

Report of a Flora and Vegetation Survey of Lot 2626
Jamisons Road, Boallia



Prepared for B&J Catalano Pty Ltd
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Executive Summary

Ecoedge was engaged by B & J Catalano in September 2017 to undertake a quadrat-based Flora and Vegetation Survey on Lot 2626 Jamisons Road, in the City of Busselton ('Survey Area'). The survey was to include reconnaissance, detailed and targeted components, as described in the Environmental Protection Authority Technical Guidance (Environmental Protection Authority, 2016).

The survey was required as part of B&J Catalano's investigations into the potential future extraction of Basic Raw Materials from the site.

The Survey Area is located approximately 16 km south southwest of Busselton townsite on Jamisons Road. It comprises 4.6 ha of remnant vegetation plus 19 paddock trees.

Ninety-two species of vascular flora were identified within the Survey Area, of which five were naturalised. No Threatened flora, species listed under the EPBC Act, Priority flora or other flora of conservation significance were found in the Survey Area. None of the introduced species are Declared Pest Plants under the *Biosecurity and Agriculture Management Act 2007* (Department of Agriculture and Food Western Australia, 2007).

Only one vegetation unit was recognised within the Survey Area, which is comprised of an open forest of Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) with occasional patches of Sheoak (*Allocasuarina fraseriana*) on sandy gravel soil. The low understorey appears to be recovering from livestock grazing.

Of the Whicher Scarp floristic vegetation types identified by Keighery *et al.* (2008), it appears to have the closest resemblance to FCT C4 – "Whicher Scarp/Blackwood Plateau Jarrah and Marri woodland". This vegetation type is widespread and common on the Whicher Scarp and adjacent Blackwood Plateau.

The Survey Area vegetation does not resemble any Threatened or Priority ecological community.

Just over half the vegetation was classified as Very Good condition, with three quarters in Good or Very Good condition. All the small remnants north of the access track were Completely Degraded.

The whole of the Survey Area is covered by an Environmentally Sensitive Area which is associated with known occurrences of a Threatened ecological community and of Threatened flora within the Treeton Forest block. Clearing regulation exemptions do not apply to vegetation that forms part of an Environmentally Sensitive Area.

The Survey Area vegetation directly forms part of a South West Regional Ecological Linkage, as mapped by Molloy *et al.* (2009).

The vegetation in the Survey Area does not have any particular conservation significance, however it is situated on the Whicher Scarp, which has been identified as a biodiversity 'hotspot' (Keighery *et al.*, 2008), most of it is in Good or Very Good condition, and it forms part of a regional ecological linkage.

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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 for 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 B & J Catalano in September 2017 to undertake a quadrat-based Flora and Vegetation Survey on Lot 2626 Jamisons Road, in the City of Busselton ('Survey Area') (Figures 1 and 2). The survey was to include reconnaissance, detailed and targeted components, as described in the Environmental Protection Authority Technical Guidance (Environmental Protection Authority, 2016).

The survey was required as part of B&J Catalano's investigations into the potential future extraction of Basic Raw Materials from the site. The purpose of the survey was to delineate key flora and vegetation values and their potential sensitivity to impact. The outcomes of the survey and information supplied in the survey report will be used to inform the environmental assessment and approvals process.

The Survey Area comprises 4.6 ha of remnant vegetation plus 19 paddock trees (Figure 3).

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

This report compiles findings of the field survey.

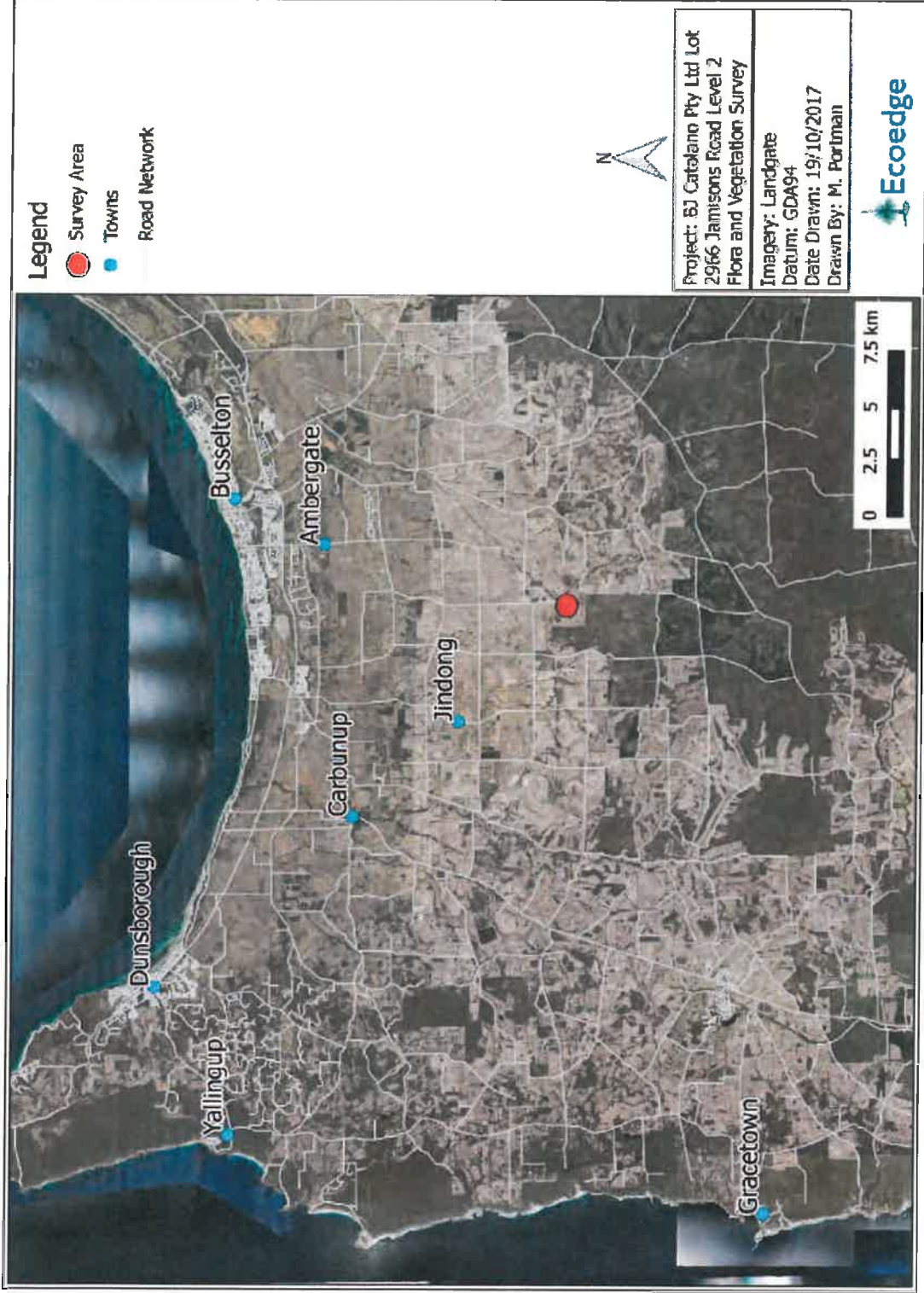


Figure 1. Aerial Photograph showing location of Survey Area.

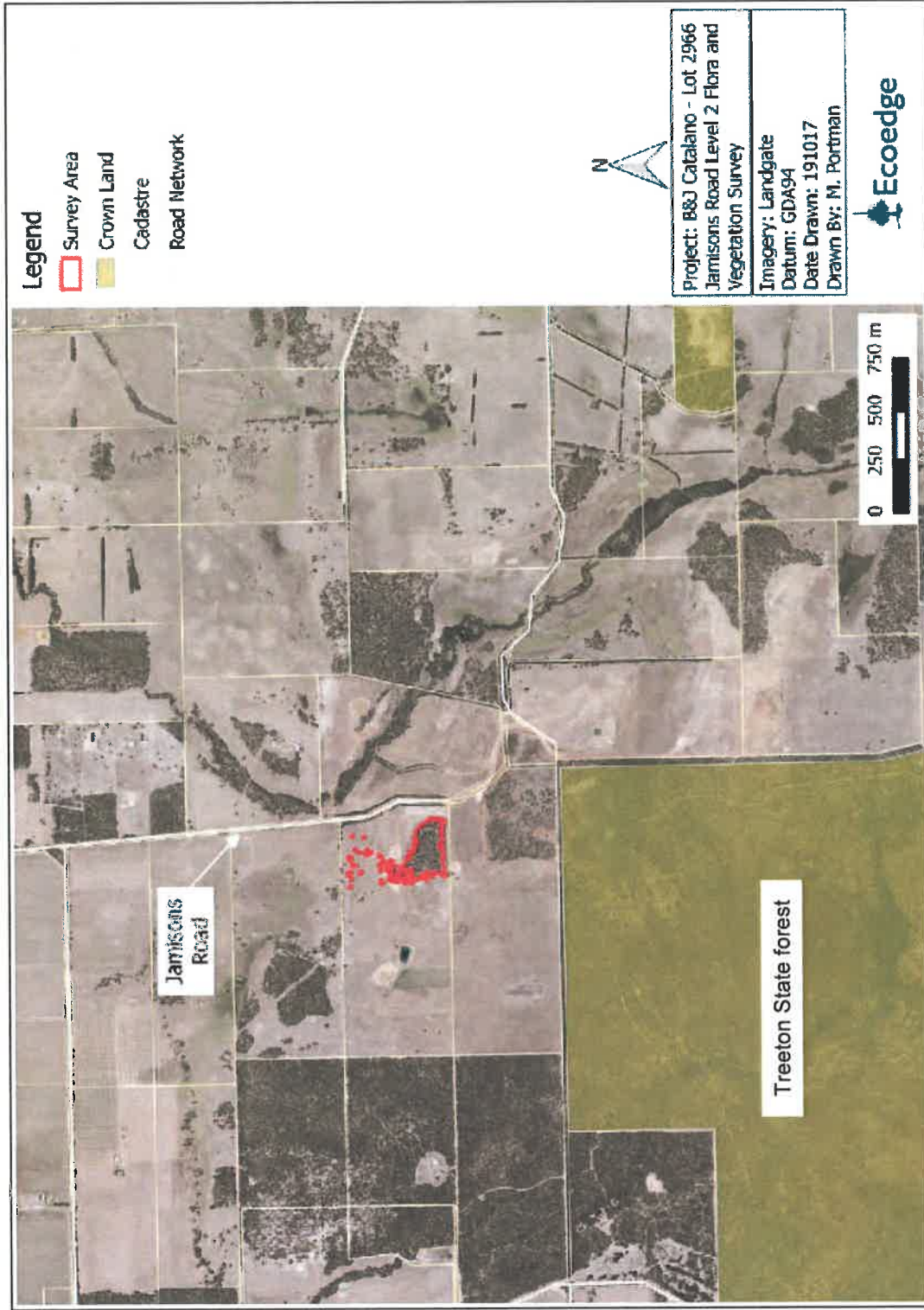


Figure 2. The Survey Area in relation to surrounding land uses and the Treeton State forest.

1.1 Project Scope

The scope of the survey was to conduct a quadrat-based (previously referred to as Level 2) Flora and Vegetation Survey of approximately 4.9 ha of remnant vegetation on Lot 2626, Jamisons Road, Boallia, as follows:

- Provide a review of, and search for, native plant species considered to be rare or potentially endangered and other species of interest, including those of limited distribution or outliers from their known range;
- Provide an inventory of the plant species present in the survey area;
- Describe and map vegetation units;
- Assess vegetation condition using the scale specified in EPA (2016); and
- Describe and map Threatened and Priority Ecological Communities.

The survey report was required to detail the scope, methodology and outcomes of the flora survey and provide the following:

1. Details of the project's purpose, background and location;
2. Description of the methodology used to assess biological factors in the desktop and field survey;
3. Presentation and discussion of the results of the survey and any resulting conclusions and/or recommendations;

Mapping of field survey data was required to consist of:

- Location and extent of vegetation units including Threatened Ecological Communities;
- Vegetation condition; and
- Location of any Threatened and/or Priority flora found during the survey.

1.2 Biogeographic Region and Location

The Survey Area is situated within the Perth (SWA02) subregion of the Swan Coastal Plain bioregion as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Commonwealth of Australia, 2016).

The Survey Area is located approximately 16 km south southwest of Busselton townsite, on Jamisons Road in the City of Busselton. The Survey Area is surrounded by cleared farmland; the nearest remnant native vegetation is approximately 180-400 metres away, and State Forest 32 (Treeton Block) is located 800 metres to the south (**Figure 2**).

1.3 Geology and Geomorphology

The Survey Area is situated on the Whicher Scarp, a sickle shape band of low hills thought to have formed as a result of marine erosion of the Perth Sedimentary Basin around two

million years ago in the Pleistocene or late Tertiary period. Following ancient shorelines at the foot of the Whicher Scarp is the Yoganup Formation, a gently sloping shelf which contains localised concentrations of heavy minerals (Churchward and McArthur, 1980). The nature of its geology, landform and soils gives the Whicher Scarp affinities with the Swan Coastal Plain. The Survey Area is located on the 'Central Whicher Scarp', which is described by Keighery *et al.* (2008) as having moderate north facing slopes with areas of laterite capped rises and soils ranging from deep sands to sand, gravel, silt, clay and ironstone

The Survey Area is situated on the Yelverton subsystem of the Whicher Scarp soil landscape system, on the Yelverton Flats soil mapping unit (214WsYL1) (**Figure 3**). The Yelverton Flats soils are described as 'Raised flats. Duplex sandy gravels, semi-wet soils, yellow deep sands and sandy earths and loamy gravels' (Tille and Lantzke, 1990).

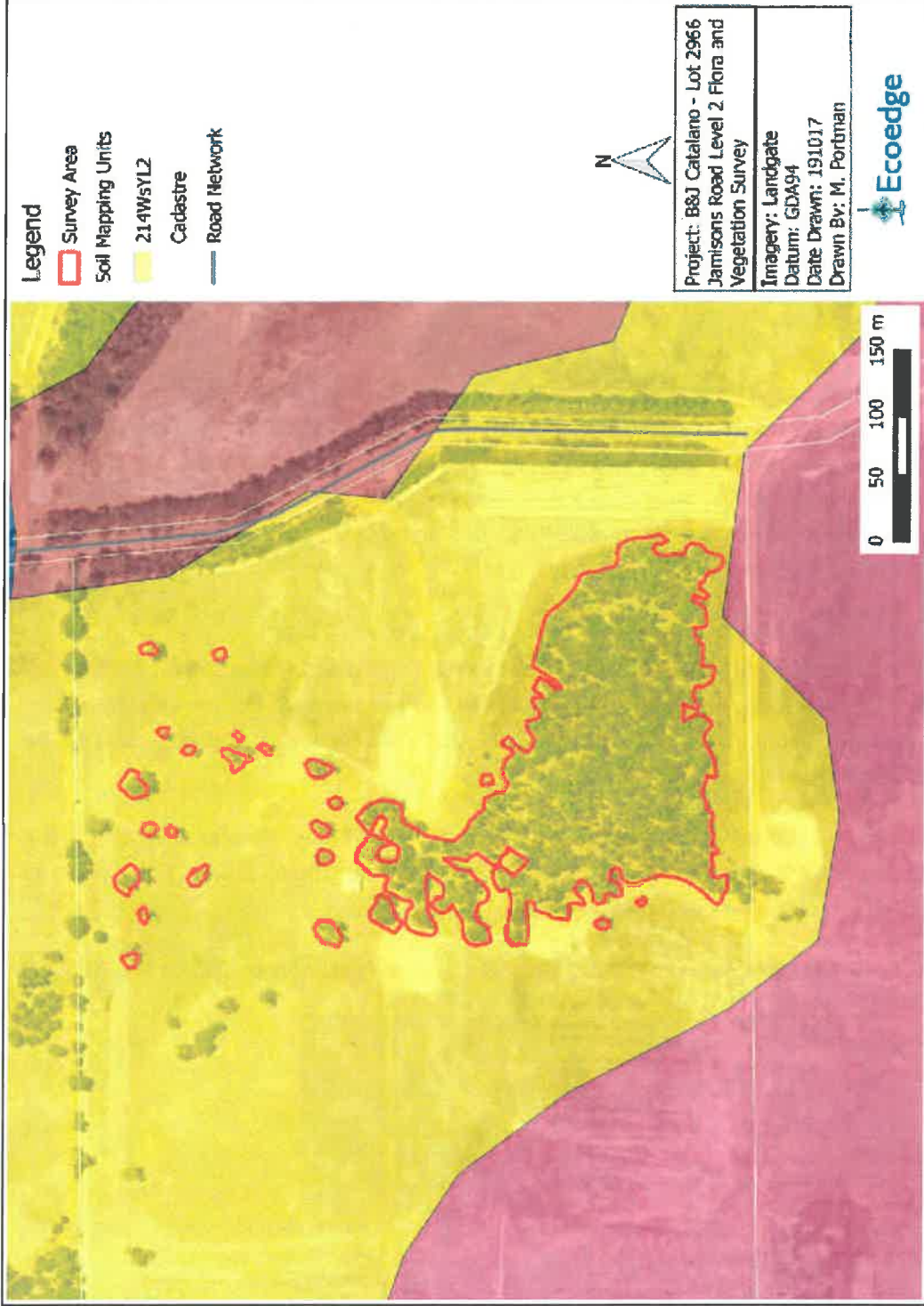


Figure 3. The Survey Area is situated on soils of the Yelverton Flats soil mapping unit (Tille and Lantzke, 1990).

1.4 Vegetation Description according to pre-European Mapping Datasets

Variation in vegetation mainly reflects the variations in soil and moisture condition of a landscape.

1.4.1 Vegetation Complexes

In 2016, the Department of Parks and Wildlife (DPaW) revised the mapping datasets for the Darling Scarp and Plateau Regional Forest Agreement (RFA) mapping of Matiske and Havel (1998) and the Swan Coastal Plain mapping of Heddle *et al.* (1980). The purpose of the revision was to fill data gaps and improve alignment and correlation between the two datasets (Webb, *et al.* 2016).

According to the 1:50,000 Mapping of Vegetation Complexes in the South West Forest Region of Western Australia (Matiske & Havel 1998) as updated by Webb *et al.* (2016), all of the Survey Area was mapped as the Yelverton (Y) vegetation complex (**Figure 4**), which is described as ‘Woodland of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla*-*Allocasuarina fraseriana*-*Agonis flexuosa* and open woodland of *Corymbia calophylla* on low undulating uplands in the humid zone.’

1.4.2 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).

Table 1 lists the percentage remaining of the Yelverton (Y) vegetation complex according to the Statewide Vegetation Statistics (Government of Western Australia, 2017). The Yelverton complex meets the 30% National retention target.

Table 1. Vegetation Complexes mapped within the Survey Area with regard to the National retention target (Government of Western Australia, 2017).

Vegetation Complex	% Remaining of pre-European	Is the 30% Target Met?	Current percentage remaining within all DPaW managed land* (%)
Yelverton (Y)	35.79%	Yes	18.83%

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the *Conservation and Land Management Act 1984*.

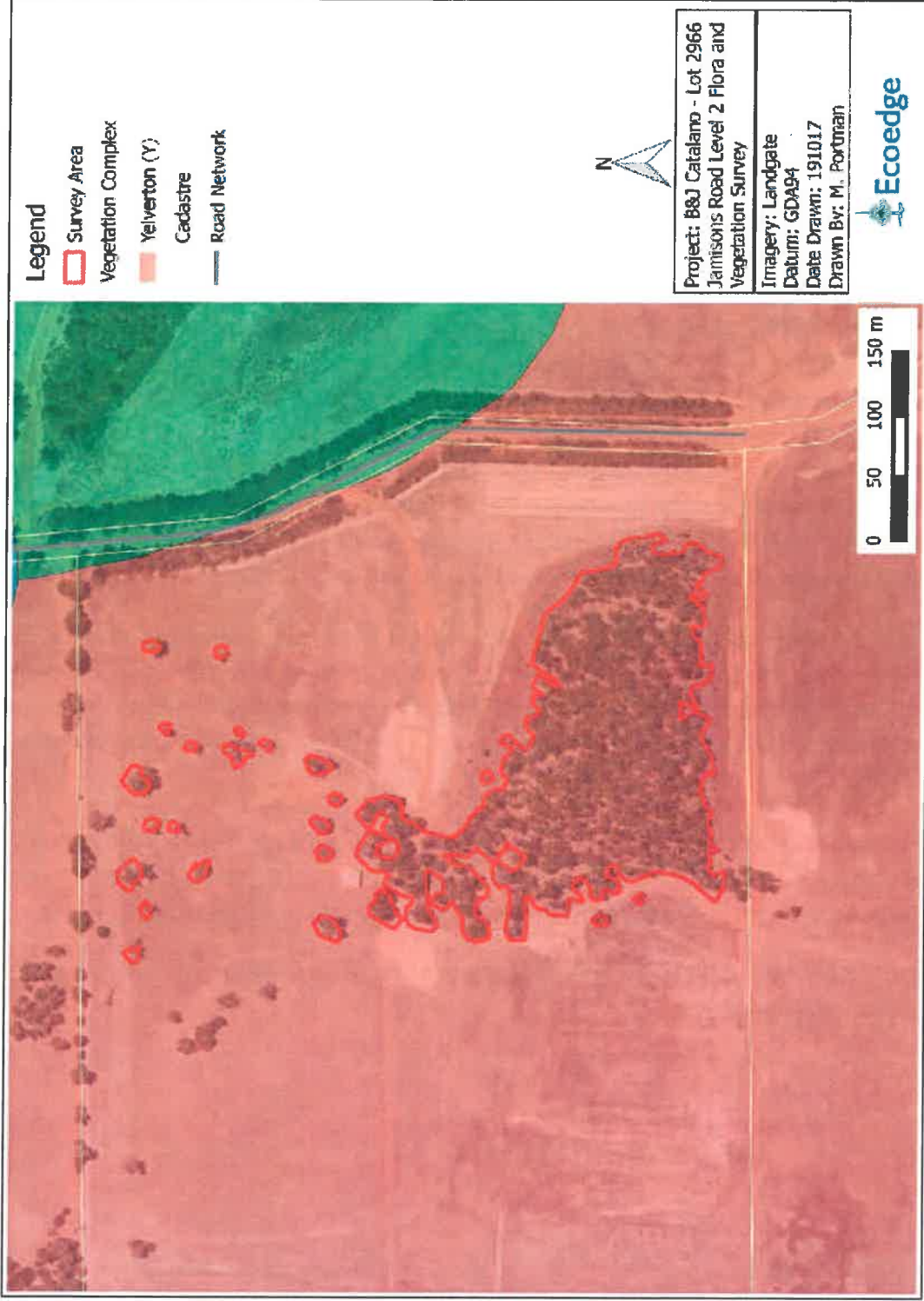


Figure 4. The Survey Area vegetation is mapped as the Yelverton complex (Webb *et al.*, 2016).

1.5 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).

Through a non-statutory process, the Minister for Environment may list communities that are considered to be at threat as either Threatened or Priority Ecological Communities. A Threatened Ecological Community (TEC) is one which is found to fit into one of the following categories; Presumed Totally Destroyed (PD), Critically Endangered (CE), Endangered (E) or Vulnerable (V) (DEC, 2013). Possible threatened ecological communities that do not meet survey criteria are added to DBCA's Priority Ecological Community Lists under Priorities 1, 2 and 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 DPaW (2016a) and DBCA (2017a).

Threatened Ecological Communities can also be listed under the Commonwealth EPBC Act (Department of the Environment and Energy (DotEE), 2017a; Department of Environment, Water, Heritage and the Arts (DEWHA), 1999). There are three categories of TEC under the *EPBC Act*: Critically Endangered (CE), Endangered (E) and Vulnerable (V). These are defined in **Appendix 1**.

A Protected Matters Search Tool query for communities listed under the EPBC Act occurring within a 10 km radius of the Survey Area was undertaken (DotEE, 2017b, **Appendix 2**), and the current TEC and PEC listings were consulted (DPaW (2016a) and DBCA (2017a)).

Threatened and Priority Ecological Communities known to occur within 10 km of the Survey Area are listed in **Table 2**.

Table 2. Threatened Ecological Communities occurring within 10 km of the Survey Area (DPaW, 2016a; DBCA, 2017a; DotEE, 2017b).

Community Name	Community Description	Status (WA)	Status (EPBC Act)
<i>Banksia</i> woodlands of the Swan Coastal Plain	<i>Banksia attenuata</i> woodland over species rich dense shrublands (a component of the <i>Banksia</i> woodlands of the Swan Coastal Plain EPBC listed TEC) Swan Coastal Plain. <i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain (a component of the <i>Banksia</i> woodlands of the Swan Coastal Plain EPBC listed TEC) Swan Coastal Plain. 'Banksia Woodlands of the Swan Coastal Plain' – a federally listed TEC consisting of numerous State-listed threatened and priority communities and non-listed communities	Various	EN
Shrublands on southern Swan Coastal Plain ironstones	Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)	CR	EN
SWAFCT1b	<i>Corymbia calophylla</i> woodlands on heavy soils of the southern Swan Coastal Plain	VN	

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

1.6 Threatened and Priority Flora

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

Threatened flora species are gazetted under Subsection 2 of Section 23F of the *Wildlife Conservation Act 1950* (WC Act) and therefore it is an offence to “take” or damage rare flora without Ministerial approval. Section 6 of the WC Act defines “to take” as “... to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means.”

Priority Flora are under consideration for future declaration as “rare 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

require monitoring every 5-10 years. Under the WC Act, Threatened Flora are ranked according to their level of threat using IUCN Red List categories and criteria of Extinct (EX), Critically Endangered (CE), Endangered (EN) or Vulnerable (VU). Definitions of categories of Threatened and Priority Flora as defined by the WC Act are included in **Appendix 3** (DBCA, 2017b).

Under the EPBC Act, a species may be listed in one of six categories; the definitions of these categories are summarised in **Appendix 4** (DotEE, 2017c).

A list of Threatened or Priority flora occurring within 10 km of the Survey Areas generated from results of the DBCA data search (DBCA, 2017c) and NatureMap search (DBCA, 2017d, **Appendix 2**) is presented in **Table 3** and the locations of these species is shown in **Figure 5**. Taxa listed under the EPBC Act are noted.

Very few of the species listed in **Table 3** could potentially occur within the Survey Area, based on an assessment of their preferred habitats. Most species listed would have either been flowering at the time of survey or could be identified in the field without flowers.

Table 3. Threatened and Priority listed Flora within 10 km of the Survey Area (DBCA, 2017c, 2017d; DotEE, 2017b).

Species	Cons Status*	Flowering	Description and Habitat	Likelihood of Occurrence
<i>Brachycias verecundus</i>	T(CE)		Annual (or ephemeral), herb, 0.012-0.022 m high, entirely glabrous. Fl. white/cream. In a moss sward. On a granite outcrop.	None
<i>Reedia spathacea</i>	T(CE)	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.	None
<i>Banksia nivea</i> subsp. <i>uliginosa</i>	T(EN)	Aug-Sep	Dense, erect, non-lignotuberous shrub, 0.2-1.5 m high. Fl. yellow, brown. Sandy clay, gravel.	None
<i>Caladenia excelsa</i>	T(EN)	Sep-Oct	Tuberous, perennial, herb, 0.45-0.9 m high. Fl. green, white, red. White, grey or brown sand, sandy loam.	Low
<i>Caladenia hoffmanii</i>	T(EN)	Aug - Oct	Tuberous, perennial, herb, 0.13-0.3 m high. Fl. green & yellow & red. Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	None
<i>Caladenia huegelii</i>	T(EN)	Sep-Oct	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green, cream, red. Grey or brown sand, clay loam.	Low
<i>Caladenia winfieldii</i>	T(EN)	Oct - Nov	Tuberous, perennial, herb, 0.3-0.6 m high. Fl. pink. Grey-black sand, sandy loam. Winter-wet depressions, swamps.	None
<i>Darwinia whicherensis</i>	T(EN)	Oct - Nov	Erect low shrub to 30 cm, flowers green, outer red. Winter-wet area of shrubland over shallow red clay over ironstone	Low
<i>Gastrolobium papilio</i>	T(EN)	Oct - Dec	Tangled, clumped shrub, to 1.5 m high. Fl. cream-red. Sandy clay over ironstone and laterite. Flat plains.	Low
<i>Lambertia echinata</i> subsp. <i>occidentalis</i>	T(EN)	Feb/May-Jun/Oct	Prickly, much-branched, non-lignotuberous shrub, to 3 m high. Fl. yellow. White sandy soils over laterite, orange/brown-red clay over ironstone.	Low
<i>Petrophile latericola</i>	T(EN)	Nov	Multi-stemmed shrub, 0.4-1.5 m high. Fl. yellow. Red lateritic clay. Winter-wet flats.	Low
<i>Sphenotoma drummondii</i>	T(EN)	Sep - Dec	Tufted shrub, 0.15-0.5 m high. Fl. white. Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	Low
<i>Verticordia densiflora</i> var. <i>pedunculata</i>	T(EN)	Dec-Jan	Erect to spreading shrub, 0.3-0.6 m high. Fl. pink/pink-white. Grey/yellow sand, sandy loam. Winter-wet low-lying areas.	None

Species	Cons Status*	Flowering	Description and Habitat	Likelihood of Occurrence
<i>Verticordia plumosa</i> var. <i>ananeotes</i>	T(EN)	Nov-Dec	Erect, sparsely branched shrub, 0.3-0.5 m high. Fl. pink-purple/white. Sandy loam. Seasonally inundated plains.	Low
<i>Verticordia plumosa</i> var. <i>vassensis</i>	T(EN)	Sep-Feb	Shrub, 0.3-1 m high. Fl. pink. White/grey sand. Winter-wet flats.	None
<i>Banksia squarrosa</i> subsp. <i>argillacea</i>	T(VU)	Jun-Nov	Erect, open, non-lignotuberous shrub, 1.2-4 m high. Fl. yellow, Jun-Nov. White/grey sand, gravelly clay or loam. Winter-wet flats, clay flats.	None
<i>Chamelaucium</i> sp. S Coastal Plain (R.D. Royce 4872)	T(VU)	Oct-Dec	Winter-wet areas, loams and ironstone.	Low
<i>Daviesia elongata</i> subsp. <i>elongata</i>	T(VU)	Dec-Feb	Spreading shrub, 0.4-1 m high. Fl. yellow, orange, red. Sandy soils.	Low
<i>Diuris micrantha</i>	T(VU)	Sep-Oct	Tuberous, perennial, herb, 0.3-0.6 m high. Fl. yellow, brown. Brown loamy clay. Winter-wet swamps, in shallow water.	Low
<i>Drakaea micrantha</i>	T(VU)	Sep-Oct	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red, yellow. White-grey sand.	Low
<i>Gastrolobium modestum</i>	T(VU)	Sep-Nov	Prostrate to clumped shrub, to 0.5 m high. Fl. cream-green-pink. Shallow red clay-loam or grey sand, ironstone. Gullies and edges of flats.	Low
<i>Eucalyptus x phylacis</i>	T	May	Mallee or tree, to 5 m high, bark rough & flaky on trunk. Fl. cream. Laterite, loam over granite. Coastal areas.	None
<i>Grevillea brachystylis</i> subsp. <i>grandis</i>	T	Aug - Sep	Shrubs, 0.3-1 m high. Fl red, very irregular. Amongst medium trees, or tall (sclerophyll) shrubland; in sand, or loam.	Low
<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)	T	Oct	Dense, clumped shrub, to 0.3 m high, to 0.4 m wide. Fl. Yellow. Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	None
<i>Tetraria australiensis</i>	T	Nov - Dec	Rhizomatous, tufted perennial, grass-like or herb (sedge), to 1 m high. Fl. brown.	Low
<i>Andersonia ferricola</i>	P1	Oct	Shrub, 0.2-0.5 m high. Fl. purple. White sand or red-brown loam over ironstone. Seasonally wet flats.	Low
<i>Loxocarya striata</i> subsp. <i>implexa</i>	P1	Jul-Dec	Winter-wet flats. Tall rush to 1.2 m tall.	Low

Species	Cons Status*	Flowering	Description and Habitat	Likelihood of Occurrence
<i>Platychorda rivalis</i>	P1		Densely clumped herb, to 0.2 m wide. Peat, laterite. Edges of swamps, valleys.	None
<i>Schoenus</i> sp. Jindong (R.D. Royce 2485)	P1		Grass-like or herb (sedge). Red loamy soils. Stream banks.	Low
<i>Stylidium ferricola</i>	P1		Caespitose perennial, herb, 0.09-0.15 m high. Shallow red-brown clay loam over ironstone. Seasonally wet poorly-drained slopes.	Low
<i>Andersonia longifolia</i>	P2	Mar - May	Sprawling to upright shrub, 0.1-0.6 m high. Fl. cream-white. Sandy loam over sandstone, laterite gravel. Breakaways, ridges.	Low
<i>Drosera binata</i>	P2	Aug-Oct	Fibrous-rooted herb, to 0.15 m high. Fl. white. Black peat. Winter-wet swamps.	None
<i>Leptomeria furtiva</i>	P2	Aug-Oct	Lax, sprawling shrub, 0.2-0.45 m high. Fl. orange, brown. Grey or black peaty sand. Winter-wet flats.	None
<i>Leucopogon incisus</i>	P2	Sep - Oct		Low
<i>Leucopogon</i> sp. Busselton (D. Cooper 243)	P2	Aug-Sep	Slender, erect shrub to 70 cm; flowers white. Pericalymma ellipticum wet shrubland, Marri-Jarrah woodland.	Low
<i>Synaphea petiolaris</i> subsp. <i>simplex</i>	P2	Sep-Oct	Tufted shrub, 0.1-0.6 m high. Fl. yellow. Sandy soils. Flats, winter-wet areas.	Low
<i>Boronia anceps</i>	P3	Sep - Dec or Jan	Perennial, herb, 0.3-0.6 m high, lacking lignotuber, stem flattened and ancipitous when young. Fl. pink/pink-purple. White sand, gravelly laterite. Seasonally swampy heaths.	Low
<i>Boronia capitata</i> subsp. <i>gracilis</i>	P3	Jun-Nov	Slender shrub, 0.3-0.6(-3) m high, branches pilose. Fl. pink. White/grey or black sand. Winter-wet swamps,	Low
<i>Boronia tetragona</i>	P3	Oct-Dec	Perennial, herb, 0.3-0.7 m high, leaves sessile, entire, with papillate margins, branches quadrangular, sepals ciliate. Fl. pink, red. Black/white sand, laterite, brown sandy loam. Winter-wet flats, swamps, open woodland.	Low
<i>Carex tereticaulis</i>	P3	Sep-Oct	Monoecious, rhizomatous, tufted perennial, grass-like or herb (sedge), 0.7 m high. Fl. brown. Black peaty sand.	None
<i>Caustis</i> sp. Boyanup (G.S.)	P3	Dec-Jan	Rhizomatous, clumped perennial, grass-like or herb (sedge), 0.7-	Low

Species	Cons Status*	Flowering	Description and Habitat	Likelihood of Occurrence
<i>McCutcheon 1706)</i>			1 m high. White or grey sand.	
<i>Dampiera heteroptera</i>	P3	Sep-Oct	Erect to semi-prostrate perennial, herb or shrub, 0.3–0.6 m high. Fl. blue. Sandy soils. Swampy areas.	None
<i>Grevillea brachystylis</i> subsp. <i>brachystylis</i>	P3	Aug-Nov	Much-branched, prostrate or decumbent, non-lignotuberous shrub, 0.2-0.5 m high, to 3 m wide. Fl. red. Black sand, sandy clay. Swampy situations.	None
<i>Hakea oldfieldii</i>	P3	Aug-Oct	Open, straggling shrub, up to 2.5 m high. Fl. white, cream, yellow. Red clay or sand over laterite. Seasonally wet flats.	None
<i>Isopogon formosus</i> subsp. <i>dasylepsis</i>	P3	Jun-Dec	Low, bushy or slender, upright, non-lignotuberous shrub, 0.2–2 m high. Fl. pink, purple, red. Sand, sandy clay, gravelly sandy soils over laterite. Often swampy areas.	None
<i>Jacksonia gracillima</i>	P3	Oct-Nov	Decumbent shrub - 20 cm high and 50 cm wide. Flowers standard orange-yellow; eye yellow with red halo; wings/keel red. Seasonally damp shrublands and woodlands, on sandy loams or clay loams	Low
<i>Lasiopetalum laxiflorum</i>	P3	Sep-Oct	Jarrah forest, lateritic soils. Erect, compact, perennial shrub 50 cm high x 50 cm wide. Flowers pink, sticky. Fruit absent.	Low
<i>Leptinella drummondii</i>	P3	Nov -Dec or Jan - Feb		None
<i>Loxocarya magna</i>	P3	Sep-Nov	Small herb. Fl. yellow-cream. Clay loam, mud. Along rivers. Rhizomatous, perennial, herb (sedge-like), 0.5-1.5 m high. Sand, loam, clay, ironstone. Seasonally inundated or damp habitats.	Low
<i>Pithocarpa corymbulosa</i>	P3	Jan-Apr	Erect to scrambling perennial, herb, 0.5-1 m high. Fl. white. Gravelly or sandy loam. Amongst granite outcrops.	None
<i>Pultenaea pinifolia</i>	P3	Oct-Nov	Erect, slender shrub, 1-3 m high. Fl. yellow, orange. Loam or clay. Floodplains, swampy areas.	None
<i>Schoenus benthamii</i>	P3	Oct-Nov	Tufted perennial, grass-like or herb (sedge), 0.15-0.45 m high. Fl. brown. White, grey sand, sandy clay. Winter-wet flats, swamps.	None
<i>Adenanthos detmoldii</i>	P4	Jan or Apr	Erect, diffuse, lignotuberous shrub, 0.9-4 m high. Fl. yellow-	None

Species	Cons Status*	Flowering	Description and Habitat	Likelihood of Occurrence
<i>Calothamnus quadrifidus</i> subsp. <i>teretifolius</i> A.S.George & N.Gibson ms		or Jun or Aug - Dec	orange. Grey or black peaty sand, wet. Swamps, roadsides.	
	P4	Nov-Dec	Erect, compact, perennial shrub 1.7 m high x 1 m wide. Fl. Red. Seeds held. Fruit exposed.	Low
<i>Chamelaucium</i> sp. Yoongarillup (G.J. Keighery 3635)	P4	Jul-Oct	Non-lignotuberous shrub, to 2.5 m high. Fl. cream, yellow. Jarrah-marri forest. Loams, sandy clays. Riverbanks, lower slopes, below laterite breakaways.	Low
<i>Lambertia rariflora</i> subsp. <i>rariflora</i>	P4	Feb-May	Small tree or shrub, to 7 m high. Fl. green, yellow. Red-brown clay soils, black organic loam, laterite. Near intermittent streams.	Low
<i>Thysanotus glaucus</i>	P4	Oct-Mar	Caespitose, glaucose perennial, herb, 0.1–0.2 m high. Fl. purple. White, grey or yellow sand, sandy gravel.	Moderate

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

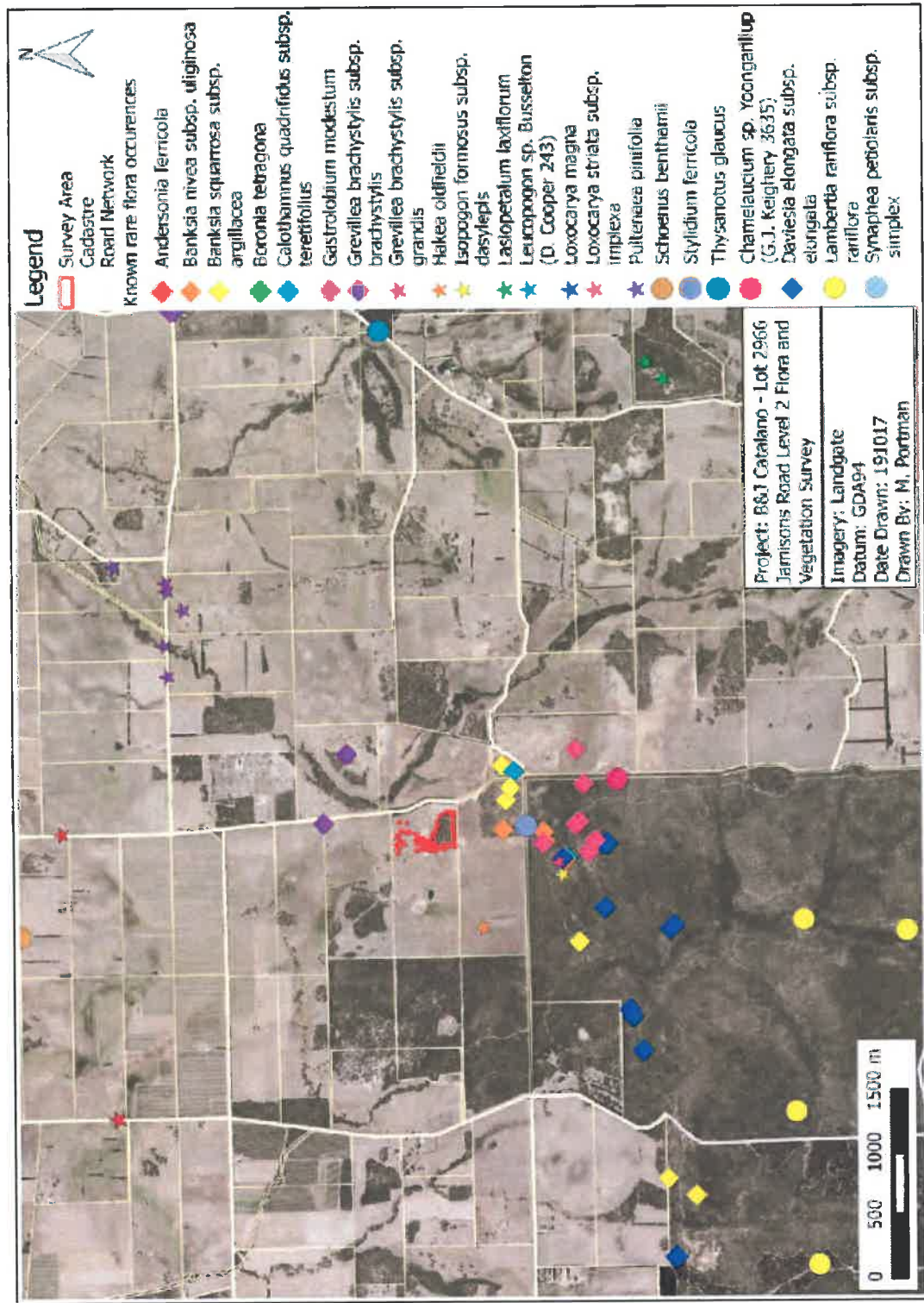


Figure 5. Known occurrences of Threatened and Priority listed flora within 10 km of the Survey Area (DBCA, 2017c).

1.7 Ecological Linkages

Information for this section is taken from Molloy *et al.* (2009) and their report on the South West Regional Ecological Linkages (SWREL) Project.

Ecological linkages are defined as:

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

Regional ecological linkages link protected patches of regional significance by retaining the best (condition) patches available as stepping stones for flora and fauna between regionally significant areas. This increases the long-term viability of all the constituent areas.

The SWREL report is the result of collaboration between the Western Australian Local Government Association’s *South West Biodiversity Project* and the then Department of Environment and Conservation’s *Swan Bioplan* to provide a tool for the identification of ecological linkages and guidance for the protection of linkages through planning policy documents.

Molloy *et al.* (2009) assessed and assigned “proximity value ratings” to all patches of remnant native vegetation as a way of indicating their distance from the nearest regional ecological linkage axis line. These values are defined in **Figure 6**. It should be noted however, that the proximity value of a patch of remnant vegetation to an ecological linkage is not intended to replace the need to consider the other biodiversity conservation values of that patch of remnant vegetation.

The Survey Area is situated between two regional ecological linkage axis lines as identified by Molloy *et al.* (2009), however does not directly form part of either linkage. Survey Area vegetation has been assigned a proximity rating of 2b, indicating its distance from the linkages.

While there is no statutory basis for regional ecological linkages identified through the SWREL project, the importance of ecological linkages has been recognised as an environmental policy consideration in EPA and Planning policy over the last decade (EPA, 2009 and references therein). In its statement regarding the SWREL Project, the EPA stated that even though Ecological Linkages are just one measure of the conservation values of a patch of remnant vegetation it expected that:

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

Figure 6. Linkage proximity rating values assigned to patches of remnant vegetation within a landscape (from Molloy et al., 2009).

1a: with an edge touching or <100m from a linkage
1b: with an edge touching or <100m from a natural area selected in 1a
1c: with an edge touching or <100m from a natural area selected in 1b
2a: with an edge touching or <500m from a linkage
2b: with an edge touching or <500m from a natural area selected in 2a
2c: with an edge touching or <500m from a natural area selected in 2b
3a: with an edge touching or <1000m from a linkage
3b: with an edge touching or <1000m from a natural area selected in 3a
3c: with an edge touching or <1000m from a natural area selected in 3b

1.8 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.

The entire Survey Area lies within an ESA associated with occurrences of Threatened ecological communities and Threatened flora within the Treeton Forest block (**Figure 8**).

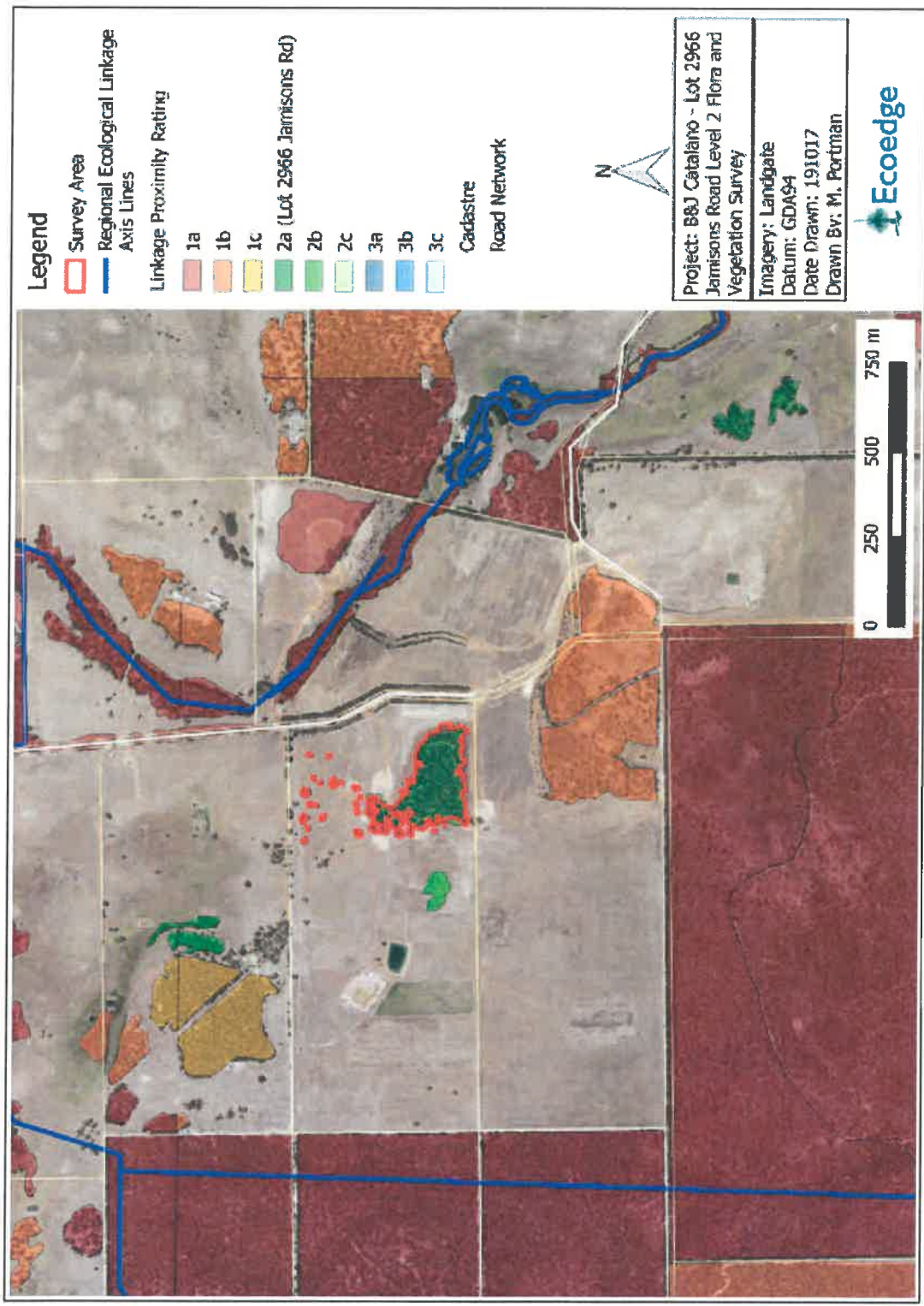


Figure 7. The Survey Area in relation to regional ecological linkages (Molloy et al., 2009).

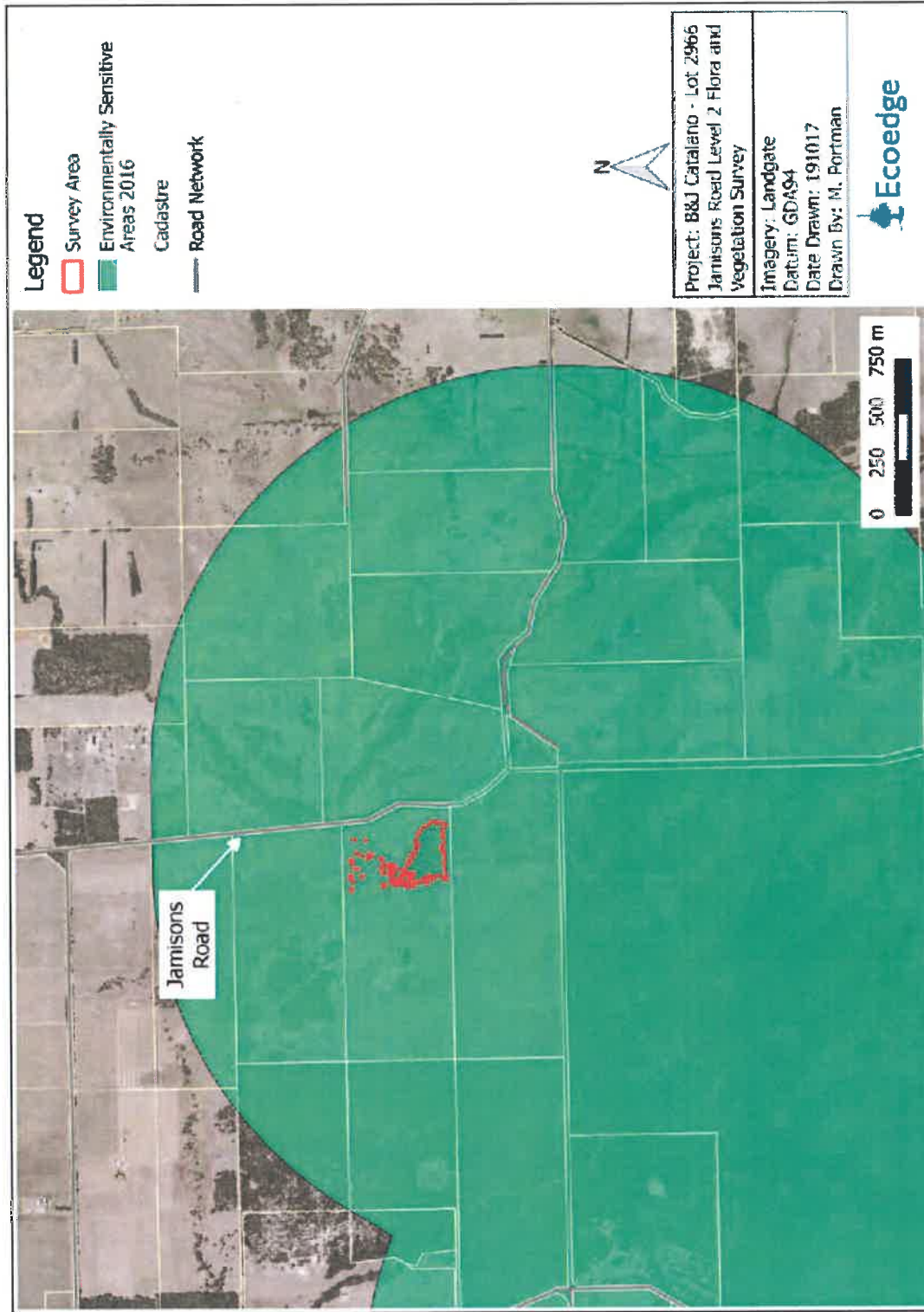


Figure 8. The Survey Area is located within a designated Environmentally Sensitive Area.

2 Methods

2.1 Desktop Assessment

Prior to the field survey, a “desktop assessment” was carried out by downloading from NatureMap (DBCA, 2017d) a list of all flora (including Threatened flora) occurring within 10 km of the Survey Area (**Appendix 2**). A download of data from the Threatened and Priority Flora (TPFL) and W.A. Herbarium databases (dated 18th September 2017) of records occurring within 10 km of the Survey Area was also provided by DBCA (DBCA, 2017c). A Protected Matters Search Tool report was generated to determine whether any Matters of National Environmental Significance were known to occur within or near to the Survey Area. This report detailed all species and threatened ecological communities listed under the EPBC Act that were known to occur or may occur within the Survey Area (DotEE, 2017b) (**Appendix 2**). This data was used to establish the list of Threatened and Priority flora 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 survey was carried out on 19th September and 11th October 2017 by Russell Smith (SL flora permit SL011843). The vegetation patches were thoroughly searched on foot and a comprehensive list of vascular flora species was compiled. Taxonomy and conservation status were checked against DBCA databases (DBCA, 2017e, 2017f).

Three 100 m² floristic quadrats were installed within the largest remnant in the Survey Area to enable a comparison with the floristic community types described by Keighery *et al.* (2008) (**Figure 9**). All species within the quadrat were recorded along with an estimate of cover. Notes on vegetation condition were taken at 18 assessment points to assist with mapping of the vegetation.

Vegetation condition was assessed against the method of the EPA (2016) (**Appendix 5**), and mapped using a combination of field observations and recent aerial photography.

2.3 Survey Limitations

Potential limitations with regard to the assessment are addressed in **Table 4**.

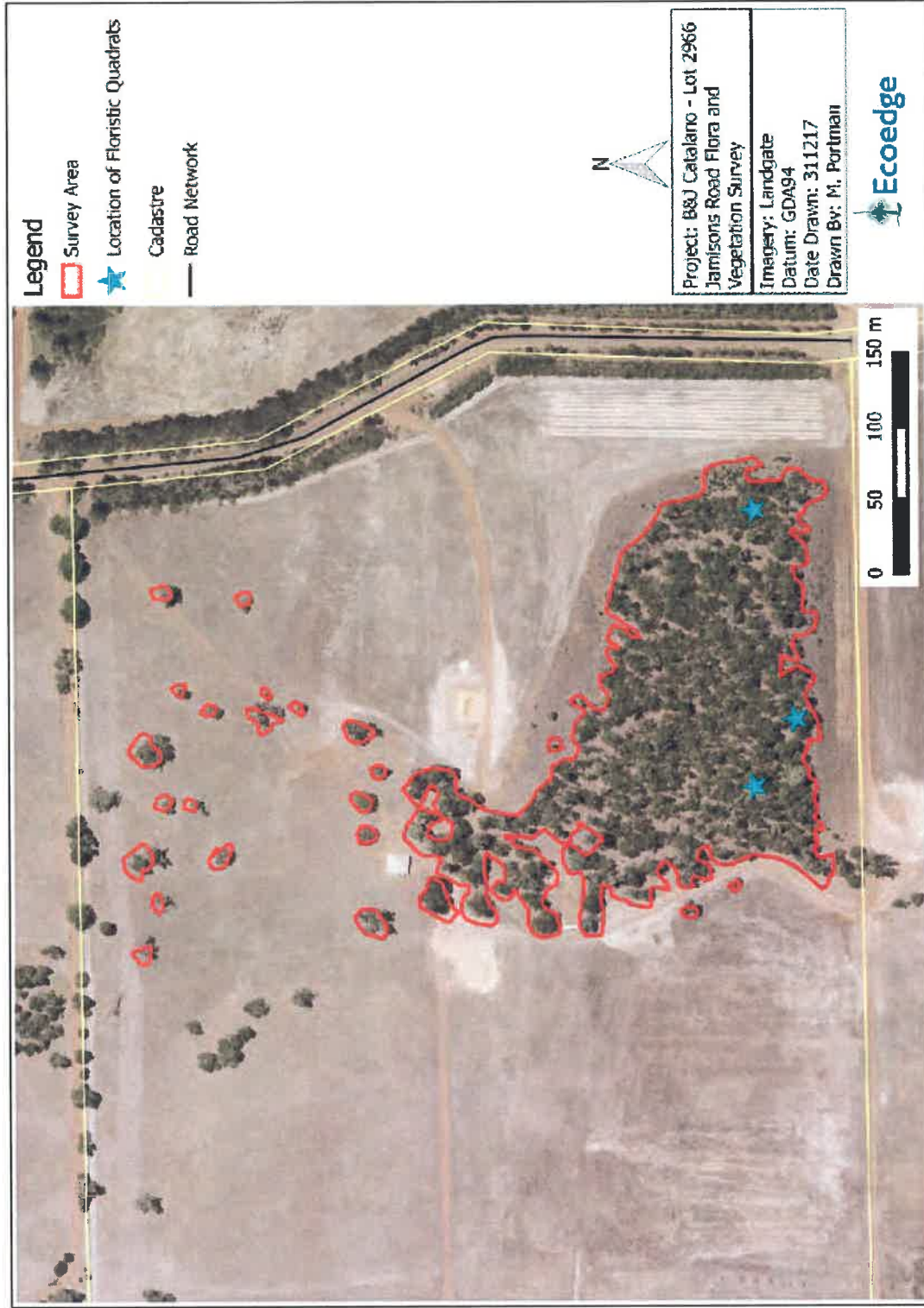


Figure 9. Location of floristic quadrats installed during the survey.

Table 4. Limitations 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	Negligible	The survey was carried out at the time of year when the highest proportion of species would be flowering.
Climatic and seasonal effects	Slight	Rainfall for the wet season in the Busselton area (1st April – 31st October) was below average. This may have resulted in a lower proportion of some annual species germinating, however rainfall over the “spring” growing season was about average.
Availability of contextual information	Negligible	Comprehensive regional surveys of remnant vegetation, as well as more localised surveys, have been carried out on the southern Swan Coastal Plain.
Completeness of the survey	Negligible	All parts of the Survey Area were accessible. Timing of the survey was optimal for flowering.
Skill and knowledge of the botanists	Negligible	The senior field botanist conducting the survey has had extensive experience in botanical surveys in south west Australia over a period of 25 years.

3 Results

3.1 Flora

Ninety-two species of vascular flora were identified within the Survey Area, of which five were naturalised (**Appendix 6**). No Threatened flora, species listed under the EPBC Act, Priority flora or other flora of conservation significance were found in the Survey Area. None of the introduced species are Declared Pest Plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) (Department of Agriculture and Food Western Australia, 2007).

Species lists and information pertaining to each of the three quadrats installed for the survey are presented in **Appendix 7**.

3.2 Vegetation Units

Only one vegetation unit was identified within the Survey Area, although it varies substantially in the number of understorey species. Most of the smaller remnants lacked native understorey species altogether, whereas within the largest remnant, the three 100 m² floristic quadrats had between 25 and 32 understorey species, most of them native. The vegetation is described below based on the National Vegetation Information System (NVIS) structural terminology (DEH, 2003), and a photograph is included in **Figure 10**.

Open forest of *Eucalyptus marginata*, *Corymbia calophylla*, (*Allocasuarina fraseriana*) (10-30 m) over *Banksia grandis* scattered trees (< 10 m) over *Acacia extensa*, *A. pulchella*, *Dillwynia laxiflora*, *Hibbertia glomerata*, *Hovea chorizemifolia*, *Lechenaultia biloba*, *Xylomelum occidentale* open shrubland (< 1 m), *Caesia micrantha*, *Chamaescilla corymbosa*, *Lagenophora huegelii*, *Millotia tenuifolia*, *Opercularia hispidula*, *Patersonia umbrosa* var. *xanthina* open forbland and *Lepidosperma pubisquameum* and *Tetraria capillaris* scattered sedges.



Figure 10. View of Quadrat 2.

3.3 Vegetation Condition

Just over half of the remnant vegetation in the Survey Area was classed as “Very Good” condition and over three quarters was Good or Very Good (Table 5) and shown in Figure 11. All the remnant vegetation has been grazed in the past, but a large part of it is relatively weed-free. The weeds present within much of the bushland are herbaceous and have not deleteriously affected the structure of the vegetation. The degree of livestock grazing appears to have declined in recent years and the understorey in the largest remnant has recovered somewhat.

All the small remnants in the northern part of the Survey Area, most of them consisting of only two or three trees are completely degraded.

Table 5. Summary of vegetation condition classes within the Survey Area.

Condition	Area (Ha)	%
Very Good	2.47	50.5
Good	1.35	27.7
Degraded	0.69	14.2
Completely Degraded	0.37	7.6
Total	4.88	100.0

4 Discussion and Conclusions

A spring survey was carried out over approximately 4.9 ha of remnant vegetation on Lot 2626, Jamisons Road, Boallia. Ninety-two species of vascular flora were identified of which five were naturalised. No Threatened flora, Priority flora, flora listed under the EBPC Act or other flora of conservation significance were found in the Survey Area and none of the introduced species are Declared Pest Plants under the BAM Act.

Only one vegetation unit was recognised within the Survey Area which is comprised of an open forest of Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) with occasional patches of Sheoak (*Allocasuarina fraseriana*) on sandy, gravel soil. The low understorey appears to be recovering from livestock grazing. The vegetation does not resemble any threatened or priority ecological community. Of the Whicher Scarp floristic vegetation types identified by Keighery *et al.* (2008) it appears to have the closest resemblance to FCT C4 – “Whicher Scarp/Blackwood Plateau Jarrah and Marri woodland”. This vegetation type is widespread and common on the Whicher Scarp and adjacent Blackwood Plateau.

Just over half the vegetation was classified as Very Good condition. All the small remnants north of the access track were Completely Degraded.

The vegetation in the Survey Area does not have any particular conservation significance, other than that it is situated on the Whicher Scarp, which has been identified as a biodiversity ‘hotspot’ (Keighery *et al.*, 2008), and that most of it is in Very Good condition.

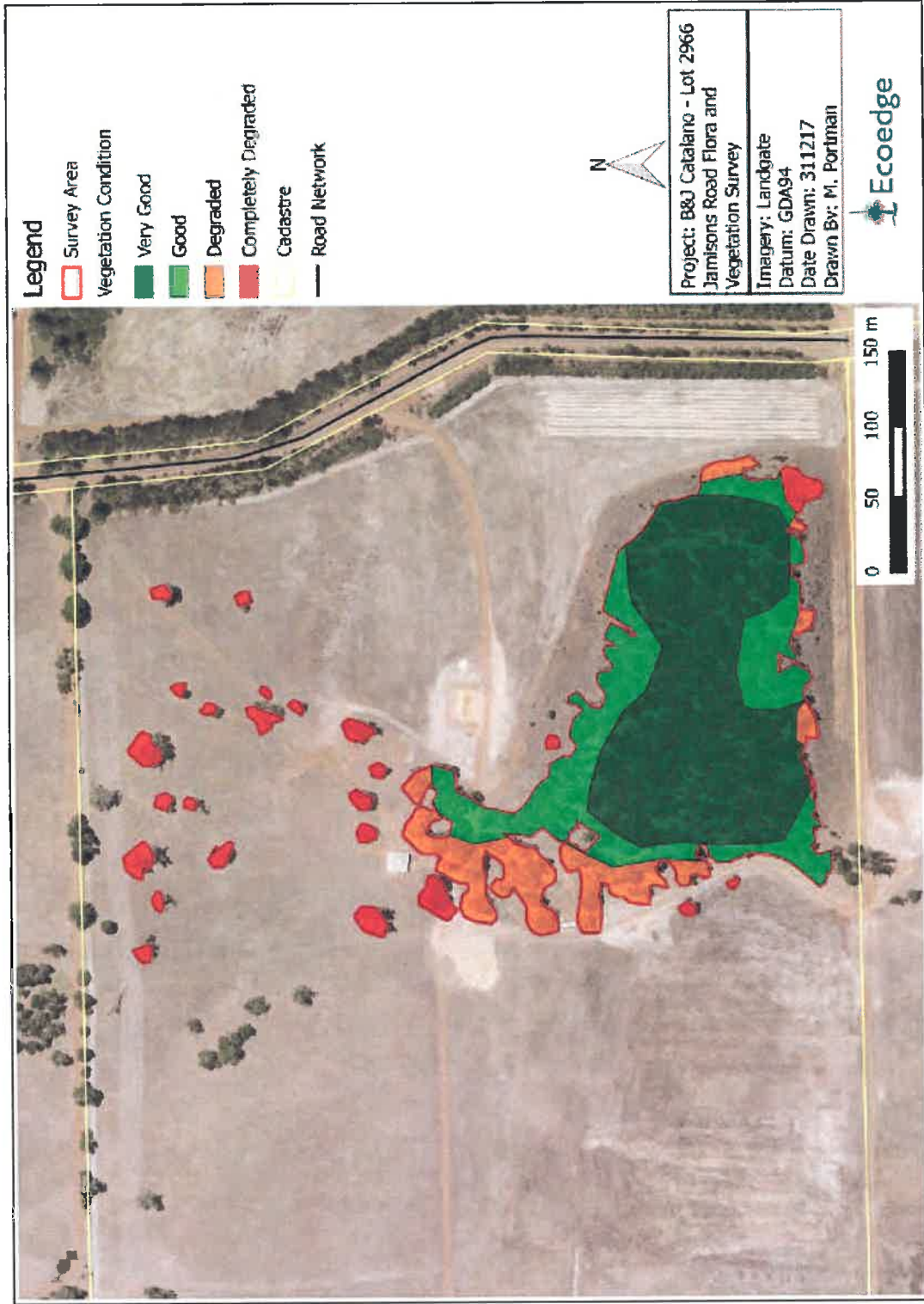


Figure 11. Condition of vegetation within the Survey Area.

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Appendix 1. Categories of Threatened Ecological Communities under the EPBC Act (DotEE, 2017a).

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 2. Protected Matters Search Tool and NatureMap Reports for the Survey Area.



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: 12/09/17 18:52:51

[Summary](#)

[Details](#)

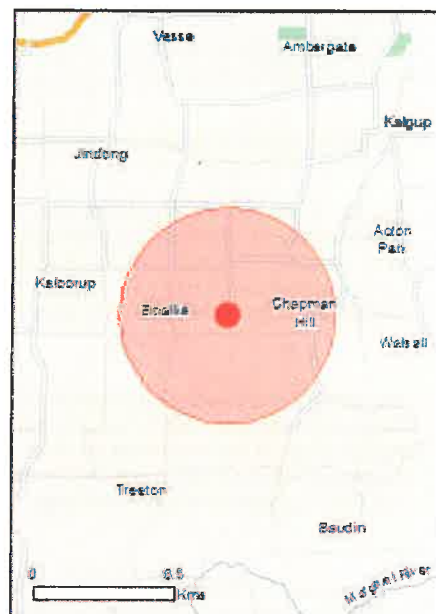
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

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Buffer: 5.0Km



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:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	34
Listed Migratory Species:	10

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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	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:	1
Regional Forest Agreements:	1
Invasive Species:	23
Nationally Important Wetlands:	None
Key Ecological Features (Marine):	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Vasse-wonnerup system	10 - 20km upstream

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
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Shrublands on southern Swan Coastal Plain ironstones	Endangered	Community likely to 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 may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may 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]	Vulnerable	Breeding likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to 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 known to occur within area
Mammals		
Dasyurus geoffroi Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<u>Pseudocheirus occidentalis</u> Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat likely to occur within area
Plants		
<u>Banksia nivea subsp. uliginosa</u> Swamp Honeypot [82766]	Endangered	Species or species habitat known to occur within area
<u>Banksia squarrosa subsp. argillacea</u> Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat known to occur within area
<u>Brachyscias verecundus</u> Ironstone Brachyscias [81321]	Critically Endangered	Species or species habitat likely to occur within area
<u>Caladenia hoffmanii</u> Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat likely to occur within area
<u>Caladenia huegelii</u> King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
<u>Caladenia winfieldii</u> Majestic Spider-orchid [64504]	Endangered	Species or species habitat may occur within area
<u>Chamelaucium sp. S coastal plain (R.D.Royce 4872)</u> Royce's Waxflower [87814]	Vulnerable	Species or species habitat likely to occur within area
<u>Darwinia whicherensis</u> Abba Bell [83193]	Endangered	Species or species habitat may occur within area
<u>Daviesia elongata subsp. elongata</u> Long-leaved Daviesia [64883]	Vulnerable	Species or species habitat known to occur within area
<u>Diuris micrantha</u> Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat may occur within area
<u>Drakaea elastica</u> Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat may occur within area
<u>Drakaea micrantha</u> Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
<u>Eucalyptus x phylacis</u> Meelup Mallee [87817]	Endangered	Species or species habitat may occur within area
<u>Gastrolobium modestum</u> Broad-leaved Gastrolobium [78361]	Vulnerable	Species or species habitat likely to occur within area
<u>Gastrolobium papilio</u> Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
<u>Grevillea brachystylis subsp. grandis</u> Large-flowered Short-styled Grevillea [85001]	Critically Endangered	Species or species habitat known to occur within area
<u>Lambertia echinata subsp. occidentalis</u> Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Petrophile latericola Laterite Petrophile [64532]	Endangered	Species or species habitat likely to occur within area
Sphenotoma drummondii Mountain Paper-heath [21160]	Endangered	Species or species habitat may occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat may occur within area
Tetraria australiensis Southern Tetraria [10137]	Vulnerable	Species or species habitat likely to occur within area
Verticordia densiflora var. pedunculata Long-stalked Featherflower [55689]	Endangered	Species or species habitat likely to occur within area
Verticordia plumosa var. ananeotes Tufted Plumed Featherflower [23871]	Endangered	Species or species habitat likely to occur within area
Verticordia plumosa var. vassensis Vasse Featherflower [55804]	Endangered	Species or species habitat likely to 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 canutus Red Knot, Knot [855]	Endangered	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
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 may occur within area

Name	Threatened	Type of Presence
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

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 canutus Red Knot, Knot [855]	Endangered	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
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
NTWA Bushland covenant (0069)	WA

Regional Forest Agreements	[Resource Information]
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Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species	[Resource Information]
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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		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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 habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

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

-33.79015 115.293

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](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [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.

Please feel free to provide feedback via the [Contact Us](#) page.