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53 McAuleys Lane, Myocum - Lot 8 DP 589795

Ecological Assessment - Rezoning Proposal

Client:	Tareeda Developments Pty Ltd and Boreas Group Pty Ltd
Prepared by:	Biodiversity Assessments & Solutions Pty Ltd
Date:	28th November 2020

Project Control

Project name: 53 McAuleys Lane, Myocum

Ecological Assessment – Rezoning Proposal

Job number: 201009

Client: Tareeda Developments Pty Ltd and Boreas Group Pty Ltd

Contact: c/o Dwayne Roberts, Ardill Payne & Partners

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Contents

1 Introduction and Background

Biodiversity Assessments & Solutions has prepared this ecological assessment for Ardill Payne & Partners on behalf of Tareeda Developments Pty Ltd and Boreas Group Pty Ltd. This report is to inform their submission for a Planning Proposal/LEP Amendment Request to Byron Shire Council (BSC) for an area of land identified as Lot 8 DP 589795, located approximately 2.5 km south east of Mullumbimby.

The aim of this assessment is to determine the ecological significance of the site and identify any key ecological issues with respect to the planning proposal and subsequent development of the site, particularly regarding any threatened species, populations or communities listed under the *Biodiversity Conservation Act 2016*, and the likely impacts of the proposal and subsequent development on biodiversity values pursuant to the *Biodiversity Conservation Regulation 2017*.

1.1 Site Summary

The site comprises one rural lot (Lot 8 DP 589795) approx. 35 ha in size which is located approx. 2.5 km south east of the township of Mullumbimby (Figure 1.1). Site elevation is variable and ranges between approx. 11-70 m AHD, with undulating topographical variations. Several drainage lines identified as 1st or 2nd order, intersect the site. The major drainage line occurs in the north west of the site and flows east.

Plate 1.1: View looking south east with cleared grazing pasture and fragmented woody vegetation.

Vegetation at the site is highly disturbed, fragmented and distinguished between substantially cleared grazing pasture and regrowth forest dominated by the invasive exotic species Camphor Laurel*

* Denotes exotic species

(*Cinnamomum camphora*). Mature native rainforest trees including Brush Box (*Lophostemon confertus*), Hoop Pine (*Araucaria cunninghamii*) and *Ficus* spp. are scattered throughout the site within regrowth forest areas and as isolated paddock trees. Several areas of native and exotic plantation also occur throughout the site. Vegetation is dominated by exotic species through all forest layers, with vegetation structure and composition generally being in low condition.

The site has a long history of use for grazing agriculture as evidenced by remaining ancillary infrastructure. The site also includes a main residential dwelling in the south and a secondary residential structure in the northern section.

Plate 1.2: View looking north with steeper northern portion of the site in foreground.

1.2 Streams and Drainage

Drainage lines at the site consist of non-perennial 1st and 2nd order streams which ultimately flow eastward and connect to Simpsons Creek located approx. 3 km to the east (Figure 1.2). Several agricultural dams occur, predominantly along drainage lines in the northern portion of the site, with the largest having a surface area of approx. 5,000m² located in the central northern portion of the site (Plate 1.3).

Drainage lines are generally devoid of significant riparian vegetation (Plate 1.4) with most streams across the site consisting of patchy and exotic dominated regrowth vegetation. The 1st and 2nd order streams in the northern portion of the site, although generally dominated by exotic vegetation through each structural layer, contain the most expansive areas of riparian associated vegetation and associated potential habitat (Plate 1.5).

Plate 1.3: The 2nd order stream in the north of the site has been dammed.

Plate 1.4: Steep land in the central east part of site with ephemeral drainage lines and small farm dam.

1.3 Underlying Geology

The site is located mostly on Lismore basalt described as predominantly tholeiitic with occasional alkaline types of formations. The south -south east portion of the site is underlain by the Neranleigh - Fernvale beds which are described as being feldspathic and lithic meta-arenite, metasiltstone and conglomerate proximal turbidite, with structurally intercalated or stratigraphically underlying chert, jasper and mafic meta-volcanics.

The 2nd order stream running west to east in the northern portion of the site and a small portion of the far north western 1st order stream are underlain by alluvial valley deposits consisting of silt, clay, fluvially deposited lithic to quartz-lithic sand and gravel. These areas flow eastward to an area of alluvial floodplain deposits located approx. 250m to the east.

Plate 1.5: The 1st order stream in the far north contains some patchy riparian and instream vegetation.

1.4 The Proposal

The proposal is a Planning Proposal / LEP Amendment Request and involves the rezoning of the land from the current zoning, part RU1 Primary Production and part DM Deferred Matter (Figure 1.3) to part R5 Large Lot Residential, part RU2 Rural Landscape, and part E2 Environmental Conservation (Figure 1.4).

A concept design for developable areas (Figure 1.5) has been identified to avoid and minimise biodiversity impacts and maximise use of low constraint exotic pasture.

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Figure 1.1: Study site and location.

Legend

- Study Site - Lot 8 DP 589795
- RoadCorridor
- ByronVeg2017_May18
- Railway
- Lot
- Contours - 10m
- Hydroline
- WaterFeature
- Hydroarea
- NPWSReserve

1:10000

0 100 200 300 400 500 m

ATTRIBUTION PARTIES

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Topographic: © Land and Property Information [2020]
Cadastral: © Land and Property Information [2020]
Vegetation: © Byron Shire Council [2017]

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Figure 1.2: Stream order with buffers and underlying geology.

Legend

- Study Site - Lot 8 DP 589795
- Lot
- Hydroline
- Stream Order Buffers - Study Site
- Contours - 1m DEM_clipped site
- Geological boundaries & Faults

Cenozoic Sedimentary - Rock Units

- Alluvial fan deposits
- Alluvial floodplain deposits
- Alluvial valley deposits

Cenozoic Igneous - Rock Units

- Lismore Basalt

New England Orogen - Rock Units

- Neranleigh-Fernvale beds

1:3250

0 75 150 m

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Figure 1.3: Study site & current zoning for the locality.

Legend

- Study Site - Lot 8 DP 589795
- RoadCorridor
- Railway
- Lot
- Contours - 10m
- Hydroline
- WaterFeature
- Hydroarea
- NPWSReserve

LZN_CRS28356_clipped 1.5km

- Deferred Matter
- General Industrial
- Infrastructure
- Large Lot Residential
- Natural Waterways
- Primary Production
- Rural Landscape

1:7500

0 100 200 300 400 m

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Figure 1.4: Concept site proposal - rezoning.

Legend

- Study Site - Lot 8 DP 589795
- RoadCorridor
- Lot
- Contours - 10m
- Hydroline
- WaterFeature

Concept Zoning Plan_sketched

- E2
- R5
- RU2

1:3250

0 75 150 m

ATTRIBUTION PARTIES

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Figure 1.5: Concept site proposal – draft lot layout.

Legend

- Study Site - Lot 8 DP 589795
- RoadCorridor
- Lot
- Contours - 10m
- Hydroline
- WaterFeature

Concept Zoning Plan_sketched

- E2
- R5
- RU2

1:3250

0 75 150 m

ATTRIBUTION PARTIES

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Cadastral: © Land and Property Information [2020]
Vegetation: © Byron Shire Council [2017]

2 Methods

2.1 Summary

The approach utilised to undertake this ecological assessment of the proposal site is consistent with NSW OEH Survey and Assessment Guidelines (2017) and are as follows, with results described in Section 3 and Section 4.

- GIS data, metadata and literature review;
- Review of the BioNet Atlas of NSW Wildlife database on the 23rd October 2020;
- Site visits/surveys over five (5) days for plant community type identification, threatened flora species search, threatened fauna habitat assessment, and Koala feed tree / activity search;
- Preliminary BAM Calculator Credit Species assessment;
- Threatened species profile database assessment;
- Preliminary statutory and constraints analysis; and
- Preliminary direct and indirect impact assessment.

2.2 Survey Limitations

The field survey methods are in accordance with NSW OEH field survey methods. No targeted fauna surveys were undertaken for this rezoning proposal and seasonal constraints may have limited search results for specific flora species, however, if preferred habitat requirements were met, threatened species are assumed to have the potential to occur. Due to the objectives of this assessment, and as no impacts would occur for the rezoning proposal, the fauna survey methods are considered adequate.

Plate 2.1: Native rainforest trees occur in association with Camphor forest or as paddock trees.

3 Flora Results

3.1 Desktop Assessment

A search of the BioNet Atlas of NSW Wildlife (23rd October 2020), based on the area within 1.5 km of site boundary, returned records for seven (7) threatened flora species listed in the BC Act (Table 3.1 and Figure 3.1). None of these records appear within the boundaries of the study site (Figure 3.1), however, two (2) of those species were also recorded during site surveys (Section 3.2).

Table 3.1: Threatened flora species recorded within 1.5 km radius of the site boundary.

Class	Family	Scientific Name	Common Name	NSW Status	Cth. Status
Flora	Fabaceae (Mimosoideae)	*Acacia bakeri*	Marblewood	V	-
Flora	Fabaceae (Mimosoideae)	*Archidendron hendersonii*	White Lace Flower	V	-
Flora	Menispermaceae	*Tinospora tinosporoides*	Arrow-head Vine	V	-
Flora	Myrtaceae	*Syzygium hodgkinsoniae*	Red Lilly Pilly	V	V
Flora	Myrtaceae	*Syzygium moorei*	Durobby	V	V
Flora	Proteaceae	*Floydia praealta*	Ball Nut	V	V
Flora	Proteaceae	*Macadamia tetraphylla*	Rough-shelled Bush Nut	V	V

V = Vulnerable; E = Endangered; P = Protected

In addition to a threatened flora BioNet Atlas search, a preliminary assessment of the site was undertaken using the BAM calculator based on the best matching PCTs identified for the site. The BAM calculator identified 68 candidate threatened flora species requiring assessment for the site (Table 3.2). Table 3.2 includes all seven (7) species found in Table 3.1.

Table 3.2: BAM Candidate threatened flora species generated by the BAM calculator for the site.

Class	Family	Scientific Name	Common Name	NSW Status	Cth. Status
Flora	Acanthaceae	*Harnieria hygrophiloides*	Harnieria hygrophiloides	E	-
Flora	Acanthaceae	*Isoglossa eranthemoides*	Isoglossa	E	E
Flora	Apocynaceae	*Cynanchum elegans*	White-flowered Wax Plant	E	E
Flora	Apocynaceae	*Marsdenia longiloba*	Slender Marsdenia	E	V
Flora	Apocynaceae	*Ochrosia moorei*	Southern Ochrosia	E	E
Flora	Argophyllaceae	*Corokia whiteana*	Corokia	V	V
Flora	Asteraceae	*Ozothamnus vagans*	Wollumbin Dogwood	E	V
Flora	Cunoniaceae	*Davidsonia jerseyana*	Davidson's Plum	E	E
Flora	Cunoniaceae	*Davidsonia johnsonii*	Smooth Davidson's Plum	E	E
Flora	Cyperaceae	*Cyperus aquatilis*	Water Nutgrass	E	-
Flora	Cyperaceae	*Cyperus semifertilis*	Missionary Nutgrass	E	V

Class	Family	Scientific Name	Common Name	NSW Status	Cth. Status
Flora	Doryanthaceae	*Doryanthes palmeri*	Giant Spear Lily	V	-
Flora	Ebenaceae	*Diospyros mabacea*	Red-fruited Ebony	E	E
Flora	Ebenaceae	*Diospyros yandina*	Shiny-leaved Ebony	E	-
Flora	Elaeocarpaceae	*Elaeocarpus williamsianus*	Hairy Quandong	E	E
Flora	Euphorbiaceae	*Acalypha eremorum*	Acalypha	E	-
Flora	Euphorbiaceae	*Fontainea australis*	Southern Fontainea	V	V
Flora	Fabaceae (Caesalpinioideae)	*Cassia marksiana*	Cassia marksiana	E	-
Flora	Fabaceae (Caesalpinioideae)	*Senna acclinis*	Rainforest Cassia	E	-
Flora	Fabaceae (Faboideae)	*Desmodium acanthocladum*	Thorny Pea	V	V
Flora	Fabaceae (Faboideae)	*Rhynchosia acuminatissima*	Rhynchosia acuminatissima	V	-
Flora	Fabaceae (Faboideae)	*Sophora fraseri*	Brush Sophora	V	V
Flora	Fabaceae (Mimosoideae)	*Acacia bakeri*	Marblewood	V	-
Flora	Fabaceae (Mimosoideae)	*Archidendron hendersonii*	White Lace Flower	V	-
Flora	Lauraceae	*Cryptocarya foetida*	Stinking Cryptocarya	V	V
Flora	Lauraceae	*Endiandra floydii*	Crystal Creek Walnut	E	E
Flora	Lauraceae	*Endiandra hayesii*	Rusty Rose Walnut	V	V
Flora	Lauraceae	*Endiandra muelleri subsp. bracteata*	Green-leaved Rose Walnut	E	-
Flora	Lindsaeaceae	*Lindsaea brachypoda*	Short-footed Screw Fern	E	-
Flora	Marattiaceae	*Angiopteris evecta*	Giant Fern	E	-
Flora	Meliaceae	*Owenia cepiodora*	Onion Cedar	V	V
Flora	Menispermaceae	*Tinospora tinosporoides*	Arrow-head Vine	V	-
Flora	Myrtaceae	*Choricarpia subargentea*	Giant Ironwood	E	-
Flora	Myrtaceae	*Gossia fragrantissima*	Sweet Myrtle	E	E
Flora	Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	CE	-
Flora	Myrtaceae	*Rhodomyrtus psidioides*	Native Guava	CE	-
Flora	Myrtaceae	*Syzygium hodgkinsoniae*	Red Lilly Pilly	V	V
Flora	Myrtaceae	*Syzygium moorei*	Durobby	V	V
Flora	Orchidaceae	*Oberonia complanata*	Yellow-flowered King of the Fairies	E	-
Flora	Orchidaceae	*Oberonia titania*	Red-flowered King of the Fairies	V	-
Flora	Orchidaceae	*Peristeranthus hillii*	Brown Fairy-chain Orchid	V	-
Flora	Orchidaceae	*Sarcochilus weinthalii*	Blotched Sarcochilus	V	V
Flora	Orobanchaceae	*Centranthera cochinchinensis*	Swamp Foxglove	E	-
Flora	Phyllanthaceae	*Phyllanthus microcladus*	Brush Sauropus	E	-

Class	Family	Scientific Name	Common Name	NSW Status	Cth. Status
Flora	Poaceae	*Arthraxon hispidus*	Hairy Jointgrass	V	V
Flora	Polypodiaceae	*Belvisia mucronata*	Needle-leaf Fern	E	-
Flora	Polypodiaceae	*Drynaria rigidula*	Basket Fern	E	-
Flora	Primulaceae	*Myrsine richmondensis*	Ripple-leaf Muttonwood	E	E
Flora	Proteaceae	*Eidothea hardeniana*	Nightcap Oak	E	CE
Flora	Proteaceae	*Floydia praealta*	Ball Nut	V	V
Flora	Proteaceae	*Grevillea hilliana*	White Yiel Yiel	E	-
Flora	Proteaceae	*Hicksbeachia pinnatifolia*	Red Boppel Nut	V	V
Flora	Proteaceae	*Macadamia tetraphylla*	Rough-shelled Bush Nut	V	V
Flora	Rhamnaceae	*Pomaderris notata*	McPherson Range Pomaderris	V	-
Flora	Rubiaceae	*Oldenlandia galioides*	Oldenlandia galioides	E	-
Flora	Rubiaceae	*Randia moorei*	Spiny Gardenia	E	E
Flora	Rutaceae	*Acronychia littoralis*	Scented Acronychia	E	E
Flora	Rutaceae	*Bosistoa transversa*	Yellow Satinheart	V	V
Flora	Rutaceae	*Coatesia paniculata*	Axe-Breaker	E	-
Flora	Rutaceae	*Melicope vitiflora*	Coast Euodia	E	-
Flora	Salicaceae	*Xylosma terrae-reginae*	Queensland Xylosma	E	-
Flora	Sapindaceae	*Cupaniopsis serrata*	Smooth Tuckeroo	E	-
Flora	Sapindaceae	*Diploglottis campbellii*	Small-leaved Tamarind	E	E
Flora	Sapindaceae	*Lepiderema pulchella*	Fine-leaved Tuckeroo	V	-
Flora	Sapotaceae	*Niemeyera chartacea*	Smooth-leaved Plum	E	-
Flora	Sapotaceae	*Niemeyera whitei*	Rusty Plum	V	-
Flora	Symplocaceae	*Symplocos baeuerlenii*	Small-leaved Hazelwood	V	V
Flora	Urticaceae	*Dendrocnide moroides*	Gympie Stinger	E	-

V = Vulnerable; E = Endangered; P = Protected

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Figure 3.1: BioNet Atlas threatened flora & vegetation mapping in 1.5 km.

Legend

- Study Site - Lot 8 DP 589795
- 1.5 km Site Assessment Circle
- RoadCorridor
- Railway
- Lot
- Contours - 10m
- Hydroline
- WaterFeature
- BioNet Atlas Records_FLORA_1.5km

ByronVeg2017_May18_clipped 1.5 km

- Camphor Laurel >80%
- Camphor Laurel 51-80%
- Coastal Floodplain Wetlands
- Coastal Freshwater Lagoons
- Coastal Swamp Forests
- Mangrove Swamps
- North Coast Wet Sclerophyll Forests
- Open Water
- Planted Exotic Pine
- Planted Hoop Pine
- Planted Landscaping, Mixed
- Planted Orchard
- Planted Rainforest
- Planted Sclerophyll
- Saltmarshes
- Subtropical Rainforests

1:13250

0 125 250 375 500 m

3.2 Site Assessment

The vegetation at the site is characterised by small, fragmented forest patches dominated by the Class 4 noxious weed, Camphor Laurel* (*Cinnamomum camphora*), with infrequent to occasional native subtropical rainforest species or planted native eucalyptus species. Other exotic species such as Slash Pine (*Pinus elliotti*) are also becoming more prevalent. Exotic species are denoted with the * symbol.

Mature native vegetation is rare, generally occurring as remnant paddock trees, in association with residential dwellings or farm structures across the site, or in the vicinity of drainage lines in the north of the site. However, all vegetation structural layers in forest areas are dominated by exotic species.

For the purposes of this assessment, the site has been broadly delineated into four (4) vegetation categories. These are illustrated in Figure 3.2 and described as being:

1. Cleared exotic grassland;
2. Subtropical rainforest (with Camphor Laurel to >90%)
3. Freshwater wetland; and
4. Plantation – eucalyptus, orchard, or native and exotic rainforest species.

3.2.1 Vegetation Category Descriptions

1. Cleared exotic grassland (~26.7ha or 76% of site)

General Comments: Cleared open pasture dominated by exotic grasses and herbs. Contains occasional isolated native or exotic paddock trees. Occurs over most of the site on both gently undulating and steeper slopes. Little to no native species regeneration was observed over most of these areas, with slightly more exotic and native species regeneration occurring on the steeper southern slopes.

Plate 3.1: Cleared exotic grassland is the most extensive of the vegetation communities identified.

Upper Stratum: Rare to occasional native (rainforest species) or exotic paddock trees (generally Camphor Laurel*).

Mid Stratum: Absent.

Ground Stratum: Dominated by exotic grasses and herbs including Whisky Grass (*Andropogon virginicus*), Vasey Grass* (*Paspalum urvillei*), Setaria* (*Setaria sphacelata*), Bahia Grass* (*Paspalum notatum*), Buffalo Grass* (*Stenotaphrum secundatum*), Kikuyu* (*Cenchrus clandestinus*), Mullumbimby Couch* (*Cyperus brevifolius*), Fireweed* (*Senecio madagascariensis*); and Cuphea (*Cuphea carthagenensis*).

Condition Rating: Very Low.

2. Subtropical Rainforest with Camphor Laurel* (to >90%) (~5.7ha or 16% of site)

General Comments: Predominantly located adjacent to the drainage line/s in the north east of the site, with other small, fragmented patches occurring sporadically and along the steeper southern slopes, or as isolated paddock trees. Rarely occurs as small patches of consolidated forest vegetation, with Camphor Laurel* dominance generally increasing with size of vegetation patch.

Plate 3.2: Small area of mixed Camphor Laurel and Rainforest species in the north west of the site.

Upper Stratum: Camphor Laurel* (*Cinnamomum camphora*) occurs as one of the major dominant species across the site, with relative abundance varying significantly, and generally increasing with size of vegetation patch. Native rainforest species occur through most areas with species such as Brush Box (*Lophostemon confertus*), Hoop Pine (*Araucaria cunninghamii*), Foam Bark (*Jagera pseudorhus*), Tuckeroo (*Cupaniopsis anacardioides*), Guioa (*Guioa semiglauca*), Teak (*Flindersia australis*) and several Fig species (*Ficus spp.*) also occurring.

Middle Stratum: Generally absent, however dominated by exotic species when present with species including Camphor Laurel* (*Cinnamomum camphora*), Tobacco Bush* (*Solanum mauritianum*), Small-leaved Privet* (*Ligustrum sinense*), Large-leaved Privet* (*Ligustrum lucidum*), Senna* (*Senna pendula*), Umbrella Tree* (*Schefflera actinophylla*) and Lantana* (*Lantana camara*). Native species generally infrequent and consisting of widespread coastal district species such as Cockspur (*Maclura cochinchinensis*) and other species occurring through the canopy.

Ground Stratum: Dominated by Camphor Laurel* seedlings and other exotic species such as Broad-leaved Paspalum* (*Paspalum mandiocanum*) and Coral Berry* (*Ardisia crenata*). Native species regeneration is generally poor to non-existent.

Condition Rating: Very Low to Moderate.

3. Freshwater Wetland (~1.2 ha or 4% of site)

General Comments: Occurs in a few locations across the rezoning site proposal as a result of the anthropogenic damming of non-perennial drainage lines. Contain a mixture of native and exotic wetland plants or those with adaptations to periodic inundation on dam edges. Variation in depth profile is the predominant determining factor as to relative abundance of exotic species (particularly grasses) and native species. Deeper areas contained a mixture of exotic and native floating macrophytes and very shallow depressions were almost completely dominated by exotic grasses. All wetland areas are subject to grazing impacts.

Plate 3.3: Farm dam with floating macrophytes and edge wetland sedges, grasses and forbs.

Upper Stratum: Absent.

Middle Stratum: Absent.

Ground Stratum: Generally consist of a suite of species in varying abundances depending on the depth profile including Giant Waterlily (*Nymphaea gigantea*), Nardoo (*Marsilea mutica*), Water Snowflake (*Nymphoides indica*), River Buttercup (*Ranunculus inundatus*), Couch (*Cynodon dactylon*), Water Pepper (*Persicaria hydropiper*), Knot Weed (*Persicaria strigosa*), Hairy Commelina* (*Commelina benghalensis*), Blue Commelina (*Commelina cyanea*), Slender Knotweed (*Persicaria decipiens*), Spike Rush (*Eleocharis equisetina*), Water Primrose (*Ludwigia peploides ssp. montevidensis*); Peruvian Primrose* (*Ludwigia peruviana*), Dirty Dora (*Cyperus difformis*), Giant Sedge (*Cyperus exaltatus*) and Bunchy Sedge* (*Cyperus polystachyos*).

Condition Rating: Low to moderate.

4. Plantation – Orchard, Eucalyptus, Exotic Palm, Exotic Pine and Casuarina (~1.4ha or 4% of site)

General Comments: Occurs predominantly in the north of the site associated with the original residential location, along driveways, and surrounding the current main residence in the southern central portion of the site. A wide range of planted vegetation types occur with both native and exotic species (Slash Pine* and various orchard species) represented. These areas still offer some current biodiversity value by way of foraging habitat (e.g. rainforest fruits, Koala feed trees, or *Casuarina* cones).

Upper Stratum: Species including *Eucalyptus spp., Casuarina glauca,* various rainforest species, Slash Pine* (*Pinus elliottii*) and a variety of cultivated orchard varieties.

Middle Stratum: Absent.

Ground Stratum: Generally, as per description and species for Community 1 – Cleared exotic grassland.

Condition Rating: Low

Plate 3.4: Palm plantation in the north west of the site.

3.2.2 Threatened Ecological Communities

Areas of consolidated vegetation akin to forest areas are largely absent, with the single largest contiguous section of forest vegetation being an area of approx. 2.5ha in the north east of the site. Several small units of vegetation (<0.75ha) also occur which are generally in poor condition and lack structural components, with a high dominance of Camphor Laurel* and other exotic species. Areas of patchy native and exotic regeneration occur predominantly on steeper slopes in the south.

Subtropical Rainforest species occur across the site with species such as Brush Box, Hoop Pine, and *Ficus* spp. being most abundant. Despite the dominance of exotic species through most structural layers across the site, it is considered that some of the vegetation at the site contains sufficient elements, to varying degrees to be considered for inclusion as *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* listed in Schedule 2 of the BC Act.

Arguments could be had for the exclusion of most of the mapped areas for reasons including the small and fragmented size of most polygons, missing structural layers highlighting the lack of structural integrity, and the dominance of exotic species through most vegetation. It is likely that the condition of most vegetation on the site would result in a Vegetation Integrity Score (VIS) in accordance with the Biodiversity Assessment Method which would exclude the vegetation from consideration as an EEC.

Plate 3.5: Area of Subtropical Rainforest dominated by Camphor Laurel in the north east of the site.

Areas mapped as being freshwater wetland occur as a result of building of dams for agriculture within non-perennial drainage lines. The abundance of freshwater wetland species has undoubtedly been directly influenced as a result of their creation.

Some of the areas of freshwater wetland associated with the 1st and 2nd order drainage lines in the north of the site do potentially satisfy the EEC locational criteria for *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* of

'association with floodplain' as a result of their occurrence on alluvial valley deposits which occur in association with the alluvial floodplain to the east of the site.

However, the level of anthropogenic disturbance is likely to exclude these areas as an EEC as per the Scientific Committee determination which states "Artificial wetlands created on previously dry land specifically for purposes such as sewerage treatment, stormwater management and farm production, are not regarded as part of this community, although they may provide habitat for threatened species".

3.2.3 Threatened Flora

Three (3) threatened flora species listed in Schedule 1 of the BC Act were recorded at the site. These were Scrub Turpentine (*Rhodamnia rubescens*) (Plate 3.7), Durobby (*Syzygium moorei*) and Rough-shelled Bush Nut (*Macadamia tetraphylla*). The individuals of Rough-shelled Bush Nut are unlikely to be from a wild population and likely to have been planted in the vicinity of the original dwelling on the site.

As site surveys were not able to cover all survey periods identified in the BAMC Candidate Species, several other species were considered for their potential to occur in the Test of Significance assessment process.

Plate 3.6: Several individuals of Rhodamnia rubescens were recorded at the site with Myrtle Rust evident.

Table 3.3: Threatened flora species within 1.5 km or identified as a BAM candidate species with the potential to occur and not surveyed for – likelihood of occurrence.

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
Acacia bakeri	Marblewood	Marblewood grows in or near lowland subtropical rainforest, in adjacent eucalypt forest and in regrowth of both. It usually occurs in the understorey but may occur as a large canopy tree.	Low	Not recorded during surveys, habitat generally degraded. However, has been recorded adjacent to the site so could potentially occur.
Archidendron hendersonii	White Lace Flower	White Lace Flower occurs in riverine and lowland subtropical rainforest, littoral rainforest, coastal cypress pine forest and their ecotones. It is found on a variety of soils including coastal sands and those derived from basalt and metasediments.	Low	Not recorded during surveys, habitat generally degraded. However, has been recorded proximal to the site so could potentially occur.
Centranthera cochinchinensis	Swamp Foxglove	Uncommon in swampy areas and other moist sites.	Very Low	Generally uncommon as a species, not previously recorded in Byron Shire and potential habitat at the site is degraded.
Cyperus aquatilis	Water Nutgrass	Grows in ephemerally wet sites, such as roadside ditches and seepage areas from small cliffs, in sandstone areas.	Very Low	Generally uncommon as a species, not previously recorded in Byron Shire and potential habitat at the site is degraded.
Tinospora tinosporoides	Arrow-head Vine	Wetter subtropical rainforest, including littoral rainforest, on fertile, basalt-derived soils.	Low	Not recorded during surveys, habitat generally degraded. However, has been recorded proximal to the site so could potentially occur.
Syzygium hodgkinsoniae	Red Lilly Pilly	Usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils.	Low	Not recorded during surveys, habitat generally degraded.
Syzygium moorei	Durobby	Durobby is found in subtropical and riverine rainforest at low altitude. It often occurs as isolated remnant paddock trees.	Recorded	One (1) mature individual recorded at the site. Other records occur proximal to the site so could potentially occur.
Floydia praealta	Ball Nut	Riverine and subtropical rainforest, usually on soils derived from basalt.	Low	Not recorded during surveys, habitat generally degraded.

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
Macadamia tetraphylla	Rough-shelled Bush Nut	Found in subtropical rainforest, usually near the coast.	Recorded	Several mature individuals and seedlings identified from near original residence at the site. Mature individuals are likely planted specimens rather than a wild population, with seedlings germinating near those.
Oldenlandia galioides	*Oldenlandia galioides*	Margins of seasonally inundated wetlands in paperbark swamps and Forest Red Gum (Eucalyptus tereticornis) woodlands.	Very Low	Generally uncommon as a species, typical habitat is not present at the site, not previously recorded in Byron Shire and potential habitat at the site is degraded.
Rhodamnia rubescens	Scrub Turpentine	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Recorded	Seven (7) living individuals and two (2) dead stumps were located at the site. All living specimens were impacted by Myrtle Rust. Other individuals of this species may have occurred previously at the site.

biodiversity assessments & solutions

Figure 3.2: Site vegetation and BioNet flora records for site and locality.

Legend

- Study Site - Lot 8 DP 589795
- RoadCorridor
- Lot
- Contours - 10m
- Hydroline
- BioNet Atlas Records_FLORA_1.5km

Vegetation - Site

- Plantation (Eucalyptus)
- Plantation (Eucalyptus/Rainforest)
- Plantation (Exotic Palm)
- Plantation (Exotic Pine)
- Plantation (Orchard)
- Plantation (Swamp Oak)
- Subtropical Rainforest
- Subtropical Rainforest (Camphor 10-50%)
- Subtropical Rainforest (Camphor 51-80%)
- Subtropical Rainforest (Camphor 81-100%)
- Freshwater Wetland / Dam

Threatened Species - Site

- Durobby
- Macadamia
- Scrub Turpentine

1:3250

0 75 150 m

3.3 Discussion

The site has been historically impacted since European settlement by way of clearing associated with agriculture, and subsequent grazing. Some regeneration has occurred, particularly in association with drainage line segments, however, regeneration has significantly advantaged exotic species, in particular Camphor Laurel*, such that the structure and diversity of all vegetation across the entirety of the site is generally poor, and not representative of its likely pre-European condition. Furthermore, all structural layers of all different vegetation communities identified for the site are generally dominated by exotic species.

The cleared agricultural land occupies a majority of the site and is almost entirely dominated by exotic grasses and herbs, with little to no native vegetation. Isolated paddock trees are generally Camphor Laurel* with occasional occurrences of some locally common native species such as Hoop Pine and Brush Box.

Areas of consolidated vegetation more akin to forested areas are largely absent, with the single largest contiguous section of forest vegetation being an area of approx. 2.5ha in the north east of the site. Several small units of vegetation (<0.75ha) also occur which are generally in poor condition with a high dominance of Camphor Laurel. Occasional mature native trees occur, almost exclusively near creeks and drainage lines, or more commonly associated with residential dwellings of each relevant land parcel or as isolated paddock trees.

Subtropical Rainforest species occur across the site with species such as Brush Box, Hoop Pine, and *Ficus* spp. being most abundant. Despite the dominance of exotic species through most structural layers across the site, it is considered that vegetation at the site contains sufficient elements, to varying degrees to be considered for inclusion as *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* listed in Schedule 2 of the BC Act. However, it is also noted that arguments could be had for the exclusion of most of the mapped areas for reasons including the small and fragmented size of most polygons, missing structural layers highlighting the lack of structural integrity, and the dominance of exotic species through most vegetation.

A continuation of existing use at the site is likely to result in the continued and increasing dominance of exotic species, particularly Camphor Laurel and exotic grasses through all vegetation communities. It would be expected that without active management the sites' vegetation condition would remain low and continue to reduce over time.

The construction of farm dams in association with non-perennial drainage lines has created habitat analogous with Freshwater Wetlands. However, as this habitat is a direct result of anthropogenic activities, it is likely that these areas would likely be precluded from consideration as the EEC *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* listed in Schedule 2 of the BC Act.

The proposal would be expected to be able to be accommodated at the site without impacting any significant vegetation or threatened flora species recorded at the site, or others with the potential to occur.

4 Fauna

4.1 Desktop Assessment

The site is within the southern portion of the Burringbar-Conondale Ranges IBRA subregion which contains a high diversity of fauna species. A search of the NSW Wildlife Atlas (23rd October 2020) based on an area within 1.5 km of the study site edge, identified the confirmed records of six (6) threatened fauna species listed in Schedule 1 of the BC Act (refer Table 4.1 and Figure 4.1).

The 1.5 km site buffer also contains the mapped Wilsons sub-regional corridor. The Wilsons sub-regional corridor is identified as being an important subregional link network for fragmented key habitats of coastal plain to hinterland and identified as of importance to the Eastern Blossum-bat, Koala & Stephens Banded Snake (refer Figure 4.1).

Table 4.1: Threatened fauna species recorded within 1.5 km of the site.

Class	Family	Scientific Name	Common Name	NSW Status	Cth Status
Aves	Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E	
Aves	Columbidae	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V	
Aves	Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V	
Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V
Mammalia	Potoroidae	*Potorous tridactylus*	Long-nosed Potoroo	V	V
Mammalia	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V

V = Vulnerable; E = Endangered; CE = Critically Endangered pursuant to the *BC Act*.

In addition to a threatened flora BioNet Atlas search, a preliminary assessment of the site was undertaken using the BAM calculator based on the best matching PCTs identified for the site which were selected from the major formations of Rainforest, Freshwater Wetland and Wet Sclerophyll Forests.

The BAM calculator identified 23 Candidate threatened fauna species requiring assessment for the site (refer Table 4.2). Table 4.2 includes only one (1) species also found in Table 4.1, although Grey-headed Flying-fox (*Pteropus poliocephalus*), is only considered a candidate species if breeding habitat requirements were met.

Table 4.2: BAM Candidate threatened fauna species generated by the BAM calculator for the site.

Class	Family	Scientific Name	Common Name	NSW Status	Cth Status
Amphibia	Hylidae	*Litoria brevipalmata*	Green-thighed Frog	V	
Amphibia	Hylidae	*Litoria olongburensis*	Olongburra Frog	V	V
Amphibia	Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V	

Class	Family	Scientific Name	Common Name	NSW Status	Cth Status
Amphibia	Myobatrachidae	*Mixophyes iteratus*	Giant Barred Frog	E	E
Aves	Psittacidae	*Cyclopsitta diophthalma coxeni*	Coxen's Fig-Parrot	CE	E
Aves	Accipitridae	*Haliaeetus leucogaster**	White-bellied Sea-Eagle	V	
Aves	Accipitridae	*Hieraaetus morphnoides**	Little Eagle	V	
Aves	Accipitridae	*Lophoictinia isura**	Square-tailed Kite	V	
Aves	Accipitridae	*Pandion cristatus**	Eastern Osprey	V	
Aves	Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V	
Aves	Scolopacidae	*Calidris ferruginea**	Curlew Sandpiper	E	CE
Aves	Scolopacidae	*Calidris tenuirostris**	Great Knot	V	CE
Aves	Strigidae	*Ninox strenua**	Powerful Owl	V	
Aves	Tytonidae	*Tyto novaehollandiae**	Masked Owl	V	
Gastropoda	Camaenidae	*Thersites mitchellae*	Mitchell's Rainforest Snail	E	CE
Insecta	Noctuidae	*Phyllodes imperialis southern subsp.*	Southern Pink Underwing Moth	E	E
Insecta	Nymphalidae	*Argynnis hyperbius*	Laced Fritillary		
Insecta	Petaluridae	*Petalura litorea*	Coastal Petaltail	E	
Mammalia	Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V	
Mammalia	Dasyuridae	*Planigale maculata*	Common Planigale	V	
Mammalia	Miniopteridae	*Miniopterus australis**	Little Bent-winged Bat	V	
Mammalia	Miniopteridae	*Miniopterus orianae oceanensis**	Large Bent-winged Bat	V	
Mammalia	Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V	
Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V
Mammalia	Pteropodidae	*Pteropus poliocephalus**	Grey-headed Flying-fox	V	V
Mammalia	Vespertilionidae	*Myotis macropus*	Southern Myotis	V	
Reptilia	Elapidae	*Cacophis harriettae*	White-crowned Snake	V	
Reptilia	Elapidae	*Hoplocephalus bitorquatus*	Pale-headed Snake	V	
Reptilia	Scincidae	*Coeranoscincus reticulatus*	Three-toed Snake-tooth Skink	V	V

V = Vulnerable; E = Endangered; CE = Critically Endangered pursuant to the *BC Act.*

** Breeding habitat required to be considered as candidate species*

4.2 Site Assessment

The on-ground assessment involved a meandering habitat survey of the site with regard for the suitability of the habitat for those threatened species recorded within 1.5 km of the site (NSW BioNet) and others with the potential to occur such as those identified as Candidate credit species in the BAMC.

The site contains several available habitats which are suitable for a range of fauna classes, however, they are generally in low condition due to a high level of infiltrations of exotic species, occur as small

fragmented patches and are regularly impacted by routine agricultural management activities. Habitat characteristics and disturbance parameters were assessed for the site to provide an understanding of habitat quality contained within the site collectively and the potential for threatened fauna to occur (refer Table 4.3).

Table 4.3: Habitat characteristics and disturbance parameters

Habitat Assessment Parameters	Score
Hollows in trees and stags	2
Nests and roosts	2
Winter flowering eucalypts	2
Koala food trees	2
Natural burrows	1
Fallen logs (>10cm diam.)	3
Decorticating bark	3
Coarse litter (>2cm diam.)	3
Fine litter (<2cm diam.)	2
Bare ground	1
Grass	7
Stones (20-60cm)	1
Boulders (61cm-2m)	1
Large boulders (>2m)	0
Wetlands, streams, other waterbodies	4
Habitat Disturbance Parameters	
Wildfire	0
Clearing/logging	-3
Grazing	-2
Weeds	-3
Erosion	-1
TOTAL	25

Characteristic Abundance Key:
0 = Nil; 1 = Rare; 2 = Rare to occasional; 3 = Occasional; 4 = Occasional to common; 5 = Common; 6 = Common to abundant; 7 = Abundant

Disturbance Rating Key:
0 = Nil; -1 = Rare to occasional; -2 = Common; -3 = Abundant

Total Habitat Rating Key:
0-21 = Low Value; 22-42 = Moderate Value; 43-63 = Good Value; 64-84 = High Value; 85-105 = Near Pristine

The site was assessed as being at the low end of the moderate value category, which is indicative of the large size and the varied habitats of the site but balanced by the small and degraded nature of natural habitats within the site. It also indicates that the site is likely to favour those fauna species with a reliance on wetland or riparian areas or those that favour open exotic grassland of varied heights.

4.2.1 Threatened Fauna Habitat

The suitability of the site for threatened vertebrate fauna previously recorded within the 1.5 km assessment circle or identified as a BAM candidate species with the potential to occur is described in Table 4.4. This assessment has been undertaken following desktop spatial analysis, field habitat surveys, review of OEH Threatened Species Profiles and other relevant literature.

The likelihood of occurrence for any of the threatened fauna species identified through the NSW Wildlife Atlas Database search (refer Table 4.1) or selected from the BAM candidate species list (refer Table 4.2) have been considered in reference to habitat features and vegetation communities at the site.

An indication of whether additional surveys may be required is also provided in the recommendations. The precise path of assessment would ultimately depend on the final subdivision design and assessment process.

Plate 4.1: Most of the site consists of exotic dominated pasture and has low biodiversity value.

Table 4.4: Threatened fauna species within 1.5 km or identified as a BAM candidate species with the potential to occur – likelihood of occurrence.

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
Amphibia				
Litoria brevipalmata	Green-thighed Frog	Occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range but extends into drier forests in northern NSW and southern Queensland.	Very Low	Typical habitat does not occur at the site which is highly disturbed. A general absence of suitable vegetation assemblages across the site reduce the viability of the site as potential habitat. No records occur in the BioNet Atlas for Byron Shire. The most valuable amphibian wetland habitat associated with the rezoning site would be retained and protected under the current concept proposal design. No preferred habitat for this species would be impacted by the proposal.
Mixophyes iteratus	Giant Barred Frog	Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams. Breeding takes place from late spring to summer. Once eggs are laid and fertilised in the water, the female kicks them out of the water where they stick onto a suitable bank (e.g. overhanging or steeply sloped). Hatchlings drop or wriggle into the water. Tadpoles grow to about 11cm and it may take up to 14 months between egg laying and the completion of metamorphosis. Although generally found within about 20m of the stream, outside the breeding season, the Giant Barred Frog may disperse away from the stream (e.g. 50m or further). It is a generalist feeder, with large insects, snails, spiders and frogs included in its diet.	Low	This species does have the potential to occur in the northern portion of the site where suitable habitat does occur despite its degraded condition. However, there are no records within approx. 10km of the site and it's proximity to a major road may affect it's suitability.

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
Aves				
Calyptorhynchus lathami	Glossy Black-Cockatoo	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuaraina diminuta*, and *A. gymnathera*. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*). Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	Very Low	Typical habitat does not occur at the site which is highly disturbed. No remnant areas of vegetation occur at the site with it being historically cleared. A small windrow of planted *Casuarina sp.* Near the entrance to the site on McAuleys Rd represent the only suitable foraging habitat. Areas of potential habitat occur further east of the site where *Casuarina sp.* Naturally occur, as well as in the wider locality with the presence of *Allocasuarina sp.* Searches did not record evidence of usage and the site is not considered significant for this species. Potential impacts of the proposal on this species are likely to be negligible.
Ephippiorhynchus asiaticus	Black-necked Stork	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Usually forage in water 5-30cm deep for vertebrate and invertebrate prey. Eels regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish). Build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat).	Moderate	Previously recorded at the site in 2006. The site contains some suitable habitat for periodic foraging requirements and has the potential to be utilised by this species on occasion. It is possible that development of the site would preclude site suitability, with other suitable locations in the locality likely to be preferred.
Haliaeetus leucogaster	White-bellied Sea-Eagle	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or seashore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland,	Very Low	The site does not currently contain any nests of this species and does not contain any suitable living or dead mature trees within preferred vegetation for nesting. The site does not contain suitable foraging habitat

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
		and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals, and carrion.		either and is unlikely to offer any opportunities for carrion resources.
Ixobrychus flavicollis	Black Bittern	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds. When disturbed, freezes in a characteristic bittern posture (stretched tall, bill pointing up, so that shape and streaked pattern blend with upright stems of reeds), or will fly up to a branch or flush for cover where it will freeze again. Like other bitterns, but unlike most herons, nesting is solitary. Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks.	Low	The site contains some areas of wetlands with marginal fringing vegetation requirements, despite being relatively disturbed. Natural drainage lines with riparian vegetation would be retained and protected from development. The proposal would not result in any impacts on potential habitat or food resources for this species.
Pandion cristatus	Eastern Osprey	Favour coastal areas, especially the mouths of large rivers, lagoons, and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Low	The site does not currently contain any nests of this species and does not contain any living or dead mature trees (> 15 m) within suitable vegetation for nesting. The site is >1 km from the coast (site approx. 4 km from coast) which further reduces potential suitability.
Ptilinopus regina	Rose-crowned Fruit-Dove	Occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. They feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits.	Moderate	The site contains a limited variety and small area relative to site size of potentially suitable food resources for fruit doves, including rainforest species and Camphor Laurel. The site is not considered to represent suitable

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
		Some populations are migratory in response to food availability - numbers in north-east NSW increase during spring and summer then decline in April or May.		roosting habitat due to fragmentation of rainforest pockets, although there is some potential to occur at the site on occasion for foraging purposes. The proposal would not result in any significant impacts on resources in the locality. Extensive preferred habitat is also available in the locality, and therefore the proposal is considered unlikely to impact on this mobile species.
Ptilinopus superbus	Superb Fruit-Dove	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. There are records of single birds flying into lighted windows and lighthouses, indicating that birds travel at night. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn. Breeding takes place from September to January. The nest is a structure of fine interlocked forked twigs, giving a stronger structure than its flimsy appearance would suggest, and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species. The male incubates the single egg by day, the female incubates at night.	Moderate	The site contains a limited variety and small area relative to site size of potentially suitable food resources for fruit doves, including rainforest species and Camphor Laurel. The site is not considered to represent suitable roosting habitat due to fragmentation of rainforest pockets, although there is some potential to occur at the site on occasion for foraging purposes. The proposal would not result in any significant impacts on resources in the locality. Extensive preferred habitat is also available in the locality, and therefore the proposal is considered unlikely to impact on this mobile species.
Tyto novaehollandiae	Masked Owl	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Low	The site does not represent typical roosting or foraging habitat for this species and no large hollows occur. Limited habitat for small mammal prey items is also likely to further reduce the importance of the site for this species and reduce foraging potential. The proposal would be unlikely to result in any impacts on potential habitat or food resources, and therefore the proposal is unlikely to impact

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
				on this species. Preferable high-quality habitat for this species occurs elsewhere in the shire, particularly west of the assessment circle.
Gastropoda				
Thersites mitchellae	Mitchell's Rainforest Snail	Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground around the edges of wetlands with palms and fig trees are particularly favoured habitat. Typically found amongst leaf litter on the forest floor, and occasionally under bark in trees. Active at night and feeds on leaf litter, fungi and lichen.	Very Low	Typical habitat does not occur at the site which is highly disturbed. No remnant areas of vegetation occur at the site with it being historically cleared. A small area of potential habitat occurs in the north east, however, this area is highly degraded and is regularly disturbed. Searches did not record evidence of usage. Spatial separation of the site from areas of potential habitat would likely preclude any potential occurrence of this species.
Insecta				
Phyllodes imperialis southern subspecies	Southern Pink Underwing Moth	The Southern Pink Underwing Moth is found in subtropical rainforest below about 600 m elevation. Potential breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, *Carronia multisepalea,* occurs in subtropical rainforest. Adult Southern Pink Underwing Moths require the low light conditions of the rainforest in order to breed.	Very Low	The site could potentially support this species; however, the caterpillar's food plant was not recorded during site surveys. Areas that have the potential to support this food plant would be most likely restricted to the north east corner and southern slopes. These areas are unlikely to be impacted by the proposal.
Mammalia				
Cercartetus nanus	Eastern Pygmy-possum	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest.	Low	This species occurs in a variety of habitats; however, the site does not represent typical habitat for this species nor does it contain an abundance of food sources. Potential shelters locations occur in more mature native vegetation; however, it is unlikely that any preferred

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
		Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal. Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.		vegetation with respect to foraging or nesting would be impacted as a result of the proposal.
Planigale maculata	Common Planigale	Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. They are fierce carnivorous hunters and agile climbers, preying on insects and small vertebrates, some nearly their own size. They breed from October to January. The female builds a nest lined with grass, eucalypt leaves or shredded bark.	Low	Some marginal potential habitat occurs at the site, however, most areas of vegetation generally luck some of the structural habitat requirements preferred by this species. The site is likely to contain suitable prey, particularly in riparian forested areas with some level of ground cover present.
Miniopterus australis	Little Bentwing-bat	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.	Moderate	The site does not represent typical habitat for this species. This species forages widely and therefore it would be accepted that potential foraging and low value temporary roosting habitat occur at the site in the few mature trees remaining at the site. However, no valuable roosting habitat occurs at the site. Therefore, the site is not considered to contain preferred habitat,

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
		In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats (*Miniopterus schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. Only five maternity colonies are known in Australia.		although there is potential for this species to utilise the site for foraging.
Miniopterus orianae oceanensis	Large Bent-winged Bat	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Moderate	The site does not represent typical habitat for this species. This species forages widely and therefore it would be accepted that potential foraging and low value temporary roosting habitat occur at the site in the few mature trees remaining at the site. However, no valuable roosting habitat occurs at the site. Therefore, the site is not considered to contain preferred habitat, although there is potential for this species to utilise the site for foraging.
Phascolarctos cinereus	Koala	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.	Low	The site contains a few small polygons of Schedule 2 tree species, occurring entirely as planted windrows or in association with gardens circa residential buildings at the site. However, the site does not contain any suitable areas of forest, nor would it be considered to contain habitat important to this species. It is possible this species may infrequently pass through the site to reach more suitable habitat in the wider area, although few recent local records occur. No records of usage were recorded during site surveys undertaken for the proposal.
Pteropus poliocephalus	Grey-headed Flying-fox	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are	Moderate	The site contains some suitable foraging resources, primarily exotic species such as Camphor Laurel, several small to medium F*icus*

Scientific Name	Common Name	Habitat Requirements	Likelihood of Occurrence	Rationale
		commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage but more often <20 km. Feed on the nectar and pollen of native trees, particularly Eucalyptus, Melaleuca & Banksia, & fruits of rainforest trees & vines. Also forage in gardens & fruit crops.		spp. and planted fruit trees. The site contains limited native rainforest fruits, or nectars from rainforest or sclerophyll species. It is likely that this species would forage at the site on occasion.
Myotis macropus	Southern Myotis	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.	Moderate	Marginal potential foraging habitat occurs over farm dam/wetland areas. Temporary low value roosting habitat may occur at the site, or in immediately adjacent areas. The site is not considered to contain preferred habitat, although there is potential for this species to utilise the site on occasions.
Reptilia				
Hoplocephalus bitorquatus	Pale-headed Snake	The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken. The Pale-headed Snake is relatively unusual amongst elapid snakes in that it is well adapted to climbing trees.	Very Low	The site does not represent typical habitat for this species and the small size of habitat likely capable of providing marginal habitat is likely to preclude the site as representative of valuable habitat. Suitable prey is likely to be available at the site in order to support this species, and it would not be expected that either sheltering or foraging habitat would be significantly impacted by the proposal.

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Figure 4.1: BioNet Atlas threatened fauna records within 1.5km and mapped habitat corridors.

Legend

- Study Site - Lot 8 DP 589795
- 1.5 km Site Assessment Circle
- RoadCorridor
- Railway
- Lot
- Contours - 10m
- Hydroline
- WaterFeature
- BioNet Atlas Records_FAUNA_1.5km

FaunaCorridors_NE_NSW

- regional
- subregional

1:13250

0 125 250 375 500 m

4.3 Discussion

The site is situated on elevated land in a heavily cleared landscape surrounded by the coastal floodplain. Elevations range between approx. 10-70 m AHD. The 1.5 km site buffer also contains the mapped Wilsons sub-regional corridor which is identified as being an important subregional link network for fragmented key habitats of the coastal plain to hinterland and identified as of importance to the Eastern Blossum-bat, Koala & Stephens Banded Snake. The nearest protected area is the Brunswick Heads Nature Reserve which is located approx. 2,000 m to the north east of the site.

The site has been extensively cleared, with remnant native species and important habitat structural features infrequent. Forest vegetation at the site has been reduced to small and fragmented patches generally dominated by Camphor Laurel* in the upper storey and a suite of other exotics through all structural layers. Regeneration across the site is dominated by a suite of exotic vegetation, with native regeneration limited. Gardens, plantation areas and occasional paddock trees occurring within exotic grassland provide limited habitat suitability for most species. Tree hollows in mature vegetation are generally small, infrequent, and likely to favour smaller hollow dependent species.

Wetland areas occur predominantly in association with dammed drainage lines in the north of the site, with these providing some habitat opportunities for native and exotic amphibian species, and limited aquatic fauna habitat. No areas of mapped fish habitat occur at the site.

As a result of significant historical impacts, and general low condition of habitat, the site represents mostly marginal habitat value for native fauna. Vegetation is degraded, fragmented, and does not form part of an important habitat corridor. The habitat assessment indicated that the habitat value is of low to moderate quality (refer Table 4.3). The presence of small drainage lines with derived freshwater wetlands in association with farm dams provide limited habitat, although these drainage lines and associated riparian habitats are degraded and generally in low condition.

Plate 4.2: Some potential habitat features associated with drainage lines and farm dams occurs at the site.

The suitability of the site for threatened fauna previously recorded in the 1.5 km assessment circle or identified as a BAM candidate species with the potential to occur, and the likelihood of occurrence is assessed in Table 4.4. The suitability assessment has been undertaken following desktop spatial analysis, site habitat assessment and review of OEH Threatened Species Profiles.

It was generally concluded that the site does not represent significant habitat for any threatened fauna species, however, additional seasonal surveys may be required for those threatened fauna species with the potential to occur and to be impacted by the proposal.

Plate 4.3: Habitat features such as cracks, crevices and small hollows occur in association with native paddock trees.

5 Statutory Assessment and Constraints

The proposal has been examined in the context of relevant environmental legislation and planning instruments. The assessment considers the site attributes, threatened species records, vegetation condition and habitat potential.

Key legislation and planning instruments assessed and of most relevance include:

- Biodiversity Conservation Act 2016 (BC Act);
- Biodiversity Conservation Regulation 2017 (BC Regulation);
- Coastal Management Act 2016;
- Water Management Act 2000 (WM Act); and
- State Environmental Planning Policy (Koala Habitat Protection) 2019;
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

5.1 Biodiversity Conservation Act 2016

Three (3) threatened flora species listed under the BC Act were recorded at the site (refer S3.2), although timing/seasonal requirements for select species were not ideal and additional flora surveys may be required. Species recorded were Scrub Turpentine (*Rhodamnia rubescens*), Durobby (*Syzygium moorei*) and Rough-shelled Bush Nut (*Macadamia tetraphylla*). It is considered that the individuals of Rough-shelled Bush Nut are unlikely to be from a wild population and likely to have been planted in the vicinity of the original dwelling on the site.

No threatened fauna species were recorded, although targeted fauna surveys were not undertaken, and surveys focused on habitat suitability only. Depending on the assessment pathway, additional fauna surveys may be required.

Although highly degraded, there are small wetland areas which share diagnostic criteria with the endangered ecological community (EEC) freshwater wetlands on coastal floodplains. However, these areas are generally considered to be artificial constructs of agricultural management at the site over several decades and therefore not considered to satisfy the relevant criteria of the EEC Scientific Committee determination.

It would be expected that careful concept design would enable impacts on biodiversity to be avoided and minimised, and as such the proposal is not likely to result in any significant impacts to threatened species, populations, ecological communities or their habitats.

The rezoning proposal does not constitute an activity that will exceed the thresholds of the Biodiversity Offsets Scheme (BOS) under Clause 7.4 of the Act and Part 7 of the BC Regulation (refer S.5.2). Further assessment under the Act would be required for subdivision when additional layout details are provided.

5.2 Biodiversity Conservation Regulation 2017

Part 6 of the BC Regulation introduces the Biodiversity Offsets Scheme (BOS) with Clause 6.1 identifying additional biodiversity impacts to which the scheme applies. These impacts on biodiversity values would need to be assessed under the BOS for any future development of the site. As the site is generally in low condition, it would be expected that concept design would be able to avoid and minimise impacts on the biodiversity of the site, mitigate for development impacts, and adopt strategies to improve the biodiversity values of the site.

Part 7 of the BC Regulation prescribes the biodiversity assessment and approvals under the *Environmental Planning and Assessment Act 1979* (EP&A Act) and details when an activity exceeds a threshold and therefore requires assessment under the Biodiversity Offset Scheme (BOS). Three main threshold triggers apply.

1. Area clearing threshold (Clause 7.2) – depends on the minimum lot size under the relevant LEP as defined in Table 5.1.

Table 5.1: Clearing thresholds Part 7.2 BC Regulation.

Minimum lot size of land	Area of clearing
Less than 1 hectare	0.25 hectare or more
Less than 40 hectares but not less than 1 hectare	0.5 hectare or more
Less than 1,000 hectares but not less than 40 hectares	1 hectare or more
1,000 hectares or more	2 hectares or more

2. Biodiversity Values Map threshold (Clause 7.3) – clearing of native vegetation or additional biodiversity impacts (Clause 6.1) within Biodiversity Values (BV) Map exceeds threshold. Land incorporating a buffer along Yankee Creek is mapped on the BV Map (refer Figure 5.1) as protected riparian land, and therefore if native vegetation clearing is required within this mapped area, a Biodiversity Development Assessment Report (BDAR) would be required.

3. A threatened species 'test of significance' – for all local developments that do not exceed the BOS threshold. If the 'test of significance' assessment indicates that there will be a significant impact, this exceeds the threshold, and the proponent must carry-out a BAM assessment.

5.3 Coastal Management Act 2016

The Act defines the coastal zone as comprising four coastal management areas of which each has different characteristics, however, at times overlap. The four coastal management areas are:

1. Coastal wetlands and littoral rainforests area – areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
2. Coastal vulnerability area – areas subject to coastal hazards such as coastal erosion and tidal

inundation.

3. Coastal environment area – areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.
4. Coastal use area – land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The site does not contain any areas of coastal wetlands or littoral rainforests and is not within the proximity areas for either of these categories. The site occurs outside of the Coastal Use Area and only a small area of the Coastal Environmental Area intersects with the site in the far north west corner. However, the features described as characterising the Coastal Environmental Area do not occur at the site and it is considered that the *Coastal Management Act 2016* and therefore the SEPP (Coastal Wetlands) 2018 are not overly relevant to the proposal.

5.4 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. Controlled activity approvals (CAA) are required in certain circumstances to authorize its holder to carry out a specified controlled activity.

Plate 5.1: Drainage lines would be suitable for re-establishment of vegetated riparian buffers.

Guidelines for riparian corridors on waterfront land have been developed by NSW DPI Office of Water to provide recommended vegetated riparian zone (VRZ) width for watercourses based on their Strahler System watercourse type.

Where suitable, applicants may undertake non-riparian corridor works or development within the outer 50% of a VRZ, if they offset this activity by connecting an equivalent area to the VRZ within the

development site.

The site contains mapped drainage lines, including a 2nd order stream running west to east through the northern portion of the site. Recommended buffer widths for watercourses would need to be considered for any concept design (refer Figure 5.1).

5.5 SEPP (Koala Habitat Protection) 2019

The Koala Habitat Protection SEPP came into effect on 1 March 2020, replacing and repealing SEPP 44. The policy intent has been retained, with the aim of the SEPP identified as:

"This Policy aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline".

Plate 5.2: Further Koala assessment is likely to be required pursuant to the SEPP.

Clause 9(1) of the SEPP indicates that it applies to the site as:

- the land is identified on the Koala Development Application Map (refer Figure 5.2), and
- the land has an area of at least 1 hectare (including adjoining land within the same ownership), and
- the land does not have an approved koala plan of management applying to the land.

Therefore, pursuant to Clause 9(2) of the SEPP, before the council may grant consent to a development application for consent to carry out development on the land, the Council must take into account –

(a) the requirements of the Guideline, or

(b) information, prepared by a suitably qualified and experienced person in accordance with the

Guideline, provided by the applicant to the council demonstrating that—

I. the land does not include any trees belonging to the feed tree species listed in Schedule 2 for the relevant koala management area, or

II. the land is not core koala habitat.

As Clause 9(1) of the SEPP applies, the development assessment requirements of core Koala habitat is triggered. Therefore the survey methods according to Appendix C of the Guidelines must be applied to the site in the preparation of a development application to establish if the development constitutes a Tier 1 or Tier 2 development, and whether the preparation of a Koala Assessment Report is required.

The site contains small areas of trees listed in Schedule 2 of the Koala Habitat Protection SEPP and numerous records occur within the locality (refer Figure 5.2).

5.6 Environment Protection and Biodiversity Conservation Act 1999

Two (2) species, Durobby (*Syzygium moorei*) and Rough-shelled Bush Nut (*Macadamia tetraphylla*), listed under the EPBC Act, have been recorded at the site. However, it is considered that the individuals of Rough-shelled Bush Nut are unlikely to be from a wild population and likely to have been planted in the vicinity of the original dwelling on the site.

Federally listed flora species such as Hairy Jointgrass (*Arthraxon hispidus*), although not detected at the time of survey, and fauna species including Koala (*Phascolarctos cinereus*), may require additional assessment for preparation of the subdivision DA. However, it is reasonably expected that the proposal and subsequent development of the site would be able to be accommodated without significant impact on any Matters of National Environmental Significance (MNES).

Where land may be subject to the EPBC Act, the Federal Minister for Environment has no power to prohibit the rezoning of land, because the rezoning of land is not an 'action' for the purposes of the EPBC Act.

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Figure 5.1: Biodiversity Value & Coastal Management Act mapping.

Legend

- Study Site - Lot 8 DP 589795
- 1.5 km Site Assessment Circle
- RoadCorridor
- Railway
- Lot
- Contours - 10m
- Hydroline
- WaterFeature
- Biodiversity Value Mapping

Coastal Management Act Layers

- Coastal_Wetland
- Coastal_Wetland_Proximity_Area
- Coastal_Use_Area
- Coastal_Environmental_Area
- Littoral_Rainforest
- Littoral_Rainforest_Proximity_Area

1:13250

0 125 250 375 500 m

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Figure 5.2: Koala BioNet records & Koala habitat mapping within 2.5km.

Legend

- Study Site - Lot 8 DP 589795
- 1.5 km Site Assessment Circle
- 2.5 km Site Assessment Circle
- RoadCorridor
- Railway
- Lot
- Contours - 10m
- Hydroline
- WaterFeature
- Koala BioNet Atlas Records_2.5km

FaunaCorridors_NE_NSW

- regional
- subregional

KoalaHabitat

- Primary
- Secondary (Class A)
- Secondary (Class B)
- Other
- Unknown

1:20000

0 150 300 450 600 m

ATTRIBUTION PARTIES

Aerials: © NearMap Pty Ltd [2020]
Topographic: © Land and Property Information [2020]
Cadastral: © Land and Property Information [2020]
Vegetation: © Byron Shire Council [2017]

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Figure 5.3: Key site ecological constraints.

Legend

- Study Site - Lot 8 DP 589795
- RoadCorridor
- Lot
- Contours - 10m
- Hydroline
- Steep/Highly Erodible Land (>18%)

Vegetation - Site

- Plantation (Eucalyptus)
- Plantation (Eucalyptus/Rainforest)
- Brush Box-Ironbark-Hoop Pine+ R/f
- Plantation (Exotic Pine)
- Plantation (Orchard)
- Plantation (Swamp Oak)
- Subtropical Rainforest
- Subtropical Rainforest (Camphor 10-50%)
- Subtropical Rainforest (Camphor 51-80%)
- Subtropical Rainforest (Camphor 81-100%)
- Freshwater Wetland / Dam

Threatened Species - Site

- Durobby
- Macadamia
- Scrub Turpentine

1:3250

0 75 150 m

6 Management Strategies to Minimise Impacts

The potential direct and indirect impacts taken into consideration for this assessment also include the future development of the site based on concept designs provided. Potential impacts on flora and fauna are considered below with key mitigation measures provided.

6.1 Clearing or Fragmentation

Modification or removal of some native vegetation may be required at the site for the establishment of asset protection zones (APZ), infrastructure and services provision. It is considered that due to the abundance of exotic vegetation at the site, the proposal and subsequent development would be able to be accommodated with minimal impacts to native vegetation.

Vegetation at the site is already highly disturbed and fragmented and the proposal would not result in additional habitat fragmentation. Offsets could be accommodated on site if mitigation against any potential loss is required.

Mitigation Measures

- Area to be impacted to be clearly marked to ensure no residual impacts to adjacent areas.
- Native trees containing habitat features (i.e. hollows) would be retained as a priority.
- Native trees with a DBH of greater than 50cm would be retained as a priority.
- Native trees removed would be compensated for in a consolidated offset area to be identified.
- Landscaping would specify suitable locally occurring native species.
- Retain and improve or reconstruct creek riparian buffers to allow for meaningful connectivity across the study site.

6.2 Habitat Loss or Disturbance

Habitat loss for native fauna is expected to be negligible due to the low to moderate condition habitat currently occurring at the site and the opportunity to consolidate and enhance habitat. Future development disturbances would generally be short term and restricted to the immediate proposal area. No areas of habitat significance would be impacted.

Mitigation Measures

- Implement mitigation measures identified in Section 6.1.
- Undertaken pre-clearing surveys of site vegetation.
- Establish tree protection zone (TPZ) fencing where required to protect significant trees.
- Retain and improve key potential habitat features such as freshwater wetlands, creek lines and riparian features.

6.3 Water Quality and Hydrology Impacts

There is some potential for sediment and nutrient loads to impact downstream environments during site preparation and future development. Appropriate planning and mitigation would be recommended to ensure any risk is further reduced.

Mitigation Measures

- Avoid and minimise potential impacts on water quality both onsite and off-site by planning for adequate buffers in the design phase.
- Ensure implementation of best practice erosion and sediment controls prior to any vegetation removal or construction activities and monitor effectiveness.
- Maintain sediment and erosion controls and continue monitoring until the site is stabilised.
- Plan for revegetation and/or appropriate buffers of watercourse edges to further reduce potential impacts to aquatic and riparian habitats.

Plate 6.1: Mitigation measures are required to ensure no direct or indirect impacts to key ecological features such as site drainage lines.

7 Summary and Conclusion

Biodiversity Assessments & Solutions has prepared this ecological assessment for Ardill Payne & Partners on behalf of Tareeda Developments Pty Ltd and Boreas Group Pty Ltd. This report is to inform their submission for a Planning Proposal/LEP Amendment Request to Byron Shire Council (BSC) for an area of land identified as Lot 8 DP 589795, located approximately 2.5 km south east of Mullumbimby.

The proposal is a Planning Proposal / LEP Amendment Request and involves the rezoning of the land from the current zoning, part RU1 Primary Production and part DM Deferred Matter (Figure 1.3) to part R5 Large Lot Residential, part RU2 Rural Landscape, and part E2 Environmental Conservation (Figure 1.4). A concept design for developable areas (Figure 1.5) has been identified to avoid and minimise biodiversity impacts and maximise use of low constraint exotic pasture.

Following a detailed assessment of all available information, threatened species records, habitat assessment of the site and potential impacts, the following conclusions are provided:

- The site covers an area of approx. 35 ha and is predominantly cleared, highly disturbed and dominated by exotic species throughout most vegetation communities and through all structural layers.
- The site contains several identified vegetation community associations which include:
    - approx. 26.7 ha of low constraint exotic grazing pasture with minimal ecological value.
    - approx. 5.7 ha of low to moderate condition Subtropical Rainforest with Camphor Laurel.
    - approx. 1.2 ha with freshwater wetland vegetation.
    - approx. 1.4 ha of planted native and exotic species as windrows, landscaping or cultivated orchard.
- It has been calculated that with the protection of freshwater wetlands, native vegetation and stream order buffers, over 70% of the site is considered low constraint.
- Most vegetation at the site is considered to have low to moderate ecological value or provide low to moderate wildlife habitat as it is predominantly exotic pasture grasses or regrowth exotic vegetation (dominated by Camphor Laurel) occurring in small isolated fragments.
- Subtropical Rainforest species occur across the site with species such as Brush Box, Hoop Pine, and Ficus spp. being most abundant. Despite the dominance of exotic species through most structural layers across the site, it is considered that some of the vegetation at the site contains sufficient elements, to varying degrees to be considered for inclusion as Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions listed in Schedule 2 of the BC Act.
- Wetlands with characteristics analogous to the EEC *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* have been identified from the rezoning proposal area. It is considered that as these are likely a direct result of anthropogenic modification, and/or not located on the coastal floodplain and are therefore unlikely to satisfy the EEC criteria.
- Three (3) threatened flora species listed in Schedule 1 of the *Biodiversity Conservation Act 2016*

were recorded during site surveys. These were Scrub Turpentine (*Rhodamnia rubescens*), Durobby (*Syzygium moorei*) and Rough-shelled Bush Nut (*Macadamia tetraphylla*). The individuals of Rough-shelled Bush Nut are unlikely to be from a wild population and likely to have been planted in the vicinity of the original dwelling. Additionally, several species identified in the BAM Calculator as having the potential to occur have specified survey periods unable to be satisfied for the purposes of this report. Additional surveys may be warranted for those species.

- Additional fauna surveys may be warranted for species identified as having the potential to occur as generated by the BAM Calculator if the BOS is triggered, particularly Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Southern myotis (*Myotis macropus*).
- Koala feed trees (as per Schedule 2 of SEPP Koala Habitat Protection 2019) occur at the site and as Clause 9(1) of the SEPP applies, the development assessment requirements of core Koala habitat is triggered. Therefore the survey methods according to Appendix C of the Guidelines must be applied to the site in the preparation of a development application to establish if the development constitutes a Tier 1 or Tier 2 development, and whether the preparation of a Koala Assessment Report is required.
- As the site contains predominantly cleared low constraint land and low condition vegetation, and contains limited habitat features, any impacts from future development would be able to be sufficiently mitigated as to be unlikely to result in significant impacts for threatened fauna listed under the NSW *Biodiversity Conservation Act 2016* or the *Environmental Protection and Biodiversity Conservation Act 1999*.
- The subsequent subdivision and development would be reasonably expected to be able to be accommodated with minimal impacts to native vegetation by utilising existing cleared agricultural areas of low ecological value.
- Potential impacts of the construction and occupation phases of the proposal would be able to be mitigated sufficiently to ensure that direct and indirect impacts on biodiversity values would be negligible.
- The proposal would also be reasonably expected to be able to incorporate strategies to mitigate direct and indirect impacts, enable regeneration, and offset onsite to achieve a net improvement in site biodiversity values.

Based on these key points it is considered from an ecological perspective, that the site is entirely suitable for the proposal and subsequent development. The impacts of any vegetation loss would be able to be suitably offset on site to provide a net native vegetation gain at the site, and an improvement in biodiversity values in general.

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Appendices

Appendix A – Flora Species List

Family	Scientific Name	Common Name	Form
Adiantaceae	*Adiantum hispidulum*	Rough Maidenhair Fern	fern
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed	herb
Anacardiaceae	*Mangifera indica**	Mango	tree
Apiaceae	*Centella asiatica*	Pennywort	herb
Apiaceae	*Daucus carota*	Wild Carrot	herb
Apocynaceae	*Asclepias curassavica**	Milk Bush	herb
Apocynaceae	*Gomphocarpus physocarpus**	Narrow-leaf Cotton Bush	herb
Apocynaceae	*Parsonsia straminea*	Common Silkpod	vine
Araceae	*Alocasia brisbanensis*	Cunjevoi	herb
Araliaceae	*Schefflera actinophylla**	Umbrella Tree	small tree
Araucariaceae	*Araucaria cunninghamii*	Hoop Pine	tree
Asleniaceae	*Asplenium australasicum*	Bird's Nest Fern	epiphyte
Asteraceae	*Ageratina adenophora**	Crofton Weed	herb
Asteraceae	*Ageratina houstonianum**	Bluetop	herb
Asteraceae	*Ageratina riparia**	Mistflower	herb
Asteraceae	*Ambrosia artemisiifolia**	Rag Weed	herb
Asteraceae	*Bidens pilosa**	Farmer's Friends	herb
Asteraceae	*Cirsium vulgare**	Spear Thistle	herb
Asteraceae	*Conyza canadensis**	Fleabane	herb
Asteraceae	*Crassocephalum crepidioides**	Thickhead	herb
Asteraceae	*Hypochaeris radicata**	Cats-ear	herb
Asteraceae	*Senecio madagascariensis**	Fireweed	herb
Asteraceae	*Soliva sessilis**	Bindii	herb
Asteraceae	*Taraxacum officinale**	Dandelion	herb
Campanulaceae	*Pratia purpurascens*	White Root	herb
Casuarinaceae	*Casuarina glauca*	Swamp Oak	tree
Commeliniaceae	*Commelina benghalensis**	Hairy Commelina	herb
Commeliniaceae	*Commelina cyanea*	Blue Commelina	herb
Commeliniaceae	*Tradescantia fluminensis**	Wandering Trad	herb
Convolvulaceae	*Ipomoea cairica**	Five-leaved Ipomoea	vine
Cyatheaceae	*Cyathea cooperi*	Straw Treefern	other
Cyperaceae	*Carex appressa*	Common Carex	sedge
Cyperaceae	*Cyperus difformis*	Dirty Dora	sedge

Family	Scientific Name	Common Name	Form
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge	sedge
Cyperaceae	*Cyperus exaltatus*	Giant Sedge	sedge
Cyperaceae	*Cyperus polystachyos**	Bunchy Sedge	sedge
Cyperaceae	*Cyperus sanguinolentus*	Purple-glume Flat Sedge	sedge
Cyperaceae	*Eleocharis equisetina*	Spike Rush	sedge
Cyperaceae	*Gahnia clarkei*	Trailing Gahnia	sedge
Dennstaedtiaceae	*Hypolepis muelleri*	Ground Fern	fern
Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken	fern
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	shrub
Elaeocarpaceae	*Sloanea australis*	Maiden's Blush	tree
Euphorbiaceae	*Mallotus philippensis*	Red Kamala	tree
Fabaceae	*Acacia melanoxylon*	Blackwood	tree
Fabaceae	*Crotalaria sp.**	Rattlepod	herb
Fabaceae	*Desmodium intortum**	Green-leaf Desmodium	vine
Fabaceae	*Glycine clandestina*	Forest Glycine	vine
Fabaceae	*Senna pendula var. glabrata**	Winter Senna	shrub
Haloragaceae	*Myriophyllum aquaticum**	Parrots Feather	herb
Juncaceae	*Juncus effusus*	Common Juncus	sedge
Lamiaceae	*Verbena bonariensis**	Tall Verbena	herb
Lauraceae	*Cinnamomum camphora**	Camphor Laurel	tree
Lythraceae	*Cuphea carthagenensis**	Columbian Waxweed	herb
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	shrub
Marsileaceae	*Marsilea mutica*	Nardoo	herb
Menyanthaceae	*Nymphoides indica*	Water Snowflake	herb
Monimiaceae	*Wilkiea huegeliana*	Veiny Wilkiea	shrub
Moraceae	*Ficus coronata*	Creek Sandpaper Fi	tree
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	tree
Moraceae	*Ficus obliqua*	Small-leaved Fig	tree
Moraceae	*Ficus watkinsiana*	Strangling Fig	tree
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn	vine
Moraceae	*Morus alba**	White Mulberry	tree
Myrtaceae	*Corymbia intermedia*	Pink Bloodwood	tree
Myrtaceae	*Eucalyptus microcorys*	Tallowwood	tree
Myrtaceae	*Lophostemon confertus*	Brush Box	tree
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	tree

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Myrtaceae	*Rhodamnia rubescens*#	Scrub Turpentine	tree
Myrtaceae	*Syzygium moorei*#	Durobby	tree
Nymphaeaceae	*Nymphaea caerulea**	Cape Waterlily	herb
Nymphaeaceae	*Nymphaea gigantea*	Giant Waterlily	herb
Ochnaceae	*Ochna serratifolia**	Mickey-mouse plant	shrub
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet	tree
Oleaceae	*Ligustrum sinense**	Small-leaved Privet	shrub
Oleaceae	*Olea europaea**	Olive	tree
Onagraceae	*Ludwigia octovalvis*	Willow Primrose	herb
Onagraceae	*Ludwigia peploides ssp. montevidensis*	Water Primrose	herb
Oxalidaceae	*Oxalis latifolia**	Wood Sorrel	herb
Petiveriaceae	*Rivina humilis*	Coral Berry	shrub
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree	tree
Pinaceae	*Pinus elliottii**	Slash Pine	tree
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	tree
Poaceae	*Andropogon virginicus**	Whisky Grass	grass
Poaceae	*Avena fatua**	Wild Oats	grass
Poaceae	*Cenchrus clandestinum**	Kikuyu	grass
Poaceae	*Cynodon dactylon*	Couch Grass	grass
Poaceae	*Imperata cylindrica*	Blady Grass	grass
Poaceae	*Paspalum conjugatum**	Sour Grass	grass
Poaceae	*Paspalum dilatatum**	Paspalum	grass
Poaceae	*Paspalum mandiocanum**	Broad-leaved Paspalum	grass
Poaceae	*Paspalum urvillei**	Vasey Grass	grass
Poaceae	*Phragmites australis*	Common Reed	grass
Poaceae	*Setaria sphacelata**	Setaria	grass
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass	grass
Polygonaceae	*Persicaria decipiens*	Slender Knotweed	herb
Polygonaceae	*Persicaria hydropiper*	Water Pepper	herb
Polygonaceae	*Persicaria strigosa*	Knot Weed	herb
Polygonaceae	*Rumex brownii*	Swamp Dock	herb
Polygonaceae	*Rumex obtusifolius*	Broad Dock	herb
Proteaceae	*Macadamia integrifolia*#	Rough-shelled Bush Nut	tree
Ranunculuaceae	*Ranunculus inundatus*	River Buttercup	herb
Rosaceae	*Prunus persica**	Peach	tree

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Rosaceae	*Rubus moluccanus*	Qld Bramble	vine
Rutaceae	*Citrus x limon**	Bush Lemon	shrub
Rutaceae	*Flindersia australis*	Teak	tree
Rutaceae	*Flindersia schottiana*	Cudgerie	tree
Rutaceae	*Melicope elleryana*	Pink-flowered Doughwood	tree
Sapindaceae	*Cupaniopsis anacardioides*	Coastal Tuckeroo	tree
Sapindaceae	*Guioa semiglauca*	Guioa	tree
Sapindaceae	*Jagera pseudorhus*	Foam Bark Tree	tree
Smilacaceae	*Smilax australis*	Lawyer Vine	vine
Solanaceae	*Cestrum nocturnum**	Lady-of-the-Night	shrub
Solanaceae	*Solanum americanum**	Black-fruited Solanum	shrub
Solanaceae	*Solanum capsicoides**	Devil's Apple	shrub
Solanaceae	*Solanum mauritianum**	Tobacco Bush	shrub
Solanaceae	*Solanum nigrum**	Black-fruited Solanum	shrub
Verbenaceae	*Lantana camara**	Lantana	shrub
Verbenaceae	*Verbena bonariensis**	Purpletop	herb

**denotes exotic species*

#denotes BC Act threatened species