northbarker
ECOSYSTEM SERVICES

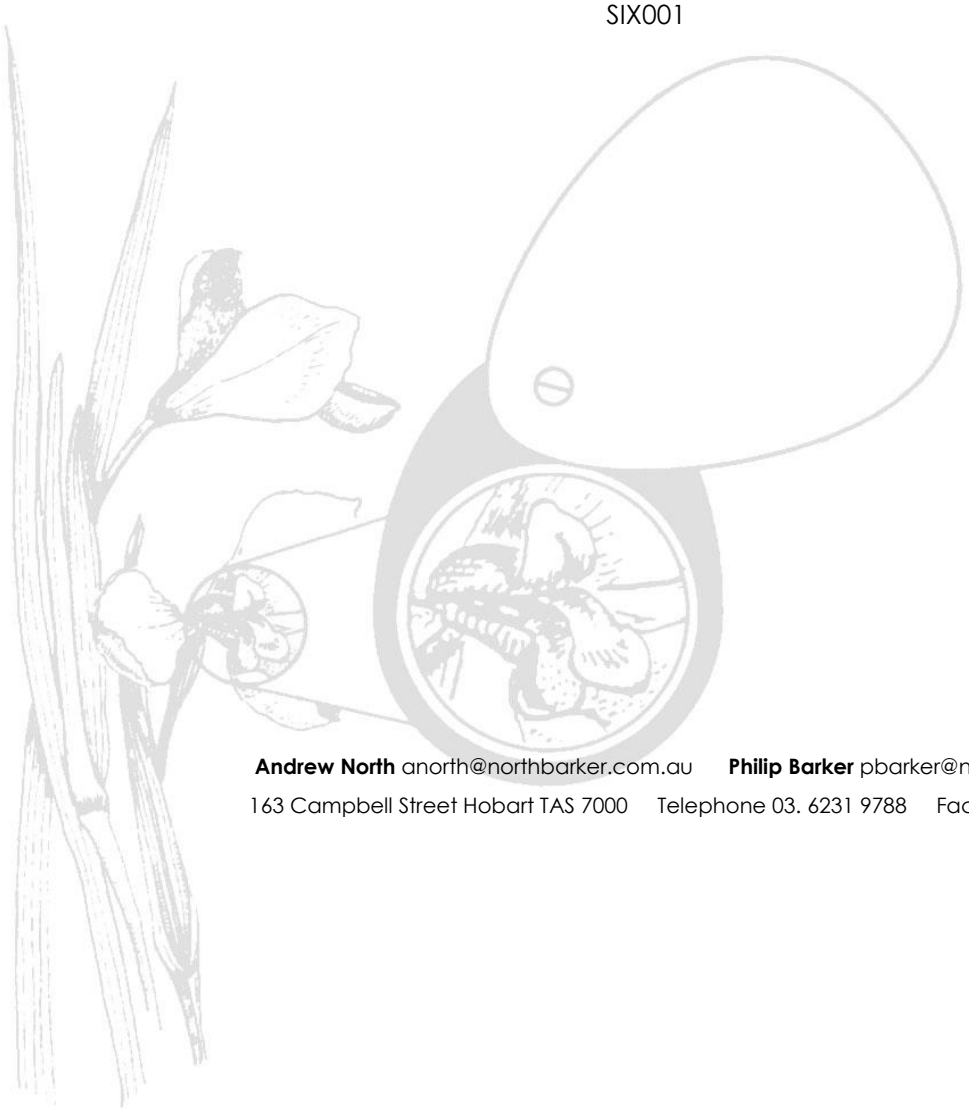
Ecclestone Road subdivision (38 Lots)

Natural Values Assessment

3 December 2020

For 6ty°

SIX001



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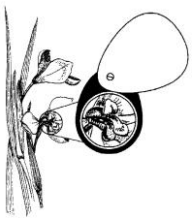
Report and mapping: Richard White and Philip Barker

File Control

Version	Date	Author / Comment
Original report for PA-2019-014 (22 lot subdivision)	06/02/2019	Richard White
Internal review of draft report for 38 lot subdivision)	03/03/2020	Philip Barker
Report for 38 lot subdivision	03/03/2020	Richard White and Philip Barker



Summary

A 38-lot subdivision is planned for Ecclestone Road in Riverside, in northern Tasmania. This will involve the clearance of ~21.3 ha of native vegetation for 37 lots and an internal access road. Lot 38 is the balance area of 15.5 ha and is not planned for development in the short to medium term. A summary of the impact to natural values and recommendations is as follows:

Vegetation communities

The planned development will remove 15.74 and 5.54 ha of DAD and NBA communities, respectively. Neither of these communities are protected under any Act. Mitigating vegetation clearance in residential developments is difficult to achieve but the impact to the communities that remain in the area can be reduced by managing the spread of weeds and pathogens; in general, it is recommended that:

- All occurrences of declared weeds are treated prior to works.
- Best practice construction hygiene[1] should be practiced to prevent the spread of weed propagules in contaminated soil.
- Follow-up weed control implemented 6-12 months after works to treat any individuals that have colonised the disturbance area.

Additionally, indirect impacts on vegetation outside the proposed impact area for the lots should be avoided by clearly defining the extent of the impact area on construction plans and the ground. All potential ancillary impact areas (e.g. parking, site office and lay down areas) should be located in the proposed impact area for the lots and not located outside the proposed impact area as defined in this report.

Threatened flora

A total of 50 plants of *Brunonia australis* (TSPA rare) were recorded in the impact area. A 'permit to take' from DPIPWE will be required to disturb these plants.

There are NVA records of *Poa mollis* in three locations in the proposal area: two areas in the proposed impact area (comprising one and an unknown number of plants), and one in the balance comprising 20 plants. Although we were unable to locate these plants and are doubtful this species still occurs in the proposal area, a 'permit to take' from DPIPWE may be required for impact to these plants.

No flora listed under the EPBCA were recorded or are expected to occur.

Threatened fauna

The proposal area contains habitat for several threatened fauna species listed under the TSPA and EPBCA: Tasmanian devil and quolls, eastern barred bandicoot, Tasmanian wedge-tailed eagle and Tasmanian masked owl.

A Tasmanian wedge-tailed eagle's nest was located on the balance lot (~170 m from the nearest residential lot boundary and 150 m from the nearest developed lot at 260 Ecclestone Road). This nest is relatively new and given the relatively exposed location of the tree, the relatively small size of the tree and supporting boughs, and the nest structure itself, it is quite possible this nest will not be used for breeding. There is no evidence that this nest was used for breeding in 2019. If the nest is shown to be used for breeding, regulatory protocols require building and vegetation clearance activities to occur outside the breeding season (July to

[1] DPIPWE 2015

January/February inclusive). This is an impractical outcome and requires resolution with DPIPWE.

Six trees were recorded in the proposal area that contain hollows that are potentially suitable for Tasmanian masked owl. Three of these trees are in the proposed impact area and should be checked for nests before any impact to these trees. The probability of occurrence is low.

The area is suitable for foraging and breeding for Tasmanian devil and quolls. The DPIPWE pre-clearance survey protocols for dens should be undertaken prior to any disturbance.

Based on the current proposal and the current knowledge of the Matters of National Environmental Significance the impact is unlikely to cause a significant impact.

Contents

1 Introduction

1.1 Background

In 2018, 6ty° Pty Ltd requested North Barker Ecosystem Services (NBES) conduct a natural values assessment for a proposed 22-lot subdivision on Ecclestone Road, Riverside (Property ID 7655464, Title Reference 43468/1). Accordingly, the area was surveyed on two occasions, including a seasonal survey for *Brunonia australis* (listed as rare under the Tasmanian Threatened Species Protection Act 1995 (TSPA)). A report on the findings that included a discussion on impacts was submitted in February 2019[2].

Representations were submitted to Council in response to the development application; these expressed a range of concerns, particularly the potential impact to natural values. NBES submitted an addendum to the natural values report to address these concerns: the addendum provided more detail on the natural values in the proposed subdivision area and the potential impact[3]. Additionally, the West Tamar Council sought external expert review of the planning documentation, specifically regarding the aforementioned NBES natural values report and addendum, and the representations[4]. Relevant outcomes have been included in this revision.

Subsequently, the design of the subdivision has changed from a 22-lot to a 38-lot subdivision, so the proponent is reapplying for an application with Council for the proposed development. Accordingly, the natural values assessment report has been updated to reflect the new design and associated impacts; it also includes any new information on natural values since the original survey and refers to the addendum on occasion. Notably, most of the supporting information in the addendum remains current and may be referred to for additional context on natural values in the proposal area.

The site is zoned as Low Density Residential and is subject to the Biodiversity Code Under the West Tamar Interim Planning Scheme 2013.

1.2 Proposal area

The total proposal area is 36.8 ha: this comprises 37 residential lots plus internal access road (21.3 ha) and the balance (lot 38, 15.5 ha). It is understood that no development is planned or the balance in the short to medium term.

The proposal area is in Riverside, Launceston in northern Tasmania (Figures 1 and 2). It is in the Tasmanian Northern Midlands bioregion[5] in the West Tamar City Council. and is approximately 36.8 ha in extent.

The mean annual rainfall for Launceston (Kings Meadows) is 693 mm (Bureau of Meteorology). The site is at ~ 170 m asl and is relatively flat with a gentle north-east aspect. There is a small creek in the south east of the proposal area. The geology is Jurassic dolerite.

[2] NBES (2019)
[3] NBES (2020a)
[4] ECOtas (2020)
[5] IBRA 7 (2012)

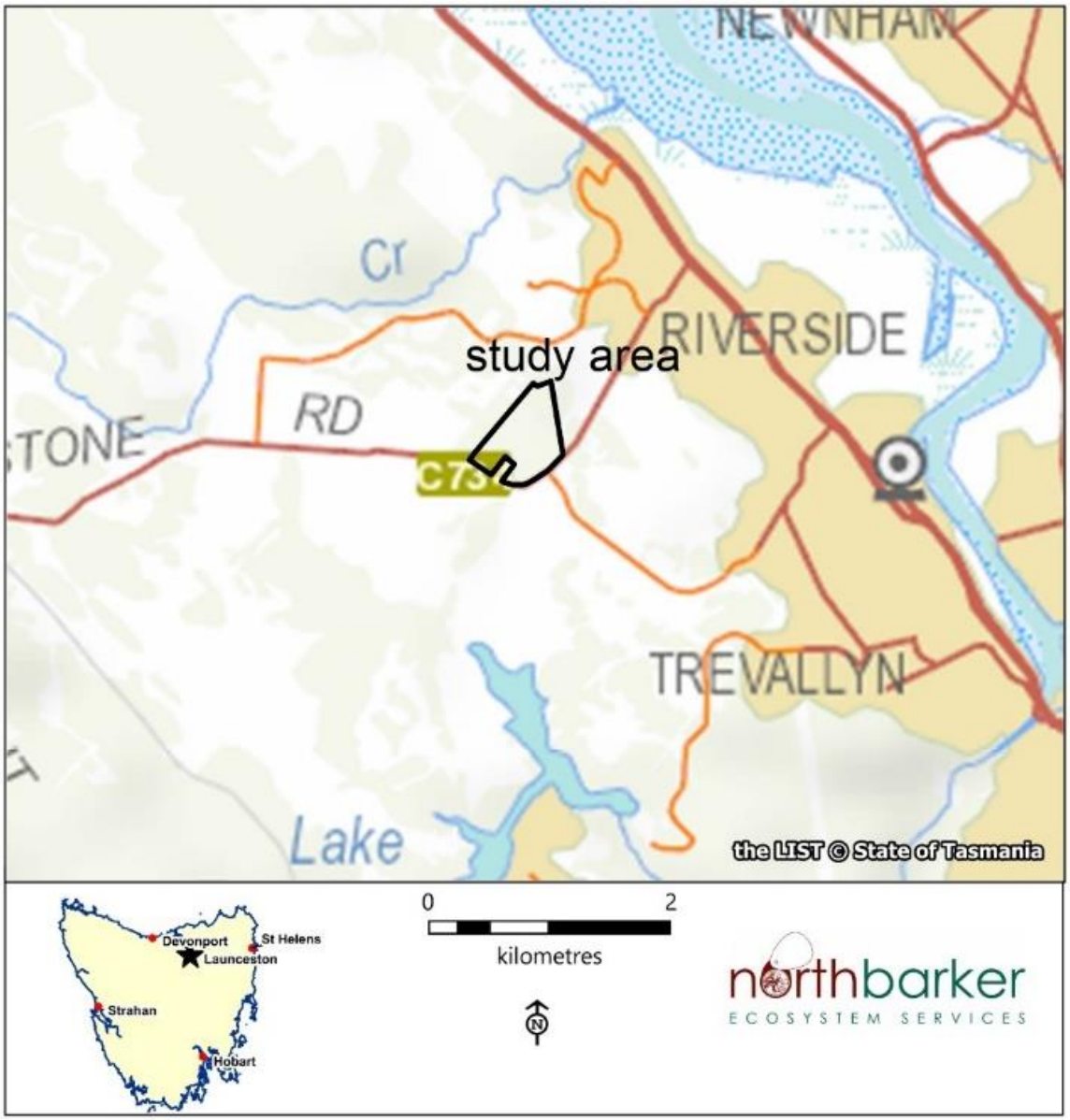


Figure 1: proposal area near Riverside in Launceston

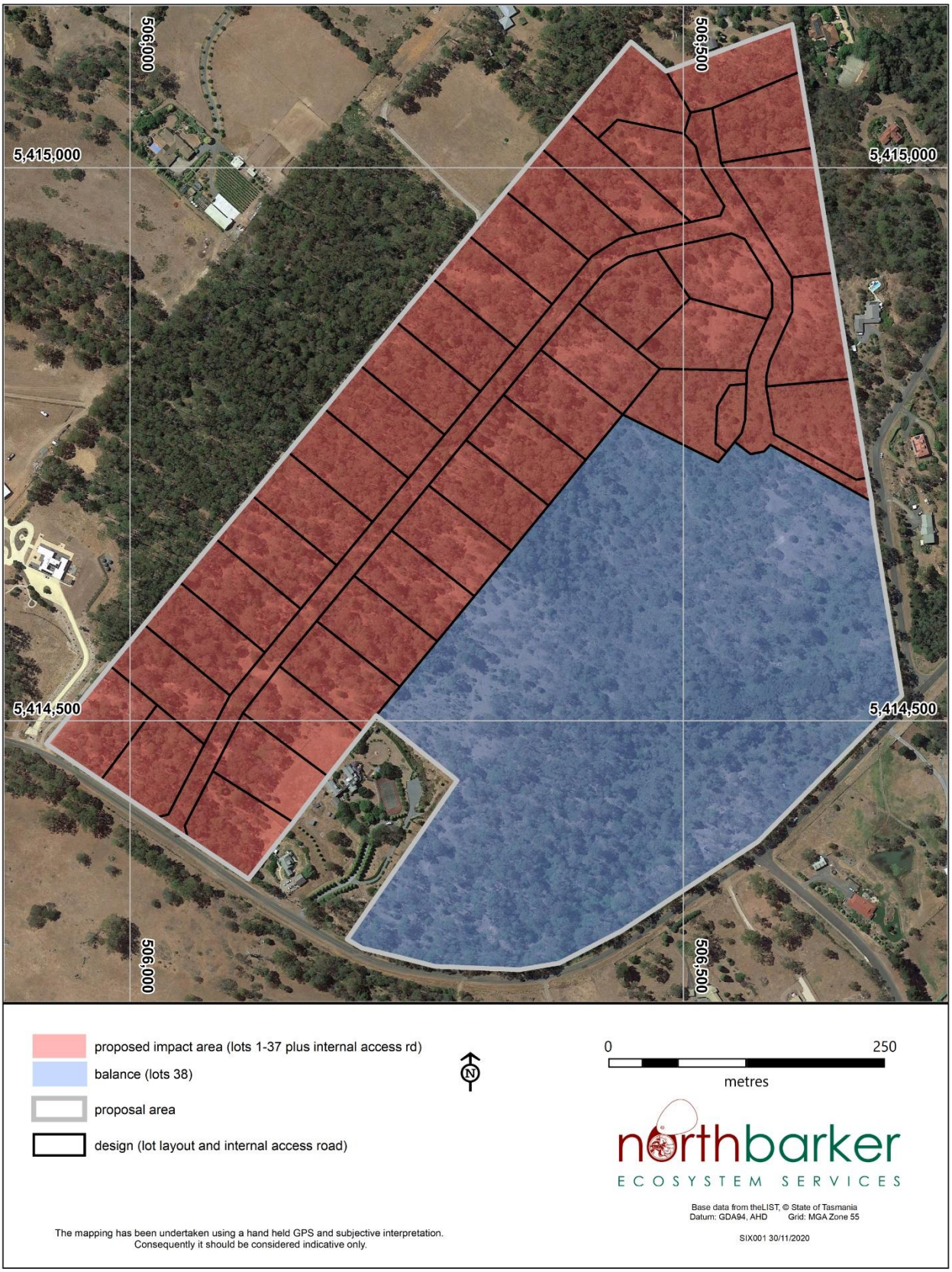


Figure 2: The Ecclestone Road proposal area showing the 38-lot design

2 Methods

This assessment was undertaken in accordance with the *Guidelines for Natural Values Surveys*[6]. The following sources were used for biological records for the region:

- TASVEG version 4.0 digital layer[7];
- Natural Values Atlas database (NVA) - all threatened species records within 5 km of the proposal area and threatened fauna considered possible to occur in suitable habitat[8];
- EPBCA Matters of National Environmental Significance database - a 5 km buffer was used to search for potential values[9];

2.1 Botanical surveys

Field work was carried out on the 26th of June 2018 and on 13th November 2018 (the latter specifically for *Brunonia australis*). Native vegetation was mapped in accordance with units defined in TASVEG 4.0[10]. Vascular plants were recorded in accordance with the current census of Tasmanian plants[11]. The site was mapped using a meandering area search technique[12]. Particular attention was given to habitats suitable for threatened species under the Tasmanian *Threatened Species Protection Act 1995* (TSPA) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA), and to 'declared' weeds under the Tasmanian *Weed Management Act 1999* (WMA)[13].

2.2 Fauna surveys

A search was made for sign (e.g. scats, tracks) and presence of potential threatened fauna concurrently with the botanical survey. A search for nests and tree hollows was done from the ground only. The survey was carried out in accordance with DPIPWE's 'Survey guidelines and management advice for development proposals that may impact on the Tasmanian devil (*Sarcophilus harrisii*)'.

Since the survey in June 2018, a Tasmanian wedge-tailed eagle's nest was discovered on the property (this species is listed as endangered under the TSPA and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBCA)*). This nest was assessed by two observers from NBES on 1 November 2019. The site was again revisited by a North Barker ecologist on the 5th of May 2020; the aim of this visit was for one of the representors (Alison Marshall) to share her knowledge of the site, particularly the location of hollow bearing trees suitable for Tasmanian masked owl (TSPA endangered and EPBCA vulnerable).

2.3 Limitations

Due to various limitations (e.g. variations in species presence and detectability), no biological survey can guarantee that all species will be recorded during a single visit. The field surveys were undertaken in winter and spring, so seasonal and ephemeral species may have been overlooked or are seasonally absent, including summer flowering species. However, we are confident the surveys sufficiently captured community level diversity. We compensate for survey limitations in part by considering all listed threatened species from data from the Tasmanian *Natural Values Atlas* (NVA)[14]. These data include records of all threatened species known to occur, or with the potential to occur, up to 5 km from the proposal area.

[6] DPIPWE 2015
[7] Kitchener and Harris 2013
[8] DPIPWE Natural Values Atlas Report, nvr_4_02-Dec-2020
[9] Commonwealth of Australia, EPBC Protected Matters Search Tool Report, 2018 (report PMST_WMVSBO)
[10] Kitchener and Harris 2013
[11] de Salas and Baker 2020
[12] Goff *et al.* 1982
[13] Tasmanian State Government 1995; Commonwealth of Australia 1999
[14] DPIPWE Natural Values Atlas Report, nvr_4_02-Dec-2020

3 Results

3.1 Vegetation communities

The following TASVEG communities were recorded in the proposal area (Figure 3):

- DAD - *Eucalyptus amygdalina* forest and woodland (23.44 ha)
- DVG - *Eucalyptus viminalis* grassy forest and woodland (0.87 ha)
- DOV - *Eucalyptus ovata* forest and woodland (1.17 ha)
- NBA - *Bursaria - Acacia* woodland and scrub (11.32 ha)

DAD, DVG and NBA are not listed under any Act. DOV is listed as threatened under the NCA. Under the EPBCA, DOV is also referred to as *Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana* where it is listed as critically endangered. Notably, the DOV in the proposal area is a *E. viminalis*-dominated facies with very sparse *E. ovata* and does not meet the key diagnostic characteristics used to identify the EPBCA-listed *E. ovata* community protected under that act[15] – see more under 3.1.3. below.

3.1.1 DAD - *Eucalyptus amygdalina* forest and woodland (23.44 ha, Plate 1)

This is the most prevalent community in the proposal area. The canopy is dominated by *Eucalyptus amygdalina* with *E. viminalis* occasional. The trees belong to several cohorts, and while occasional larger trees (> 100 cm DBH) are present, most trees are in the 40-70 cm DBH range. There has been selective clearing in this community in the past with some areas having been extensively cleared. The canopy is generally in good health. Regular understorey species include *Acacia dealbata* and *Exocarpos cupressiformis*. In large areas the ground cover is dominated by either *Pteridium esculentum* or *Gahnia radula*. Introduced species are common, the most notable of which is blackberry (*Rubus fruticosus*), which has formed infestations in places. In the south east of the proposal area some areas of this community have been used for dumping, and a few corrugated iron structures remain (Plate 2). The threatened *Brunonia australis* (TSPA rare) occurs in this community.

This community is not listed under any Act.

Plate 1: DAD in the proposal area

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Plate 2: Corrugated iron structures and rubbish in the DAD in the south west of the proposal area

3.1.2 DVG - *Eucalyptus viminalis* grassy forest and woodland (0.87 ha)

A small patch of this community occurs in the south west of the proposal area, upslope from the moist areas along the watercourse. *Eucalyptus viminalis* is the canopy dominant, with *E. amygdalina* occasional. Trees are generally in the 50-70 cm DBH range and are in good health. Regular understorey species include *Bursaria spinosa* and *Exocarpos cupressiformis*. The ground cover is dominated by grasses, particularly *Poa labillardierei*; *Lepidosperma laterale* is also common. Blackberry (*Rubus fruticosus*) has formed infestations on the fence line.

This community is not listed under any Act.

3.1.3 DOV - *Eucalyptus ovata* forest and woodland (1.17 ha)

This community occurs in the moist drainage line in the south west of the proposal area. While *E. viminalis* is the canopy dominant and *E. ovata* is very sparse, this community is mapped as DOV rather than DVG due to the sedge-dominated understorey: DVG is only described with a grassy understorey and the description of DOV allows for *E. viminalis* as the only dominant[16]. On the creek line the understorey is dominated by *Melaleuca ericifolia*, while upslope drier habitat species such as *Bursaria spinosa* and *Acacia dealbata* occur. *Gahnia radula*, and *Lepidosperma* spp. dominate the ground cover layer. Introduced species are sparse.

This is a threatened community under the NCA. This *E. viminalis*-dominated facies with very sparse *E. ovata* does not satisfy the key diagnostic characteristics used to identify the EPBCA-listed *E. ovata* community protected under that act[17].

3.1.4 NBA - *Bursaria - Acacia* woodland and scrub (11.32 ha, Plate 3)

This community occurs in drier sites, occupying much of the central part of the proposal area. The canopy consists largely of *Acacia mearnsii, and A. dealbata*. This community is generally species poor. Large areas of the ground cover are dominated by *Gahnia radula*. Rocky areas with areas of shallow soil are in poor condition and there is no potential for threatened specialist rockplate species; *Cheilanthes austrotenuifolia* was common in these areas. A range

16 Kitchener and Harris 2013
17 Commonwealth of Australia 2020

of widespread introduced species are present (e.g. *Hypochaeris radicata, Lysimachia arvensis*) but declared weeds are largely absent.

Plate 3: NBA in the proposal area

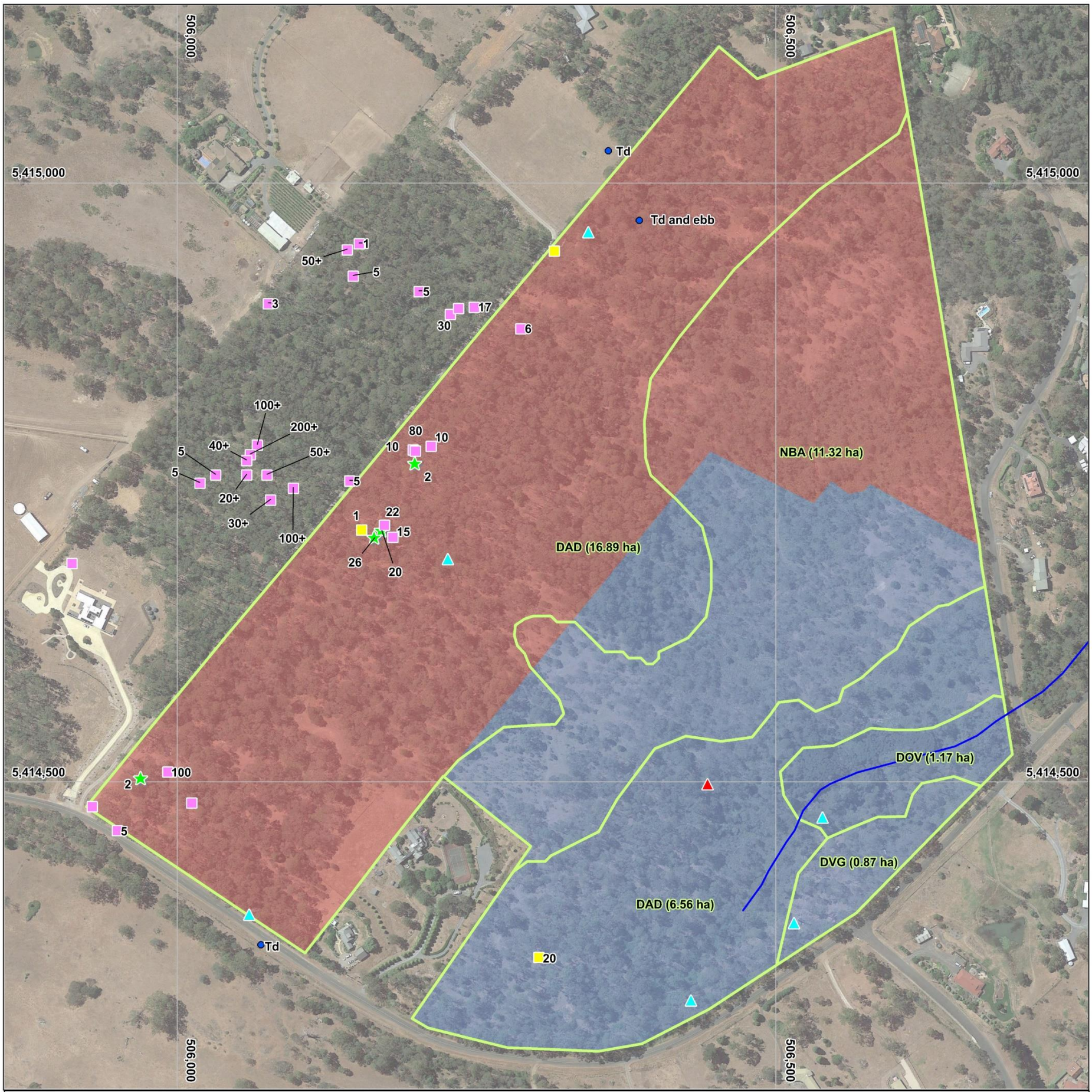

Figure 3: Threatened flora and fauna and vegetation values at proposed Ecclestone Road subdivision

3.2 Threatened flora

A total of 99 species of vascular plants were recorded in the proposal area (Appendix A). Fifty plants of the threatened *Brunonia australis* (TSPA rare) occur in four locations (Figure 3 above, Plate 4). These records are close to previous records (from 2010). A targeted search was carried out in all areas of potential habitat, including previous locations of this species in the proposal area; in three of the previous locations no plants were located, but two these locations had a location accuracy of > 100 m. Regardless, we are confident that we have assessed the likely current extent of this species in the proposal area. Notably, several hundred plants were recently (November 2020) found in the less disturbed patch immediately west of the proposal area (NVA records and pers. comm. Mark Wapstra).

Poa mollis, also TSPA rare, has also been previously recorded in two locations the proposal area (21 plants in 2010, Figure 3). This species was not located in these areas in the NBES surveys. The similar *Poa rodwayi and P. labillardierei* were recorded in these areas and may have displaced or been misidentified as this species. Given the survey effort and result, the likelihood of *Poa mollis* occurring on the site is considered low. Additional comment provided in the addendum[18] and the external expert review report[19] do not conflict with this conclusion.

No additional threatened species are known within 500 m of the proposal area. However, several species have been recorded within 5000 m, as well as a number of species that are considered to have potential habitat in the region according to the EPBCA Protected Matters Search Tool. Each of these threatened flora species are presented in Table 1 in context of the suitability of habitat within the proposal area, and the likelihood of occurrence.

Plate 4: *Brunonia australis* in the proposal area

[18] NBES (2020a)
[19] ECOtas (2020)

Table 1: Flora species of conservation significance known to occur, or which may potentially occur based on range boundaries, within a 5 km radius of the proposal areas.

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
Alternanthera denticulata lesser joyweed	Endangered/ -	LOW	*Alternanthera denticulata* displays a preference for rocky (dolerite) river margins, but has also been recorded from disturbed *Melaleuca ericifolia* swamp forest and damp riparian grasslands. Suitable habitat on site is limited and sub-optimal for this species and it is unlikely to have been overlooked.
Anogramma leptophylla annual fern	Vulnerable/ -	NONE	*Anogramma leptophylla* grows in shallow soil layers over rock, on exposed or semi-exposed outcrops in dry or damp sclerophyll forest. Plants are mostly found on rock ledges, often on, or just inside, the drip line of the overhead rock-face. The substrate is variable, including dolerite, basalt and sandstone. No suitable habitat in the proposal area.
Aphelia gracilis slender fanwort	Rare/ -	NONE	*Aphelia gracilis* inhabits damp sandy ground and wet places in the Midlands and north-east of the State. It may readily colonise sites after fire or other disturbance. No suitable habitat on site.
Aphelia pumilio dwarf fanwort	Rare/ -	VERY LOW	*Aphelia pumilio* is found growing on damp flats, often with impeded drainage. The main vegetation types are lowland grassland (*Themeda triandra)* and dry sclerophyll forest and woodland dominated by *Eucalyptus viminalis*, *E. amygdalina* or *E. ovata*. Suitable habitat on site is very limited and it is not likely this species occurs.
Barbarea australis riverbed wintercress	endangered/ -	NONE	*Barbarea australis* is a riparian species found near river margins, creek beds and along flood channels adjacent to the river. It tends to favour the slower reaches, and has not been found on steeper sections of rivers. It predominantly occurs in flood deposits of silt and gravel deposited as point bars and at the margins of base flows, or more occasionally or between large cobbles on sites frequently disturbed by fluvial processes. Some of the sites are a considerable distance from the river, in flood channels scoured by previous flood action, exposing river pebbles. Most populations are in the Central Highlands, but other populations occur in the north-east and upland

[20] Threatened Species Section (2018)

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
			areas in the central north. Not recorded within 5 km. No suitable habitat in the proposal area.
Blechnum spinulosum small raspfern	Endangered/ -	NONE	*Blechnum spinulosum* is an erect tufted fern, known from a few rivers in northern Tasmania. The species is strictly riparian in habitat, occurring amongst boulders and along shaded banks of rivers and creeks. In Tasmania, it is known to be extant at three locations: River Leven, Pipers River and the lower reaches of the South Esk River near Launceston. No suitable habitat in the proposal area.
Bolboschoenus caldwellii sea clubsedge	Rare/ -	NONE	*Bolboschoenus caldwellii* is widespread in shallow, standing, sometimes brackish water, rooted in heavy black mud. No suitable habitat in the proposal area.
Boronia gunnii river boronia	Vulnerable/ VULNERABLE	NONE	*Boronia gunnii* is strictly riparian in habitat, occurring in the flood zone of the Apsley, St Pauls, and Dukes rivers (where extant) and the Denison Rivulet and South Esk River (where presumed extinct) in rock crevices or in the shelter of boulders. The base substrate is always dolerite. No suitable habitat on site.
Caesia calliantha blue grasslily	Rare/ -	LOW	*Caesia calliantha* is found predominantly in the Midlands in grassland or grassy woodland including wattle and prickly box "scrub" (occasionally extending into forest, then usually dominated by *Eucalyptus viminalis* or *E. amygdalina*). It has also been recorded from grassy roadsides. While some habitat occurs in the proposal area, all potential areas were searched at the optimum time of year; it is a distinctive species and is unlikely to have been overlooked.
Caladenia caudata tailed spider-orchid	vulnerable/ VULNERABLE	VERY LOW	*Caladenia caudata* has highly variable habitat, which includes the central north: *Eucalyptus obliqua* heathy forest on low undulating hills; the north-east: *E. globulus* grassy/heathy coastal forest, *E. amygdalina* heathy woodland and forest, *Allocasuarina* woodland; and the south-east: *E. amygdalina* forest and woodland on sandstone, coastal *E. viminalis* forest on deep sands. Substrates vary from dolerite to sandstone to granite, with soils ranging from deep windblown sands, sands derived from sandstone and well-developed clay loams developed from dolerite. A high degree of insolation is typical of many sites. Not recorded within 5 km. The habitat on

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
			site is sub optimal for this species and it is unlikely to occur. The survey time was during flowering for this species and it is distinctive and unlikely to have been overlooked.
Callitris oblonga subsp. *oblonga* south esk pine	Vulnerable/ ENDANGERED	NONE	*Callitris oblonga* subsp. *oblonga* occurs predominantly in riparian scrub, woodland and forest (where it can extend away from rivers) in areas with low precipitation and usually sandy soil. It is local on the East Coast, particularly on the margins of the Swan, Apsley, South Esk, Cygnet and St Pauls rivers. A small population is also present in Cataract Gorge. This is a large, distinctive species that unlikely to have been overlooked.
Calochilus campestris copper beard-orchid	Endangered/ -	NONE	On mainland Australia, *Calochilus campestris* occurs on ridges and slopes in forest and woodland and can also be found in coastal heath and headlands. The species is known to colonise embankments and road verges. The habitat in Tasmania is poorly understood. There is only a single record of this species for Tasmania and it is highly unlikely that it occurs in the proposal area.
Calystegia sepium swamp bindweed	Rare/ -	VERY LOW	*Calystegia sepium* has been recorded from riverbanks and the margins of forests in the north of the State around the Tamar region, where it mainly occurs in *Melaleuca ericifolia* swamp forest and amongst *Phragmites australis* swampland. This is a distinctive perennial vine and is highly unlikely to have been overlooked.
Carex gunniana mountain sedge	Rare/ -	LOW	The habitat of *Carex gunniana* is poorly understood and highly variable. It includes wet eucalypt forest, sandy heathlands, margins of streams, littoral sands, shingle with seepage, damp grasslands within dry forest and rough pasture. No sedges that resemble this species were found during the survey, and it unlikely to have to have been overlooked.
Carex longebrachiata drooping sedge	Rare/ -	LOW	*Carex longebrachiata* grows along riverbanks, in rough grassland and pastures, in damp drainage depressions and on moist slopes amongst forest, often dominated by *Eucalyptus viminalis, E. ovata* or *E. rodwayi*. No sedges that resemble this species were found during the survey, and it unlikely to have to have been overlooked.
Centipeda cunninghamii erect sneezeweed	Rare/ -	NONE	*Centipeda cunninghamii* is found in a wide variety of soil types, usually in areas subject to flooding or where water is stagnant. The seasonally dry margins of wetlands and lagoons also have the potential to support this species. No suitable habitat in the proposal area.

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
Chiloglottis trapeziformis broadlip bird-orchid	Endangered/ -	VERY LOW	*Chiloglottis trapeziformis* is known from near Wynyard on sandy soil in damp sclerophyll forest. There is a historical record from dry open forest near Legana. It has also been recorded from *Leptospermum* (teatree) and *Allocasuarina* (sheoak) scrub on sandy humus overlying granite on Great Dog Island (Furneaux group). While this species occurs in a range of habitats there are very few records from Tasmania and the chances of this species occurring in the proposal area are very low.
Dianella amoena grassland flaxlily	Rare/ ENDANGERED	VERY LOW	*Dianella amoena* occurs mainly in the northern and southern Midlands, where it grows in native grasslands and grassy woodlands. Suitable habitat was limited in the proposal area. This is a distinctive species and it is highly unlikely that it was overlooked.
Discaria pubescens spiky anchorplant	Endangered/ -	NONE	*Discaria pubescens* is found sporadically in the Midlands and more abundantly in drier parts of the Central Highlands. It grows on sandy or gravelly soil, in basalt talus slopes and clefts amongst fractured dolerite rocks and flood channels. Many sites are in rough pasture, and it also grows on roadsides. Recent collections indicate the species is occasionally associated with sandstone outcrops. No suitable habitat in the proposal area.
Diuris palustris swamp doubletail	Endangered/ -	NONE	*Diuris palustris* occurs in coastal areas in grassy open eucalypt forest, sedgy grassland and heathland with *Leptospermum* (teatree) and *Melaleuca* (paperbark) on poorly- to moderately-drained sandy peat and loams, usually in sites that are wet in winter. No suitable habitat in the proposal area.
Epacris exserta south esk heath	Endangered/ ENDANGERED	NONE	*Epacris exserta* occurs along the lower reaches of the South Esk, North Esk and Supply rivers. It is a strictly riparian species that grows in areas subject to periodic inundation, mainly on alluvium amongst dolerite boulders within dense riparian scrub, and occasionally in open rocky sites. It has been recorded from 10-310 m above sea level. No suitable habitat in the proposal area.
Epilobium pallidiflorum showy willowherb	Rare/ -	LOW	*Epilobium pallidiflorum* occurs in wet places (e.g. natural wetlands amongst forest, margins of *Melaleuca ericifolia* swamp forest, scrubby-sedgy *E. ovata* woodland on heavy soils, etc.) mostly in the north and north-west of the State. There is limited habitat in the proposal area; this is a distinctive species and is unlikely to have been overlooked.

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
Glycine latrobeana clover glycine	vulnerable/ VULNERABLE	VERY LOW	*Glycine latrobeana* occurs in a range of habitats, geologies and vegetation types. Soils are usually fertile but can be sandy when adjacent to or overlaying fertile soils. The species mainly occurs on flats and undulating terrain over a wide geographical range, including near-coastal environments, the Midlands, and the Central Plateau. It mainly occurs in grassy/heathy forests and woodlands and native grasslands, and favours areas of loose sandy soil. No records within 5 km. The habitat for this species is sub-optimal and it is unlikely to occur.
Gratiola pubescens hairy brooklime	Vulnerable/ -	NONE	*Gratiola pubescens* is most commonly located in permanently or seasonally damp or swampy ground, including the margins of farm dams. There is no suitable habitat in the proposal area.
Gyrostemon thesioides broom wheelfruit	Rare/ -	NONE	*Gyrostemon thesioides* occurs predominately on dolerite in *Allocasuarina* (sheoak) forest in the north and east of the State. No suitable habitat in the proposal area.
Haloragis heterophylla variable raspwort	Rare/ -	NONE	*Haloragis heterophylla* occurs in poorly-drained sites (sometimes only marginally so), which are often associated with grasslands and grassy woodlands with a high component of *Themeda triandra* (kangaroo grass). It also occurs in grassy/sedgy *Eucalyptus ovata* forest and woodland, shrubby creek lines, and broad sedgy/grassy flats, wet pasture and margins of farm dams. No suitable habitat in the proposal area.
Hovea tasmanica rockfield purplepea	Rare/ -	VERY LOW	*Hovea tasmanica* occurs in central and north-eastern regions. It is usually found on dry, rocky ridges or slopes (mostly dolerite) in forest and riverine scrub. Limited habitat on site. A distinctive species that is highly unlikely to have been overlooked.
Juncus amabilis gentle rush	Rare/ -	VERY LOW	*Juncus amabilis* occurs in a variety of habitats, usually poorly-drained sites such as damp grasslands and grassy woodlands, wet pastures, roadside ditches and edges of still and slow-flowing waterbodies. As presently understood, the species is mainly confined to lowland areas in the eastern half of the State but there are potential higher elevation and more western records that require confirmation. There is limited habitat for this species in the proposal area. It is also a distinctive *Juncus* and is unlikely to have been overlooked.

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
Lachnagrostis punicea subsp. *punicea* bristle blowngrass	Rare/ -	NONE	*Lachnagrostis punicea* subsp. *punicea* (both subspecies) occurs in moist depressions in grassy woodlands/forests and grasslands, and on the edges of swamps and saline flats. No suitable habitat in the proposal area.
Lepidium hyssopifolium soft peppercress	endangered/ ENDANGERED	NONE	The native habitat of *Lepidium hyssopifolium* is the growth suppression zone beneath large trees in grassy woodlands and grasslands (e.g. over-mature black wattles and isolated eucalypts in rough pasture). *Lepidium hyssopifolium* is now found primarily under large exotic trees on roadsides and home yards on farms. It occurs in the eastern part of Tasmania between sea-level to 500 metres above sea level in dry, warm and fertile areas on flat ground on weakly acid to alkaline soils derived from a range of rock types. It can also occur on frequently slashed grassy/weedy roadside verges where shade trees are absent. No records within 5km. The proposal area is unsuitable for this species.
Lycopus australis australian gypsywort	Endangered/ -	VERY LOW	*Lycopus australis* occurs in moist shaded places including disturbed areas within *Melaleuca ericifolia* swamp forest, *Phragmites australis* reed beds, and rocky (dolerite) riverbeds fringed by riparian scrub. There are however few records of this species in Tasmania; it is a distinctive species and given the small area of suitable habitat it is unlikely that it was overlooked.
Lythrum salicaria purple loosestrife	Vulnerable/ -	VERY LOW	*Lythrum salicaria* inhabits swamps, stream banks and rivers mainly in the north and north-east of the State. It can also occur between gaps in *Melaleuca ericifolia* forest. This species can act as a weed, proliferating along roadsides and other disturbed areas, and, as horticultural strains are in cultivation and birds can disperse seed, some occurrences may not be native. It is a distinctive species and given the small area of suitable habitat it is unlikely that it was overlooked.
Mentha australis river mint	Endangered/ -	NONE	*Mentha australis* is known from riparian habitats along the lower reaches of the South Esk River, Lake Trevallyn and the Rubicon River, where it occurs along the rocky (dolerite) margins of rivers and lakes. There is no suitable habitat in the proposal area.

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
Muehlenbeckia axillaris matted lignum	Rare/ -	NONE	*Muehlenbeckia axillaris* is predominantly found in moist gravely or rocky places on the Central Plateau, extending out to the west, north-west and lower reaches of the South Esk River. No suitable habitat in the proposal area.
Myriophyllum integrifolium tiny watermilfoil	Vulnerable/ -	NONE	*Myriophyllum integrifolium* occurs mostly in the Northern Midlands, with isolated populations in the State's north, north-east and south. It grows at the margins of wetlands and in seasonally wet places, including depressions associated with small ephemeral lakes. It can occur in coastal heathland and in forest in the Midlands, where it is often associated with old muddy tracks. No suitable habitat in the proposal area.
Parietaria debilis shade pellitory	Rare/ -	NONE	*Parietaria debilis* occurs around muttonbird rookeries, on cliffs/rocks in the salt spray zone, in moist shaded areas in dune scrubs, and under rock overhangs in forested gullies. No suitable habitat in the proposal area.
Persicaria decipiens slender waterpepper	Vulnerable/ -	VERY LOW	*Persicaria decipiens* occurs on the banks of rivers and streams, mostly in the north of the State, including King Island. The species may colonise farm dams. It is a distinctive species and given the limited suitable habitat it is unlikely that it was overlooked.
Persicaria subsessilis bristly waterpepper	Endangered/ -	VERY LOW	*Persicaria subsessilis* occurs in Launceston and on the Ringarooma River in rocky (dolerite) river margins, where it co-occurs with the more frequent *Persicaria hydropiper* (green waterpepper); disturbed *Melaleuca ericifolia* (coast paperbark) swamp forest and lagoon margins; *Cyperus lucidus* (leafy flatsedge) sedgeland with the allied *Persicaria praetermissa* (arrow waterpepper) prominent; and within openings in riparian scrub on alluvium. Habitat in the proposal area was sub optimal and this species is unlikely to have been overlooked.
Phyllangium divergens wiry mitrewort	Vulnerable/ -	NONE	*Pyllangium divergens* occurs in a wide variety of near-coastal habitats on a range of substrates, a common feature usually being bare ground (e.g. tracks) and rock exposures (e.g. outcrops, coastal cliffs, etc.). The site is not near the coast.
Prostanthera rotundifolia roundleaf mintbush	Vulnerable/ -	NONE	*Prostanthera rotundifolia* mainly occurs along flood-prone rocky riverbeds as a component of the dense riparian shrubbery but also extends to adjacent rocky slopes. Habitat in the proposal area is largely unsuitable – this is also a large and distinctive species that is highly unlikely to have been overlooked.

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
Pterostylis commutata midlands greenhood	endangered/ CRITICALLY ENDANGERED	NONE	No records within 5 km. *Pterostylis commutata* is restricted to Tasmania's Midlands, where it occurs in native grassland and *Eucalyptus pauciflora* grassy woodland on well-drained sandy soils and basalt loams. No suitable habitat in the proposal area.
Pterostylis ziegeleri grassland greenhood	vulnerable/ VULNERABLE	NONE	No records within 5 km. *Pterostylis ziegeleri* is restricted to the east and north of Tasmania. In coastal areas, the species occurs on the slopes of low stabilised sand dunes and in grassy dune swales, while in the Midlands it grows in native grassland or grassy woodland on well-drained clay loams derived from basalt. No suitable habitat in the proposal area.
Ranunculus pumilio var. *pumilio* ferny buttercup	Rare/ -	VERY LOW	*Ranunculus pumilio* var. *pumilio* occurs mostly in wet places (e.g. broad floodplains of permanent creeks, "wet pastures") from sea level to altitudes of 800-900 m above sea level. Limited potential due to the dense sward of sedges in the riparian habitat that reduces the chances of this species occurring.
Rumex bidens mud dock	R (V Pending)/ -	NONE	*Rumex bidens* grows at the margins of lakes, swamps, and slow-moving rivers and streams, and may also occur in drainage channels. No suitable habitat in the proposal area.
Schoenoplectus tabernaemontani river clubsedge	Rare/ -	NONE	*Schoenoplectus tabernaemontani* inhabits the margins of lagoons on King Island, Flinders Island and on some riverbanks in the Midlands. No suitable habitat in the proposal area.
Scutellaria humilis dwarf scullcap	Rare/ -	NONE	*Scutellaria humilis* is found in moist, shady places in the north-east and south-east of the State. Recent sites have been associated with rocky slopes and rises. No suitable habitat in the proposal area.
Senecio campylocarpus bulging fireweed	- (V Pending)/ -	NONE	*Senecio campylocarpus* occurs on grassy margins of permanent rivers in the Midlands and on broad floodplains. No suitable habitat in the proposal area.
Senecio psilocarpus swamp fireweed	Endangered/ ENDANGERED	NONE	*Senecio psilocarpus* is known from six widely scattered sites in the northern half of the State, including King and Flinders islands. It occurs in swampy habitats including broad valley floors associated with rivers, edges of farm dams amongst low-lying grazing/cropping ground, herb-rich native grassland in a broad swale between stable

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
			sand dunes, adjacent to wetlands in native grassland, herbaceous marshland and low-lying lagoon systems. No suitable habitat in the proposal area.
Siloxerus multiflorus small wrinklewort	Rare/ -	NONE	*Siloxerus multiflorus* occurs in a range of somewhat exposed lowland habitats, including bare soil and rocks amongst dense windswept coastal shrubbery to rock outcrops and bare ground associated with native grassland, grassy woodland and forest. No suitable habitat for this species.
Spyridium eriocephalum var. *eriocephalum* heath dustymiller	Endangered/ -	NONE	In Tasmania, *Spyridium eriocephalum* var. *eriocephalumis* known to be extant at a single subpopulation within East Risdon State Reserve. This is an erroneous record from the 1800's.
Spyridium vexilliferum var. *vexilliferum* helicopter bush	Rare/ -	NONE	*Spyridium vexilliferum* occurs in a range of vegetation types, including sandy heaths, rock plates and dry sclerophyll forest and woodland (mainly dominated by *Eucalyptus amygdalina*). It is found on a range of substrates (e.g. mudstone, granite, laterite gravels) from near-coastal areas in the east, north and west of the State, to the Midlands and lower Derwent Valley. It is most abundant in open or disturbed areas, as it can proliferate from soil-stored seed after disturbance. No suitable habitat in the proposal area.
Stylidium despectum small triggerplant	Rare/ -	NONE	*Stylidium despectum* has mainly been recorded from wet sandy heaths, moist depressions, soaks and hollows in near-coastal areas. It extends to similar habitat amongst forest and woodland in the Midlands. No suitable habitat in the proposal area.
Teucrium corymbosum forest germander	Rare/ -	VERY LOW	*Teucrium corymbosum* occurs in a wide range of habitats from rocky steep slopes in dry sclerophyll forest and *Allocasuarina* (sheoak) woodland, riparian flats and forest. Habitat in the proposal area is sub optimal for this species; it is also a distinctive species that is unlikely to have been overlooked.
Triptilodiscus pygmaeus dwarf sunray	Vulnerable/ -	NONE	*Triptilodiscus pygmaeus* grows within grasslands, grassy woodlands or rockplates, with the underlying substrate being mostly Tertiary basalt or Jurassic dolerite. The elevation range of recorded sites in Tasmania is 30-470 m above sea level, with an annual rainfall

Species	Status TSPA / EPBCA	Potential to occur in proposal area	Observations and preferred habitat[20]
			of about 450-600 mm. The species occurs within native grassland dominated by *Themeda triandra* (kangaroo grass). No suitable habitat.
Utricularia australis yellow bladderwort	Rare/ -	NONE	*Utricularia australis* has a widespread distribution, ranging from the Gordon River in the south-west to the northern part of Flinders Island in the far north-east (and also reportedly from the Derwent River in the State's south). It grows in stationary or slow-moving water, including natural lakes, farm dams and reservoirs, where it has been reported as forming 'locally dense swards'. No suitable habitat.
Velleia paradoxa spur velleia	Vulnerable/ -	VERY LOW	*Velleia paradoxa* is known from the Hobart and Launceston areas, and the Midlands and the Derwent Valley, where it occurs in grassy woodlands or grasslands on dry sites. It has been recorded up to 550 m above sea level at sites with an annual rainfall range of 450-750 mm. This is the northern extreme of the species in Tasmania with very few records this far north. Highly unlikely to occur.
Veronica plebeia trailing speedwell	Rare/ -	LOW	*Veronica plebeia* typically occurs in dry to damp sclerophyll forest dominated by *Eucalyptus amygdalina* on dolerite or Tertiary sediments but can also occur in *Eucalyptus ovata* grassy woodland/forest and *Melaleuca ericifolia* swamp forest. Possible, but only the similar *V. calycina* was recorded and it is not expected this species was overlooked.
Viola caleyana swamp violet	Rare/ -	VERY LOW	The habitat of *Viola caleyana* in Tasmania is poorly understood but includes lowland wet grasslands, possibly wet heathlands and a variety of forest types. There are very few records of this species in Tasmania, and it is unlikely to have been overlooked.
Xerochrysum bicolor eastcoast everlasting	Rare/ -	NONE	Species of *Xerochryrum* are poorly understood in Tasmania, especially the identification of coastal species (*X. bicolor* and *X. bracteatum*). *X. bicolor* may be restricted to stabilised dune systems. No suitable habitat in the proposal area.

3.3 Threatened fauna and threatened fauna habitat

The July and November 2018 surveys revealed no sighting or sign (e.g. scats, prints, nests) of any listed threatened fauna. In 2019, a Tasmanian wedge-tailed eagle's nest was reported on the property, this was verified by two observers from NBES in November 2019 (Figure 3 above, Plate 5).

In the July 2018 survey a tree hollow potentially suitable for masked owl[21] was recorded in a large *Eucalyptus viminalis* (DBH 170 cm) in the south east of the proposal area (and outside the impact area, Plate 6). Subsequently, the site was visited by an NBES ecologist with one of the representors who shared her knowledge of the location of trees with hollows potentially suitable for masked owl. During this search an additional ten trees were noted as having potential hollows suitable for masked owl, but further analysis of these trees reduced the number of potential trees to six trees (Plate 7, Figure 3 above).

Our survey for Tasmanian devil is consistent with the survey guidelines for this species[22]. Regardless, it should be noted that that locating breeding sites for these species is typically challenging and even if potential denning sites are located, breeding sites may still remain undetected. No suitable breeding sites were located for this species.

In Table 2, all species known from within a 5 km radius (or considered likely to have potential habitat), as identified in the natural Values Atlas and EPBC Protected Matters Search Tool reports, are discussed[23]. Coastal, marine, cave-dwelling and wetland species (e.g. Australasian Bittern, Eastern Curlew) included in these reports are excluded from the table as they have no chance of occurring in the proposal area.

Plate 5: Tasmanian wedge-tailed eagle nest in the south east of the proposal area

[21] Forest Practices Authority 2016
[22] Natural and Cultural Heritage Division (2015)
[23] DPIPWE Natural Values Atlas Report, nvr_4_02-Dec-2020, Commonwealth of Australia, EPBC Protected Matters Search Tool Report, 2018 (report PMST_WMVSBO)

Plate 6: tree hollow in *Eucalyptus viminalis* potentially suitable for Tasmanian masked owl in proposal area

Plate 7: tree hollow in *Eucalyptus amygdalina* potentially suitable for Tasmanian masked owl in proposal area

Table 1: Fauna species of conservation significance previously recorded, or which may potentially occur, within 5 km of the proposal area[24]

Species	Status[25] TSPA/EPBCA	Potential for breeding to occur	Observations and preferred habitat[26]
BIRDS			
azure kingfisher *Alcedo azurea* ssp. *diemenensis* (*Ceyx azureus* ssp. *diemenensis*)	Endangered/ ENDANGERED	NONE	The Tasmanian subspecies of the azure kingfisher occurs in shady and overhanging forest vegetation along the forested margins of major rivers on the south, west, north and northwest coasts. It catches prey by plunging from perches overhanging the water. It feeds on small fish, freshwater crayfish, aquatic insects, and occasionally frogs. The main threat to the species is clearing and modification of river-side vegetation. No suitable habitat in the proposal area. Not recorded within 5 km of the proposal area. The watercourses in the proposal area are not sufficient to offer foraging or nesting habitat for this species.
grey goshawk *Accipiter novaehollandiae*	Endangered/-	LOW	Recorded within 500 m of the proposal area. Nesting habitat potential in the proposal area is very low (no category 1 or 2 habitat[27]). The species may forage in the area on occasion but the relatively closed nature of the forest across much of the proposal area is sub-optimal for this species.
wedge-tailed eagle *Aquila audax fleayi*	Endangered/ ENDANGERED	NEST PRESENT	Since the June and November 2018 surveys, a nest of this species was recorded in the balance of the proposal area. Given the freshness of the material and the lack of compression, the nest appears relatively new; in November 2019 was aged at between a few months and a year, two at the most (pers. comm. Bill Brown and Jason Wiersma). The nest was visited during the breeding season in 2019 and there was no indication the nest was being used. The site is largely sub-optimal for nesting trees and the nest tree itself is relatively small for this species (~70 cm DBH). Although birds have been seen near the nest, there is no evidence that it has been used successfully for breeding. Given the relatively exposed location of the tree, the relatively small size of the tree and supporting boughs, and the nest structure itself, it is quite possible this nest will not be used for breeding. The

[24] DPIPWE Natural Values Atlas Report, nvr_4_02-Dec-2020, Commonwealth of Australia, EPBC Protected Matters Search Tool Report, 2018 (report PMST_WMVSBO)
[25] National - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* including JAMBA, CAMBA and Migratory species; State - Tasmanian *Threatened Species Protection Act, 1995.*
[26] Bryant & Jackson 1999;
[27] Forest Practices Authority 2011

Species	Status[25] TSPA/EPBCA	Potential for breeding to occur	Observations and preferred habitat[26]
			species may forage in the area on occasion but the relatively closed nature of the forest across much of the proposal area is sub-optimal for this species.
white-bellied sea-eagle *Haliaeetus leucogaster*	Vulnerable/ MIGRATORY	NONE	Occurs in coastal habitats and large inland waterways. No nests belonging to this species were observed in the proposal area. Forages in coastal and wetland environments and not likely to occur in the proposal area.
swift parrot *Lathamus discolor*	Endangered/ ENDANGERED	VERY LOW	Recorded within 500 m of the proposal area. However, the proposal area is not within the core range of this species. Also, this species' preferred foraging habitat tree - blue gum (*Eucalyptus globulus*) - is not present, and black gum (*Eucalyptus ovata*) – another foraging tree - is very sparse in a small area in the proposal area. Breeding is not known from the area and based on the lack of observations highly unlikely to occur.
masked owl *Tyto novaehollandiae castanops*	Endangered/ VULNERABLE	LOW / MODERATE	Recorded within 500 m of the proposal area. Requires a mosaic of forest and open areas for foraging and large old-growth hollow-bearing trees for nesting. This species has a territory of ~2000 ha and this site may form part of a territory. Six potentially suitable nesting trees occur on the site on the site and may hunt over proposal area. Three of these trees are in the proposed impact area.
fork-tailed swift *Apus pacificus*	-/MIGRATORY	None	This species is predicted to occur in the area by habitat mapping only. Most records of the Fork-tailed swift are from Bass Strait Islands with fewer on mainland northern Tasmania. Almost exclusively an aerial species, with no likelihood of roosting in the proposal area.
white-throated needletail *Hirundapus caudacutus*	-/MIGRATORY	None	This species is infrequently recorded in Tasmania and although it may sporadically occur over the area it is an aerial feeder and the impact on this species is considered negligible.

Species	Status[25] TSPA/EPBCA	Potential for breeding to occur	Observations and preferred habitat[26]
satin flycatcher *Myiagra cyanoleuca*	-/MIGRATORY	LOW	A summer migrant that is widespread in Tasmanian forested habitats. Is sensitive to fragmentation and canopy thinning. Optimal habitat is considered to contain old growth elements and occur along water courses, but the species is not entirely absent from habitats lacking these features. May occur in the general area at low frequency. Highly unlikely to be meaningfully impacted by a proposal of this nature.
Japanese snipe *Gallinago hardwickii*	-/MIGRATORY	NONE	This species is predicted to occur in the area by habitat mapping only. Typical habitat is the low vegetation around wetlands. Habitat in the proposal area is entirely unsuitable for this species.
great egret *Ardea alba*	-/MIGRATORY	NONE	This species is predicted to occur in the area by habitat mapping only. A non-breeding wetland species with no habitat on site.
cattle egret *Ardea ibis*	-/MIGRATORY	NONE	This species is predicted to occur in the area by habitat mapping only. A cosmopolitan species that self-colonised Tasmania in the 1960's and migrates annually for the non-breeding season. It is infrequent, and often recorded foraging in pasture. No habitat on site.
MAMMALS			
Tasmanian devil *Sarcophilus harrisii*	Vulnerable/ VULNERABLE	Moderate	Recently recorded (2019) in the north west of the proposal area and on the nearby boundary. There are additional less recent records from the broader area. It is expected that that the species forages in the proposal area. No suitable denning structures were observed. Suitable denning habitat is having '*one or a combination of burrowable well-drained soil, sheltered overhangs such as cliffs, rocky outcrops, knolls, caves and*

Species	Status[25] TSPA/EPBCA	Potential for breeding to occur	Observations and preferred habitat[26]
			earth banks, and log piles with at least one entrance through which a devil could pass'[28]. In this regard, the only quality observed in the proposal area is burrowable well-drained soil. In areas of denser vegetation near the creek (in the balance area not planned for development) more optimum denning habitat may be present. However, as is stated in the addendum, it is equally possible that devils the utilise the land are denning on other properties within their home range either in natural or artificial den opportunities, including under sheds, old wood piles and the like. Nevertheless, it is possible the species breeds in the proposal area. More detail is provided in the addendum.[29]
eastern quoll *Dasyurus viverrinus*	-/ ENDANGERED	MODERATE to HIGH	There are several records within 5 km. No scats or tracks were located but suitable habitat is widespread in proposal area and it is possible this species occurs. Denning requirements for eastern quoll are typically less than for devils and it is possible that this species utilises the proposal area for breeding. More detail is provided in the addendum.[30]
spotted-tailed quoll *Dasyurus maculatus*	Rare/ VULNERABLE	MODERATE	There are several records within 5 km. No scats or tracks were located but suitable habitat is present especially in the densely vegetated areas near the creek. One of the representors (an experienced biologist) noted a track of this species on the property boundary. Denning requirements for quolls are typically less than for devils with potential breeding habitat described *as structurally complex (high canopy, with dense understorey and ground vegetation cover) forest*[31]. It is possible that this species utilises the proposal area for breeding. More detail is provided in the addendum [32].

[28] Natural and Cultural Heritage Division 2015
[29] North Barker Ecosystem Services 2020a
[30] North Barker Ecosystem Services 2020a
[31]Forest Practices Authority 2014
[32] North Barker Ecosystem Services 2020a

Species	Status[25] TSPA/EPBCA	Potential for breeding to occur	Observations and preferred habitat[26]
eastern barred-bandicoot *Perameles gunnii*	-/VULNERABLE	PRESENT Likely to breed	Recorded relatively recently (2019) in the proposal area. Grassy habitat is patchy and widespread in the proposal area and sufficient cover is present for this species to breed in the proposal area. More detail is provided in the addendum. [33]
REPTILES			
tussock skink *Pseudemoia pagenstecheri*	Vulnerable/-	NONE	Inhabits tussock grasslands. No suitable habitat in the proposal area.
INVERTEBRATES			
green-lined ground beetle *Catadromus lacordairei*	Vulnerable/-	NONE	The species occurs in open grassy woodland associated with wetlands at low elevations. No suitable habitat.
Mount Arthur burrowing crayfish *Engaeus orramakunna*	Vulnerable/ VULNERABLE	NONE	Not recorded within 5 km of the proposal area, and the catchment range for this species is not near the proposal area.
chaostola skipper *Antipodia chaostola leucophaea*	Endangered/ ENDANGERED	LOW	No records within 5 km. The core range of the chaostola skipper is a 3 km (radius) buffer centred on the known sites[34] - there are no known sites near the proposal area, so this is not part of the core range of this species. *Gahnia radula* (the larval host plant for this species) is common in places on the site, often forming dense swards; there is therefore potential habitat for this species[35]. Notably, areas west of the Tamar but nearer the coast were surveyed in 2017 to better understand the state-wide distribution of the species; these surveys did not record the skipper[36]. Also, the host plant species is a relatively

[33] North Barker Ecosystem Services 2020a
[34] Bell, PJ 2017
[35] Bell, PJ 2017
[36] Bell, PJ 2017

Species	Status[25] TSPA/EPBCA	Potential for breeding to occur	Observations and preferred habitat[26]
			common understorey plant that has a much broader distribution than the skipper across Tasmania. So, although the possibility of additional surveying was raised in the addendum, we conclude that the potential for this species to occur is low and that dedicated surveys are not warranted.
snail (Cataract Gorge) *Pasmaditta jungermanniae*	Rare/-	NONE	Known only from the Cataract Gorge and nearby locations.
spider (Cataract Gorge) Migas plomleyi	Rare/-	NONE	Only know from the slopes surrounding Cataract Gorge, near Launceston. Inhabits burrows in moss covering boulders and in crevices in open bushland.
AMPHIBIANS			
green and golden frog *Litoria raniformis*	Vulnerable/ VULNERABLE	VERY LOW	Recorded within 500 m of the proposal area. Requires shallow standing water. It is conceivable that the frog occurs from time to time in association with the creek in the south east but this is considered highly unlikely because it is a basking frog that prefers open water and open ground. Frogs do migrate from suitable habitat in wet years but generally only colonise similar core habitats.
striped marsh frog *Limnodynastes peroni*	Endangered / VULNERABLE	NONE	No suitable habitat in the proposal area.
FISH			
eastern dwarf galaxias *Galaxiella pusilla*	Vulnerable/ VULNERABLE	NONE	Lives in still or slow-flowing waters such as ponds, swamps, drains and backwaters of streams, often containing dense aquatic or emergent plants. No suitable habitat present.
swan galaxias *Galaxias fontanus*	Endangered /ENDANGERED	NONE	Found only in the Swan River and Macquarie River catchments of eastern Tasmania.

Species	Status[25] TSPA/EPBCA	Potential for breeding to occur	Observations and preferred habitat[26]
australian grayling *Prototroctes maraena*	Vulnerable/ VULNERABLE	NONE	Occurs in unpolluted streams with large pools and major rivers. No suitable habitat.

3.4 Declared weeds

Three species of declared weeds occur in the proposal area: slender thistle (*Carduus pycnocephalus*), blackberry (*Rubus fruticosus,* Plate 8) and gorse (*Ulex europaeus*, Plate 9). Slender thistle occurs as an infestation in one area; blackberry has invaded areas along the southern boundary; and there is a single occurrence of gorse (Figure 4).

Plate 8: blackberry infestation on the fenceline in the south of the proposal area

Plate 9: gorse in the proposal area

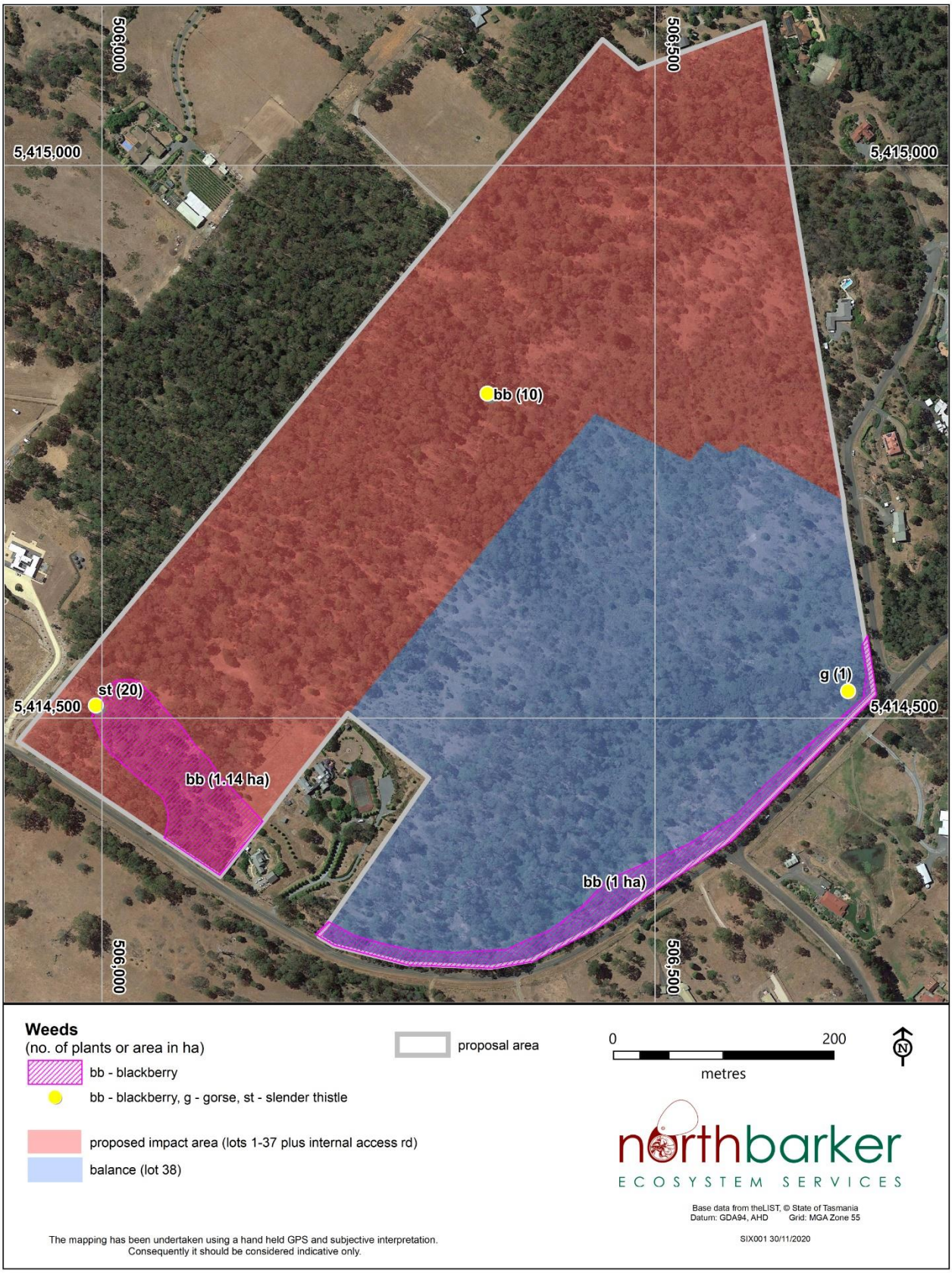

Figure 4: map of the declared weeds in the proposal area

4 Assessment of impact and mitigation

While the entire property was surveyed, only the western side is currently planned for the development of the 37 lots and access road (lot 38 is the balance, see Figure 2 above); this is 21.29 ha (or 58 %) of the 36.8 ha proposal area. It is understood that the remaining eastern portion of the property (15.5 ha - the balance or lot 38) is not planned for development in the short to medium term.

The requirements of the bushfire hazard management plan[37] in terms of impact is for the 37 lots are to be maintained in a low fuel state:

"Maintain HMA in a low fuel state. Ground cover vegetation less than 100 mm tall – this can be achieved by mowing and raking; larger trees pruned to at least 2 m; and if necessary, remove sufficient trees to maintain a 3 m canopy separation; selectively removing small trees and shrubs to create clumps"

Although these management specifications allow some room to partially maintain the understorey and occasional trees, it is understood that the proponent would like to clear the lots. Accordingly, in the impact sections below it is assumed that all the 21.29 ha occupied by the 37 lots and access road will be cleared of vegetation.

In the addendum[38] it was proposed that the balance be set aside as a conservation area to protect the remaining values in the proposal area. It is understood that in discussions between the Council, the proponent and with external expert advice, it was determined that the broader circumstances of the land including its intended use under the planning scheme did not justify the protection of the remaining natural values by a conservation covenant or a Part 5 agreement. Nevertheless, the remaining values would be protected to the extent required of the relevant regulations.

4.1 Vegetation communities

Vegetation clearance in the proposed impact area for the 37-lots and the internal access road will remove 15.74 and 5.54 ha of DAD and NBA, respectively. Neither of these communities are protected under any Act.

The impact of vegetation clearance from a residential development is difficult to mitigate. Effort should however be made to reduce the risk of the spread of weeds and pathogens during construction. Accordingly, the implementation of the proposal would benefit from a weed management plan.

- It is recommended that all occurrences of declared weeds are treated prior to works.
- Best practice construction hygiene[39] should be practiced to prevent the spread of weed propagules in contaminated soil. This should involve cleaning all machinery before leaving the works area, as well as not bringing dirty machinery into the site.
- Follow-up weed control implemented 6-12 months after works to treat any individuals that have colonised the disturbance area.

Indirect impacts on vegetation outside the proposed impact area for the lots should be avoided by clearly defining the extent of the impact area on construction plans and the ground. All potential ancillary impact areas (e.g. parking, site office and lay down areas) should be located in the proposed impact area for the lots and not located outside the proposed impact area as defined in this report.

[37] NBES 2020c
[38] NBES 2020a
[39] DPIPWE 2015

4.2 Threatened flora

The proposed development will remove ~50 *Brunonia australis* (TSPA rare). Although it is suggested in the addendum[40] that a Part 5 agreement can be used to protect habitats for threatened flora, it should be noted that this is not a significant occurrence of the species and that such the measure is not necessarily warranted.

Poa mollis was not recorded during any of the NBES surveys and although there are records from the NVA in the proposal area, we are unable to confirm its presence in the proposal area. Of the three NVA record locations, two are in the proposed impact area (the number of plants at one of these locations was not recorded on the NVA and at the other was one). The record outside the proposed impact area is of 20 plants.

4.3 Threatened fauna and threatened fauna habitat

Tasmanian devil, eastern barred bandicoot and a Tasmanian wedge-tailed eagle nest have all been recorded in the proposal area since the NBES surveys in 2018. Although no presence or sign of quolls or Tasmanian masked owl were recorded during the 2018 surveys, spotted-tailed quoll prints were reported from the boundary of the property by one of the representors in 2019, and foraging and potential breeding habitat for these species is present in the proposal area.

4.3.1 Tasmanian devil

Tasmanian devil has been recorded in the proposed impact area. The size of the proposed impact area (~21 ha) is considerably less than a typical home range for this species (median density in healthy populations has been recorded at 1.3 animals per km^2)[41] and while density may exceed this in optimum habitat, the impact to this wide-ranging species by the removal of potential habitat by the current development is not expected to be significant. In the broader area there is extensive habitat for this species, particularly, the forested areas in Trevallyn Nature Recreation Area as well as large areas of native habitat west and north west of the proposal area.

Although no dens were located in the proposed impact area these can be difficult to locate, and a dedicated pre-clearance survey for dens in line with state guidelines will help reduce potential impact to this species[42]. If a den is located a den decommissioning protocol exists under which the den can be destroyed once proven to be vacant.

An increase in road traffic due to residential development may result in higher risk of devils and other fauna being killed on the road. Mitigation can be achieved for this through speed control but the efficacy on Ecclestone road is not known. Reduced traffic speed is an effective measure in mitigating roadkill due to existing traffic. Additional local traffic such as generated by the proposal is likely to travel slower than the existing through traffic.

4.3.2 Spotted-tailed quoll

The loss of potential habitat by the current proposal could conceivably reduce the carrying capacity in the local area for this species. It is unknown exactly how many quolls could be displaced by the expected loss of habitat, but this is a low density carnivore and 1 km^2 approximates the smallest home range for a spotted-tailed quoll[43]; so, although home ranges do overlap and > 1 individual may be found in an area, the clearance area is relatively small (~21 ha or ~21 % of a home range) and this impact to potential habitat is not expected to have a significant impact on this species. In the broader area there is extensive habitat for this

[40] NBES 2020a
[41] Lazenby 2018
[42] Natural and Cultural Heritage Division 2015
[43] This was the spatial scale used by Troy in her research on spotted-tailed quoll: Spatial Ecology of the Tasmanian Spotted-Tailed Quoll submitted in fulfilment of the requirements for the degree of Doctor of Philosophy, School of Biological Sciences, University of Tasmania, November 2014

species, particularly, the forested areas in Trevallyn Nature Recreation Area as well as large areas of native habitat west and north west of the proposal area.

Due to the overlap in habitat requirements, the recommended pre-clearance survey for Tasmanian devil is applicable to spotted-tailed quoll.

4.3.3 Eastern quoll

Based on the habitat in the proposal area and the records in the broader area it is possible this species utilises the proposal area. The impact may result in an adjustment to home range, by displacement to neighbouring habitat. There is no known evidence that the site is important for dispersal or connectivity at the population level. On its own it is unlikely that the proposal will cause a significant impacts to this species.

4.3.4 Eastern barred bandicoot

This species has been recorded in the proposed impact area. The scale of the development (~21 ha) will not result in a significant impact to this wide-ranging species. In the broader area there is extensive habitat for this species, particularly the forested areas in Trevallyn Nature Recreation Area as well as large areas of native habitat west and north west of the proposal area. Locally, the area consists of a mosaic of forest, residential area and agricultural land that is suitable for the species.

4.3.5 Tasmanian wedge-tailed eagle

A wedge-tailed eagles' nest was recorded in the proposal area after the initial natural values surveys were conducted. Given the freshness of the material and the lack of compression the nest appears relatively new; in November 2019 it was aged at between a few months and a year, two at the most (pers. comm. Bill Brown and Jason Wiersma). The nest was visited (from the ground only) during the breeding season in 2019 and there was no indication the nest was being used.

The nest is about 150 m from the nearest occupied residential lot and 170 m from Ecclestone Road. The proposal would result in the nest being ~170 m from proposed new residential lots. The nest will be no closer than it is now to existing development, but the density of the proposed development will be higher. The nest is unlikely to have being utilized successfully to date and so the impact cannot be judged against previous success. However, given the relatively exposed location of the tree, the relatively small size of the tree and supporting boughs, and the nest structure itself, it is quite possible this nest will not be used for breeding.

If the event the nest is shown to be active, potential risk of impact during breeding can be managed by avoiding construction and vegetation clearance during the breeding season (July to January/February inclusive) within 500 m of the nest site[44].

4.3.6 Tasmanian masked owl

The site is suitable for masked owl and six trees with hollows potentially suitable for masked owl were recorded in the proposal area. Of these, three are in the proposed development area for the 37 lots and internal access road (one of these is on the boundary of this impact area and Ecclestone Road). Given the relatively large territorial range of the species (~2000 ha), the removal of ~21 ha of habitat will not have a significant impact on this species.

To manage any potential risk to the species the three trees with potential hollows in the proposed impact area should be checked for nests prior to removal.

[44] Forest Practices Authority 2015

5 Legislation

5.1 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The EPBCA is structured for self-assessment; the proponent must indicate whether or not the project is considered a 'controlled action' which if confirmed would require approval from the Commonwealth Minister.

The development of the subdivision is unlikely to cause a "significant impact" on any of the nationally listed species with the potential to occur in the proposal area.

The residential development footprint does not affect any vegetation communities listed under this Act.

5.2 Tasmanian *Threatened Species Protection Act 1995*

The impact to the 50 *Brunonia australis* will require a 'permit to take' from the Department of Primary Industries, Parks, Wildlife and the Environment (DPIPWE).

Although we are unable to confirm the presence of *Poa mollis* from the proposal area, DPIPWE may require a permit to take for the records on the Natural Values Atlas (one plant at one location and no number provided at the other location).

5.3 Tasmanian *Nature Conservation Act 2002*

Of the four vegetation communities on site, *Eucalyptus ovata* forest and woodland (DOV), is listed under the Act. No impact to this community is expected by the current subdivision proposal.

5.4 Tasmanian *Weed Management Act 1999*

West Tamar is a Zone B municipality for the species of declared weed observed on site (blackberry, slender thistle and gorse). According to the provisions of the *Weed Management Act 1999,* Zone B municipalities are those which host widespread infestations where control and prevention of spread is the principle aim. The containment principles of this Act should be sufficiently met with best practice construction hygiene that prevents the transport of contaminated material off site.

5.5 West Tamar Interim Planning Scheme 2013

The clearance of native vegetation triggers the Biodiversity Code (E8) of the Scheme. The purpose of the code (E.8.1.1) is to:

a) protect, conserve and enhance the region's biodiversity in consideration of the extent, condition and connectivity of critical habitats and priority vegetation communities, and the number and status of vulnerable and threatened species; and

b) ensure that development is carried out in a manner that assists the protection of biodiversity by:

i) minimising vegetation and habitat loss or degradation; and

ii) appropriately locating buildings and works; and

iii) offsetting the loss of vegetation through protection of other areas where appropriate.

The objective of the Development Standards of the Scheme (E.8.6.1) is to ensure that:

a) vegetation identified as having conservation value as habitat has priority for protection and is appropriately managed to protect those values; and

b) the representation and connectivity of vegetation communities is given appropriate protection when considering the impacts of use and development.

Acceptable Solution A1 to the Standards is:

A1.1 Clearance or disturbance of priority habitat is in accordance with a certified Forest Practices Plan or;

A1.2 Development does not clear or disturb native vegetation within areas identified as priority habitat.

There is no Priority Vegetation overlay in the proposal area, so the development can meet Acceptable Solution A1.

Acceptable Solution A2 to the Standards is:

A2 Clearance or disturbance of native vegetation is in accordance with a certified Forest Practices Plan.

The development will require the clearance of native vegetation and does not accord with a certified Forest Practices Plan so will therefore be required to meet Performance Criteria P2.1.

P2.1 Clearance or disturbance of native vegetation must be consistent with the purpose of this Code and not unduly compromise the representation of species or vegetation communities of significance in the bioregion having regard to the:

a) quality and extent of the vegetation or habitat affected by the proposal, including the maintenance of species diversity and its value as a wildlife corridor; and

The opening statement in P2.1 regarding the purpose of the Code was not addressed in either the initial NVA[1] or the addendum[2]. It is our understanding that the intent of P2.1 is addressed by responding to sub-clauses a) through f) that follow the closing statement.

In response to a): the quality of the vegetation likely to be impacted (mostly DAD and a small area of NBA) is in moderate condition: there are infestations of blackberry on the southern and eastern boundaries, and there is evidence of selective harvesting of wood throughout. Several roads and tracks are also evident, permitting access for the dumping of waste; this is especially evident in the south-west. While there are occasional large trees (>100 cm DBH) in the impact area, most trees are < 80 cm DBH.

The property is surrounded by modified land that has been partially or wholly cleared of native vegetation. The nearest block of native vegetation lies to ~1 km to the north west. Hence, the vegetation in the proposal area cannot be considered an important corridor. However, the notion of corridor can be expanded to include a more diffuse "corridor" that includes low density development. The proposal would result in a portion of the land mirroring the same diffuse corridor that is adjacent and a portion retained undisturbed.

Excluding the proposal and within 1 km of the lot, there are 140 ha of native habitat representing 23% of land. Within 2 km, there are 530 ha of native habitat representing 30% of land. A substantial habitat patch is 1.3 km north and another 1.4 km west in the rural resource zone. A large patch occurs 2.3 km south in the environmental protection zone. These habitats include the habitats type as the lot on Ecclestone Road. Within 5 km there are 3300 ha of native habitat representing 36% of the land. The predominant habitat type is the same as is at

[1] North Barker Ecosystem Services (2019) Ecclestone Road subdivision. Natural Values Assessment, 6 February 2019, For 6ty°, SIX001
[2] North Barker Ecosystem Services (2020) Ecclestone Road subdivision, Natural Values Assessment – Response to Representations, Addendum, 5TH February 2020, For 6ty°, SIX001

Ecclestone Road. Given this context the impact of the development is not expected to reduce species diversity in the bioregion.

Accordingly, the development can meet this criterion.

b) means of removal; and

This is unknown at this stage.

c) value of riparian vegetation in protecting habitat values; and

The riparian vegetation is in the south-east corner of the property, and this vegetation will not be impacted by this development. The development can therefore meet this criterion.

d) impacts of siting of development (including effluent disposal) and vegetation clearance or excavations, in proximity to habitat or vegetation; and

Within the context of this development there are no alternatives regarding siting as the entire property is entirely native vegetation; the siting of the development will therefore unavoidably impact native vegetation. The native vegetation communities (DAD and NBA) are however well-represented in the bioregion, and the development will not meaningfully compromise the representation of these communities or their species in the bioregion. The development can therefore meet this criterion.

e) need for and adequacy of proposed vegetation or habitat management; and

Given the nature of this development and the landscape context a weed management plan would be appropriate to minimise the risk of the introduction and spread of weeds that are present, particularly on the balance lot.

Given the scale of this development it is not expected that additional vegetation or habitat management plans are required. The development can therefore meet this criterion.

f) conservation outcomes and long-term security of any offset in accordance with the General Offset Principles for the RMPS, Department of Primary Industries, Parks, Water and Environment.

RMPS and DPIPWE Offset guidelines - the guidelines do not identify a requirement for offsets for any vegetation or species affected by the development of any lot. The guidelines are high level and not species specific and it is not expected that the species that will be impacted (particularly *Brunonia australis*) will require offsetting by DPIPWE under these principles.

It is our understanding that the potential need for an offset would be a consideration of Council and based on the proposed impact to threatened flora (~50 *Brunonia australis*) it is not expected that an offset will be required.

6 Conclusion and recommendations

A 38-lot subdivision is planned for Ecclestone Road in Riverside, in northern Tasmania. This will involve the clearance of ~21.3 ha of native vegetation for 37 lots and an internal access road. Lot 38 is the balance area of 15.5 ha and is not planned for development in the short to medium term. A summary of the impact to natural values and recommendations is as follows:

<u>Vegetation communities</u>

The planned development will remove 15.74 and 5.54 ha of DAD and NBA communities, respectively. Neither of these communities are protected under any Act. Mitigating vegetation clearance in residential developments is difficult to achieve but the impact to the communities that remain in the area can be reduced by managing the spread of weeds and pathogens; in general, it is recommended that:

- All occurrences of declared weeds are treated prior to works.
- Best practice construction hygiene[45] should be practiced to prevent the spread of weed propagules in contaminated soil.
- Follow-up weed control implemented 6-12 months after works to treat any individuals that have colonised the disturbance area.

Additionally, indirect impacts on vegetation outside the proposed impact area for the lots should be avoided by clearly defining the extent of the impact area on construction plans and the ground. All potential ancillary impact areas (e.g. parking, site office and lay down areas) should be located in the proposed impact area for the lots and not located outside the proposed impact area as defined in this report.

Threatened flora

A total of 50 plants of *Brunonia australis* (TSPA rare) were recorded in the impact area. A 'permit to take' from DPIPWE will be required to disturb these plants.

There are NVA records of *Poa mollis* in three locations in the proposal area: two areas in the proposed impact area (comprising one and an unknown number of plants), and one in the balance comprising 20 plants. Although we were unable to locate these plants and are doubtful this species still occurs in the proposal area, a 'permit to take' from DPIPWE may be required for impact to these plants.

No flora listed under the EPBCA were recorded or are expected to occur.

Threatened fauna

The proposal area contains habitat for several threatened fauna species listed under the TSPA and EPBCA: Tasmanian devil and quolls, eastern barred bandicoot, Tasmanian wedge-tailed eagle and Tasmanian masked owl.

A Tasmanian wedge-tailed eagle's nest was located on the balance lot (~170 m from the nearest residential lot boundary and 150 m from the nearest developed lot at 260 Ecclestone Road). This nest is relatively new and given the relatively exposed location of the tree, the relatively small size of the tree and supporting boughs, and the nest structure itself, it is quite possible this nest will not be used for breeding. There is no evidence that this nest was used for breeding in 2019. If the nest is shown to be used for breeding, regulatory protocols require building and vegetation clearance activities to occur outside the breeding season (July to January/February inclusive). This is an impractical outcome and requires resolution with DPIPWE.

Six trees were recorded in the proposal area that contain hollows that are potentially suitable for Tasmanian masked owl. Three of these trees are in the proposed impact area and should be checked for nests before any impact to these trees. The probability of occurrence is low.

The area is suitable for foraging and breeding for Tasmanian devil and quolls. The DPIPWE pre-clearance survey protocols for dens should be undertaken prior to any disturbance.

Based on the current proposal and the current knowledge of the Matters of National Environmental Significance the impact is unlikely to cause a significant impact.

[45] DPIPWE 2015

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Appendix A: Plant species recorded in the proposal area

Status codes:

ORIGIN	NATIONAL SCHEDULE	STATE SCHEDULE
i - introduced	EPBC Act 1999	TSP Act 1995
d - declared weed WM Act	CR - critically endangered	e - endangered
en - endemic to Tasmania	EN - endangered	v - vulnerable
t - within Australia, occurs only in Tas.	VU - vulnerable	r - rare

Sites:

1	DAD - E506048, N5414409	26/06/2018	Richard White
2	NBA - E506407, N5414836	26/06/2018	Richard White
3	DOV - E506539, N5414470	26/06/2018	Richard White
4	DVG - E506563, N5414426	26/06/2018	Richard White

Site	Name	Common name	Status
	DICOTYLEDONAE		
	APIACEAE		
1	*Hydrocotyle hirta*	hairy pennywort	
	ASTERACEAE		
1	*Carduus pycnocephalus*	slender thistle	d
1 4	*Cassinia aculeata subsp. aculeata*	dollybush	
1 2	*Cirsium vulgare*	spear thistle	i
1 2	*Euchiton japonicus*	common cottonleaf	
1	*Hypochaeris radicata*	rough catsear	i
1	*Lagenophora stipitata*	blue bottledaisy	
1	*Senecio sp.*	groundsel	
	BORAGINACEAE		
1	*Cynoglossum suaveolens*	sweet houndstongue	
	BRUNONIACEAE		
1	*Brunonia australis*	blue pincushion	r
	CAMPANULACEAE		
1	*Wahlenbergia sp.*	bluebell	
	CASUARINACEAE		
1	*Allocasuarina littoralis*	black sheoak	
	CONVOLVULACEAE		
1 2	*Dichondra repens*	kidneyweed	
	DROSERACEAE		
1	*Drosera hookeri*	grassland sundew	en
1	*Drosera peltata subsp. auriculata*	tall sundew	
	EPACRIDACEAE		
1	*Acrotriche serrulata*	ants delight	
1	*Epacris impressa*	common heath	
1	*Lissanthe strigosa subsp. subulata*	peachberry heath	
	EUPHORBIACEAE		
1	*Poranthera microphylla*	small poranthera	
	FABACEAE		
1	*Bossiaea prostrata*	creeping bossiaea	
1	*Daviesia latifolia*	hop bitterpea	
3	*Ulex europaeus*	gorse	d
	FUMARIACEAE		
1	*Fumaria sp.*	fumitory	i
	GENTIANACEAE		
1 2 4	*Centaurium erythraea*	common centaury	i
1	*Centaurium tenuiflorum*	slender centaury	i
1	*Cicendia filiformis*	slender cicendia	i

	GERANIACEAE		
1	*Geranium sp.*	native geranium	
	GOODENIACEAE		
1	*Goodenia lanata*	trailing native-primrose	
	HALORAGACEAE		
1 2	*Gonocarpus tetragynus*	common raspwort	
	LAURACEAE		
1 3 4	*Cassytha melantha*	large dodderlaurel	
	MIMOSACEAE		
1 2 3 4	*Acacia dealbata subsp. dealbata*	silver wattle	
1	*Acacia floribunda*	gossamer wattle	i
2 4	*Acacia mearnsii*	black wattle	
1 2	*Acacia melanoxylon*	blackwood	
1	*Acacia verticillata*	prickly moses	
	MYRTACEAE		
1 2 3 4	*Eucalyptus amygdalina*	black peppermint	en
3	*Eucalyptus ovata var. ovata*	black gum	
1 3 4	*Eucalyptus viminalis subsp. viminalis*	white gum	
1 3	*Melaleuca ericifolia*	coast paperbark	
	OLEACEAE		
1	*Ligustrum vulgare*	privet	i
	OXALIDACEAE		
1 2 4	*Oxalis perennans*	grassland woodsorrel	
	PITTOSPORACEAE		
1	*Billardiera mutabilis*	green appleberry	
1 2 4	*Bursaria spinosa subsp. spinosa*	prickly box	
1	*Pittosporum undulatum*	sweet pittosporum	i
	PLANTAGINACEAE		
1	*Plantago lanceolata*	ribwort plantain	i
	POLYGALACEAE		
1	*Comesperma volubile*	blue lovecreeper	
	PRIMULACEAE		
1	*Lysimachia arvensis*	scarlet pimpernel	i
	RANUNCULACEAE		
1	*Clematis aristata*	mountain clematis	
1 2 3 4	*Clematis sp.*	clematis	
	ROSACEAE		
1 2	*Acaena novae-zelandiae*	common buzzy	
4	*Cotoneaster sp.*	cotoneaster	i
2	*Rosa rubiginosa*	sweet briar	i
1 3 4	*Rubus fruticosus*	blackberry	d
	RUBIACEAE		
1 2	*Coprosma quadrifida*	native currant	
1	*Galium sp.*	bedstraw	
	SANTALACEAE		
1 2 4	*Exocarpos cupressiformis*	common native-cherry	
	SCROPHULARIACEAE		
1	*Veronica calycina*	hairy speedwell	
	SOLANACEAE		
1	*Solanum laciniatum*	kangaroo apple	
	THYMELAEACEAE		

1	*Pimelea humilis*	dwarf riceflower	
	VIOLACEAE		
1	*Viola hederacea*	ivyleaf violet	
	MONOCOTYLEDONAE		
	ARACEAE		
1	*Zantedeschia aethiopica*	arum lily	i
	CYPERACEAE		
1	*Carex breviculmis*	shortstem sedge	
1 2 3 4	*Gahnia radula*	thatch sawsedge	
1 2 3	*Lepidosperma ensiforme*	arching swordsedge	
1 2 3 4	*Lepidosperma laterale*	variable swordsedge	
	IRIDACEAE		
1	*Diplarrena moraea*	white flag-iris	
	JUNCACEAE		
1	*Juncus procerus*	tall rush	
1	*Juncus sarophorus*	broom rush	
	LILIACEAE		
1	*Arthropodium strictum*	chocolate lily	
1	*Bulbine bulbosa*	golden bulbine-lily	
1	*Burchardia umbellata*	milkmaids	
1	*Dianella revoluta*	spreading flaxlily	
1	*Thysanotus patersonii*	twining fringelily	
1	*Wurmbea uniflora*	oneflower early nancy	
	ORCHIDACEAE		
1	*Chiloglottis triceratops*	threehorned bird-orchid	
1	*Pterostylis sp.*	greenhood	
1	*Thelymitra nuda*	plain sun-orchid	
	POACEAE		
1	*Agrostis capillaris*	brown top bent grass	i
1	*Aira caryophyllea*	silvery hairgrass	i
1	*Anthoxanthum odoratum*	sweet vernalgrass	i
1	*Austrostipa semibarbata*	fibrous speargrass	
1 2 4	*Austrostipa sp.*	speargrass	
1 4	*Briza minor*	lesser quaking-grass	i
1	*Cynosurus echinatus*	rough dogstail	i
1 4	*Dactylis glomerata*	cocksfoot	i
1	*Ehrharta distichophylla*	hairy ricegrass	
1	*Ehrharta stipoides*	weeping grass	
1 4	*Poa labillardierei*	silver tussockgrass	
1	*Poa rodwayi*	velvet tussockgrass	
1 4	*Poa sp.*	poa	
1 2	*Rytidosperma sp.*	wallabygrass	
1 2 4	*Themeda triandra*	kangaroo grass	
	XANTHORRHOEACEAE		
1 2 3	*Lomandra longifolia*	sagg	
	PTERIDOPHYTA		
	ASPIDIACEAE		
2 3	*Polystichum proliferum*	mother shieldfern	
	BLECHNACEAE		
3	*Blechnum nudum*	fishbone waterfern	
	DENNSTAEDTIACEAE		
1 3	*Pteridium esculentum subsp. esculentum*	bracken	
	DICKSONIACEAE		
1 3	*Dicksonia antarctica* soft treefern	soft treefern	