthemoides* Very Open Herbs and *Lepidosperma squamatum* Open Sedges on grey sand (Relevé 2).

4.2.2 Vegetation Unit B

Site 1. *Eucalyptus marginata*, *Corymbia calophylla* Open Forest over *Daviesia physodes*, *Gompholobium knightianum*, *G. tomentosum* Very Open Low Shrubland over *Hyalosperma cotula*, *Levenhookia stipitata*, *Podotheca angustifolia* and *Trachymene pilosa* Open Herbs and pasture grasses on gravel over laterite (Relevé 4).

Site 2. *Eucalyptus marginata*, *Corymbia calophylla* Open Forest over *Jacksonia furcellata*, *Xanthorrhoea preissii* Open Shrubland over *Acacia pulchella*, *Hibbertia hypericoides*, *Lechenaultia biloba* Open Low Shrubland over *Burchardia congesta*, *Caladenia flava*, *Conostylis aculeata*, *Haemodorum spicatum*, **Hypochaeris glabra*, *Hypolaena pubescens*, *Lomandra sericea*, **Trifolium campestre* Open Herbs and **Briza maxima* Open Grassland on grey sand with light gravel (Quadrat 1).

4.2.3 Vegetation Unit C

Site 1. *Corymbia haematoxylon* Open Woodland over *Hakea amplexicaulis*, *Xanthorrhoea gracilis* Open Shrubland over **Arctotheca calendula*, **Cotula turbinata*, **Lotus*

angustissimus, **Moraea flaccida* Herbland and **Bromus catharticus* and **B. diandrus* Grassland on heavy gravel over laterite (Quadrat 2).

Site 2. *Eucalyptus marginata*, *Corymbia calophylla*, (*Corymbia haematoxylon*) Open Forest over pasture grasses and herbs on heavy gravel over laterite

4.3 Vegetation Condition

Most of the remnant vegetation in the Survey Area was classified as 'Degraded' (92%), having lost most of its native species following grazing and from the effects of change in microclimate following clearing of the surrounding vegetation (**Figure 8**). A very small amount of vegetation (0.06 ha) on the verge of Panizza Road was scored 'Very Good' and a somewhat larger area (0.31 ha) in the northwest corner of Lot 4580 was given a condition rating of 'Good'. The rest of the Survey Area consisted of 'Completely Degraded' vegetation ('paddock trees over pasture').

4.4 Conservation Significance of Vegetation

As mentioned in Section 4.3, most remnant vegetation in the Survey Area is highly degraded. For this reason it is difficult to ascribe much of the vegetation to a particular floristic community type as described for the Whicher Scarp by Keighery *et al*. (2008) or Gibson *et al*. (1994). The two areas of vegetation where this is possible are at Relevé 1 on the verge of Panizza Road, which has affinities with FCT A2 (North Whicher Scarp Jarrah and Woody Pear woodland), and Quadrat 1 on Lot 4580, which has similarities with both FCT A2 and FCT A3 (North Whicher Scarp *Banksia* and Woody Pear woodland). Neither of these communities is a threatened or priority ecological community.

The vegetation in which Quadrat 2 is located, in the south east part of Lot 4580, was possibly originally FCT C5 (Dardanup Jarrah and Mountain Marri woodland on laterite). FCT C5 is a Priority 1 ecological community but because of its high degree of degradation, the vegetation could no longer be regarded as representing this community.

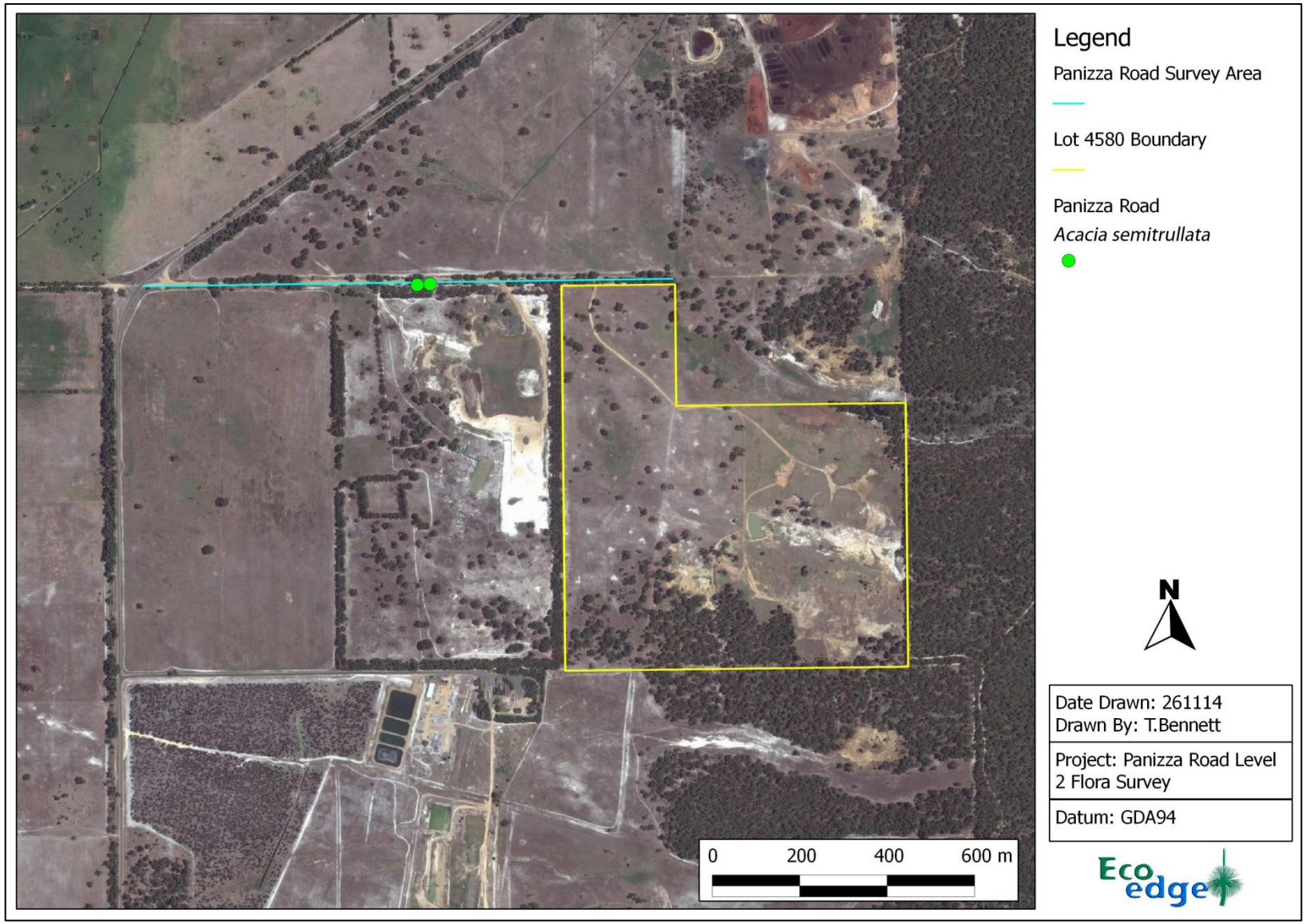

Figure 6. Location of *Acacia semitrullata* within the Survey Area.

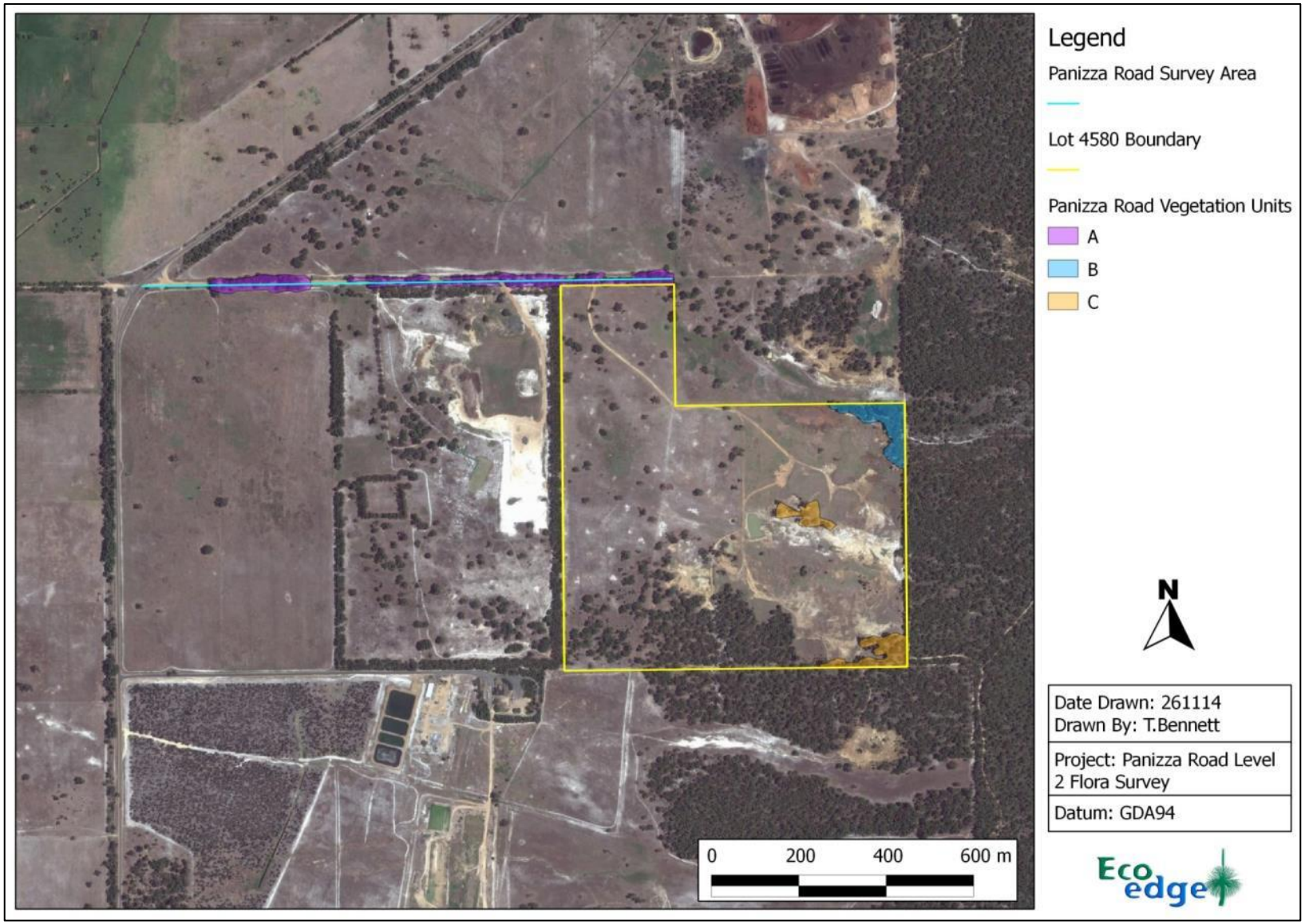

Figure 7. Vegetation units occurring within the Survey Area.

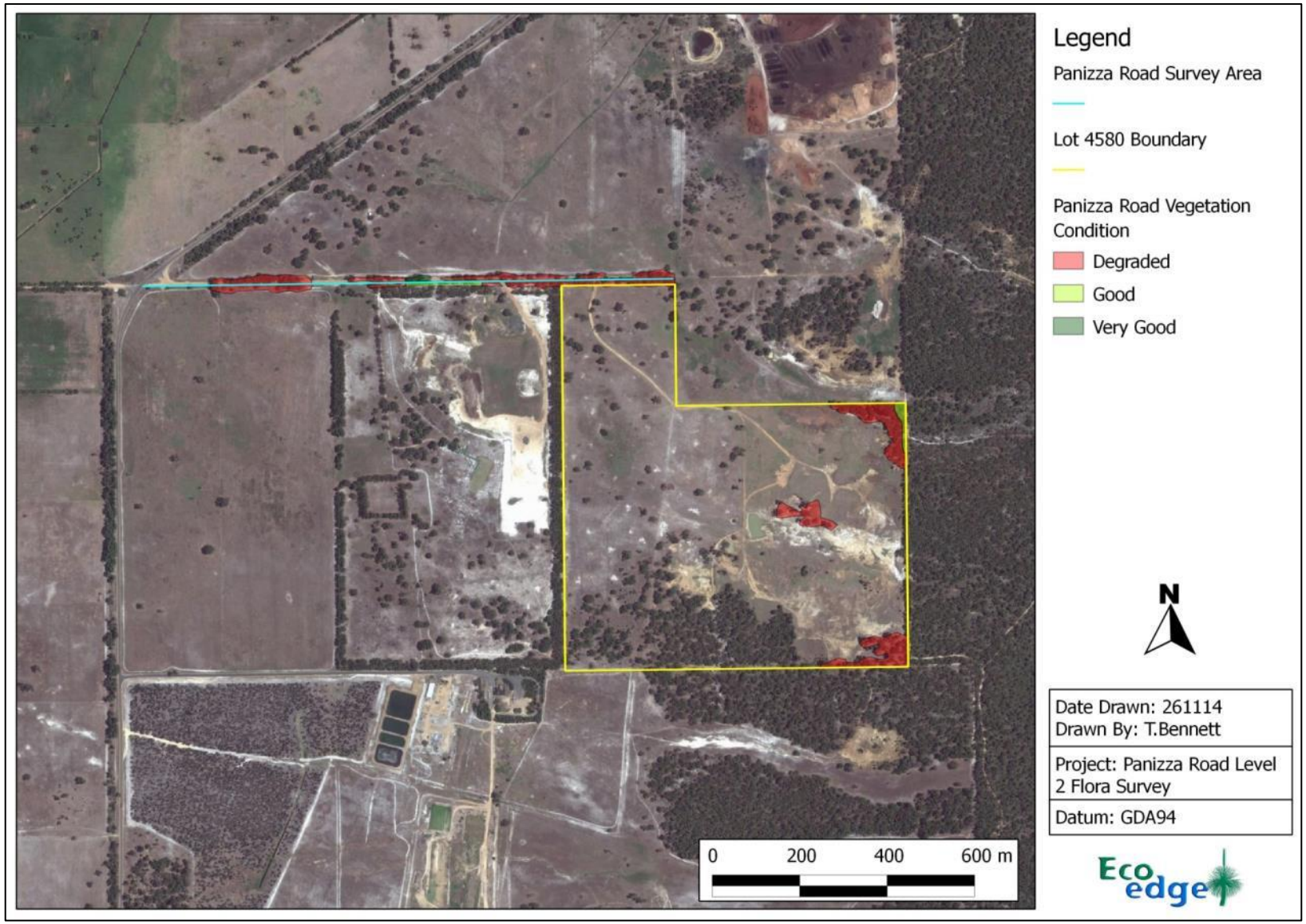

Figure 8. Condition of vegetation within the Survey Area.

5 Discussion

The vegetation and flora assessment of approximately 4.5 ha of remnant vegetation along part of Panizza Road resulted in the identification of 115 species of vascular flora, about a quarter of which are introduced species. No Declared Rare Flora was found in the Survey Area. Five plants of one species of Priority Flora, *Acacia semitrullata* (P3), was found on the south verge of Panizza Road.

No other Priority Flora (*Wildlife Conservation Act*), or flora listed under the *EPBC Act*, or species otherwise of conservation significance were found. One of the introduced species, *Moraea flaccida* (One-leaf Cape Tulip) is listed as a C3 (management) species under the *Biosecurity and Agriculture Management Act 2007*.

Three vegetation units were identified within the Survey Area. Because of the high level of degradation by grazing of most of the remnant vegetation many understorey species are no longer present. The vegetation units identified may have originally comprised a number of plant communities that are no longer recognisable because of species loss. Most of the remnant vegetation appears to belong to floristic community types that are not threatened or priority ecological communities. A small area of vegetation in the south east corner of Lot 4580 was possibly originally FCT C5 (Dardanup Jarrah and Mountain Marri woodland on laterite). FCT C5 is a Priority 1 ecological community but because of its high degree of degradation the vegetation could no longer be regarded as representing this community.

Apart from the presence of *Acacia semitrullata* (Priority 3) in vegetation on the south verge of Panizza Road that was rated as 'Good' condition remnant vegetation in the Survey Area has low conservation significance.

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Appendix 1. Protected Matters Search Tool Report (Attached)

Appendix 2. Vascular Flora Identified with the Survey Area

FAMILY	SPECIES	ROAD VERGE	LOT 4580	NATURALISED
Anarthriaceae	*Lyginia imberbis*	x	x	
Apiaceae	*Xanthosia huegelii*		x	
Apocynaceae	*Gomphocarpus fruticosus*		x	*
Araliaceae	*Trachymene pilosa*		x	
Asparagaceae	*Chamaescilla corymbosa*		x	
	Lomandra sericea		x	
	Thysanotus manglesianus		x	
	Thysanotus tenellus		x	
Asteraceae	*Arctotheca calendula*	x	x	*
	Carduus pycnocephalus		x	*
	Cotula turbinata		x	*
	Hyalosperma cotula		x	
	Hypochaeris glabra	x	x	*
	Lactuca serriola	x		*
	Osteospermum ecklonis	x		*
	Podotheca angustifolia		x	
	Siloxerus humifusus		x	
	Sonchus asper	x		*
	Ursinia anthemoides	x	x	*
Casuarinaceae	*Allocasuarina humilis*	x		
Colchicaceae	*Burchardia congesta*	x	x	
Cyperaceae	*Lepidosperma pubisquameum*	x		
	Lepidosperma squamatum		x	
	Tetraria octandra		x	
Dasypogonaceae	*Dasypogon bromeliifolius*	x		
Dilleniaceae	*Hibbertia hypericoides*		x	
Dilleniaceae	*Hibbertia vaginata*	x		
Ericaceae	*Leucopogon conostephioides*		x	
Euphorbiaceae	*Ricinus communis*		x	*

FAMILY	SPECIES	ROAD VERGE	LOT 4580	NATURALISED
Fabaceae	*Acacia longifolia*	x		*
	Acacia pulchella	x	x	
	Acacia semitrullata	x		
	Bossiaea eriocarpa	x		
	Bossiaea sp. Waroona (B.J. Keighery & N. Gibson 229)		x	
	Daviesia physodes		x	
	Daviesia preissii		x	
	Gompholobium knightianum		x	
	Gompholobium tomentosum		x	
	Jacksonia furcellata		x	
	Labichea punctata		x	
	Lotus angustissimus		x	*
	Lupinus angustifolius		x	*
	Trifolium campestre	x		*
Goodeniaceae	*Dampiera linearis*		x	
	Goodenia eatoniana		x	
	Lechenaultia biloba		x	
	Scaevola calliptera		x	
Haemodoraceae	*Conostylis aculeata*	x	x	
	Conostylis setigera		x	
	Haemodorum spicatum	x	x	
	Phlebocarya ciliata		x	
Hemerocallidaceae	*Agrostocrinum hirsutum*		x	
	Caesia micrantha		x	
	Tricoryne elatior		x	
Iridaceae	*Moraea flaccida*		x	*
	Patersonia occidentalis		x	
	Patersonia umbrosa var. *xanthina*		x	
	Watsonia meriana	x		*

FAMILY	SPECIES	ROAD VERGE	LOT 4580	NATURALISED
Juncaceae	*Juncus microcephalus*		x	*
Lindsaeaceae	*Lindsaea linearis*		x	
Loganiaceae	*Logania serpyllifolia* subsp. *angustifolia*		x	
Loranthaceae	*Nuytsia floribunda*	x		
Myrtaceae	*Corymbia calophylla*	x	x	
	Corymbia haematoxylon		x	
	Eremaea pauciflora	x		
	Eucalyptus marginata	x	x	
	Hypocalymma angustifolium		x	
	Hypocalymma robustum	x	x	
	Kunzea recurva	x		
	Melaleuca preissiana	x	x	
	Melaleuca thymoides	x	x	
	Melaleuca viminea	x		
	Paragonis grandiflora		x	
Orchidaceae	*Caladenia flava*		x	
	Disa bracteata		x	*
	Pyrorchis nigricans		x	
	Thelymitra cornicina	x	x	
Orobanchaceae	*Orobanche minor*	x		*
Papaveraceae	*Fumaria muralis*	x		*
Phytolaccaceae	*Phytolacca octandra*		x	
Poaceae	*Austrostipa flavescens*	x		
	Avena fatua	x		*
	Briza maxima	x	x	*
	Bromus catharticus		x	*
	Bromus diandrus	x	x	*
	Cenchrus clandestinus	x		*
	Ehrharta longiflora		x	

FAMILY	SPECIES	ROAD VERGE	LOT 4580	NATURALISED
Poaceae	*Eragrostis curvula*	x	x	*
	Rytidosperma setaceum		x	
Polygonaceae	*Acetosella vulgaris*		x	*
Primulaceae	*Lysimachia arvensis*		x	*
Proteaceae	*Adenanthos meisneri*	x		
	Adenanthos obovatus	x		
	Banksia bipinnatifida		x	
	Banksia dallanneyi		x	
	Banksia grandis		x	
	Banksia ilicifolia	x		
	Hakea amplexicaulis		x	
	Hakea lissocarpha		x	
	Hakea stenocarpa		x	
	Stirlingia latifolia	x		
	Xylomelum occidentale	x	x	
Restionaceae	*Desmocladus fasciculatus*		x	
	Desmocladus flexuosus		x	
	Hypolaena exsulca	x	x	
Rutaceae	*Boronia spathulata*		x	
Stylidiaceae	*Levenhookia stipitata*		x	
	Stylidium calcaratum		x	
	Stylidium ciliatum		x	
	Stylidium dichotomum		x	
	Stylidium diversifolium		x	
Thymelaeaceae	*Pimelea* sp.	x	x	
Xanthorrhoeaceae	*Xanthorrhoea gracilis*		x	
	Xanthorrhoea preissii	x	x	
Zamiaceae	*Macrozamia riedlei*	x	x	

Appendix 3. Descriptions of Quadrats

Legend

Cover/Abundance Scale	
1	Rare or of low cover (one or two or <2%)
2	Present but in low numbers (a few, 2% - 10%)
3	Common locally, but niot uniform over the whole area (10% - 30%)
4	Common over whole area (30% - 70%)
5	Completely dominating understorey (>70%)

QUADRAT PANI01.

Location: Lot 4580, Panizza Road, Dardanup

Easting: 388162.94 m, **Northing**: 6302011.65 m

Landscape Position: Mid-slope

Soil: Grey sand with light gravel

Condition: Good (Keighery, 1994)

Trees	**Cover**	**Flowering**	**Herbs**	**Cover**	**Flowering**
Eucalyptus marginata	2	No	*Patersonia occidentalis*	1	Yes
Corymbia calophylla	4	No	**Ursinia anthemoides*	1	Yes
Shrubs			*Lindsaea linearis*	1	No
Xanthorrhoea gracilis	1	Yes	**Hypochaeris glabra*	1	Yes
Jacksonia furcellata	2	No	*Conostylis setigera*	1	No
Hibbertia hypericoides	1	No	*Thelymitra cornicina*	1	Yes
Acacia pulchella	1	No	*Burchardia congesta*	1	Yes
Lechenaultia biloba	1	No	*Haemodorum spicatum*	1	No
			**Moraea flaccida*	1	No
			Caladenia flava	1	No
			Thysanotus tenellus	1	Yes
			Lomandra sericea	1	No
			**Trifolium campestre*	1	No
			Grasses/Sedges etc.		
			**Briza maxima*	4	Yes
			Hypolaena exsulca	1	Yes

QUADRAT: PANI02

Location: Lot 4580, Panizza Road, Dardanup

Easting: 388162.02 m, **Northing**: 6301470.25 m

Landscape Position: Upper-slope

Soil: Grey sand with heavy gravel

Condition: Degraded (Keighery, 1994).

Trees	**Cover**	**Flowering**
Corymbia haematoxylon	2	No
Shrubs		
Hakea amplexicaulis	1	No
Xanthorrhoea gracilis	2	Yes
Herbs		
**Moraea flaccida*	1	No
**Arctotheca calendula*	1	No
**Cotula turbinata*	1	No
**Bromus catharticus*	3	No
**Lotus angustissimus*	1	Yes
Grasses		
**Bromus diandrus*	1	No
**Eragrostis longifolia*	1	No
**Eragrostis curvula*	3	No
**Bromus catharticus*	3	No