

Reconnaissance and Targeted Flora and Vegetation Survey

Wingebellup Road and Kojonup – Frankland Road



Prepared for the Shire of Cranbrook
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Executive Summary

Ecoedge was engaged by the Shire of Cranbrook to undertake a Reconnaissance and Targeted Flora and Vegetation Survey of approximately 0.58 hectares of road reserve located in four separate locations, one on Wingebellup Road and three along the Kojonup Frankland Road. Area 1 is approximately 6.5 km west of the town of Frankland River.

The flora and vegetation survey was undertaken on the 30 September 2020 in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016).

72 species of vascular flora (including 24 introduced species) were identified across the four areas

No Threatened flora, Priority flora or other flora of conservation significance were found.

One of the introduced species was the Declared Pest *Asparagus asparagoides* (Bridal creeper).

Seven vegetation units were described across the survey area, most of which is in a degraded condition due to the occurrence of the vegetation in road reserves in a predominantly agricultural area.

None of vegetation units meet the criteria of a State listed Priority Ecological Community (PEC) or the criteria of a State or Federally listed Threatened Ecological Community (TEC).

One Vegetation Association is mapped across the four Survey areas: Association 4 'medium woodland; marri & wandoo'. The current Statewide extent of this association (at 26.95 %) is below the Commonwealth government's 30% retention threshold, with 14.48% represented within the DBCA estate. The current extent of this association within the Shire of Cranbrook exceeds the target at 33.12%.

Vegetation Units A, B and C are regarded as having vegetation associated with and dependant on the Frankland River waterway. Vegetation Units E and F which is dependent on and associated with an ephemeral wetland in a depression at the base of a hill. Vegetation associated with waterways and wetlands is specially protected under the EP Act.

The survey areas 1, 2 and 3 form part of a network of connected native vegetation associated with the Frankland River in a predominantly cleared agricultural landscape.

There are no Environmentally Sensitive Areas within or in close proximity to the survey area.

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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.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and no other party. Ecoedge assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of Ecoedge or for any loss or damage suffered by any other party relying on the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

1 Introduction

Ecoedge was engaged by the Shire of Cranbrook in August 2020 to undertake a Reconnaissance and Targeted Flora and Vegetation Survey of approximately 0.58 hectares of road reserve located in four separate locations, one on Wingebellup Road (Area 1) and three along the Kojonup Frankland Road (Areas 2, 3 and 4), in the Shire of Cranbrook (survey area) **Figure 1**.

The Shire is planning upgrades to the road in these areas and required the survey in order to inform any environmental approvals that may be required as part of the project.

This report compiles findings of the survey.

1.1 Scope and Objectives

The scope of the survey was to carry out a Targeted and Reconnaissance Flora and Vegetation Survey in accordance with the Environmental Protection Authority's (EPA) Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (December 2016). The survey was to be undertaken by a botanist with at least 2 years' experience in the Southern Jarrah Forest (JAF02) sub-region of the Jarrah Forest biogeographic region.

1.2 Biogeographic Region and Location

The survey area occurs in the Southern Jarrah Forest (JAF02) sub-region of the Jarrah Forest biogeographic region, as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Commonwealth of Australia, 2016). A brief description of the location and setting of the four areas is described below.

Area 1 (0.87 ha) occurs in road reserve on both sides of Wingebellup Road approximately 6.5 km west of the town of Frankland River and approximately 75 m east of the Frankland River. The southern portion is adjacent to native vegetation in the south that is contiguous with the Frankland River and the northern portion is mostly adjacent to agricultural land to the north (**Figure 2**).

Area 2 (0.165 ha) occurs on a west facing slope on both sides of the Kojonup-Frankland Road approximately 2 km from the Wingebellup Road intersection. The lower side of the area is adjacent to partially cleared agricultural land and is 50 m from the Frankland River, whilst the upper slope is adjacent to a plantation (**Figure 3**).

Area 3 (0.139 ha) occurs on the eastern side of Kojonup-Frankland road on a flat section of land near the base of low hill approximately 2.4 km NNW of the Wingebellup Road intersection. It is surrounded by native vegetation in the south and east and cleared agricultural land in the north and west (**Figure 4**).

Area 4 (0.188 ha) occurs on both sides of the Kojonup-Frankland road about 2.8 km NNW of the Wingebellup Road intersection. It is surrounded by cleared agricultural land (**Figure 5**).

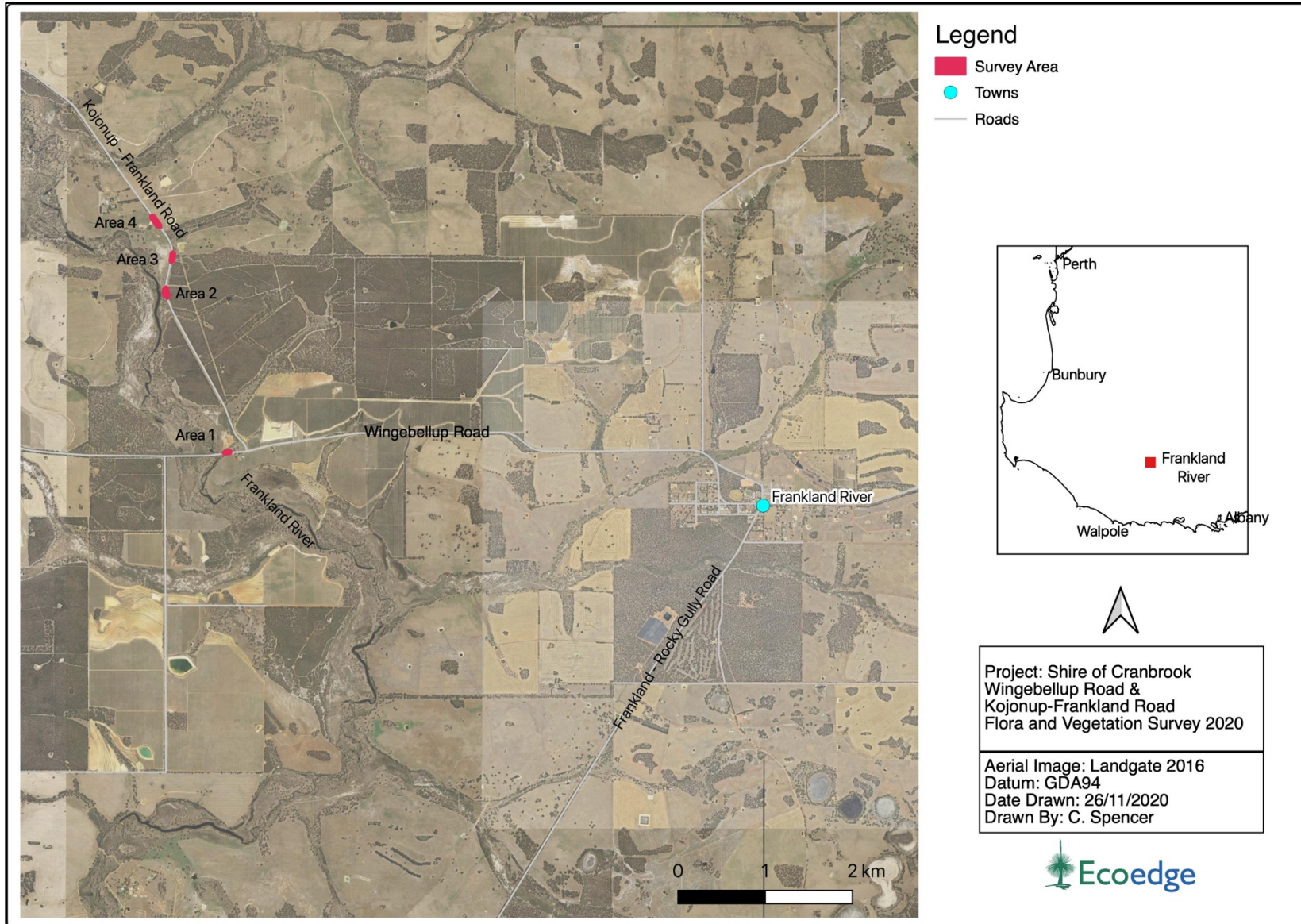


Figure 1. Aerial photograph showing the location of the survey area.

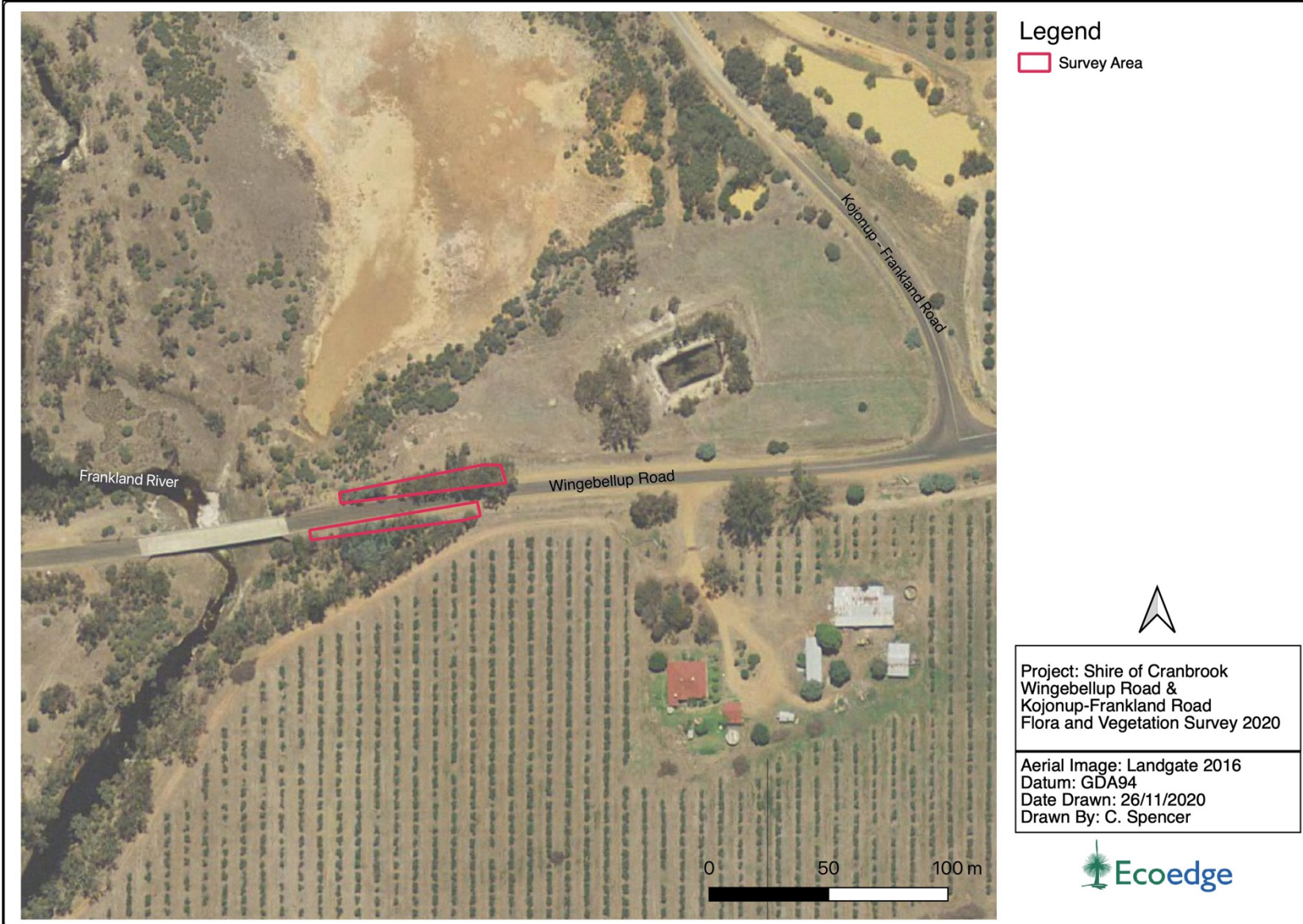


Figure 2. Aerial photograph of Area 1 of the survey area.

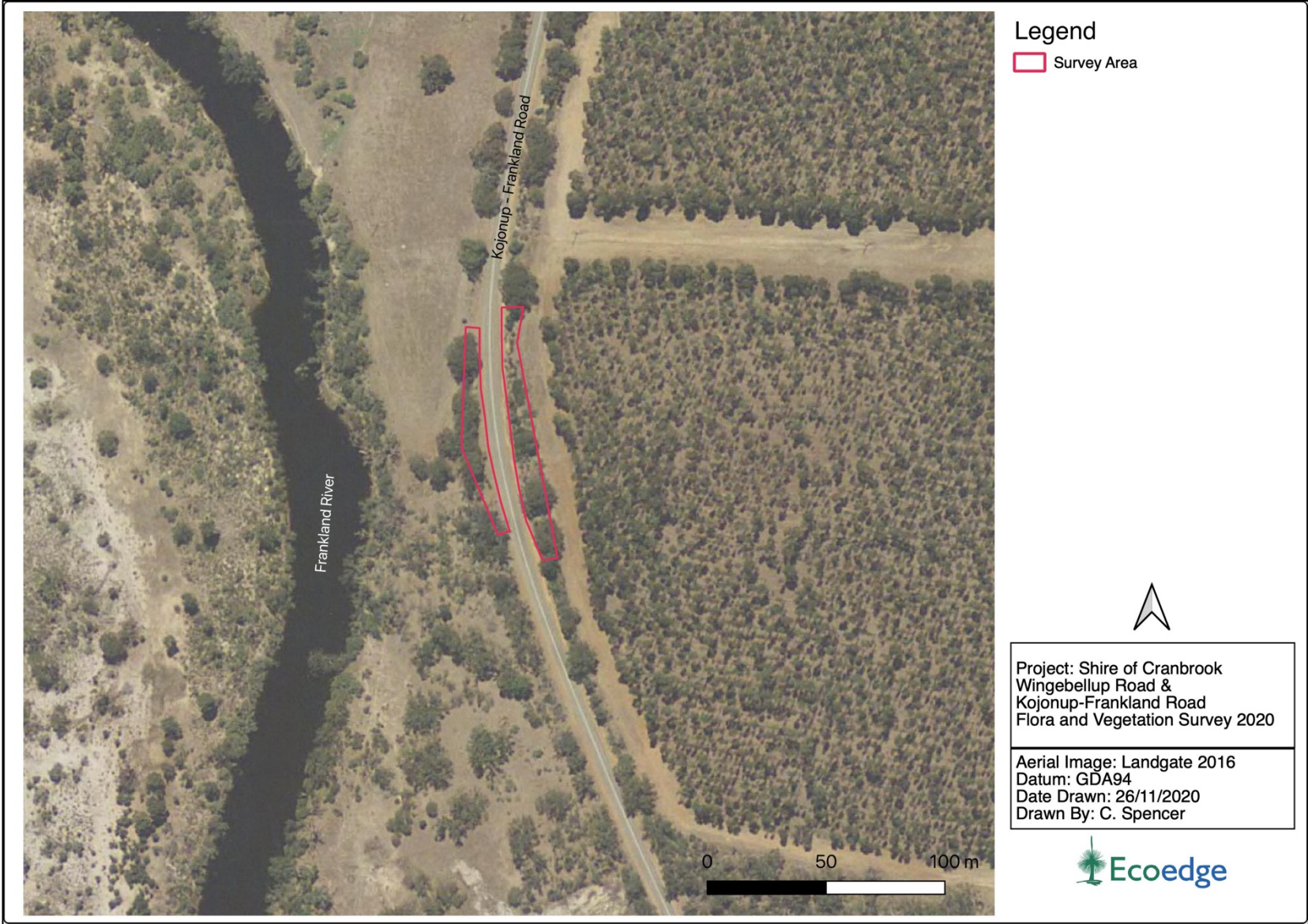


Figure 3. Aerial photograph of Area 2 of the survey area.

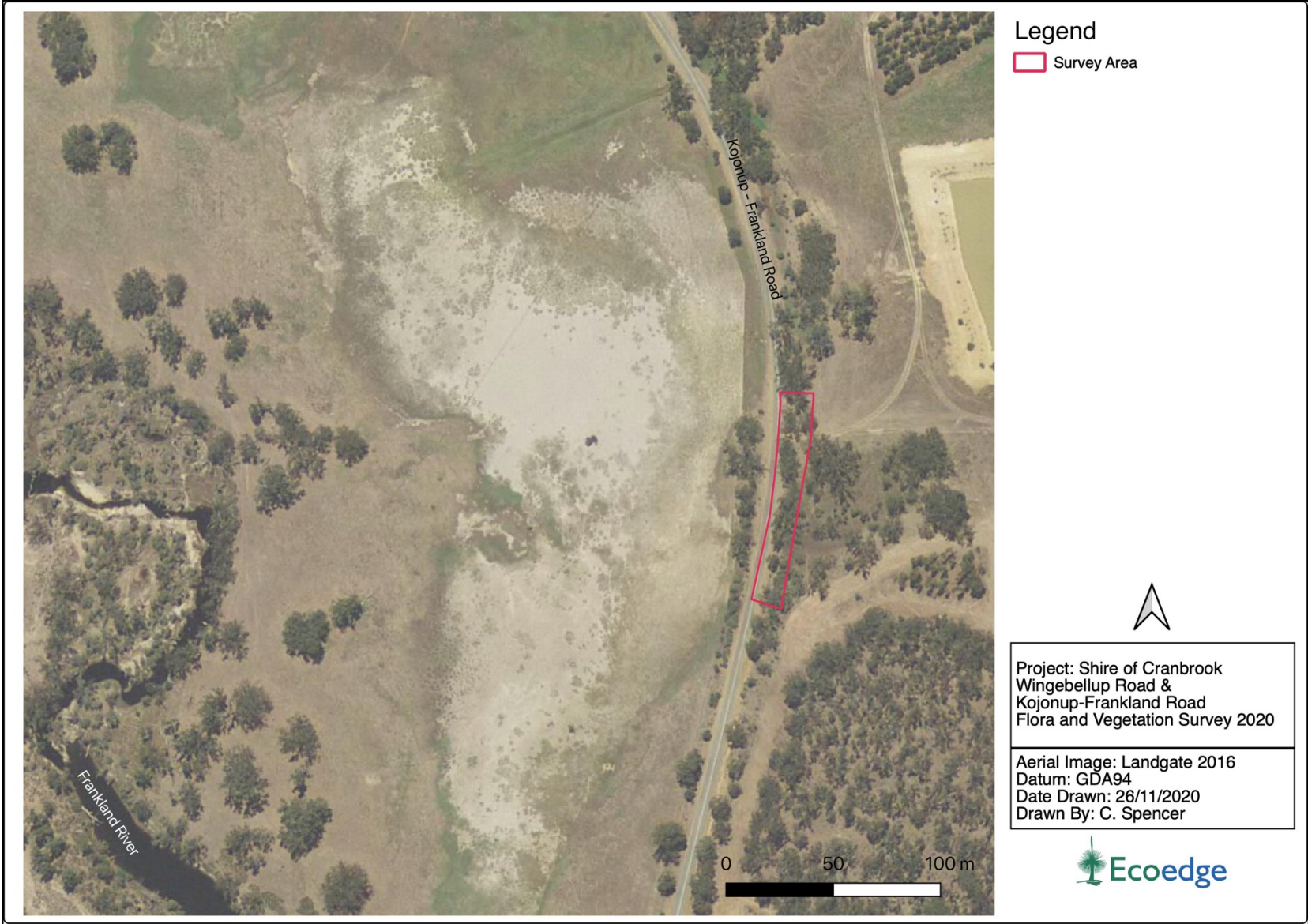


Figure 4. Aerial photograph of Area 3 of the survey area.



Figure 5. Aerial photograph of Area 4 of the survey area.

1.3 Climate

The survey area has a mediterranean climate with hot, dry summers and mild, wet winters. The mean daily minimum and maximum temperatures range from 6.3 °C to 15.2 °C in winter and 11.6 °C to 28.1 °C in summer and the mean average rainfall for the survey area is 602.4 mm, according to climate statistics (1975 – 2020) for the nearest weather station (Frankland Vineyards SN:009843) located approximately 11 km south of the survey area (BOM 2020).

1.4 Geology

The survey area occurs within the Warren-Denmark Southland Zone (WDSZ) which rises in a series of broad benches from the Southern Ocean north to the Blackwood Valley. It comprises of a diverse area of extensive laterite plateau, deeply dissected valleys and a coastal plain of dunes with swampy back-plains, estuaries and lakes (Tilley 1996).

The WDSZ has been divided into landscape systems and subsystems. The survey area is situated on soils of the Frankland Hills System, and within that on the 254Fh_2, 254Fh_3 and 254Fh_7 subsystems, as shown in **Figure 6** (Stuart-Street 2005). These are described in **Table 1**.

Table 1. Soil mapping units for the survey area (Stuart-Street 2005).

Zone	Landscape System	Soil Subsystem
257 – Warren-Denmark Southland Zone	254Fh Frankland Hills System undulating low hills and rises in the north east of the Warren-Denmark Southland. Loamy gravels, duplex sandy gravels, deep sandy gravels and grey deep sandy duplexes are dominant.	254Fh_2 Upper to lower slopes surrounding 254Fh_1. Loamy gravels, duplex sandy gravels and deep sandy gravels are widespread with grey deep sandy duplex and loamy earth soils common also. Jarrah - marri forest and woodland with wandoo.
		254Fh_3 Minor valleys. Duplex sandy gravel soils are common with loamy and deep sandy gravels.
		254Fh_7 Incised drainage of the Frankland River including narrow floodplain and flanking slopes. Soils are predominantly brown loamy earth and duplex sandy gravels, deep sandy duplex with saline wet and semi wet soils.

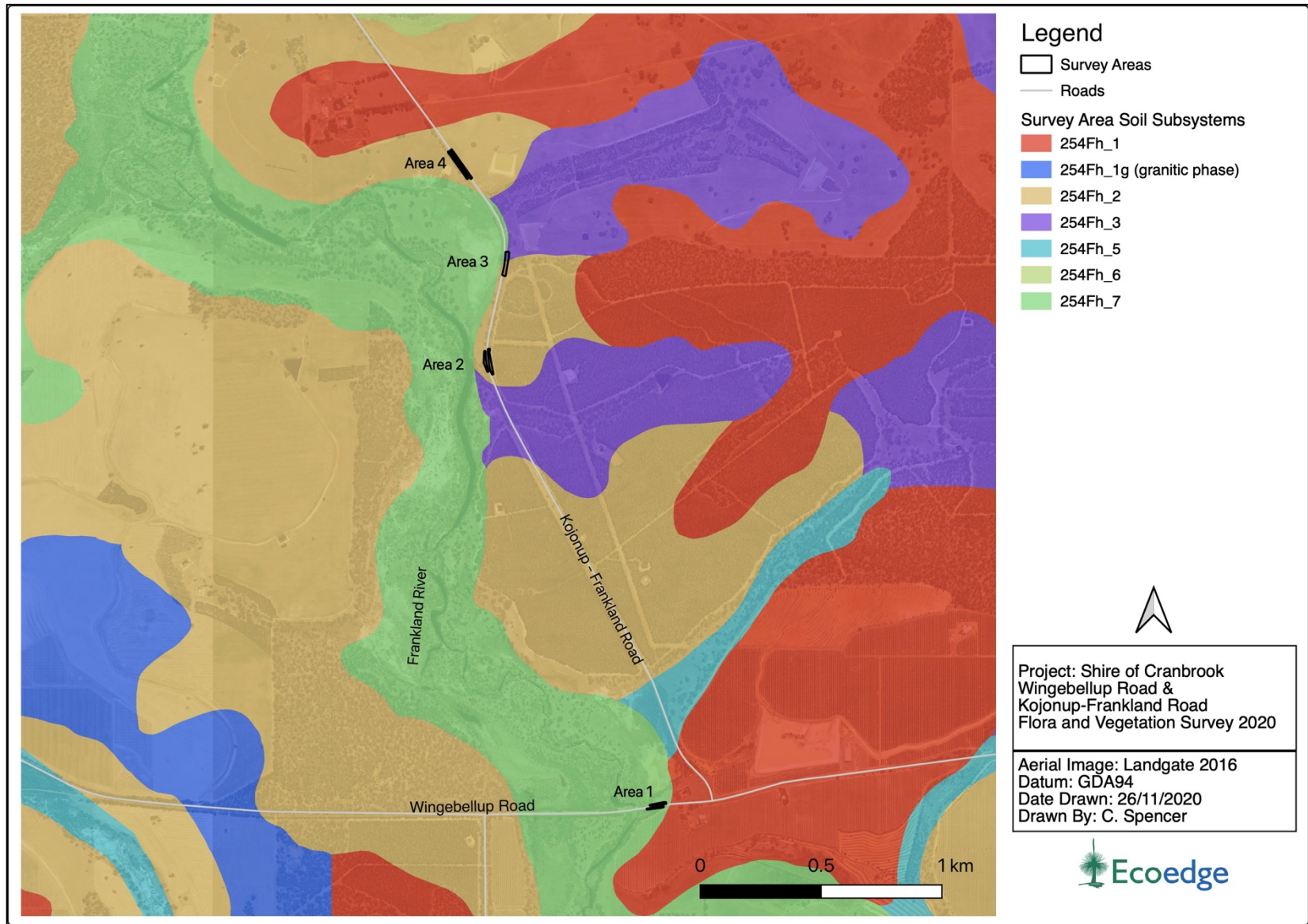


Figure 6. Soil subsystems mapped for the survey area (Stuart-Street 2005).

1.5 Vegetation Description according to pre-European Mapping Datasets

The survey area contains approximately 0.58 ha of remnant native vegetation.

1.5.1 Vegetation Associations

A systematic survey of native vegetation in Western Australia was undertaken by J. S. Beard (along with others) during the 1970s, which described vegetation systems in the south-west of Western Australia at a scale of 1:250,000. Beard’s vegetation maps attempted to depict the vegetation as it might have been prior to European settlement in terms of type and extent (Beeston *et al.*, 2001). The Beard Vegetation Association dataset, also referred to as the pre-European native vegetation extent dataset, was digitised by Shepherd *et al.* (2002).

Beard vegetation associations have been described to a minimum standard of Level 3 “Broad Floristic Formation” for the National Vegetation Inventory System (NVIS) (state-wide to regional scale)¹. One Beard vegetation association was mapped as occurring within the survey area: association 4 ‘Medium woodland; marri & wandoo’ (Beard, 1979).

1.5.2 Assessment of Remaining Extent against Pre-European Extent

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).

In its report on the Statewide Vegetation Statistics incorporating the Comprehensive, Adequate and Representative (CAR) Reserve Analysis, the Government of Western Australia provides information on the pre-European and current extent of the ecological communities of Western Australia and reports on the status of the CAR reserve system for WA (Government of Western Australia, 2018). This system is also based on the National retention targets of 30% overall. Only reserves managed by DBCA under the *Conservation and Land Management Act 1984* are considered for inclusion in the “CAR Reserve Analysis”.

An assessment of Beard’s vegetation association 4 against the *Statewide Vegetation Statistics* (Government of Western Australia, 2019) is presented in **Table 2**. The extent remaining of association 4 falls below the 30% retention target.

The red, orange and yellow shading in the tables indicates the status of the Commonwealth 30% retention target.

Colour indicator	>30%	<30%	<10%
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¹ Beard’s vegetation mapping units are referred to as ‘associations’ however these do not correspond to the NVIS Level 5 ‘Associations’. The NVIS system was developed long after Beard’s work was completed, and while both classification systems use the same term, NVIS ‘Associations’ describe vegetation in more detail than do Beard’s.

Table 2. Vegetation Associations within the project area with regard to the Commonwealth retention targets (Government of Western Australia, 2019).

Beard Vegetation Association	Pre-European (ha)	Current Extent (ha)	% Remaining	% remaining in DBCA Managed Land
Association 4: 'Medium woodland; marri & wandoo'				
State-wide	1,054,279.89	284,102.41	26.95%	14.48
IBRA region: Jarrah Forest	1,022,712.69	277,087.18	27.09%	6.45
IBRA sub-region: Southern Jarrah Forrest (JF2)	408,511.88	79,183.37	19.38%	1.34
Shire of Cranbrook	26,926.43	8,919.04	33.12%	4.75

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

1.6 Threatened and Priority Ecological Communities

Ecological communities are defined by Western Australia's DBCA (previously DPaW and 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, 2013).

Under Section 27 of the *Biodiversity Conservation Act 2016* (BC Act) the Western Australian Minister for Environment may list communities that are considered to be under significant threat as a Threatened ecological communities (TEC). These TECs can be listed under one of three conservation categories: critically endangered (CE), endangered (EN), vulnerable (V). The BC Act also provides for listing communities as collapsed ecological communities.

Possible TECs that do not meet survey criteria are added to the DBCA's Priority ecological community lists under Priorities 1, 2 or 3 (referred to as P1, P2, P3). 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 (P4). These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (P5) (DEC, 2013).

The current listing of Threatened and Priority ecological communities is specified in DBCA (2018a, 2020a). The conservation categories for these Threatened and Priority ecological communities are defined in **Appendix 1**.

TECs can also be listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are three categories of TEC under the EPBC Act: Critically Endangered (CE), Endangered (E) and Vulnerable (V) (Department of Agriculture, Water and the Environment) (DAWE 2020a). These are defined in **Appendix 2**.

Under both the State BC Act and Federal EPBC Act, ministerial authorisation is required where significant permanent modification to a TEC will occur.

Noting that if an occurrence of a TEC is found during a survey conducted under the auspices of the *Environmental Protection Act 1986* (EP Act) it must be mandatorily reported to the Chief Executive Officer of the DBCA under Section 49 of the BC Act.

Two types of TEC were identified as occurring within 30 km of the survey area based on results generated from an extract from the DBCA databases (DBCA, 2020b) and a 10 km radius Protected Matters Search Tool (PMST) query (DAWE, 2020b). No PECs were recorded in these search areas. These TEC types are listed in **Table 3** with their occurrences shown in **Figure 7**.

A copy of the PMST data search is provided in **Appendix 3**.

Table 3. TECs potentially occurring within 30 km of the survey area (DBCA 2020b, DAWE 2020b).

Community Name	Status (WA)	Status (EPBC Act)
'Eucalypt Woodlands of the Western Australian Wheatbelt'; a federally listed TEC consisting of numerous State-listed communities. (Wheatbelt woodlands TEC)	P3	CR
Proteaceace dominated Kwongkan shrublands of the Southeast Coastal Floristic province of Western Australia (Kwongkan shrublands TEC)		EN

Note: This table only includes formally recognised TECs that are known of and mapped by DBCA and are included in their database.

The closest occurrence of the Kwongkan shrublands TEC is approximately 33 km east of the survey areas and the closest occurrence of Wheatbelt woodlands TEC is approximately 10 km north and east of the survey areas **Figure 7**.

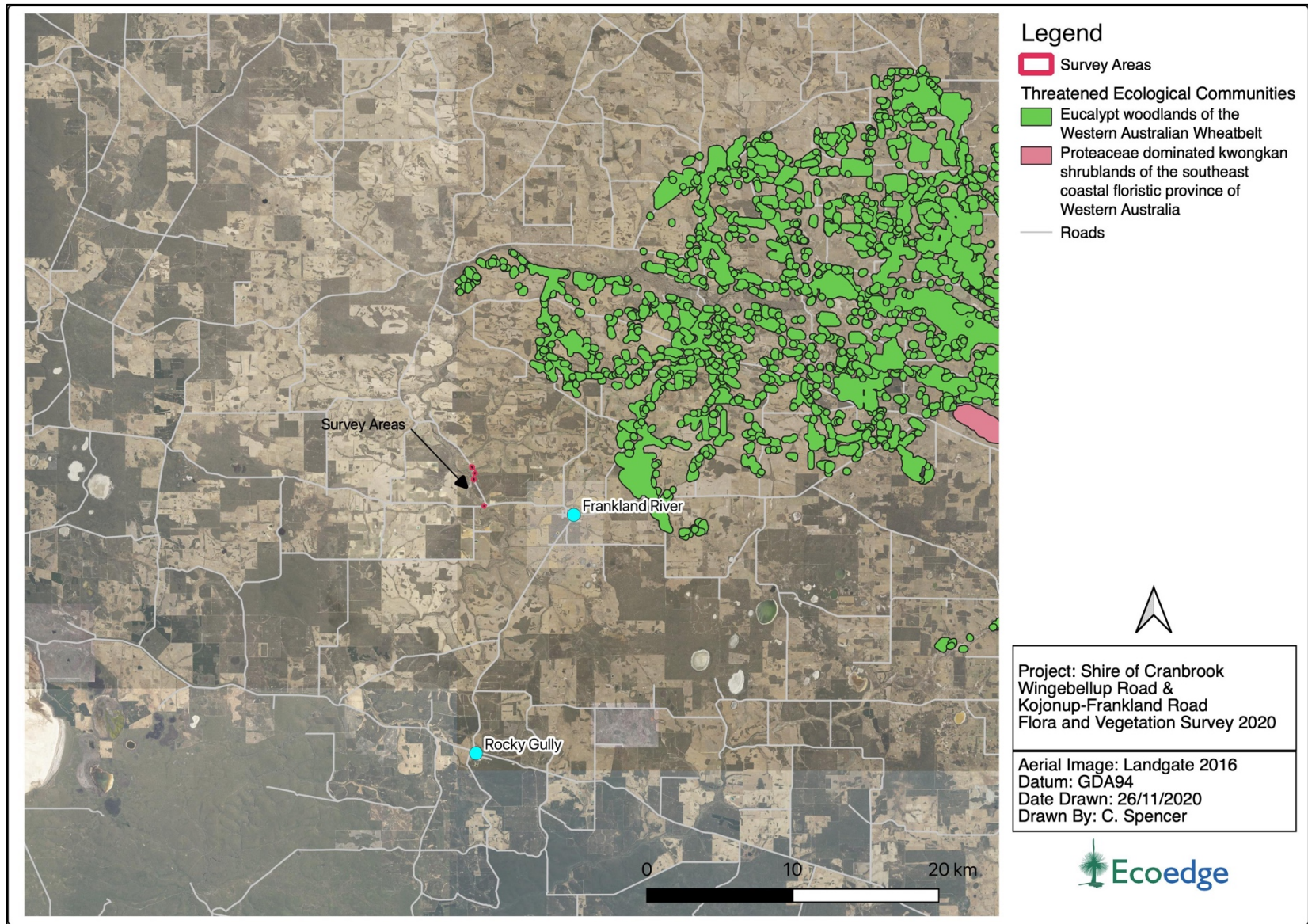


Figure 7. Location of TECs in proximity to the survey area (DBCA 2020).

1.7 Threatened and Priority Flora

Species of flora and fauna are defined as having a Threatened or Priority conservation status where their extant populations are restricted geographically and or under threat of possible extinction. The Department of Biodiversity, Conservation and Attractions recognises these threats and consequently applies regulations towards population and species protection.

Threatened extant flora species are listed under Section 19 of the BC Act and are ranked according to their level of threat using the International Union for Conservation of Nature (IUCN) Red List categories and criteria of; Critically Endangered (CE), Endangered (EN), Vulnerable (VU). It is an offence to “take” or damage Threatened flora without Ministerial approval. Section 5 of the Act defines “to take” as “... to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means”.

Priority flora are under consideration for future declaration as “Threatened flora”, dependent on more information. Species classified as Priority One to Three (referred to as P1, P2 and P3) are in need of further survey to determine their status, while Priority Four (P4) species are adequately known rare or Threatened species that require regular monitoring.

Threatened flora lists are formally reviewed on an annual basis, whilst the Priority flora list is subject to a less formal ongoing review. The current listing of Threatened and Priority flora was updated on the 5th December 2018 (DBCA, 2018b).

Categories of Threatened and Priority flora as defined by the BC Act are presented in **Appendix 4**, (DBCA 2019b).

Threatened flora may also be protected under the Commonwealth EPBC Act and be listed in one of six categories; the definitions of these categories are summarised in **Appendix 5** (DAWE 2020c).

Threatened or Priority flora occurring within 10 km of the project area generated from a NatureMap search and a Protected Matters Search Tool query **Appendix 3** (DBCA 2020d, DAWE 2020b), together with results of a DBCA data search query (DBCA 2020c) are provided in a likelihood of occurrence table in **Table 4**. The location of flora identified in the DBCA (2020c) data search query shown in **Figure 8**. Several of the species listed in **Table 4** could potentially occur within the survey area, based on an assessment of their preferred habitats.

Table 4. Threatened and Priority List flora known to occur within 30 km of the survey area (DBCA 2020c, 2020d; DAWE 2020b.)

Species	Cons Status*	Flowering	Description and Habitat	*Likelihood
<i>Reedia spathacea</i>	T (CR)	Nov-Dec or Jan	Robust, tufted perennial, grass-like or herb (sedge), 2-4 m high, clumps 1.5-2 m wide. Fl. brown. Peaty sand. Swamps, river edges.	Unlikely
<i>Caladenia dorrienii</i>	T (EN)	Sep-Nov	Tuberous, perennial, herb, 0.1-0.2 m high. Fl. white-cream-yellow. Clayey loam. Moist sites adjacent to rivers and seasonal creeks.	Possible
<i>Adenanthos pungens subsp. pungens</i>	T (EN)	Aug - Nov	Erect shrub, 0.5-3 m high. Fl. pink/red. White/grey or pink sand, rocky soils, gypsum. Sand dunes, hillsides.	Unlikely
<i>Bossiaea reptans</i>	T (EN)	Oct	Subshrub to 20 cm high, consisting of small, compact individuals or forming extensive colonies 1–10 m diam. Fl. Yellow red pea. Low rises adjacent to winter-wet depressions or subdued watercourses in Jarrah (<i>Eucalyptus marginata</i>) and Marri (<i>Corymbia calophylla</i>) woodland.	Possible
<i>Conostylis misera</i>	T (EN)	Oct - Nov	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Fl. yellow. White or grey sand, sandy loam. Winter-wet flats.	Possible
<i>Grevillea acropogon</i>	T (EN)	Jun-Sept	Prostrate to erect shrub to 1.8m high. Fl. Red. Shallow soils over ironstone on the margins of a seasonally inundated area.	Unlikely
<i>Gastrolobium lehmannii</i>	T (VU)	Sep - Oct	Erect, domed shrub, to 1.5 m high. Fl. orange-yellow-red-purple. Red clay, laterite. Low hilltop of breakaway.	Unlikely
<i>Myoporum cordifolium</i>	T (VU)	Jul - Nov	Spindly, erect shrub, 0.3-0.8 m high. Fl. white/white-pink. Sandy loam or clay loam. Flat plains.	Possible
<i>Caladenia christineae</i>	T (VU)	Sep-Nov	Tuberous, perennial, herb, 0.25-0.4 m high. Fl. white-cream-yellow. Sand, clayey loam, laterite. Margins of winter-wet flats, swamps, & freshwater lakes.	Possible
<i>Caladenia harringtoniae</i>	T (VU)	Oct-Nov	Tuberous, perennial, herb, 0.2-0.4 m high. Fl. pink. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Possible
<i>Caladenia validinervia</i>	P1	Sep-Oct	Tuberous, perennial, herb, single erect, hairy leaf and up to three greenish to creamy white flowers with red stripes on the sepals and petals. Only known from an area between Rocky Gully and Collie. Grows in jarrah and marri woodland.	Unlikely
<i>Senecio gilbertii</i>	P1	Sep-Nov	Erect, slender perennial, herb, to 1.5 m high. Fl. yellow. Peaty sand. Swamps, slopes.	Possible

Species	Cons Status*	Flowering	Description and Habitat	*Likelihood
<i>Tetraria</i> sp. Warren (M. McCallum Webster 23/2/1979)	P1		Only limited information available.	Possible
<i>Xanthoparmelia sammyi</i>	P1	Ju	Species of fungi in the family Parmeliaceae. Limited information available.	Possible
<i>Adenanthos linearis</i>	P2	Jan - Mar	Prostrate shrub, 0.15-0.6 m high. Fl. yellow & pink/cream & pink. Sandy soils, gravel.	Unlikely
<i>Andersonia hammersleyana</i>	P2	Aug - Oct	Erect to straggling shrub, 0.3-0.8 m high. Fl. blue/blue & white. Granitic sand, gravelly clay loam. Granite outcrops, slopes.	Unlikely
<i>Astartea</i> sp. Lake Muir (B.L. Rye 230128 & R.W. Hearn)	P2		Shrub, Fl. Pink/white, limited information available.	Possible
<i>Caladenia erythrochila</i>	P2	Sep-Oct	Tuberous, perennial, herb, 0.2-0.25 m high. Fl. red-brown-purple. Grey sand over laterite. Well-drained lateritic soils under scattered jarrah.	Unlikely
<i>Caladenia perangusta</i>	P2	Aug - Oct	Tuberous, perennial, herb, 0.17-0.37 m high. Variably cream, creamy yellow, pale yellow or red flowers. Lateritic and sandy clay soils in open <i>Eucalyptus wandoo</i> woodland, favour open situations above seasonal drainage lines and streams.	Possible
<i>Caladenia startiorum</i>	P2	Sep - Oct	Tuberous, perennial, herb, 0.2-0.6 m high. Fl. pink & white. Clay loam. Winter-wet swamps.	Possible
<i>Calothamnus scabridus</i>	P2	Oct-Dec	Erect shrub, to 1.5 m high. Terete scabrid leaves. Fl. Pale to bright red. Granitic loam.	Unlikely
<i>Eryngium</i> sp. Lake Muir (E. Wittwer 2293)	P2	Jan	Near prostrate herb. Fl. white. Black peaty silty soils. Winter-wet swamps.	Possible
<i>Euphrasia scabra</i>	P2	Oct	Erect annual, herb, (0.085-)0.15-0.35(-0.5) m high. Fl. yellow.	Possible
<i>Gratiola pedunculata</i>	P2	Sep-Nov	Erect to decumbent perennial herb 13–50 cm high. Damp areas.	Possible
<i>Hibbertia sejuncta</i>	P2	Aug - Oct	Low-growing shrubs to 25 cm high, Fl. Yellow, Stamens. 11, all around the gynoeceum. Winter-damp areas on gentle slopes adjacent to minor drainage lines and run-on areas, in grey sand beneath low, open jarrah forest.	Possible
<i>Logania sylvicola</i>	P2	Aug-Sep	Spreading, compact shrub to 40 cm x 50 cm. Inflorescence more or less pendant. Flowers cream. Mid slopes. Dry brown gravelly, sandy loam over laterite.	Unlikely
<i>Melaleuca ordinifolia</i>	P2	Aug - Oct	Compact, spreading shrub, 0.3-1.5 m high. Fl. white-cream. Sandy loam or clay.	Possible

Species	Cons Status*	Flowering	Description and Habitat	*Likelihood
<i>Montia australasica</i>	P2	Oct - Jan	Terrestrial or aquatic perennial herb, rooting from leaf nodes, terrestrial plants densely tufted and carpeting, aquatics loose and open. Fl. White - pale pink. Wet soil in permanent or winter wet swamps or aquatic in slow moving watercourses.	Possible
<i>Pentapogon quadrifidus</i> var. <i>quadrifidus</i>	P2		Annual or perennial, grass-like or herb, 0.3-0.6 m high, panicles to 20 cm, glumes usually 6.5-10 mm long. Fl. green/purple. Clay. Open winter wet flat in forest.	Possible
<i>Schoenus loliaceus</i>	P2	Aug-Nov	Annual, grass-like or herb (sedge), 0.03–0.06 m high. Sandy soils. Winter-wet depressions.	Possible
<i>Spyridium riparium</i>	P2	Jul to Oct	Erect shrub, 0.8-1.5 m high. Fl. white/cream. Sandy or gravelly soils over laterite. Riverbanks, slopes.	Possible
<i>Stylidium squamellosum</i>	P2	Oct-Nov	Caespitose perennial, herb, 0.12-0.35 m high, leaves tufted, linear to narrowly oblanceolate, 1-5 cm long, 0.8-2.5 mm wide, apex subacute, margin entire, glandular. Scape glandular throughout. Inflorescence racemose. Fl. yellow. Brown to red-brown clay loam. Winter-wet habitats and depressions, open woodland, shrubland.	Possible
<i>Synaphea</i> sp. <i>Kwornicup</i> (D. Trenowden 429)	P2		Only limited information available.	Possible
<i>Thysanotus</i> sp. <i>Badgingarra</i> (E.A. Griffin 2511)	P2	Dec	Perennial, herb (with tuberous roots), ca 0.35 m high. Fl. blue. Grey sand with lateritic gravel.	Unlikely
<i>Thysanotus unicipensis</i>	P2	Oct-Dec	Erect perennial dwarf shrub, height to 15 cm, width to 11 cm; flowers purple. Dry lateritic and grey sandy soils in moderately sunny places within Jarrah/Marri forests.	Unlikely
<i>Acacia parkerae</i>	P3	Sept-Oct	Prostrate, intricately branched, often sprawling shrub to c. 1 m across, branches sometimes erect and reaching c. 0.2 m high. Fl. Yellow, globular. Brown loam, clay or clay loam (normally not lateritic), typically in association with <i>Eucalyptus wandoo</i> .	Possible
<i>Andersonia auriculata</i>	P3	Apr-Oct	Erect or spreading shrub, 0.1-0.3(-0.5) m high. Fl. white & blue. Grey or peaty sand, often over laterite. Swampy areas, granite outcrops.	Unlikely
<i>Calytrix pulchella</i>	P3	Aug-Nov	Shrub, 0.3-0.7(-1) m high. Fl. pink. Grey or white sand over laterite. Ridges, flats.	Unlikely

Species	Cons Status*	Flowering	Description and Habitat	*Likelihood
<i>Chamaescilla gibsonii</i>	P3	Sep	Clumped tuberous, herb. Fl. blue. Clay to sandy clay. Winter-wet flats, shallow water-filled claypans.	Possible
<i>Cryptandra arbutiflora</i> var. <i>pygmaea</i>	P3	Aug-Nov	Low & spreading shrub, 0.05-0.2 m high. Fl. white. Shallow clay. Around granite outcrops.	Unlikely
<i>Cymbonotus preissianus</i>	P3	Aug - Sep	Stemless perennial, herb. Fl. yellow.	Possible
<i>Eryngium</i> sp. <i>ferox</i>	P3	Oct,Nov	Only limited information available.	Possible
<i>Kunzea micrantha</i> subsp. <i>hirtiflora</i>	P3	Sep	Spindly shrub, 0.6-1 m high. Fl. pink/white/purple. In temporary marshes, often partly submerged.	Unlikely
<i>Melaleuca pritzelii</i>	P3	Aug-Oct or Dec	Shrub, 0.7-1.6 m high. Fl. cream. Sandy or clayey soils. Swampy areas.	Possible
<i>Stylidium rhipidium</i>	P3	Oct-Nov	Slender annual, herb, ca 0.05 m high. Fl. white. Sandy soils. Wet creek flats, swamps, granite outcrops.	Possible
<i>Stylidium roseonanum</i>	P3	Oct	Diminutive, short-lived annual, herb, 0.015-0.03 m high. Fl. red-white. Swamps.	Possible
<i>Synaphea decumbens</i>	P3	Sep-Oct	Decumbent shrub. Fl. yellow. Sand over laterite.	Unlikely
<i>Synaphea hians</i>	P3	Jul-Nov	Prostrate or decumbent shrub, 0.15-0.6 m high, to 1 m wide. Fl. Yellow. Sandy soils. Rises.	Unlikely
<i>Synaphea otio stigma</i>	P3	Jul - Oct	Erect shrub, 0.8-1.5 m high. Fl. white/cream. Sandy or gravelly soils over laterite. Riverbanks, slopes.	Possible
<i>Tetratheca exasperata</i>	P3	Sep-Oct	Few-branched shrub (subshrub), 0.1–0.35 m high. Fl. pink, purple. White-grey sand, sandy loam with gravel, orange-brown gravelly loam.	Unlikely
<i>Wurmbea</i> sp. <i>Cranbrook</i> (A.R. <i>Annels 3819</i>)	P3	Sep	Cormous, perennial, herb, ca 0.25 m high. Fl. white. Valley floor.	Possible
<i>Stylidium lepidum</i>	P3	Oct-Nov	Spreading, rosetted perennial, herb, ca 0.05 m high, forming densely packed colonies. Fl. pink, orange. Gravelly sand or loam, clay. Winter-wet depressions.	Possible
<i>Banksia acuminata</i>	P4		Prostrate, lignotuberous shrub, to 0.2 m high, to 1 m wide. Fl. yellow-orange, Oct. Gravelly soils also sand in Kwongon.	Unlikely
<i>Banksia porrecta</i>	P4	Jul - Aug	Prostrate, sprawling, mat-forming, lignotuberous shrub, 0.2-0.35 m high, 0.6-4 m wide. Fl. white-cream. White/grey sand, sandy loam.	Unlikely

Species	Cons Status*	Flowering	Description and Habitat	*Likelihood
<i>Caladenia integra</i>	P4	Sep - Oct	Tuberous, perennial, herb, 0.2-0.5 m high. Fl. green & red. Clayey loam. Granite outcrops, rocky slopes.	Unlikely
<i>Eucalyptus brevistylis</i>	P4	Jan-Feb or Oct-Dec	Tree, 20-50 m high, bark fibrous to stringy. Fl. white. Sandy loam, sand.	Unlikely
<i>Lasiopetalum cardiophyllum</i>	P4	Aug-Jan	Erect, multi-stemmed shrub, 0.2–0.5 m high. Fl. pink. Lateritic gravelly soils, sandy clay. Flats, hillslopes.	Possible
<i>Microtis quadrata</i>	P4	Dec-Jan	Slender erect annual herb, 0.3 - 0.8 m high, up to 100 yellowish-green flowers 2.5 - 3mm across. Clay based coastal flats.	Unlikely
<i>Ornduffia submersa</i>	P4	Sep-Oct	Tuberous emergent aquatic perennial dwarf shrub, height to 35 cm; flowers white; leaves floating on surface of water. Clay-based ponds and swamps (semi-aquatic).	Unlikely
<i>Schoenus natans</i>	P4	Oct	Aquatic annual, grass-like or herb (sedge), 0.3 m high. Fl. brown. Winter-wet depressions.	Unlikely
<i>Trithuria australis</i>	P4	Sep- Nov	Small aquatic herb. Ponds, pools.	Unlikely
<i>Xanthosia eichleri</i>	P4	Oct-Nov	Erect, procumbent or decumbent shrub (subshrub), 0.05-0.25 m high, leaves simple, cuneate; umbels simple; petals shorter than sepals. Fl. white-cream. Grey sand over granite, sandy loam. Granite outcrops, jarrah/marri woodland.	Unlikely
<i>Eucalyptus erectifolia</i>	P4	Mar - May	(Mallee), 1-4 m high, bark smooth, grey. Fl. white. White sand, sandy loam & gravel. Hillslopes, sandplains.	Unlikely

Note: The BC Act Conservation Status is shown, EPBC Act status, where relevant, is in brackets.

*

Likely – Known to occur within one kilometres of the survey area with suitable habitat within the survey area.

Possible – Suitable habitat within the survey area.

Unlikely – No suitable habitat existing within the survey area.

Unknown – Data deficient.

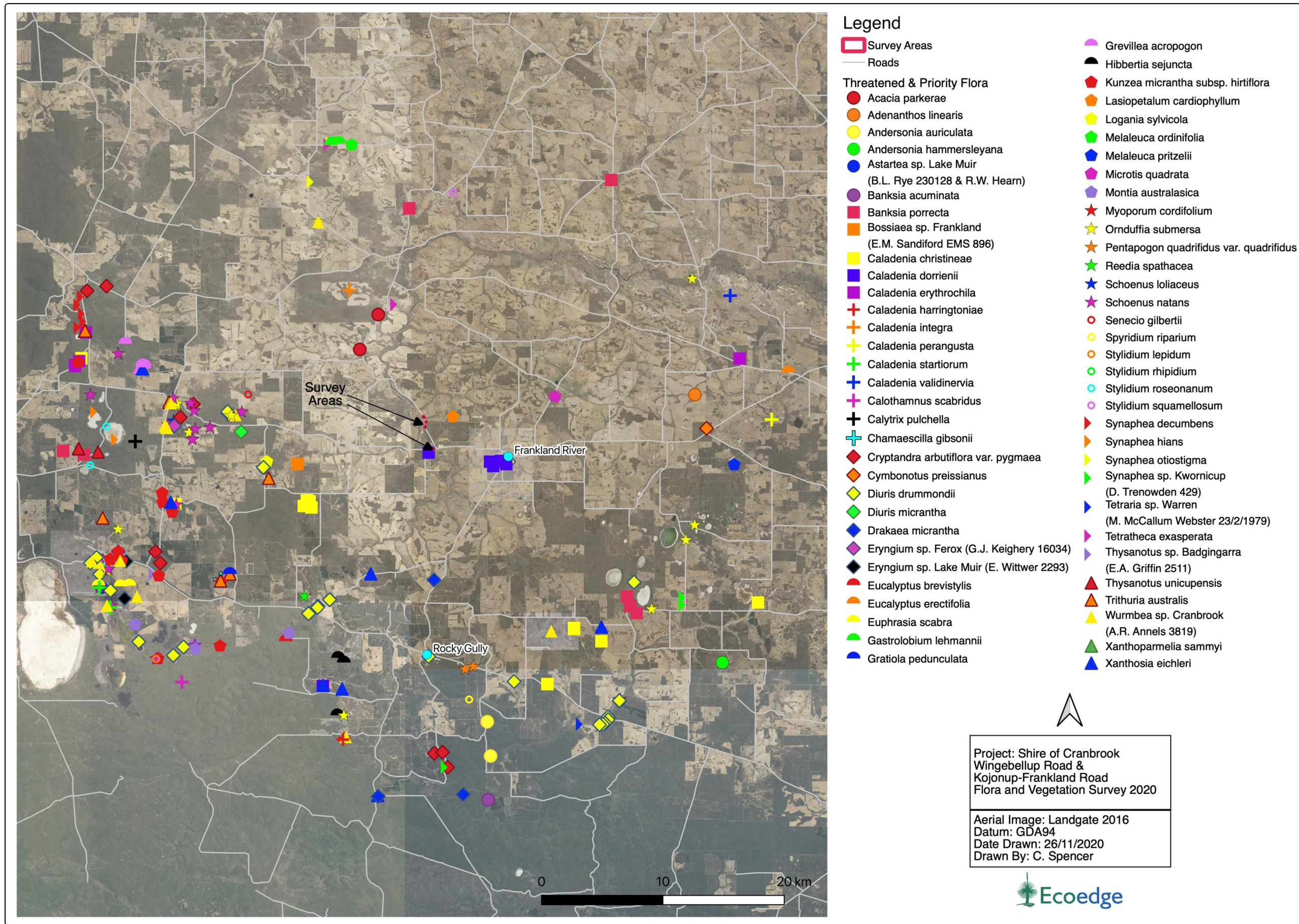


Figure 8. Location of Threatened and Priority flora mapped within 30 km of the survey area (DBCA, 2020c).

1.8 Ecological Corridors and Connectivity

Vegetation within the survey area does not form part of a formally recognised ecological linkage. However, the survey areas, especially areas 1, 2 and 3 form part of a network of connected native vegetation associated with the Frankland River in a predominantly agricultural landscape. Area 4, which is mostly degraded, is not strongly connected to any other parcel of native vegetation with the nearest parcel about 100 m away (**Figure 9**).

1.9 Wetlands and Watercourses

The survey areas occur in proximity to the Frankland River, in particular Area 1 which is approximately 50 m from the eastern bank of the river and Area 2 which is approximately 40 m from the eastern bank (**Figure 9**). The proximity of these two areas to the river means that they are likely to contain riparian vegetation which will be subject to special protection under State environmental legislation, in particular the EP Act.

1.10 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are protected under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 and are selected for their environmental values at State or National levels (Government of Western Australia, 2005). They include;

- Defined wetlands and riparian vegetation within 50 m;
- Areas covered by Threatened ecological communities;
- Area of vegetation within 50 m of Threatened flora;
- Bush Forever sites; and
- Declared World Heritage property sites.

According to the latest ESA dataset there are no ESAs in close proximity to the survey area (DWER 2020). The nearest is located approximately 13.5 km west of the survey area.



Figure 9. Survey area in context of nearby and adjacent native vegetation.

2 Methods

2.1 Desktop Assessment

Prior to the field survey, a “desktop assessment” was undertaken, this included a review of:

- A NatureMap report listing all flora (including Threatened and Priority flora) occurring within 10 km of the survey area (DBCA 2020d) (**Appendix 3**)
- A Protected Matters Search report of all Matters of National Environmental Significance (MNES) known or potentially occurring within 10 km of the survey area (DAWE 2020b) (**Appendix 3**).
- A DBCA database download of all Threatened and Priority flora and TEC and PEC occurrences within 30 km of the survey area (DBCA 2020b, 2020c).

This data was used to establish the list of Threatened and Priority flora and TEC and PEC occurrences to target during the survey, as well as providing a list of what other plant taxa might be encountered during the survey.

2.2 Field Survey

The flora and vegetation survey was undertaken on the 30 September 2020 by Colin Spencer (SL flora permit FB62000169) in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016). The survey area comprising four separate areas covered a total of approximately 0.58 ha of vegetation in Completely Degraded to Good condition.

A comprehensive list was made of native and introduced flora and information on vegetation structure, dominant species and vegetation condition at regular intervals through the survey area. A map showing the location of data collection points and survey track files is provided in **Appendix 6**.

Flora species that were not identified in the field were either photographed or collected for later identification.

Vegetation condition was assessed against the method of the EPA (2016) (**Appendix 7**).

2.3 Survey Limitations

Potential limitations with regard to the assessment are addressed in **Table 5**.

Table 5. Limitations of the field survey with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	No	The survey scope was prepared in consultation with the client and was designed to comply with EPA requirements.
Proportion of flora identified	Minor	The survey was carried out in only one visit in September which is within the optimal survey time.
Climatic and seasonal effects	Negligible	The survey area recorded about average rainfall and temperatures in the lead up to the survey.
Availability of contextual information	Minor	Some regional surveys have been carried out in the Southern Jarrah Forest (JAF02) IBRA sub-region, and some contextual information is available.
Completeness of the survey	Negligible	All of the survey area vegetation was easily accessible.
Skill and knowledge of the botanists	No	The botanist undertaking the survey has over 2 years' experience in identification and surveys of flora native to the Southern Jarrah Forest (JAF02) IBRA sub-region. The supervising botanist has over 25 years' experience in the sub-region.

3 Results

3.1 Flora

A total of 72 species of vascular flora species were recorded across the four survey areas.

Over a third of these (24) were weed species, reflecting the mostly narrow, and fragmented nature of the survey area vegetation within an agricultural landscape. One of these species, Bridal Creeper (*Asparagus asparagoides*) is a Declared Pest plant under the *Biosecurity and Agriculture Management Act 2007*. This was recorded in Area 3 (**Figure 4**) and Area 4 (**Figure 5**).

No Threatened or Priority listed flora species under either the BC Act or the EPBC Act were found.

The list of vascular flora for each area recorded during the field survey is included in **Appendix 8**.

3.2 Vegetation Units

Six vegetation units were identified across the four survey areas. These are described below and shown in **Figure 10** to **Figure 16**.

3.2.1 Survey area 1 - Wingellebup Road

Survey area 1 comprised of two vegetation units, Vegetation Unit A and Vegetation Unit B.



Figure 10. Vegetation Unit A, looking west from the middle of the survey area.

3.2.1.1 *Vegetation Unit A*

Mid Open woodland of *Eucalyptus rudis* subsp. *rudis* over isolated clumps of *Melaleuca viminea* mid-shrubland over a sparse sedgeland of *Lepidosperma leptostachyum* and an open forbland of **Ursinia anthemoides*, **Romulea rosea* and *Kennedia prostrata* and a sparse grassland of **Briza maxima*, **Lolium perenne* and *Neurachne alopecuroides* over a gravelly red-brown loam (Degraded – Completely Degraded).



Figure 11. Vegetation Unit B, looking South East from the middle of the survey area.

3.2.1.2 Vegetation Unit B

Mid open woodland of *Eucalyptus rudis* subsp. *rudis* over a low woodland of **Acacia dealbata* over a grassland of **Avena barbata*, **Briza maxima* and **Lolium perenne* and an open forbland of *Ursinia anthemoides* over a gravelly red-brown loam (Completely Degraded).

The extent in hectares of each vegetation unit within the Area 1 is provided in **Table 6**.

Table 6. Breakdown of vegetation unit areas with Area 1.

Vegetation Unit	Area (ha)	%
A	0.0472	54.50
B	0.0394	45.50
Total	0.0866	100

3.2.2 Survey area 2

Survey area 2 comprised of two vegetation units, Vegetation Unit B and Unit C. Vegetation Unit C is upslope of Unit B which occurs near the lower slopes of a valley associated with the Frankland River water course.



Figure 12. Vegetation Unit C, looking NW from near the southern boundary of the survey area.

3.2.2.1 *Vegetation Unit C*

Eucalyptus wandoo, *E. rudis* subsp. *rudis* woodland over sparse *Melaleuca raphiophylla* and *Acacia saligna* trees over *Allocasuarina lehmanniana* subsp. *lehmanniana*, *Hakea prostrata* Sparse mid shrubland over a low shrubland of *Hibbertia pilosa*, *Dianella divaricata* with occasional *H. amplexicaulis* and *Conostylis aculeata* subsp. *aculeata* over a sparse *Desmocladus asper* sedgeland and **Briza maxima*, *Austrostipa elegantissima*, *Neurachne alopecuroides* open grassland over gravelly red brown loam (Degraded – Good).



Figure 13. Vegetation Unit D, looking north west from near the middle of the survey area.

3.2.2.2 Vegetation Unit D

Eucalyptus wandoo, with occasional *E. marginata* mid-woodland over a mid-shrubland of *Allocasuarina lehmanniana* subsp. *lehmanniana*, *Hakea prostrata*, *Kunzea glabrescens* and *Leptospermum erubescens* over a low-shrubland of *Gastrolobium praemorsum*, *Hypocalymma angustifolium*, *G. spinosum* and *Hibbertia pilosa* over a grassland of **Briza maxima*, *B. minor* and *Neurachne alopecuroides* with isolated clumps of forbs including **Ursinia anthemoides*, *Caesia micrantha*, and *Sowerbaea laxiflora* on gravelly red brown loam (Degraded – Good).

The extent in hectares of each vegetation unit within the Area 2 is provided in **Table 7**.

Table 7. Breakdown of vegetation unit areas within Area 2.

Vegetation Unit	Area (ha)	%
C	0.0687	41.71
D	0.096	58.29
Total	0.1647	100

3.2.3 Survey area 3

Survey area 3 comprised of two vegetation units, Vegetation Unit E and Unit F. Vegetation Unit F occurs in brown clay at the base of a shallow valley with Unit E on brown loam – clay-loam on the valley upslopes.



Figure 14. Vegetation Unit E looking south to Unit F, from near the northern edge of the survey area.

3.2.3.1 *Vegetation Unit E*

Eucalyptus rudis subsp. rudis woodland over *Ehrharta longiflora* closed grassland with a sparse forbland of *Trifolium* spp., *Raphanus raphanistrum*, *Hibbertia pilosa* and *Monadenia bracteata* and isolated clumps of the sedge *Lepidosperma leptostachyum* over brown loam (Completely Degraded - Degraded).



Figure 15. Vegetation Unit F looking north from the middle of the survey area.

3.2.3.2 Vegetation Unit F

Eucalyptus rudis subsp. *rudis* woodland over a mid-shrubland of *Kunzea glabrescens* and *Melaleuca blaeriifolia* over an open sedgeland of *Cyathochaeta avenacea* and *Chorizandra enodis* and a grassland of *Ehrharta longiflora* and *Briza maxima* with isolated clumps of the forbs **Rumex crispus*, *Caesia micrantha*, *Stylidium crassifolium* and *Sowerbaea laxiflora* over brown clay (Completely Degraded – Good).

The extent in hectares of each vegetation unit within the Area 3 is provided in **Table 8**.

Table 8. Breakdown of vegetation unit areas within Area 3.

Vegetation Unit	Area (ha)	%
E	0.0518	37.32
F	0.087	62.68
Total	0.1388	100

3.2.4 Survey area 4

Survey area 4 comprised of one vegetation unit, Vegetation Unit G. The dominant tree species associated with this unit is the non-native *Eucalyptus botryoides* which has been planted into the road reserve. It is from eastern states of Australia.



Figure 16. Vegetation Unit G, looking south east from the northern end of the survey area.



Figure 17. Vegetation Unit G, looking north west from near the southern edge of the survey area.

3.2.4.1 Vegetation Unit G

**Eucalyptus botryoides* over introduced grassland of **Ehrharta longiflora*, **Avena barbata*, **Briza maxima* and **Paspalum dilatatum* (in wetter areas) with isolated clumps of *Allocasuarina lehmanniana* subsp. *lehmanniana*, *Hakea lissocarpha* and *Xanthorrhoea preissii* mid shrubland over isolated low shrubs of *Acacia pulchella* and isolated clumps of the forbs *Dianella divaricata* and *Conostylis aculeata* subsp. *aculeata* and isolated clumps of the sedges *Lepidosperma squamatum* and *Tetraria capillaris* on gravelly red brown loam (Completely Degraded to Good).

The extent in hectares of each vegetation unit within the Area 4 is provided in Table 9.

Table 9. Breakdown of vegetation unit areas within Area 4.

Vegetation Unit	Area (ha)	%
G	0.1883	100
Total	0.1883	100

3.3 Vegetation Condition

Most of the vegetation within the survey areas is in a degraded to completely degraded condition. The fragmented and linear nature of the areas along the edge of roads in a mostly cleared agricultural landscape makes them vulnerable to degradation from edge disturbance and weed invasion.

A breakdown of the vegetation condition per survey area is provided in Table 10 and a breakdown of vegetation condition per vegetation unit is provided in Table 11.

Vegetation condition is mapped in **Figure 17** to **Figure 20**.

Table 10. Breakdown of vegetation condition per survey area.

Survey area	Vegetation Condition	Area (Ha)	%
1	Degraded	0.0168	19.40
	Completely Degraded	0.0698	80.60
	Total	0.0866	100
2	Good	0.0268	16.27
	Degraded	0.1379	83.73
	Total	0.1647	100
3	Good	0.0415	29.90
	Degraded	0.0571	41.14
	Completely degraded	0.0402	28.96
	Total	0.1388	100
4	Good	0.0097	5.15
	Degraded	0.0136	7.22
	Completely degraded	0.165	87.63
	Total	0.1883	100

Table 11. A breakdown of vegetation condition by vegetation unit.

AREA	Vegetation Unit	Cons Status*	Vegetation Condition	Area (Ha)
1	A		Degraded	0.0168
			Completely Degraded	0.0304
	B		Completely Degraded	0.0394
	Total			0.0866
2	C		Good	0.0268
			Degraded	0.0419
	D		Degraded	0.096
	Total			0.1647
3	E		Degraded	0.392
			Completely Degraded	0.0126
	F		Good	0.0415
			Degraded	0.0179
			Completely Degraded	0.0276
Total			0.1388	
4	G		Good	0.0097
			Degraded	0.0136
			Completely Degraded	0.165
	Total			0.1883
Total			0.578	

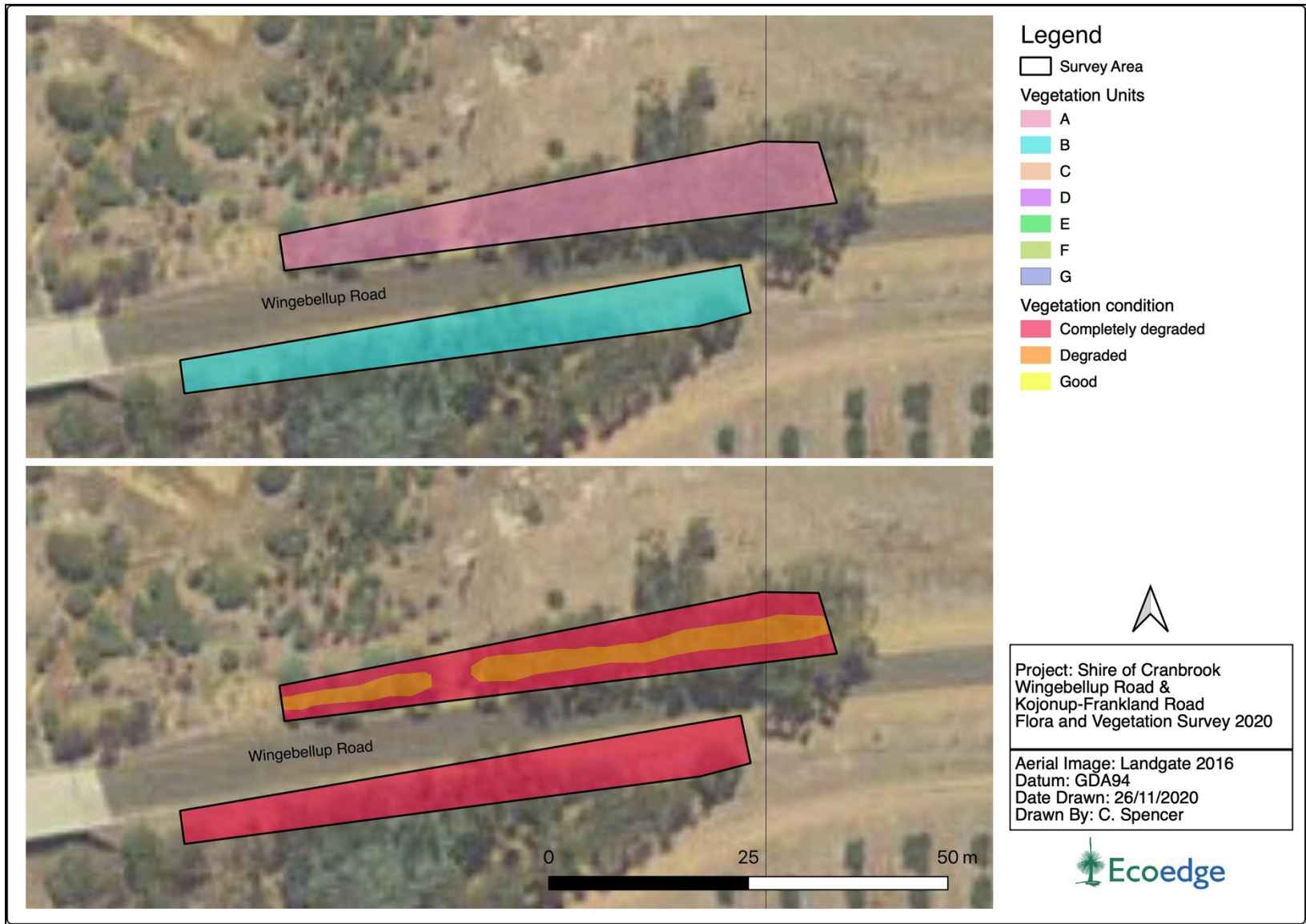


Figure 18. Survey area 1 - vegetation units and vegetation condition.

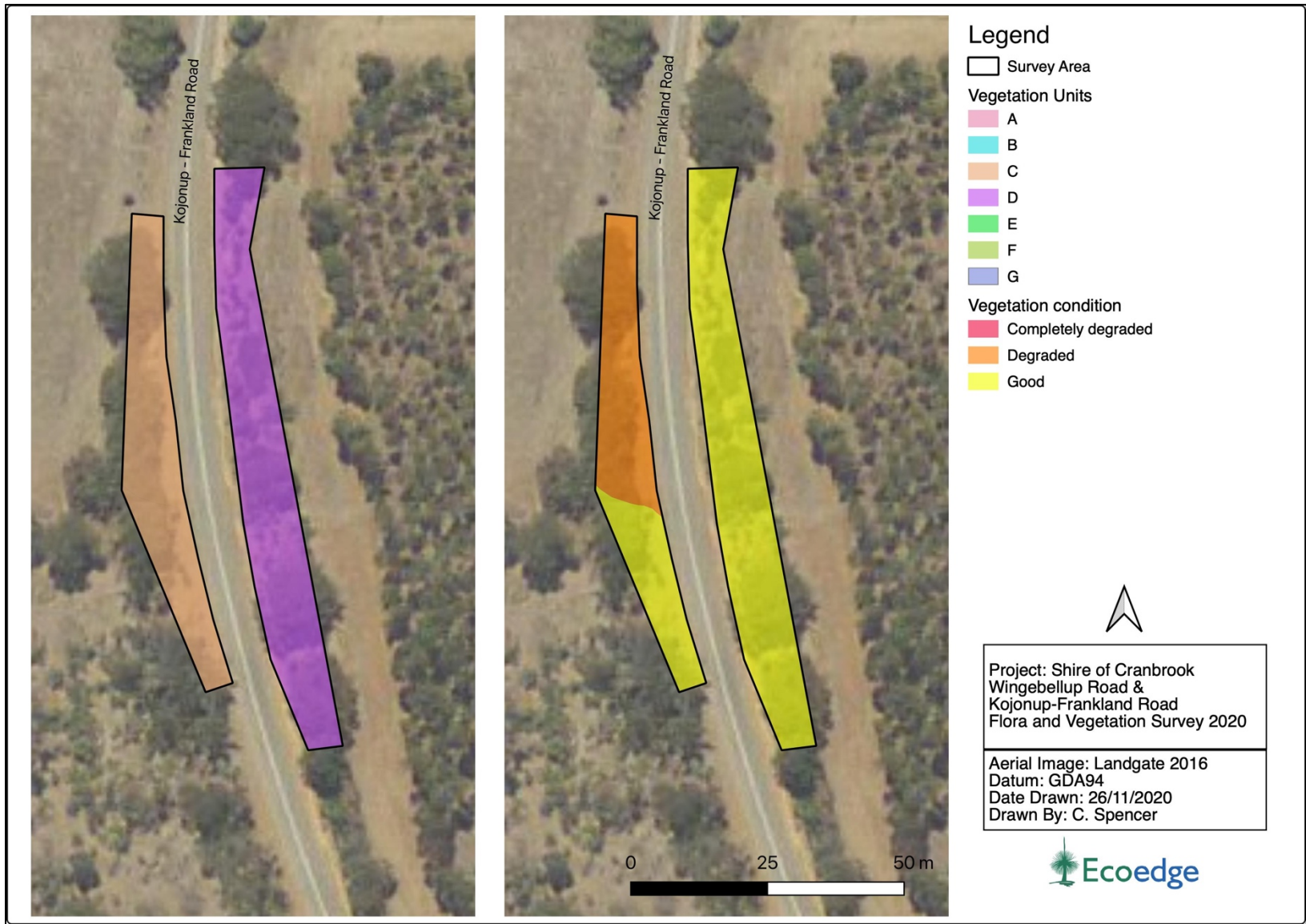


Figure 19. Survey area 2 - vegetation units and vegetation condition.

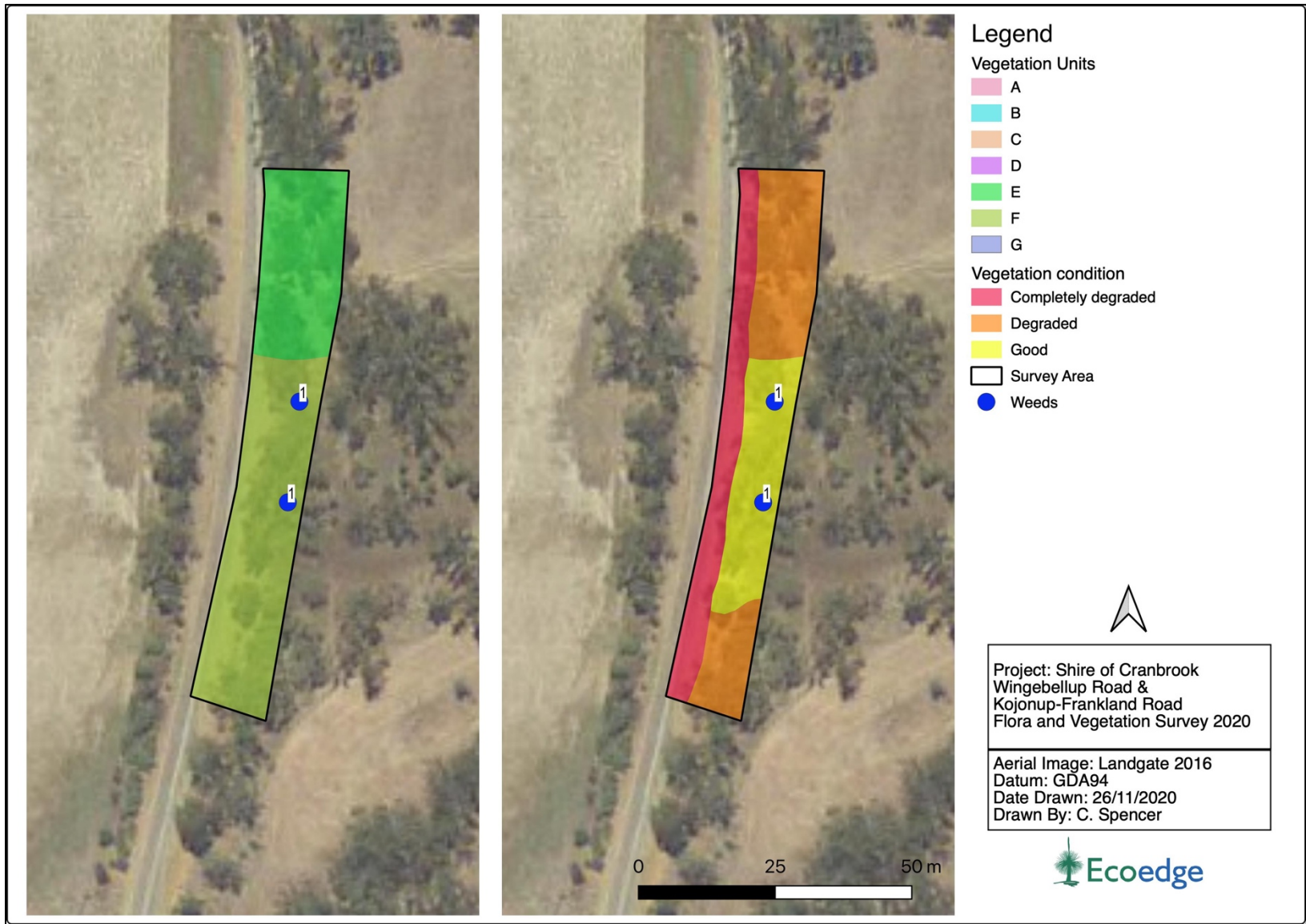


Figure 20. Survey area 3 - vegetation units and vegetation condition.

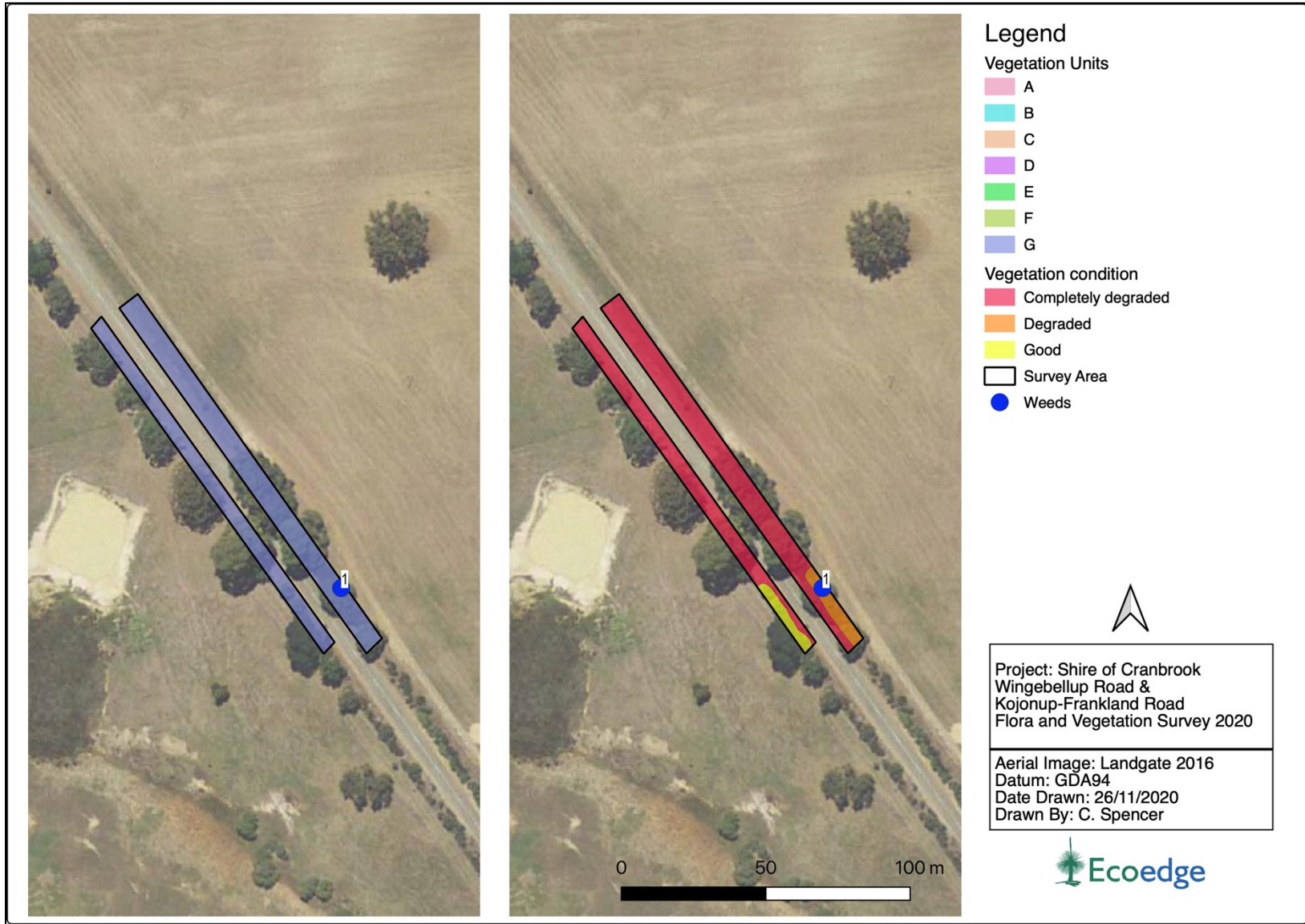


Figure 21. Survey area 4 - vegetation units and vegetation condition.

3.3.1 Threatened and Priority Ecological Communities

The vegetation units occurring within the four survey areas were compared against the key diagnostic characteristics for both the Wheatbelt woodland TEC and the Kwongkan shrubland TEC identified in the Desktop Assessment as potentially occurring within the survey area. The results of the comparison presented in **Table 13** and **Table 14**.

3.3.1.1 Wheatbelt Woodlands TEC

The comparison showed that the survey area vegetation for all sites did not meet the key diagnostic location characteristic for the TEC meaning that the survey area occurs outside of the potential occurrence area for the TEC. This is discussed further in **Section 4**.

3.3.1.2 Kwongkan Shrublands TEC

The comparison showed that all of the survey area vegetation units did not include any of the key diagnostic flora species diagnostic of this TEC.

3.3.2 Waterway Dependent Communities

Vegetation Units A, B (Area 1) and C (Area 2) have vegetation associated with and dependent on the Frankland River waterway. Vegetation Unit E and Unit F (Area 3) have vegetation associated with an ephemeral wetland in a depression at the base of a hill. The typical species dependant on these waterways and wetland are presented in **Table 12**.

Table 12. Typical waterway dependent flora species within the Survey area.

Waterway dependent species	Area 1	Area 2	Area 3
<i>Chorizandra enodis</i>	-	-	x
<i>Eucalyptus rudis</i> subsp. <i>rudis</i> (Flooded gum)	x	x	x
<i>Melaleuca raphiophylla</i>	-	x	-
<i>Melaleuca viminea</i>	x	-	-

Table 13. Comparison of the survey area vegetation units with the Wheatbelt woodland TEC key diagnostic characteristics criteria (DotEE, 2015).

Key diagnostic	Comment			
<p>1. It occurs in part of the following IBRA regions:</p> <ul style="list-style-type: none"> • Avon Wheatbelt - sub regions AVW01 Merredin and AVW02 Katanning; • Mallee - MAL02 Western Mallee only; and • Jarrah Forest – outlying patches in the eastern parts of JAF01 Northern Jarrah Forests and JAF02 Jarrah Forests adjacent to the Avon Wheatbelt, that are off the Darling Range, and receive less than 600 mm mean annual rainfall. They are effectively an extension of the Avon Wheatbelt landscape in that they comprise areas subject to similar climate, landscape and threats. 	<p>No, criteria not met.</p> <p>The survey area occurs within the Southern Jarrah Forest IBRA subregion, but the survey area is inferred to have a greater than 600 mm mean annual rainfall. The annual average rainfall for the closest Bureau of Meteorology weather station (Frankland Vineyards 009843) is 602.4 mm (1975-2020). This station is approximately 11 km south of the survey area.</p>			
	Area 1	Area 2	Area 3	Area 4
<p>2. The structure of the ecological community is a woodland in which the minimum crown cover of the tree canopy in a mature woodland is 10% (crowns measured as if they are opaque).</p>	Yes	Yes	Yes	Yes
<p>3. The dominant / codominant species of the tree canopy are key species of <i>Eucalyptus</i> (typically with a single trunk).</p>	Yes <i>E. rudis</i>	Yes <i>E. rudis</i> and <i>E. wandoo</i>	Yes <i>E. rudis</i> and <i>E. wandoo</i>	No <i>E. botryoides</i> is an eastern states eucalypt
<p>4. A native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs.</p>	Yes Mostly in a completely degraded condition	Yes	Yes	Yes

Table 14. Comparison of the survey area vegetation units, with the Kwongkan shrublands TEC key diagnostic characteristics criteria (DoE, 2014).

Key diagnostic	Comment			
1. Occurs within the Southeast Coastal Floristic Province (sensu Hopper and Gioia, 2004; relating to south west Australian phytogeographic boundaries. Includes the islands of the Recherche Archipelago), AND	Yes, criteria met. The survey area occurs just within the western boundary of the province at the Frankland River, (DoE 2014 Figure 1, p4).			
	Area 1	Area 2	Area 3	Area 4
2. Characterised by Proteaceae species having 30% or greater cover of Proteaceae species across all layers where these shrubs occur (crowns measured as if they are opaque), OR	No	No	No	No
3. Two or more diagnostic Proteaceae species are present that are likely to form a significant vegetative component when regenerated (see list of diagnostic species in Table 1). The use of diagnostic species is for situations in which the cover of Proteaceae species is reduced due to recent disturbance (e.g. fire).	No	No	No	No

4 Discussion and Conclusions

The targeted and reconnaissance survey was conducted on 30 September 2020 in accordance with the EPA (2016) Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment.

Seventy two species of vascular flora were identified across the four survey areas, none of which were a Priority or Threatened species under either the State BC Act or Federal EPBC Act.

Seven vegetation units were identified across the four survey areas (Unit A- G). Most of these were in degraded condition due to their occurrence within road reserves in an agricultural landscape.

These vegetation units were compared against key diagnostic characteristics for both the Wheatbelt woodlands TEC and the Kwongkan shrublands TEC, which were identified as potentially occurring within the survey area.

All four of the survey areas did not meet the key location diagnostic characteristic of the Wheatbelt woodlands TEC as they occurred within an area receiving greater than 600 mm of annual average rainfall. The approved conservation advice indicates that occurrences of Wheatbelt woodlands TEC within the Southern Jarrah Forest IBRA sub region are restricted to those areas receiving less than 600 mm of annual average rainfall (DoEE 2015).

The 600 mm mean annual average rainfall isohyet occurs to the east and north of the town of Frankland River, which occurs about 6.2 km east of the survey area, according to the Tonebridge-Frankland area land resources Survey Report (Stuart-Street 2005, p13.) and according to the description in Approved Conservation Advice for the TEC (DoEE 2015). The inferred annual average rainfall for the survey area is 602.4 mm which is based on the Bureau of Meteorology rainfall statistics for the Frankland Vineyards weather station. This station is located approximately 11 km south of the survey area and is the closest station to the survey area.

This means that the survey areas, whilst very close to the 600 mm cut off area, would not be regarded as meeting key criteria to be considered as containing potential occurrences of the Wheatbelt woodlands TEC.

This determination is supported by DBCA mapping (DBCA 2020) of occurrences of Wheatbelt woodlands TEC which show the nearest occurrences approximately 10 km to the north east and east of the survey area (**Figure 7**).

The survey area occurs within the Southeast Coastal Floristic Province which is the location diagnostic for this Kwongkan shrublands community. However, none of the vegetation units were characterised by any of the Proteaceae species diagnostic of the TEC.

Only two of the survey area vegetation units, Units C and D, provide a reasonable match for the Beard (1979) vegetation association 4 'Medium woodland; 'Medium woodland; marri & wandoo' mapped across the survey area in terms of the presence of one of the dominant trees, *E. wandoo*. However, the absence of Wandoo in the other units and Marri overall is considered reasonable given the relatively small size of the survey area. Additionally, Beard's mapping was undertaken at a broad scale of 1:250,000 and would have inherent variations in species composition across the extent of the association.

The Statewide extent remaining of this association (at 26.95 %) is below the Commonwealth government's 30% retention threshold, with 14.48% represented within the DBCA estate. Noting, however that the current extent of the association within the Shire of Cranbrook exceeds the target at 33.12%.

Vegetation Units A, B and C are regarded as having vegetation associated with and dependant on the Frankland River waterway. Vegetation within Unit E and Unit F is associated with an ephemeral wetland in a depression at the base of a hill. Vegetation associated with waterways and wetlands is specially protected under the EP Act.

The survey areas 1, 2 & 3 form part of a network of connected native vegetation associated with the Frankland River in a predominantly cleared agricultural landscape. There is no statutory basis for the protection of these corridors as ecological linkages, however their importance, in general, has been recognised as an environmental policy consideration in EPA and Planning policy over the last decade (EPA, 2008 and references therein).

There are no ESAs within or in close proximity to the survey area that will need to be considered as part of the proposed road upgrade. The closest of these is located approximately 13.5 km west of the survey area.

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Appendix 1. Categories of threatened and priority ecological communities under the BC Act (DEC, 2013).

Conservation code	Category
(T) Threatened ecological community pursuant to Sect 27 of the <i>Biodiversity Conservation Act 2016</i> .	
T	<p>(T) CR – Critically endangered</p> <p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.</p>
	<p>(T) EN - Endangered</p> <p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.</p>
	<p>(T) VU - Vulnerable</p> <p>An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.</p>
(P) Priority species – possible threatened communities.	
p1	<p>Poorly known communities</p> <p>Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>

Conservation code	Category
P2	<p>Poorly known communities</p> <p>Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.</p>
P3	<p>Poorly known communities</p> <ul style="list-style-type: none"> a) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: b) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; c) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. <p>Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.</p>
P4	<p>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.</p> <ul style="list-style-type: none"> 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 are close to qualifying for vulnerable but are not listed as Conservation Dependent. c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	<p>Conservation dependent ecological communities</p> <p>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.</p>

Appendix 2. Categories of Threatened Ecological Communities under the EPBC Act (DAWE, 2020a).

Category	Definition
Critically endangered	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable	If, at that time, an ecological, community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).

Appendix 3. Protected Matters Search Tool and NatureMap reports.



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 25/09/20 21:33:39

[Summary](#)

[Details](#)

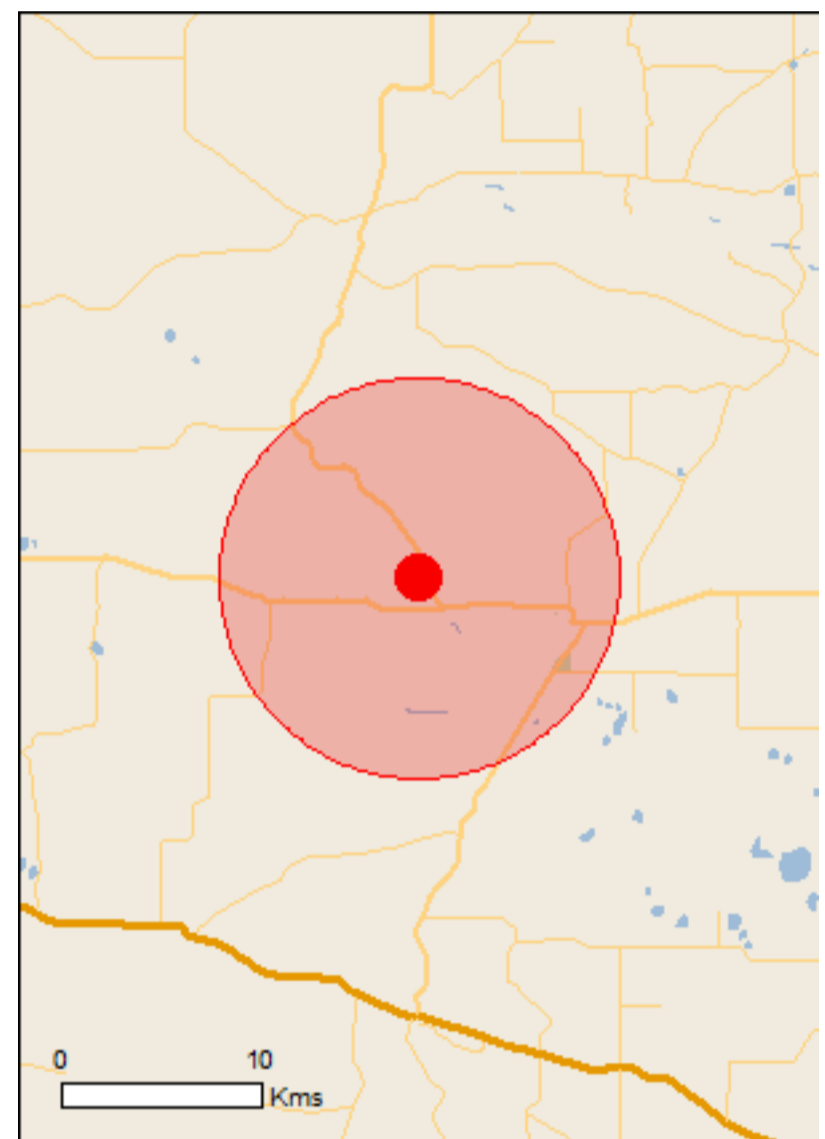
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

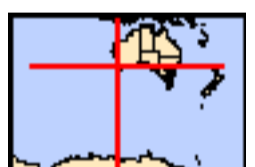
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

[Buffer: 10.0Km](#)



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	20
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	13
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	1
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Eucalypt Woodlands of the Western Australian Wheatbelt	Critically Endangered	Community likely to occur within area
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community may occur within area

Listed Threatened Species

[\[Resource Information \]](#)

Name	Status	Type of Presence
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Birds

Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Fish

Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat may occur within area
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Mammals

Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Phascogale calura Red-tailed Phascogale, Red-tailed Wambenger,	Vulnerable	Species or species

Name	Status	Type of Presence
Kenngoor [316]		habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat may occur within area
Setonix brachyurus		
Quokka [229]	Vulnerable	Species or species habitat may occur within area
Plants		
Adenanthos pungens subsp. pungens		
Spiky Adenanthos [19429]	Vulnerable	Species or species habitat may occur within area
Caladenia christineae		
Christine's Spider Orchid [56716]	Vulnerable	Species or species habitat likely to occur within area
Caladenia dorrienii		
Cossack Spider-orchid [6596]	Endangered	Species or species habitat likely to occur within area
Caladenia harringtoniae		
Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat may occur within area
Conostylis misera		
Grass Conostylis [21320]	Endangered	Species or species habitat may occur within area
Diuris drummondii		
Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area
Diuris micrantha		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat may occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	habitat may occur within area Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Extra Information

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species

Name	Status	Type of Presence
<p>Sus scrofa Pig [6]</p>		<p>habitat likely to occur within area</p> <p>Species or species habitat likely to occur within area</p>
<p>Vulpes vulpes Red Fox, Fox [18]</p>		<p>Species or species habitat likely to occur within area</p>
Plants		
<p>Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Genista sp. X Genista monspessulana Broom [67538]</p>		<p>Species or species habitat may occur within area</p>
<p>Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]</p>		<p>Species or species habitat may occur within area</p>
<p>Rubus fruticosus aggregate Blackberry, European Blackberry [68406]</p>		<p>Species or species habitat likely to occur within area</p>
<p>Ulex europaeus Gorse, Furze [7693]</p>		<p>Species or species habitat likely to occur within area</p>

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-34.3467 117.0096

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
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- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Wingebellup Rd NatureMap Species Report 25092020_10km

Created By Guest user on 25/09/2020

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 117° 00' 35" E, 34° 20' 48" S
Buffer 10km
Group By Family

Family	Species	Records
Apiaceae	1	1
Araliaceae	1	1
Asparagaceae	3	3
Asteraceae	8	8
Campanulaceae	1	1
Caryophyllaceae	4	4
Casuarinaceae	1	1
Centrolepidaceae	3	3
Colchicaceae	2	2
Crassulaceae	2	2
Cyperaceae	2	2
Dilleniaceae	3	3
Droseraceae	2	2
Ericaceae	9	10
Fabaceae	13	16
Geraniaceae	2	3
Goodeniaceae	3	3
Haemodoraceae	5	5
Haloragaceae	1	1
Hemerocallidaceae	3	3
Iridaceae	2	3
Juncaceae	2	2
Juncaginaceae	1	1
Lamiaceae	1	1
Lentibulariaceae	1	1
Malvaceae	4	6
Myrtaceae	11	12
Orchidaceae	28	37
Orobanchaceae	1	1
Phyllanthaceae	1	1
Pittosporaceae	3	3
Poaceae	4	4
Polygalaceae	1	1
Polygonaceae	1	1
Proteaceae	9	9
Ranunculaceae	1	1
Restionaceae	2	2
Rubiaceae	3	3
Rutaceae	4	7
Selaginellaceae	1	1
Stylidiaceae	3	3
Thymelaeaceae	5	5
TOTAL	158	179

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Apiaceae				
1.	6222 <i>Homalosciadium homalocarpum</i>			
Araliaceae				
2.	6226 <i>Hydrocotyle callicarpa</i> (Small Pennywort)			
Asparagaceae				
3.	1312 <i>Sowerbaea laxiflora</i> (Purple Tassels)			
4.	1339 <i>Thysanotus multiflorus</i> (Many-flowered Fringe Lily)			
5.	1354 <i>Thysanotus tenellus</i>			
Asteraceae				
6.	7851 <i>Asteridea pulverulenta</i> (Common Bristle Daisy)			
7.	16759 <i>Hyalosperma simplex</i> subsp. <i>simplex</i>			
8.	14344 <i>Millotia tenuifolia</i> var. <i>tenuifolia</i> (Soft Millotia)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
9.	8143 <i>Olearia paucidentata</i> (Autumn Scrub Daisy)			
10.	14370 <i>Picris angustifolia</i> subsp. <i>angustifolia</i>			
11.	8175 <i>Podolepis gracilis</i> (Slender Podolepis)			
12.	8195 <i>Quinetia urvillei</i>			
13.	13328 <i>Waitzia nitida</i>			
Campanulaceae				
14.	7396 <i>Isotoma hypocrateriformis</i> (Woodbridge Poison)			
Caryophyllaceae				
15.	2889 <i>Cerastium glomeratum</i> (Mouse Ear Chickweed)	Y		
16.	2894 <i>Moenchia erecta</i> (Erect Chickweed)	Y		
17.	19825 <i>Petrorhagia dubia</i>	Y		
18.	15972 <i>Silene gallica</i> var. <i>gallica</i>	Y		
Casuarinaceae				
19.	13908 <i>Allocasuarina lehmanniana</i> subsp. <i>lehmanniana</i>			
Centrolepidaceae				
20.	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
21.	1125 <i>Centrolepis drummondiana</i>			
22.	1133 <i>Centrolepis pilosa</i>			
Colchicaceae				
23.	12770 <i>Burchardia congesta</i>			
24.	12072 <i>Wurmbea dioica</i> subsp. <i>alba</i>			
Crassulaceae				
25.	17701 <i>Crassula closiana</i>			
26.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
Cyperaceae				
27.	1006 <i>Schoenus odontocarpus</i>			
28.	1013 <i>Schoenus sculptus</i> (Gimlet Bog-rush)			
Dilleniaceae				
29.	5109 <i>Hibbertia amplexicaulis</i>			
30.	5117 <i>Hibbertia cuneiformis</i> (Cutleaf Hibbertia)			
31.	5172 <i>Hibbertia stellaris</i> (Orange Stars)			
Droseraceae				
32.	3109 <i>Drosera menziesii</i> (Pink Rainbow)			
33.	3131 <i>Drosera stolonifera</i> (Leafy Sundew)			
Ericaceae				
34.	6324 <i>Astroloma compactum</i>			
35.	6334 <i>Astroloma pallidum</i> (Kick Bush)			
36.	6352 <i>Cosmelia rubra</i> (Spindle Heath)			
37.	6395 <i>Leucopogon gilbertii</i>			
38.	6435 <i>Leucopogon polystachyus</i>			
39.	35498 <i>Leucopogon</i> sp. <i>Boyup Brook</i> (A. Webb BNC 1025)			
40.	34736 <i>Lysinema pentapetalum</i>			
41.	6465 <i>Oligarrhena micrantha</i>			
42.	31952 <i>Sphenotoma gracilis</i> (Swamp Paper-heath)			
Fabaceae				
43.	44477 <i>Acacia parkerae</i>		P3	
44.	3581 <i>Acacia trigonophylla</i>			
45.	3718 <i>Bossiaea rufa</i>			
46.	15505 <i>Daviesia incrassata</i> subsp. <i>incrassata</i>			
47.	20512 <i>Gastrolobium praemorsum</i>			
48.	20500 <i>Gastrolobium sericeum</i>			
49.	3964 <i>Hovea chorizemifolia</i> (Holly-leaved Hovea)			
50.	3992 <i>Isotropis cuneifolia</i> (Granny Bonnets)			
51.	4044 <i>Kennedia prostrata</i> (Scarlet Runner)			
52.	4090 <i>Mirbelia dilatata</i> (Holly-leaved Mirbelia)			
53.	4187 <i>Pultenaea verruculosa</i>			
54.	4207 <i>Sphaerolobium medium</i>			
55.	4295 <i>Trifolium dubium</i> (Suckling Clover)	Y		
Geraniaceae				
56.	4335 <i>Erodium cygnorum</i> (Blue Heronsbill)			
57.	4346 <i>Pelargonium littorale</i>			
Goodeniaceae				
58.	7487 <i>Diaspasis filifolia</i> (Thread-leaved Diaspasis)			
59.	7602 <i>Scaevola calliptera</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
60.	7626 <i>Scaevola nitida</i> (Shining Fanflower)			
Haemodoraceae				
61.	1407 <i>Anigozanthos flavidus</i> (Tall Kangaroo Paw)			
62.	11261 <i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>			
63.	1413 <i>Anigozanthos preissii</i> (Albany Catspaw)			
64.	11597 <i>Conostylis setigera</i> subsp. <i>setigera</i>			
65.	1483 <i>Tribonanthes longipetala</i> (Branching Tiurmdin)			
Haloragaceae				
66.	6159 <i>Gonocarpus nodulosus</i>			
Hemerocallidaceae				
67.	23474 <i>Agrostocrinum hirsutum</i>			
68.	1276 <i>Caesia micrantha</i> (Pale Grass Lily)			
69.	1297 <i>Johnsonia lupulina</i> (Hooded Lily)			
Iridaceae				
70.	1518 <i>Gladiolus angustus</i> (Long Tubed Painted Lady)	Y		
71.	19179 <i>Moraea flaccida</i> (One-leaf Cape Tulip)	Y		
Juncaceae				
72.	1178 <i>Juncus bufonius</i> (Toad Rush)	Y		
73.	1180 <i>Juncus capitatus</i> (Capitate Rush)	Y		
Juncaginaceae				
74.	18587 <i>Triglochin nana</i>			
Lamiaceae				
75.	6883 <i>Mentha pulegium</i> (Pennyroyal)	Y		
Lentibulariaceae				
76.	7158 <i>Utricularia volubilis</i> (Twining Bladderwort)			
Malvaceae				
77.	5026 <i>Lasiopetalum cardiophyllum</i>		P4	
78.	5033 <i>Lasiopetalum floribundum</i> (Free Flowering Lasiopetalum)			
79.	5091 <i>Thomasia paniculata</i>			
80.	5097 <i>Thomasia rhynchocarpa</i>			
Myrtaceae				
81.	20127 <i>Astartea glomerulosa</i> (Early Astartea)			
82.	20283 <i>Astartea scoparia</i> (Common Astartea)			
83.	5394 <i>Callistemon glaucus</i>			
84.	13534 <i>Eucalyptus aspersa</i>			
85.	5625 <i>Eucalyptus diversicolor</i> (Karri)			
86.	5739 <i>Eucalyptus patens</i> (Swan River Blackbutt, Dwuda)			
87.	5796 <i>Eucalyptus uncinata</i> (Hook-leaved Mallee)			
88.	5816 <i>Homalospermum firmum</i>			
89.	5878 <i>Melaleuca blaeriifolia</i>			
90.	5900 <i>Melaleuca cuticularis</i> (Saltwater Paperbark)			
91.	20114 <i>Taxandria fragrans</i>			
Orchidaceae				
92.	1577 <i>Caladenia barbarossa</i> (Dragon Orchid)			
93.	10850 <i>Caladenia dorrienii</i>		T	
94.	15350 <i>Caladenia flava</i> subsp. <i>sylvestris</i>			
95.	15355 <i>Caladenia hirta</i> subsp. <i>rosea</i>			
96.	1601 <i>Caladenia lobata</i> (Butterfly Orchid)			
97.	1604 <i>Caladenia macrostylis</i> (Leaping Spider Orchid)			
98.	10883 <i>Caladenia magniclavata</i> (Big Clubbed Spider Orchid)			
99.	1605 <i>Caladenia marginata</i> (White Fairy Orchid)			
100.	1609 <i>Caladenia pectinata</i> (King Spider Orchid)			
101.	15376 <i>Caladenia polychroma</i>			
102.	1612 <i>Caladenia radiata</i> (Ray Spider Orchid)			
103.	15380 <i>Caladenia splendens</i>			
104.	15383 <i>Caladenia uliginosa</i> subsp. <i>uliginosa</i>			
105.	19867 <i>Caladenia x exserta</i>			
106.	19868 <i>Caladenia x hypata</i>			
107.	10964 <i>Cyrtostylis robusta</i>			
108.	10796 <i>Diuris drummondii</i> (Tall Donkey Orchid)		T	
109.	15436 <i>Diuris porrifolia</i>			
110.	1638 <i>Diuris setacea</i> (Bristly Donkey Orchid)			
111.	1656 <i>Lyperanthus serratus</i> (Rattle Beak Orchid)			
112.	1657 <i>Microtis alba</i> (White Mignonette Orchid)			
113.	16688 <i>Prasophyllum gracile</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
114.	1677 <i>Prasophyllum macrostachyum</i> (Laughing Leek Orchid)			
115.	10853 <i>Prasophyllum plumiforme</i>			
116.	48683 <i>Pterostylis serotina</i>			
117.	<i>Pterostylis</i> sp.			
118.	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
119.	1701 <i>Thelymitra antennifera</i> (Vanilla Orchid)			
Orobanchaceae				
120.	7089 <i>Parentucellia latifolia</i> (Common Bartsia)	Y		
Phyllanthaceae				
121.	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
Pittosporaceae				
122.	3154 <i>Billardiera coriacea</i>			
123.	3169 <i>Cheiranthra preissiana</i>			
124.	17635 <i>Marianthus drummondianus</i>			
Poaceae				
125.	17237 <i>Austrostipa elegantissima</i>			
126.	17241 <i>Austrostipa hemipogon</i>			
127.	476 <i>Lolium perenne</i> (Perennial Ryegrass)	Y		
128.	33101 <i>Vulpia myuros forma myuros</i>	Y		
Polygalaceae				
129.	8395 <i>Polygala myrtifolia</i> (Myrtleleaf Milkwort)	Y		
Polygonaceae				
130.	2412 <i>Muehlenbeckia adpressa</i> (Climbing Lignum)			
Proteaceae				
131.	10824 <i>Acidonia microcarpa</i>			
132.	32202 <i>Banksia nivea</i> (Honeypot Dryandra, Pudjarn)			
133.	1844 <i>Banksia quercifolia</i> (Oak-leaved Banksia)			
134.	16878 <i>Conospermum caeruleum subsp. spathulatum</i>			
135.	13085 <i>Grevillea centristigma</i>			
136.	1987 <i>Grevillea depauperata</i>			
137.	15990 <i>Grevillea pulchella subsp. ascendens</i>			
138.	2293 <i>Petrophile diversifolia</i>			
139.	12911 <i>Synaphea obtusata</i>			
Ranunculaceae				
140.	2932 <i>Ranunculus colonorum</i> (Common Buttercup)			
Restionaceae				
141.	17663 <i>Desmocladius asper</i>			
142.	16595 <i>Desmocladius flexuosus</i>			
Rubiaceae				
143.	7321 <i>Galium divaricatum</i>	Y		
144.	7323 <i>Galium murale</i> (Small Goosegrass)	Y		
145.	7362 <i>Sherardia arvensis</i> (Field Madder)	Y		
Rutaceae				
146.	4422 <i>Boronia gracilipes</i> (Karri Boronia)			
147.	4423 <i>Boronia heterophylla</i> (Kalgan Boronia)			
148.	4429 <i>Boronia molloyae</i> (Tall Boronia)			
149.	17729 <i>Crowea angustifolia var. platyphylla</i>			
Selaginellaceae				
150.	6 <i>Selaginella gracillima</i> (Tiny Clubmoss)			
Stylidiaceae				
151.	7681 <i>Stylidium affine</i> (Queen Triggerplant)			
152.	7799 <i>Stylidium spathulatum</i> (Creamy Triggerplant)			
153.	45593 <i>Stylidium tenue subsp. tenue</i> (Little Fountain Triggerplant)			
Thymelaeaceae				
154.	5240 <i>Pimelea cracens</i>			
155.	5259 <i>Pimelea preissii</i>			
156.	5264 <i>Pimelea spectabilis</i> (Bunjong)			
157.	12041 <i>Pimelea suaveolens subsp. suaveolens</i>			
158.	5269 <i>Pimelea sylvestris</i>			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
S	Other specially protected fauna			
1	Priority 1			
2	Priority 2			
3	Priority 3			
4	Priority 4			
5	Priority 5			

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 4. Definitions of Conservation Codes for Threatened and Priority flora (DBCA, 2019b).

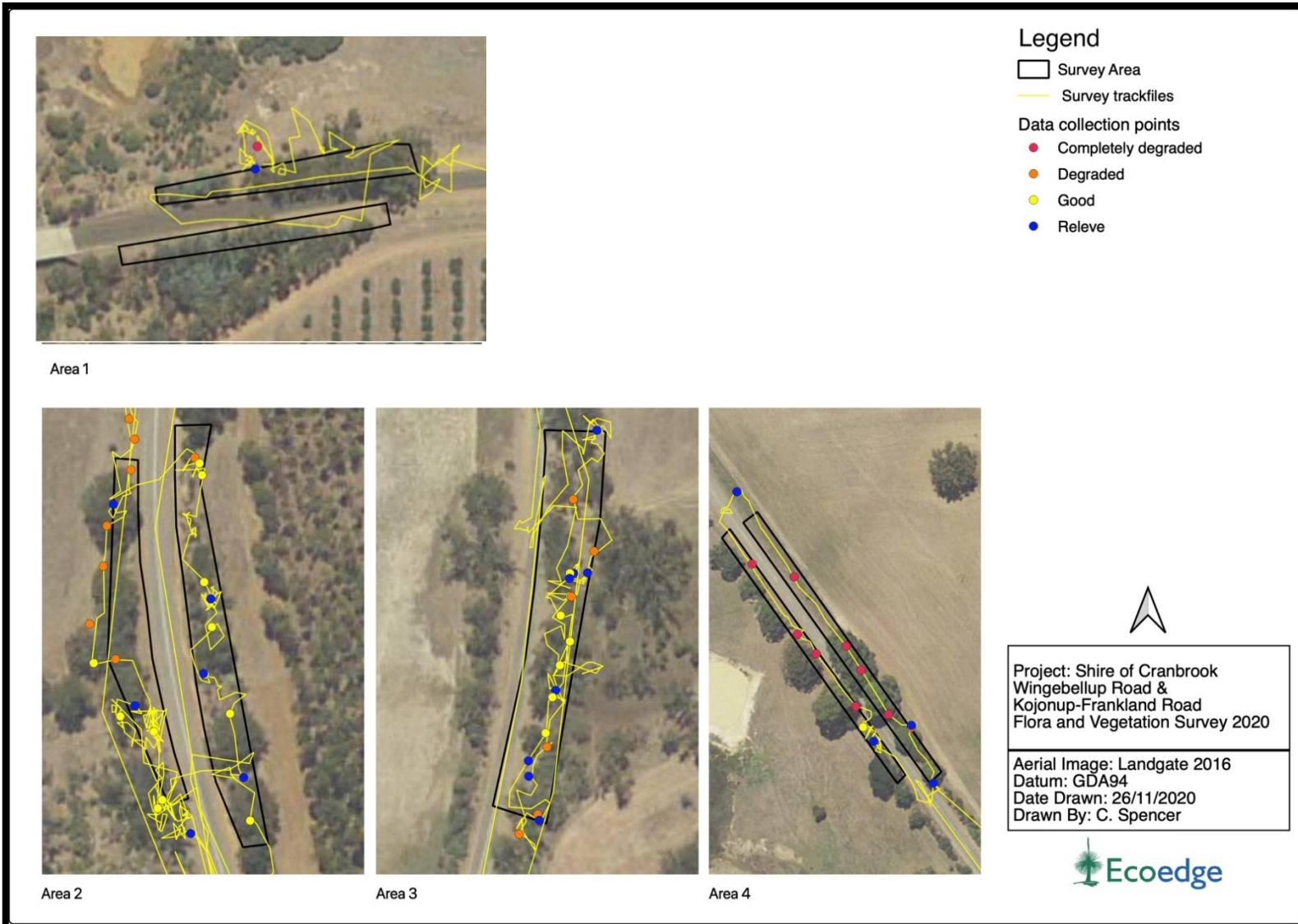
Conservation code	Category
(T) Threatened species pursuant to Sect 19 of the BC Act 2016.	
T	<p>(T) CR – Critically endangered</p> <p>Threatened species considered to be <i>“facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”</i>.</p>
	<p>(T) EN - Endangered</p> <p>Threatened species considered to be <i>“facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”</i>.</p>
	<p>(T) VU - Vulnerable</p> <p>Threatened species considered to be <i>“facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”</i>.</p>
(P) Priority species – possible Threatened species.	
P1	<p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p>
P2	<p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p>

Conservation code	Category
P3	<p>Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p>
P4	<p>(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.</p> <p>(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

Appendix 5. Categories of Threatened Species under the EPBC Act (DAWE, 2020c).

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 (EN)	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 (VU)	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.

Appendix 6. Survey Area Trackfile and Waypoint Data.



Appendix 7. Vegetation condition scale (EPA, 2016).

Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Appendix 8. List of vascular flora found within the Shire of Cranbrook Survey Areas

No	FAMILY NAME	SPECIES NAME	NATURALISED	CONSV CODE	Area 1	Area 2	Area 3	Area 4
1	Asparagaceae	<i>Asparagus asparagoides</i>	x	DP			x	x
2	Asparagaceae	<i>Dichopogon capillipes</i>	x			x		
3	Asparagaceae	<i>Lomandra micrantha</i> subsp. <i>micrantha</i>				x		
4	Asparagaceae	<i>Sowerbaea laxiflora</i>	x			x		
5	Asparagaceae	<i>Thysanotus manglesianus</i>	planted			x		
6	Asteraceae	<i>Arctotheca calendula</i>						x
7	Asteraceae	<i>Hypochaeris glabra</i>	x		x			
8	Asteraceae	<i>Ursinia anthemoides</i>			x			
9	Brassicaceae	<i>Raphanus raphanistrum</i>					x	
10	Caryophyllaceae	<i>Petrorhagia dubia</i>			x			
11	Casuarinaceae	<i>Allocasuarina lehmanniana</i>				x		x
12	Crassulaceae	<i>Crassula decumbens</i>				x		
13	Cyperaceae	<i>Chorizandra enodis</i>					x	
14	Cyperaceae	<i>Cyathochaeta avenacea</i>					x	
15	Cyperaceae	<i>Ficinia nodosa</i>				x		
16	Cyperaceae	<i>Lepidosperma leptostachyum</i>			x		x	

No	FAMILY NAME	SPECIES NAME	NATURALISED	CONSV CODE	Area 1	Area 2	Area 3	Area 4
17	Cyperaceae	<i>Lepidosperma squamatum</i>						x
18	Cyperaceae	<i>Tetraria capillaris</i>	x		x			x
19	Dilleniaceae	<i>Hibbertia amplexicaulis</i>				x		
20	Dilleniaceae	<i>Hibbertia pilosa</i>				x	x	
21	Fabaceae	<i>Acacia dealbata</i>	x		x			
22	Fabaceae	<i>Acacia pulchella</i> var. <i>glaberrima</i>				x		x
23	Fabaceae	<i>Acacia saligna</i>				x		
24	Fabaceae	<i>Bossiaea eriocarpa</i>	x		x			
25	Fabaceae	<i>Daviesia incrassata</i>				x		
26	Fabaceae	<i>Gastrolobium praemorsum</i>				x		
27	Fabaceae	<i>Gastrolobium spinosum</i>				x		
28	Fabaceae	<i>Hakea lissocarpha</i>						x
29	Fabaceae	<i>Hakea prostrata</i>	x			x		
30	Fabaceae	<i>Kennedia prostrata</i>			x	x		x
31	Fabaceae	<i>Trifolium repens</i>					x	
32	Haemodoraceae	<i>Conostylis aculeata</i> subsp. <i>aculeata</i>				x		x

No	FAMILY NAME	SPECIES NAME	NATURALISED	CONSV CODE	Area 1	Area 2	Area 3	Area 4
33	Hemerocallidaceae	<i>Caesia micrantha</i>				x	x	
34	Hemerocallidaceae	<i>Dianella revoluta</i>	x			x		x
35	Hemerocallidaceae	<i>Stypandra glauca</i>	x		x			
36	Hemerocallidaceae	<i>Tricoryne elatior</i>						x
37	Iridaceae	<i>Romulea rosea</i>	x		x	x		
38	Myrtaceae	<i>Eucalyptus botryoides</i>						x
39	Myrtaceae	<i>Eucalyptus marginata</i>				x		
40	Myrtaceae	<i>Eucalyptus rudis</i> subsp. <i>rudis</i>			x	x	x	
41	Myrtaceae	<i>Eucalyptus wandoo</i>				x		
42	Myrtaceae	<i>Hypocalymma angustifolium</i>				x		
43	Myrtaceae	<i>Kunzea glabrescens</i>	x			x	x	
44	Myrtaceae	<i>Leptospermum erubescens</i>				x		
45	Myrtaceae	<i>Melaleuca blaeriifolia</i>				x	x	x
46	Myrtaceae	<i>Melaleuca raphiophylla</i>	x			x		
47	Myrtaceae	<i>Melaleuca viminea</i>	x		x			
48	Orchidaceae	<i>Monadenia bracteata</i>	x		x		x	
49	Oxalidaceae	<i>Oxalis perennans</i>	x			x		

No	FAMILY NAME	SPECIES NAME	NATURALISED	CONSV CODE	Area 1	Area 2	Area 3	Area 4
50	Oxalidaceae	<i>Oxalis purpurea</i>	x			x		
51	Phyllanthaceae	<i>Poranthera microphylla</i>				x		
52	Pinaceae	<i>Pinus pinaster</i>						x
53	Pittosporaceae	<i>Billardiera heterophylla</i>	x			x		
54	Poaceae	<i>Austrostipa elegantissima</i>	x			x		
55	Poaceae	<i>Austrostipa mollis</i>			x			
56	Poaceae	<i>Avena barbata</i>			x	x		x
57	Poaceae	<i>Briza maxima</i>			x	x	x	x
58	Poaceae	<i>Briza minor</i>				x		
59	Poaceae	<i>Ehrharta calycina</i>			x			
60	Poaceae	<i>Ehrharta longiflora</i>					x	
61	Poaceae	<i>Lolium perenne</i>	x		x			
62	Poaceae	<i>Neurachne alopecuroidea</i>	x		x	x		
63	Poaceae	<i>Paspalum dilatatum</i>	x					x
64	Poaceae	<i>Pentaschistis airoides</i>			x			
65	Polygonaceae	<i>Rumex crispus</i>	x				x	

No	FAMILY NAME	SPECIES NAME	NATURALISED	CONSV CODE	Area 1	Area 2	Area 3	Area 4
66	Primulaceae	<i>Lysimachia arvensis</i> var. <i>caerulea</i>				x		
67	Restionaceae	<i>Desmocladus asper</i>				x		
68	Restionaceae	<i>Desmocladus flexuosa</i>				x		
69	Rubiaceae	<i>Opercularia vaginata</i>				x		
70	Scrophulariaceae	<i>Zaluzianskya divaricata</i>	x		x			
71	Stylidiaceae	<i>Stylidium crassifolium</i>					x	
72	Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>						x