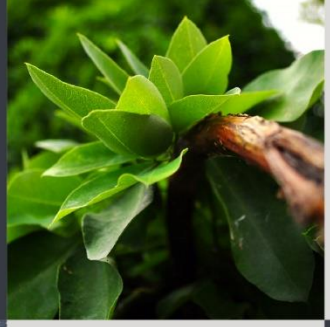
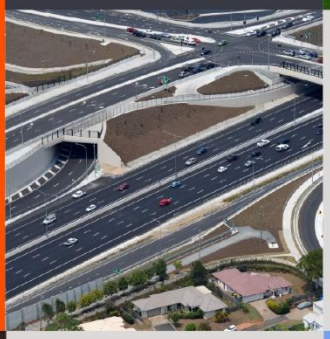
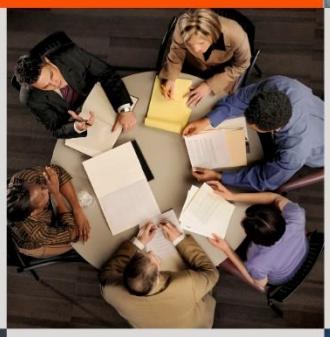
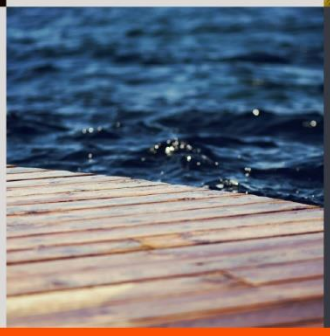






Basic Terrestrial Flora and Fauna Assessment

103 Paterson Street, Byron Bay | Lot 101 on DP839601

By Planit Consulting Pty Ltd

March 2021



This report has been written by

Planit Consulting Pty Ltd
ABN 20 099 261 711

Level 1, 2247 Gold Coast Highway
Nobby Beach QLD 4218

PO Box 206
Nobby Beach QLD 4218

Telephone: (07) 5526 1500
Facsimile: (07) 5526 1502

Email: admin@planitconsulting.com.au
Web: www.planitconsulting.com.au

Document Control

Version	Date	Document Type	Prepared By	Reviewed By
A	01.04.20	Draft	TR	BS
B	08.07.20	Client Issue	TR	BS
C	07.09.20	Final	TR	**BS**
D	22.03.21	Amended Report	TR	**BS**

Project Details

Project Name	**103 Paterson Street, Byron Bay**
Client Project Manager	**LB**
Authors	**TR**
Planit Reference	**J6643**

Disclaimer

Contents

Figures

Tables

Appendices

Appendix 1 – Proposal Plans

Appendix 2 – NSW Bionet Database Records (2020)

Appendix 3 – Arboricultural Impact Assessment Report

Appendix 4 – BOSET Report Prepared for the Site

1 INTRODUCTION

Planit Consulting Pty Ltd has been engaged to prepare a Basic Terrestrial Flora and Fauna Assessment document for proposed Multi Dwelling Housing (fourteen dwellings). The site is located at 103 Paterson Street, Byron Bay and is legally described as Lot 101 on DP839601.

This report outlines the results of flora and fauna investigations and describes vegetation types, habitat associations and ecological values of the proposed development envelope and surrounding areas.

2 SITE DESCRIPTION & LOCATION

2.1 Site Description

The subject site comprises of Lot 101 DP839601 located 103 Paterson Street, Byron Bay (**Figure 1**). This allotment shall be hereafter referred to as '*the site*.' The site is irregular in shape and is bordered by Paterson Street to the north, a drainage line along the southern boundary, and urban allotments to the east and west. The overall site has a total land area of ~0.38ha.

Figure 1: Subject Site (Nearmap, 2020)

The site is zoned R2- Low Density Zone pursuant to the Byron Local Environmental Plan 2014 (LEP 2014).

2.2 Existing Use and Resultant Vegetation

The site is currently utilised as a residential property with the following existing structures occurring on the site:

- dwelling;
- shed;
- driveway and parking area;
- fencing & retaining walls;
- swimming pool;
- drainage line along the eastern boundary; and
- garden beds and yard.

The Byron Shire Vegetation Mapping (refer to **Figure 2**) did not map the site as containing any vegetation community. This was ground-truthed to be largely accurate although there are some residual areas of native vegetation remaining throughout the site (further details provided within **Section 3**).

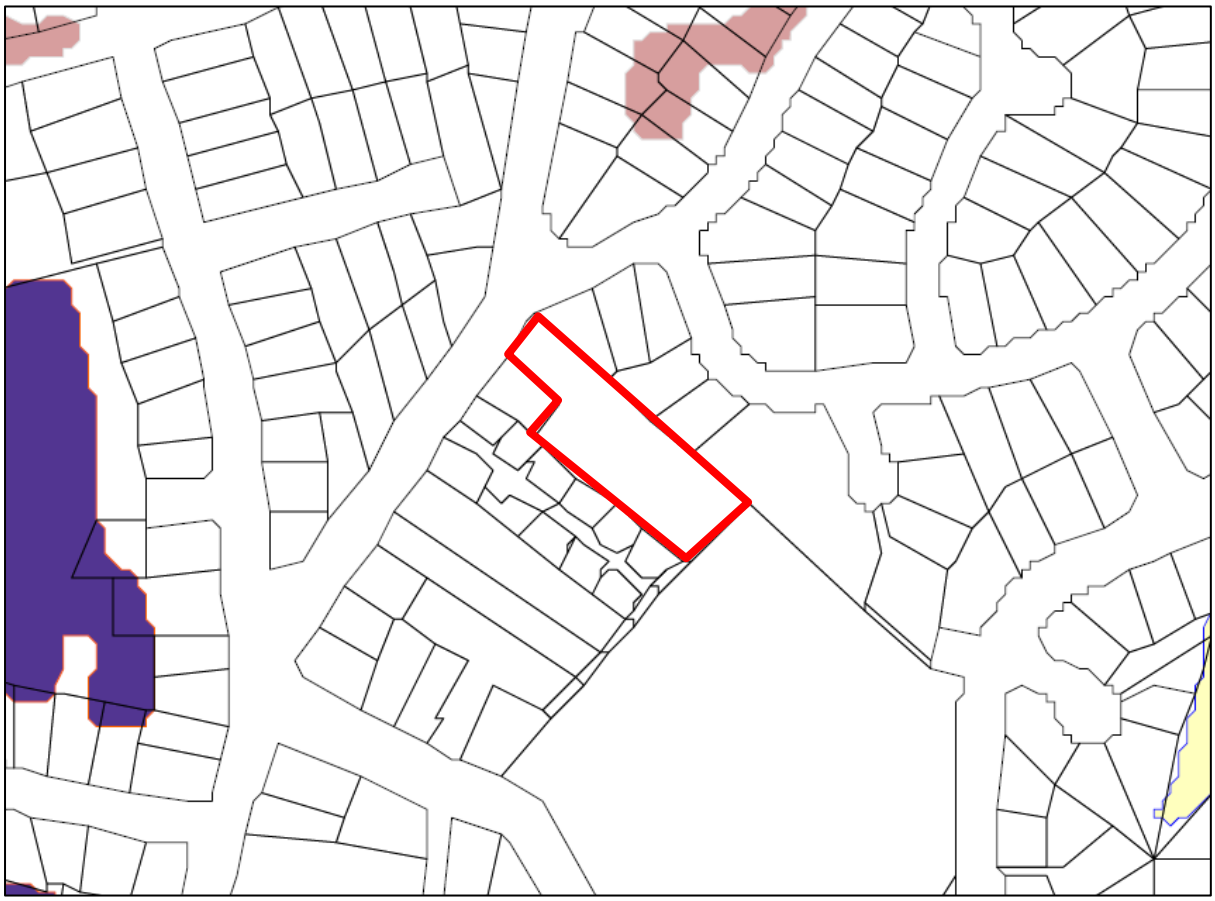


Figure 2: Byron Shire Vegetation Mapping (Source: BSC, 2012)

2.3 Project Description

The proposal relates to a proposed multi-dwelling housing (14 dwellings) as depicted within **Figure 3** and **Appendix 1**.

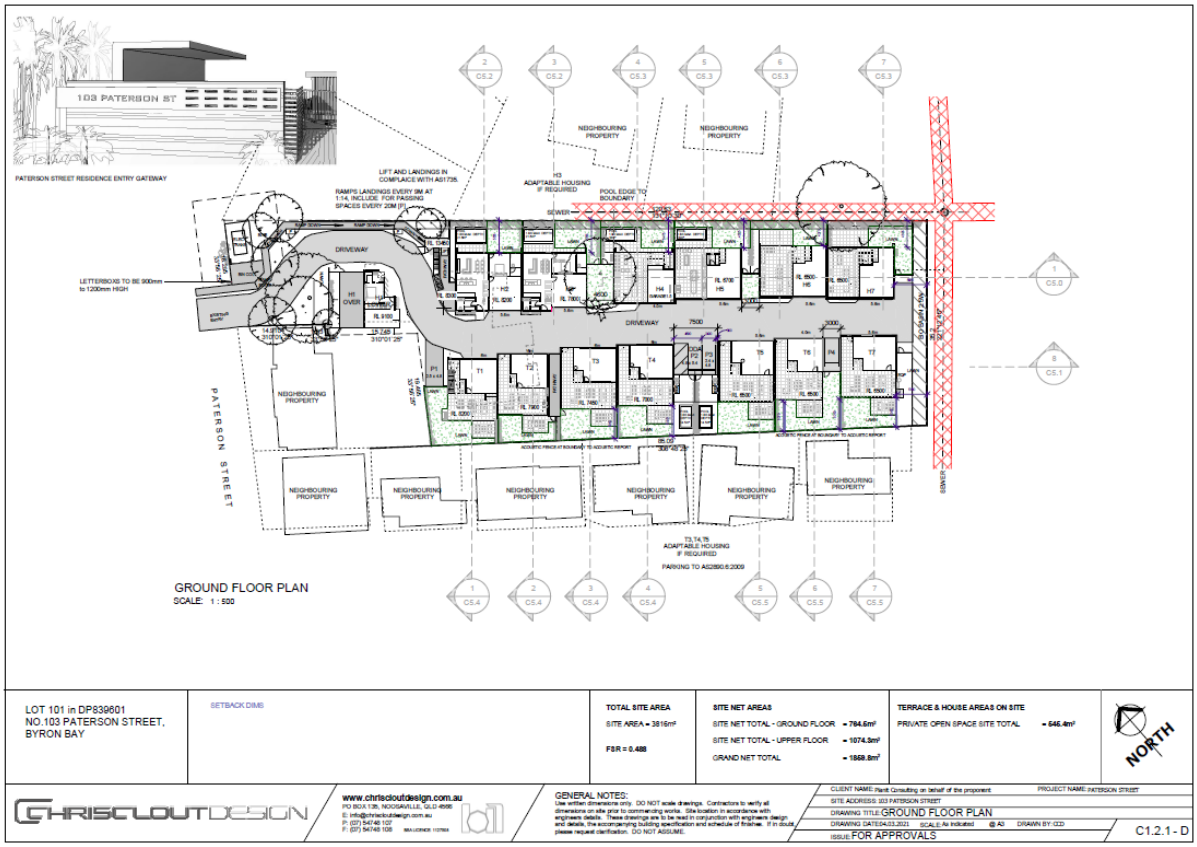


Figure 3: Proposal Plan

2.4 Geology

As illustrated within the eSPADE geology mapping extract **(Figure 4**), the site contains one soil landscape type, described as follows:

- Bilinudgel variant a (9540bia).

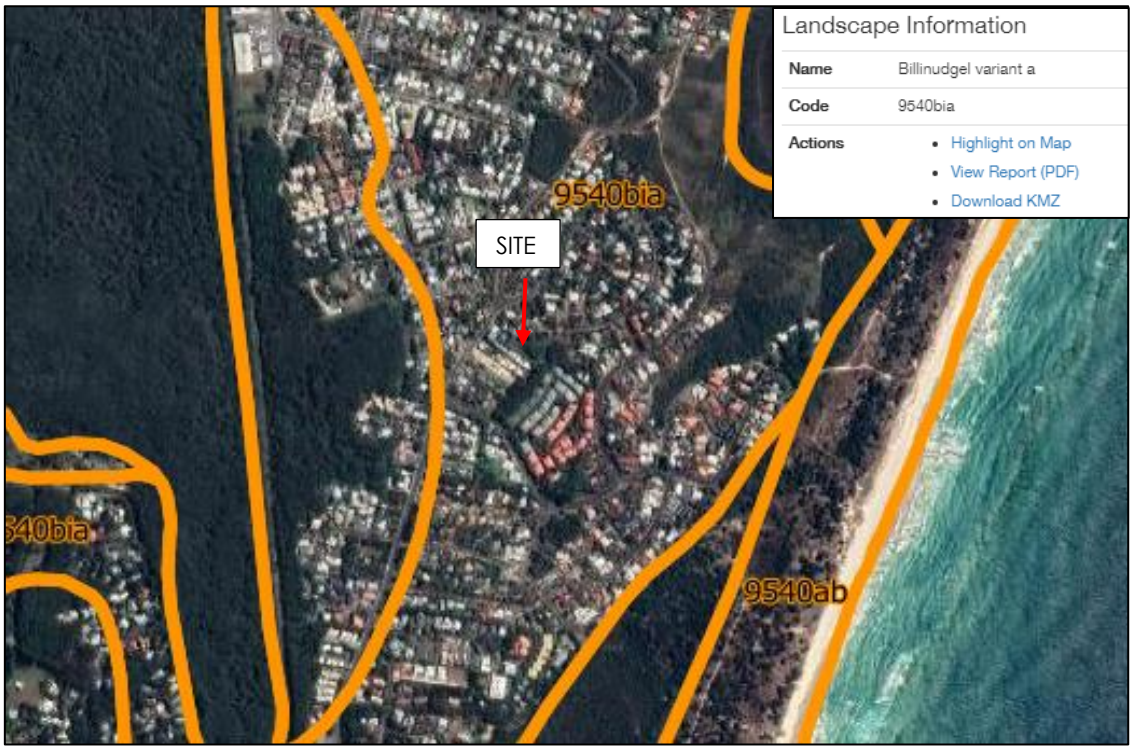


Figure 4: eSPADE Geology Mapping Extract (Source: eSPADE Mapping, 2020)

Such areas are described in detail within Morland, 1994:

- Bilinudgel variant a (9540bia): Mapped over the entire site.

Location: Low hills on the metasediments of the Neranleigh-Fernvale Group. Occurs on the edges of the Burringbar Hills and on the flanks of the Alstonville Plateau. Also occurs as headlands at Cape Byron and Broken Head. Type location is the area of low hills surrounding Billinudgel and Ocean Shores.
Landscape: low rolling hills on metamorphics of the Neranleigh-Fernvale Group. Relief is 50–100 m, slopes 10–20% and locally >33%. Slopes are generally moderately long (100–300 m). Ridges and crests are narrow (100–150 m). Partly cleared open eucalypt forest. Littoral closed-forest at Brunswick and Broken Heads.
Geology: Neranleigh-Fernvale Group. Thinly bedded fissile shales, siltstones and sandstones with occasional more massive units such as greywacke, volcanic tuffs, agglomerates, sandstones and massive cobble conglomerates (Chesnut 1980). These were previously known as the Fitzroy Beds. Also quartzite, slate and phyllite.
Topography: Low rolling hills that abut the higher and steeper Burringbar (bu) soil landscape. Relief is 50–100 m and slopes range from 10–20%, with some localised steeper (>33%) areas. Elevation is 60–100 m. Slope length is generally moderate (200–300 m) and slope shape is simple and occasionally waning. Ridges and crests are narrow (100–150 m). Sideslopes, rather than distinct hills, are common on the southern part of the sheet near Uralba. Where this soil landscape meets the coast, seacliffs are common such as at Cape Byron and Broken Head. Streams are erosional, tributary and integrated.

2.5 Aims of Study

The aim of this report is to describe the terrestrial flora and fauna habitat of the Study Area and adjoining areas and to examine the potential for the occurrence of threatened species, populations, their habitats or endangered ecological communities. In order to provide this information, the following specific objectives are to:

- Determine and describe the existing flora, vegetation communities, fauna assemblage and associated habitats of the Study Area and adjoining areas,
- Determine the occurrence, or likely occurrence, threatened species, populations, their habitats or endangered ecological communities as a result of detailed survey and literature review,
- Undertake the 'test of significance' pursuant to Section 7.3 of the *Biodiversity Conservation Act 2016*,
- Undertake SEPP (Koala Habitat Protection) 2019 & SEPP (Coastal Management) assessments,
- Describe the potential direct and indirect impacts of the proposal on existing terrestrial ecological values,
- Propose amelioration measures to avoid, manage or mitigate potential impacts upon the ecological values of the Study Area.

2.6 Definitions, Terminology & Nomenclature

For the purposes of this flora and fauna assessment the following definitions apply:

Site/Subject Site: refers to the extent of the lands forming the boundaries of this development application as described in Section 2.0

Works Envelope/Development Footprint/Proposal Footprint: refers to those areas of the site which will be occupied by the works footprint (as depicted within **Figure 3 and Appendix 1**).

Study Area: refers areas which onsite ecological survey works were conducted as a part of this application. This includes the works envelope and additional areas which could be potentially affected by the development directly or indirectly. In this case the study area is considered to be the subject site buffered by a zone of approximately 20m.

EEC: denotes an Endangered Ecological Community as defined within the *Biodiversity Conservation Act 2016.*

Additional terminology associated with significance assessments (i.e. threatened species, populations, communities, threatening process, direct impacts, indirect impacts etc.) and the factors of such assessments (i.e. test of significance) are taken to be those existing within the *Biodiversity Conservation Act 2016*, *Environmental Planning and Assessment Act 1979*, and OEH documents entitled *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017) and *Threatened Species Test of Significance Guidelines (OEH 2018*). Additional terms within the report which warrant the source of the definition have been specifically referenced in the text.

Nomenclature for all plant species contained within this document follow Harden (1992, 1993, 2000 & 2003) The Flora of NSW Volumes 1-4. Scientific names for plants are used primarily in the document to avoid any confusion associated with use of common or descriptive plant names.

Nomenclature for all animal species contained within this document follows those utilised by the Office of Environment and Heritage/National Parks and Wildlife Service (2020) in association with the Atlas of NSW Wildlife. Scientific names for fauna are used primarily in the document to avoid any confusion associated with use of common or descriptive animal names.

2.7 Contributors

Contributors to this report and their roles are tabulated below:

Table 1: Report Contributors

NAME	ORGANISATION	ROLE
Tomislav Rados	Planit Consulting	Report preparation, flora/fauna survey and assessment

All work was performed under the appropriate licences which are summarized within **Section 4.4**.

2.8 Biodiversity Offsets Scheme

The *Biodiversity Conservation Act 2016*, together with the *Biodiversity Conservation Regulation 2017*, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS).

The Biodiversity Offsets Scheme creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity. It also establishes biodiversity stewardship agreements, which are voluntary in-perpetuity agreements entered into by landholders, to secure offset sites.

The Scheme applies to:

- Local development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that is likely to significantly affect threatened species or triggers the Biodiversity Offsets Scheme threshold.
- State significant development and state significant infrastructure projects, unless the Secretary of the Department of Planning and Environment and the Chief Executive of OEH determine that the project is not likely to have a significant impact
- Biodiversity certification proposals
- Clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the Biodiversity Offsets Scheme threshold and does not require development consent
- Clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2016*
- Activities assessed and determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (generally, proposals by government entities), if proponents choose to 'opt in' to the Scheme.

The Biodiversity Offsets Scheme Threshold is a test used to determine when is necessary to engage an accredited assessor to apply the Biodiversity Assessment Method (the BAM) to assess the impacts of a proposal.

It is used for local developments (development applications submitted to councils) and clearing that does not require development consent in urban areas and areas zoned for environmental conservation (under the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*).

The *Biodiversity Conservation Regulation 2017* sets out threshold levels for when the Biodiversity Offsets Scheme will be triggered. The threshold has two elements:

- whether the amount of native vegetation being cleared exceeds a threshold area set out below
- whether the impacts occur on an area mapped on the Biodiversity Values map published by the Minister for the Environment.

If clearing and other impacts exceeds either trigger, the Biodiversity Offset Scheme applies to the proposed development including biodiversity impacts prescribed by clause 6.1 of the *Biodiversity Regulation 2017*.

Biodiversity Values Map Threshold

The Biodiversity Values Map identifies land with high biodiversity value, as defined by clause 7.3(3) of the *Biodiversity Conservation Regulation 2017*. The Biodiversity Offsets Scheme applies to all clearing of native vegetation and other biodiversity impacts prescribed by clause 6.1 of the *Biodiversity Regulation 2017* on land identified on the map.

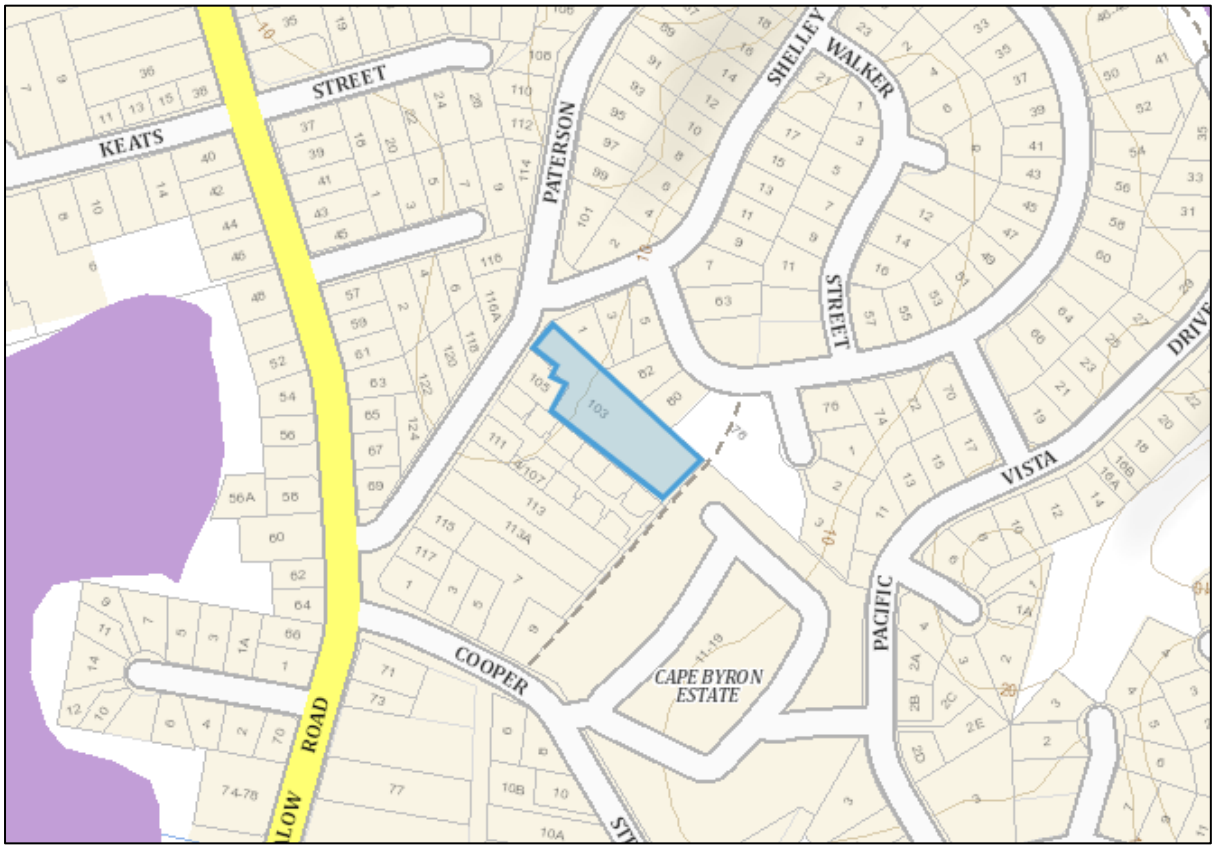


Figure 5: Biodiversity Values Map with the Site Highlighted Blue

Reviewing the Biodiversity Values Map (refer to **Figure 5**), numerous areas of mapped biodiversity values occur within the site.

Area Clearing Threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

Figure 6: BOS Area Clearing Threshold

The area threshold applies to all proposed native vegetation clearing associated with a proposal, regardless of whether this clearing is across multiple lots. In the case of a subdivision, the proposed clearing must include all future clearing likely to be required for the intended use of the land after it is subdivided / developed.

Reviewing the *Byron Local Environmental Plan (2014)*, the minimum Lot size over the subject site is 600sqm. Reviewing the BOS area clearing threshold, it is noted that threshold for native vegetation clearing is 0.25ha or more (refer to **Figure 6**).

The proposal requires the removal of ~904sqm of native vegetation community.

Reviewing the above, a BAM assessment will not be required for the proposed development.

A Biodiversity Offset Scheme Entry Threshold (BOSET) report has been prepared for the overall allotment and provided within **Appendix 4**.

Threatened Species 'Test of Significance'

Proponents are also required to carry out a 'Test of Significance' for all local development proposals that do not exceed the Biodiversity Offset Scheme Threshold.

The 'Test of Significance' is intended to provide standardised and transparent consideration of threatened species, ecological communities, and their habitats, through the development assessment process.

In the context of a Part 4 development (not including major projects) if the 'Test of Significance' assessment indicates that there will be a significant impact, the proponent must carry out a BAM assessment.

Please refer to **Section 6** for the 'Test of Significance' conducted for the proposal.

3 VEGETATION ASSESSMENT

To identify and classify vegetation species and communities which occur within the Study Area, the following methodology was applied over ~3 hours total on the 25th March 2020:

- Desktop analysis including:
  - i. Review of Council's Planning Scheme Mapping & Associated Reporting (i.e. Byron Shire LEP 2014 Maps)
  - *ii.* Review of existing vegetation community documentation to confirm dominant elements, forest descriptions and conservation status of mapped forested remnants/ecosystems including:
    - Forestry Commission NSW (1989) *Research Note 17: Forest Types in NSW*.
    - National Parks and Wildlife Service (1999) *Forest ecosystem classification and mapping for the upper and lower north east cra regions*. CRA Unit-Northern Zone.
    - DECC (2008) *BioMetric: Terrestrial Biodiversity Tool for the NSW Property Vegetation Planning System: Definitions of Vegetation Types for CMA Areas* (online @ http://www.environment.nsw.gov.au/projects/Biometric Tool.htm)
    - Keith, D. (2004) *Ocean Shores to Desert Dunes*. The native vegetation of NSW. DECC, Hurstville.
    - Sheringham, P.R., Dr. Benwell, A., Gilmour, P., Graham, M.S., Westaway, J., Weber, L., Bailey, D., & Price, R. (2008). *Targeted Vegetation Survey of Floodplains and Lower Slopes on the Far North Coast*. A report prepared by the Department of Environment and Climate Change for the Comprehensive Coastal Assessment. Department of Environment and Climate Change (NSW), Coffs Harbour, NSW.
  - iii. Review of threatened flora species and endangered ecological communities listed as occurring within the Murwillumbah (Qld – Southeast Hills and Ranges) CMA sub-region of the Northern Rivers CMA: (http://threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=15)
  - iv. Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records
  - v. Review of Environment Australia Protected Matters data within a search area 10km surrounding the site to review threatened plant records
  - vi. Review of SEPP Mapping (Coastal Management) mapping to determine the indicative presence/absence of regional forest ecosystems reflective of wetland (marine, estuarine, riverine, lacustrine and/or palustrine) communities and/or Littoral Rainforests.
  - vii. Review of selected ecological surveys previously undertaken in the locality
  - viii. Review of the following legislation to ensure the latest lists of threatened species and communities were noted as well as investigating the existence of any relevant recovery plans, threat abatement plans, key threatening processes or any preliminary determinations which may be applicable to the site and/or the proposed use/action:
    - *Biodiversity Conservation Act (2016)*
    - *Environment Protection and Biodiversity Conservation Act (1999)*
- *Site survey including:*
  - i. Random Meander/Diversity Searches: Random searches within each vegetation community were undertaken recording all species observed was undertaken in

accordance with Cropper (1993) and DEC (2004). Knowledge of known habitat of protected and uncommon floral species was utilized to target such species. Observation also included recording crown cover, tree heights and DBH estimation, dominant species present and identification of ecologically dominant layer.

The above survey techniques were applied to determine the following:

- Validate or modify existing vegetation mapping;
- Meet minimum Council and State Government vegetation/survey requirements;
- Identify floral species existing within the site;
- Measure and/or estimate Crown Cover (Walker and Hopkins, 1998, Nelder, 2004. EPA, 2005) to determine vegetation structure designations;
- Identify average height of canopy trees;
- Identify the incidence of senescent trees;
- Determine species dominance within ecologically dominant layer;
- Determine incidence of weed invasion and disturbance over the site and within vegetation strata;
- Determine incidence of species listed as endangered, vulnerable or rare under the *Biodiversity Conservation Act 2016;*
- Determine incidence of species listed as endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999.*

The above methodology is considered to be reasonably consistent with the intent of the following documents:

- NSW Department of Infrastructure, Planning and Natural Resources (1997) *Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997*.
- NSWNPWS (2001) *The Community Biodiversity Survey Manual*. New South Wales National Parks & Wildlife Service.
- QLD Department of Environment and Heritage (1999) *Suggested Conservation Criteria for Development Assessment*.
- Gold Coast City Council (2004) *Guidelines for preparing Ecological Site Assessments during the Development Process (v1.1)*. G.C.C.C., Nerang.
- Shire of Maroochy (1997) *Flora and Fauna Assessment Requirements for Developments in Maroochy Shire*. M.S.C
- Brisbane City Council (1999) *Ecological Assessment Guidelines*. B.C.C.
- Byron Shire Council *Guidelines for Ecological Assessment in Byron Shire*. B.S.C
- Walker, J. & Hopkins, M.S. (1998) Chapter 5: Vegetation in McDonald, R. C., Isbell, R.F., Speight, J.G., Walker, J. & Hopkins, M.S. *Australian Soil and Land Survey: Field Handbook Second Edition*. CSIRO Australia, Canberra.
- Nelder, V. J., Wilson, B.A., Thompson, E. J. & Dillewaard, H.A. (2004) *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. EPA, Brisbane.
- DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*. DEC, NSW.

The above methodology is considered to be reasonably consistent with the intent of the following documents:

- NSW Department of Infrastructure, Planning and Natural Resources (1997) *Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997*.
- NSWNPWS (2001) *The Community Biodiversity Survey Manual*. New South Wales National Parks & Wildlife Service.
- QLD Department of Environment and Heritage (1999) *Suggested Conservation Criteria for Development Assessment*.
- Gold Coast City Council (2004) *Guidelines for preparing Ecological Site Assessments during the Development Process (v1.1)*. G.C.C.C., Nerang.
- Shire of Maroochy (1997) *Flora and Fauna Assessment Requirements for Developments in Maroochy Shire*. M.S.C
- Brisbane City Council (1999) *Ecological Assessment Guidelines*. B.C.C.
- Walker, J. & Hopkins, M.S. (1998) Chapter 5: Vegetation in McDonald, R. C., Isbell, R.F., Speight, J.G., Walker, J. & Hopkins, M.S. *Australian Soil and Land Survey: Field Handbook Second Edition*. CSIRO Australia, Canberra.
- Nelder, V. J., Wilson, B.A., Thompson, E. J. & Dillewaard, H.A. (2004) *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. EPA, Brisbane.
- DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*. DEC, NSW.

3.1 Vegetation Survey Results

As a result of flora surveying two (2) vegetation communities were identified within the site and are described separately below and designated the most appropriate Plant Community Type (PCT) as per NSW's Biometric Vegetation Database. Where possible, identified communities were compared to recognized documents such as Forest Types in NSW (1989), CRA Forest Ecosystems (1999), Byron Shire Vegetation Mapping (2012), Byron Flora and Fauna Study (1999) and Keith (2004) Ocean Shores-Desert Dunes. A vegetation community map has been produced for the site (refer to **Figure 7**) with descriptions provided below.

Vegetation Community 1: Paperbark Swamp Forest of the Coastal Lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (PCT 1064)

This community occurs as fragmented patches at the rear of the property, as well as small copses at the front of the property. The canopy layer generally ranges between 8-16m in height although several emergent Swamp Mahogany exceeds this.

Canopy species within this community were principally Broad-leaved Paperbark (*Melaleuca quinquenervia*). Lesser occurring canopy and sub-canopy species included Swamp Mahogany (*Eucalyptus robusta*), Cheese Tree (*Glochidion sumatranum*) and Alexander Palm (*Archontophoenix alexandrae*).

The shrub and small tree layer (2-6m in height) were scarce and is limited to Tuckeroo (*Cupaniopsis anacardioides*), Macaranga (*Macaranga tanarius*) and Pink Euodia (*Melicope elleryana*).

Species within the ground layer were primarily limited to weeds are described below or ornamental species within garden beds, although the odd native was noted which included Pennywort (*Centella asiatica*), Native Violet (*Viola hederacea*) and Wandering Jew (*Commelina cyanea*).

Grass species include both native and exotic species such as Whiskey Grass (*Andropogon virginicus*), Wiry Panic (*Entolasia stricta*), Blady Grass (*Imperata cylindrica*), Red Natal Grass (*Melinis repens*), Guinea Grass (*Megathyrsus maximus var. maximus*) and Buffalo Grass (*Stenotaphrum secundatum*).

Scramblers, vines and epiphytic species included Strangler Fig (*Ficus watkinsiana*), Bird's Nest Fern (*Asplenium australasicum*), Snake Vine (*Hibbertia scandens*), Coastal Morning Glory (*Ipomoea cairica*), Climbing Fern (*Lygodium microphyllum*), Common Milk Vine (*Marsdenia rostrata*), Monkey Rope (*Parsonsia straminea*), Barbed Wire Vine (*Smilax australis*) and Tape Vine (*Stephania japonica*).

Weed were common and dominated the understorey of the community, in particularly Singapore Daisy (*Sphagneticola trilobata*) and exotic grasses such as Pigeon Grass (*Setaria sphacelata*), Dallis Grass (*Paspalum dilatatum, P. mandiocanum*), Couch (*Cynodon dactylon*), Carpet Grass (*Axonopus compressus*). Additional exotic species noted within this community included Blue Billygoat Weed (*Ageratum houstonianum*), Thickhead (*Crassocephalum crepidioides*), Umbrella Tree (*Schefflera actinophylla*), Broad-leaved Pepper Tree (*Schinus terebinthifolius*), Chinese Elm (*Ulmus parvifolia*), Easter Cassia (*Senna pendula var. glabrata*), Paddy's Lucerne (*Sida rhombifolia*), Camphor Laurel (*Cinnamomum camphora*), Wild Tobacco (*Solanum mauritianum*), Cocos Palm (*Syagrus romanzoffianum)* and Alexander Palm (*Archontophoenix alexandrae*).

Equivalent vegetation communities
Forest Types in NSW 1989: Code 31_ Paperbark
CRA Forest Ecosystems 1999: Code112_Paperbark
Byron Shire Vegetation Mapping 2012: Paperbark
Byron Flora and Fauna Study 1999: Paperbark (PB)
Keith (2004) Ocean Shores-Desert Dunes: Coastal Swamp Forests

Vegetation Community 2: Modified / Cleared Areas with Garden Beds, Ornamental Species and Weeds

This community occurs over the majority of the site and is characterized by mown grasses/lawn and exposed concreted areas associated with the driveway and paths around the dwellings. Areas surrounding the dwellings are landscaped with planted and potted ornamental species.

A small copse of planted Palms (*Archontophoenix alexandrae, Syagrus romanzoffiana, A. cunninghamiana, Livistona australis*) occurs in the western portion of the site, along the existing driveway. Although not going into too much detail, additional ornamental plantings noted included Silky Oak (*Grevillea robusta*), Willow Bottlebrush (*Callistemon salignus*), Sweet Viburnum (*Viburnum odoratissimum*), Eumundi Quandong (*Elaeocarpus eumundi*), Queensland Silver Wattle (*Acacia podalyriifolia*), Pom Pom Bush (*Calliandra haematocephala*), Palm Lillies (*Cordyline spp.*), Magnolia (*Magnolia grandiflora*), Foxtail Agave (*Agave attenuata*), Philodendrons (*Philodendron bipinnatifidum, P. xanadu*), Hibiscus (*Hibiscus spp.*), Lilli Pilli (*Acmena smithii*), Bougainvillea (*Bougainvillea spp.*), Arrowhead Plant (*Syngonium podophyllum*), Pawpaw (*Asimina trilobata*), Tree Fern (*Cyathea cooperi*), Gymea Lily (*Doryantes excelsa*) etc.

Native regrowth (<3m in height) occurs along the driveway and/or within garden beds proximate to the dwellings which included Tuckeroo (*Cupaniopsis anacardiodes*), Macaranga (*Macaranga tanarius*) and Cheese Tree (*Glochidion sumatranum*).

Natives groundcovers, vines and epiphytes were generally uncommon within this association although Native Violet (*Viola hederacea*), Pennywort (*Centella asiatica*), Fishbone Fern (*Nephrolepis exaltata*), Monkey Rope (*Parsonsia straminea*), Bird's Nest Fern (*Asplenium australasicum*), Wombat Berry (*Eustrephus latifolius*), Tape Vine (*Stephania japonica*) and Wandering Jew (*Commelina cyanea*) were noted.

Self-sown pasture weeds were evident throughout this association which primarily contained herbaceous species such as Blue Billygoat Weed (*Ageratum houstonianum*), Cobbler's Pegs (*Bidens pilosa*), Siratro (*Macroptilium atropurpuremum*), Fireweed (*Senecio madagascariensis*), Tasselflower (*Emilia sonchifolia*), Thickhead (*Crassocephalum crepidioides*), Flaxleaf Fleabane (*Conyza bonariensis*), Bunchy Sedge (*Cyperus polystachyos*), Singapore Daisy (*Sphagneticola trilobata*), Siratro (*Macroptilium atrourpureeum*), Wild Tobacco (*Solanum mauritianum*), Blackberry Nightshade (*S. nigrum*), Rattlepods (*Crotalaria spp.*), Flatweed (*Hypochaeris radicata*), Camphor Laurel (*Cinnamomum camphora*), Easter Cassia (*Senna pendula var. glabrata*), Umbrella Tree (*Schefflera actinophylla*), Columbian Waxweed (*Cuphea carthagenensis*), Coastal Morning Glory (*Ipomoea cairica*), Micky Mouse Plant (*Ochna serrulata*) and Broad-leaved Pepper Tree (*Schinus terebinthifolius*).

Grasses previously mentioned within Community 1 also occurring throughout this community.

A drainage line occurs along the eastern boundary of the site which is heavily infested with Singapore Daisy, Pigeon Grass, and other weeds previously mentioned.

<u>Equivalent vegetation communities</u>

Forest Types in NSW 1989: Code 220_Cleared/Partially Cleared

CRA Forest Ecosystems 1999: Code173_Cleared/Partially Cleared

Byron Shire Vegetation Mapping 2012: N/A cleared

Byron Flora and Fauna Study 1999: N/A cleared

Keith (2004) Ocean Shores-Desert Dunes: N/A

Figure 7: Vegetation Community Plan

3.2 Endangered Ecological Communities

A discussion of potentially applicable endangered ecological communities (EECs) scheduled under the *Biodiversity Conservation Act 2016* is provided below in the context of vegetation surveys undertaken of the Study Area and the relevant scientific determinations for EECs.

One vegetation community within the site is floristically similar to one (1) EEC known to occur on coastal floodplains:

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (adapted from Speight 1990). Swamp Sclerophyll Forest on Coastal Floodplains generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains in the NSW North Coast, Sydney Basin and South East Corner bioregions. Bioregions are defined in Thackway and Cresswell (1995). The structure of the community is typically open forest, although partial clearing may have reduced the canopy to scattered trees. In some areas the tree stratum is low and dense, so that the community takes on the structure of scrub. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent. Typically these forests, scrubs, fernlands, reedlands and sedgelands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water (e.g. Pressey 1989a).

The composition of Swamp Sclerophyll Forest on Coastal Floodplains is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil. Composition also varies with latitude.

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has an open to dense tree layer of eucalypts and paperbarks, which may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. For example, stands dominated by Melaleuca ericifolia typically do not exceed 8 m in height. The most widespread and abundant dominant trees include Eucalyptus robusta (swamp mahogany), Melaleuca quinquenervia (paperbark) and, south from Sydney, Eucalyptus botryoides (bangalay) and Eucalyptus longifolia (woollybut). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including Callistemon salignus (sweet willow bottlebrush), Casuarina glauca (swamp oak) and Eucalyptus resinifera subsp. hemilampra (red mahogany), Livistona australis (cabbage palm) and Lophostemon suaveolens (swamp turpentine). A layer of small trees may be present, including Acacia irrorata (green wattle), Acmena smithii (lilly pilly), Elaeocarpus reticulatus (blueberry ash), Glochidion ferdinandi (cheese tree), Melaleuca linariifolia and M. styphelioides (paperbarks). Shrubs include Acacia longifolia (Sydney golden wattle), Dodonaea triquetra (a hopbush), Ficus coronata (sandpaper fig), Leptospermum polygalifolium subsp. polygalifolium (lemon-scented tea tree) and Melaleuca spp. (paperbarks). Occasional vines include Parsonsia straminea (common silkpod), Morinda jasminoides and Stephania japonica var. discolor (snake vine). The groundcover is composed of abundant sedges, ferns, forbs, and grasses including Gahnia clarkei, Pteridium esculentum (bracken), Hypolepis muelleri (batswing fern), Calochlaena dubia (false bracken), Dianella caerulea (blue flax lily), Viola hederacea, Lomandra longifolia (spiny-headed mat-rush) and Entolasia marginata (bordered panic) and Imperata cylindrica var. major (blady grass). The endangered swamp orchids Phaius australis and P. tankervillei are found in this community. On sites downslope of lithic substrates or with soils of clay-loam texture, species such as Allocasuarina littoralis (black she-oak), Banksia oblongifolia, B. spinulosa (var. collina or var. spinulosa) (hairpin banksia), Ptilothrix deusta and Themeda australis (kangaroo grass), may also be present in the understorey. The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs (NSW Scientific Committee 2011 online @

https://www.environment.nsw.gov.au/topics/animalsand-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2011-2012/swamp-sclerophyll-forest-on-coastal-floodplains-of-the-nsw-north-coast-minor-amendment-determination).

It is considered that portions of Community 1 [Paperbark Swamp Forest of The Coastal Lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (PCT 1064)] are partially reflective of the above listed EEC as described by the Scientific Committee. The community has dominance of Paperbark within the canopy, is situated in low-lying areas (<5mAHD) and according to geological mapping (Morland, 1996) is located on the Billinudgel fissile shales, siltstones and sandstones.

Review of Gales Holdings Pty Ltd VS Tweed Shire Council (NSWLEC 209, 2008) notes that:

> *As with the Scientific Committee's description of Freshwater Wetlands, the description of Swamp Sclerophyll Forest has three components: an edaphic component ("humic clay loams and sandy loams"), a topographical component ("waterlogged or periodically inundated alluvial flats and drainage lines") and a locational component ("associated with coastal floodplains"). [106]*

The court in this instance held that the soils described in the applicable soil landscapes of Kingscliff Aeolian sand sheets establish that the soils are not humic clay loams or sandy loams, nor are they associated with such soils. For this reason the court held that the edaphic component of the EEC determination was not met and thus not an EEC.

A detailed analysis of coastal floodplain forests and freshwater wetlands associated with sandy deposits in NE NSW was composed by Smith (2009) was also reviewed which notes that while some forest types which are 'similar in floristic composition to Coastal Floodplain EECs and which may be dominated by the same tree species, including Casuarina glauca and Melaleuca quinquenervia, can occur on other low lying coastal landforms such as coastal sands, beach ridges and swales, lagoons, tidal flats and sand plains with regard to coastal floodplain forests. These communities, while similar in species dominance to some Coastal Floodplain EECs, are not identified as endangered ecological communities by Keith and Scott (2005) because they do not occur on coastal floodplains' (Smith, 2009 in Consulting Ecology V23, 38-39).

Regardless of the above, as no detailed soil survey work has occurred within the affected area, a precautionary approach is adopted, and Community 1 is assessed as the Swamp Sclerophyll EEC. A 'test of significance' has been conducted for Community 1 (refer to **Section 6**).

4 FAUNA ASSESSMENT

This section describes the Study Areas' fauna and associated habitat as identified through surveying. The methodology applied to arrive at the species list is outlined and significant species have been identified where relevant.

4.1 Methodology

- Desktop analysis including:

  i. Review of Council's Planning Scheme Mapping and associated reporting (i.e. Byron Shire LEP 2014 maps)

  ii. Review of threatened fauna species and endangered populations listed as occurring within the Murwillumbah (Qld - Southeast Hills and Ranges) CMA sub-region of the Northern Rivers CMA (http://threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=15

iii. Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records

iv. Review of selected ecological surveys/reports previously undertaken in the locality

v. Review of the following legislation to ensure the latest lists of threatened species were noted as well as investigating the existence of any relevant recovery plans, threat abatement plans, key threatening processes or any preliminary determinations which may be applicable to the site and/or the proposed use/action:
  - *Biodiversity Conservation Act (2016)*
  - *Environment Protection and Biodiversity Conservation Act (1999)*

- Field survey of the flora communities located within and immediately adjacent to the Study Area (in accordance with Section 3 above) to review habitat values;

- The following fauna field survey methods were implemented on 25th March 2020 in general accordance with the following:

  - DEC (2004) Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft. DEC, NSW.

  - NSWNPWS (2001) The Community Biodiversity Survey Manual. New South Wales National Parks & Wildlife Service.

  - Gold Coast City Council (2006) Planning Scheme Policy 8: Guidelines for Ecological Assessments. G.C.C.C., Nerang.

  - Shire of Maroochy (1997) Flora and Fauna Assessment Requirements for Developments in Maroochy Shire. M.S.C

  - Department of Land and Water Conservation (1997) Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997. NSWDLWC, Parramatta.

  - Brisbane City Council (1999) Ecological Assessment Guidelines. B.C.C.

  - Redland Shire's Planning Scheme Policy 4-Ecological Impacts

Weather conditions were warm during the day becoming cool at night (maximum of 28.0 C° and minimum of 18.4 C° as measured at Cape Byron AWS [058216]). No rainfall occurred during the onsite survey works. 6mm of rain fell one day prior to onsite survey works.

4.2 Fauna Survey Techniques

4.2.1 Diurnal Survey

- Binocular search and identification of all fauna heard or sighted;
- Bird identification surveys were conducted in association with dusk activity and comprised walked transects through the study area.

Duration: 1 x dusk (1 researcher x 60 minutes) [25th March 2020]

- Ground track/trace survey was performed including:
  - Scat/pellet examination
  - Scratch/trace examination of trees

- Diggings, burrow, trace and track examination
- Humus/crevice examination
- Examination and assessment of any tree hollows, hanging bark, termite mounds, flowering and nesting trees etc.

Duration: 1 researcher x 30 minutes [25th March 2020] and opportunistic during other survey works

- Diurnal frog-call recognition and identification

Duration: Opportunistic during all other survey works.

- Ground strata searches and rock/timber/leaf litter rolls and examination for reptiles, frogs and the Mitchell's Rainforest Snail (*Thersites mitchellae*).

Duration: 1 researcher x 30 minutes during the middle of the day [25th March 2020], opportunistic during all other survey works.

4.2.2 Nocturnal Survey

Nocturnal survey included the following survey techniques:

- Audible survey for calls, scratching and landings;
- Spotlighting focusing on flowering and senescent trees, vegetated areas, drainage lines, open grassland and canopy breaks utilising:
    - Short duration-long distance white light, and
    - Long duration-short distance red light

Duration: 1 researcher on one night for 45 minutes [25th March 2020]

- Naked eye observation utilising dusk/moon light for bats and fauna returning to potential nest/shelter areas.

Duration: One dusk/evening [25th March 2020]

- Amphibian waterbody assessments were conducted along areas considered to represent potential habitat for amphibians (i.e. drainage line at the rear). This included randomized walks adjacent the waterbodies actively looking for exposed frogs and active frogs and eyeshine. Aspects of the waterbody and adjacent areas were searched, including under rocks and logs, under bark, leaf litter and emergent vegetation. Call playback was conducted randomly for targeted species either from the surveyor's mobile phone, or on a 25W Toa Megaphone.

- Amplified call recording/playback for avifauna, mammals and amphibians. Playback of pre-recorded calls included the following threatened species:

    - Koala
    - Squirrel Glider
    - White-eared Monarch
    - Powerful Owl
    - Masked Owl
    - Sooty Owl
    - Bush-stone Curlew
    - Little Lorikeet
    - Wallum Froglet
    - Wallum Sedgefrog

Each call playback session comprised of the following:

- A 5min listening period for unelicited fauna calls
- A 5min call playback for relevant species on a 25W Toa Megaphone or mobile phone
- A 5min search/spotlight for fauna at the playback site

Depending on the targeted species playback was undertaken at dawn, dusk and after dark. All call files were obtained from BOCA or NATURESOUND. The approximate locations of fauna survey plots (for defined methods such as call playback, spotlighting etc.) across the Study Area are depicted in **Figure 8**.

Figure 8: Fauna Survey Locations

4.3 Survey Limitations

Whilst the duration of flora surveys and inspections of the site are considered appropriate for the small area of modified residual habitat on the site, additional undetected native flora species may be present (particularly exotic species within lawn and garden bed areas). Seasonal surveys would also be necessary to detect flora species that are dormant or inconspicuous for part of the year (i.e. from the Asteraceae, Orchidaceae, Cyperaceae, Poaceae etc). Some of these species (dormant or non-flowering) may have been undetected or under-represented within the survey period. Further ungerminated seed of various species may have been present within the soil seed bank.

Whilst the duration and sampling methodology of the fauna survey is considered appropriate for the proposal site, it is acknowledged that the entire seasonal fauna assemblage is unlikely to be recorded. It is also accepted that although assessments of habitat and species ecology does provide an additional measure to anticipate the presence of species (as a surrogate for its actual observation), there is no absolute certainty to the absence of a species from marginal or potential habitat.

Additionally, there may be some species that may utilise the habitats within the site but have remained undetected due to their rarity, elusive nature or the sporadic utilisation of the habitats (i.e. the Long-nosed Potoroo, Common Planigale and Dunnart are elusive species that are difficult to trap or observe directly; the Black-necked Stork, Powerful Owl, Spotted-tail Quoll and Red Goshawk may only visit an area occasionally within a much larger home-range; the Swift Parrot and Regent Honeyeater may only visit an area during peak flowering periods etc.).

The conclusions of this report are therefore based upon data available at the time and the results of field works undertaken and are therefore indicative of the environmental condition of the site at the time of sampling, including the presence or otherwise of species. At should be acknowledged that site conditions, including the presence of threatened species, can change over time. Additionally, flora and fauna results from previous ecological studies of the site were taken into account.

The above limitations have been taken into account and the likelihood of threatened such species occurring within the site assessed through habitat assessment, records of the species within the locality and aspects of species ecology. Previously conducted ecological studies over the site by other consultants have also been considered for this proposal.

4.4 Licencing

The following issued licences are held by the surveyors:

Table 2: Relevant NSW Licences

Authority	Licence/Permit	Title	Expiration	Permit No.
NSW DPI Animal Care & Ethics Committee	Animal Research Approval	Fauna Surveying, Trapping & Release	30 June 2020	TRIM 14/1971
NSW DPI Animal Care & Ethics Committee	Animal Research Authority	Fauna Surveying, Trapping & Release	30 June 2020	TRIM 14/1971
NSW National Parks & Wildlife Service	Scientific Licence	Ecological Survey	31 July 2020	SL100142

It is also noted that Tomislav Rados is an accredited assessor under the Biodiversity Offsets Scheme.

4.5 Habitat Assessment

Prior to the commencement of the abovementioned survey works within the Study Area a broad habitat assessment was conducted. The purpose of this overview was to determine potential occurrence of fauna based on available habitat components and to target areas for detailed surveying of protected fauna species. The following habitat components were reviewed and occur as a result of previous land use, vegetation types (refer **Section 3**), geomorphic variability, surrounding uses and hydraulic regime:

Table 3: Habitat Features

Habitat Element/Feature	Comment
Presence of hollow bearing trees	Not recorded.
Presence of koala habitat and/or favoured koala trees	Although no Eucalypt Forest is present, several individual Swamp Mahogany (*Eucalyptus robusta*) were noted. The site has not been mapped as containing any Koala Habitat under Byron Council's Koala Habitat Mapping (2012). No signs of Koala activity were recorded during site survey.
Presence of caves, culverts or disused buildings suitable for roosting of microchiropteran bat species	Existing structures (i.e. office buildings, sheds etc.) present although no evidence of microbats occurring. No caves, overhangs or substantial culverts noted.
Presence of scratches or feeding scars on tree trunks	Not recorded.
Presence of megabat roosting sites	Not recorded. Nearest known flying-fox roost camp occurs ~1km north of the development site located near Middleton Street (DoEE, 2020).
Presence of creeklines, estuaries, mudflats, mangroves and/or riparian vegetation	Absent.
Presence of dams, ponds, lakes and/or other natural or constructed permanent water sources	Man-made drainage line occurring along astern boundary which was significantly infested with Singapore Daisy and exotic grasses/weeds. Swimming Pool present.
Presence of dense understorey and ground cover vegetation	Scarce although there are dense areas of Singapore Daisy and unmaintained grasses within the eastern portions of the site.
Presence of deep leaf litter layer and/or debris (fallen logs etc.)	Scarce.
Presence of fruiting flora species	Scarce. Primarily limited to ornamental species, palms, weeds and cheese trees.
Presence of flowering species	Uncommon and limited to Paperbarks, Swamp Mahogany and ornamental species.
Presence of large stick nests indicative of raptor presence	Not recorded.
Presence of rocky outcrops and/or extensive exposed rocky areas favoring reptile populations	Boulder type retaining walls and concrete driveways present. Large outcrops, caves and boulders are absent.

4.6 Fauna Survey Results

The following section(s) list the fauna species recorded on the subject site during detailed surveying and lists the methods by which each species was identified. Results are grouped by the Class of species recorded. Those techniques utilised to record fauna are listed below and correlate with the acronyms included within the Survey Methods column of the grouped Survey Results tables. All bolded fauna species are threatened under the *BC Act 2016*.

Survey Method Codes:

A	Stranding/beached
AR	Acoustic recording
B	Burnt
C	Cat kill
D	Dog kill
E	Nest/roost
F	Tracks, scratchings
FB	Burrow
G	Crushed Cones
H	Hair, feathers or skin
I	Subfossil/Fossil Remains
K	Dead
O	Observed
OW	Observed and Heard call
P	Scat
Q	Camera
R	Road kill
S	Shot
T	Trapped or netted
U	Ultrasonic recording
V	Fox kill
W	Heard call
X	In scat
Y	Bone, teeth or shell
Z	In raptor/owl pellet

* All birds were either directly observed through diurnal survey, spotlighting or call identification
** Introduced/feral species
*** Recorded in adjacent areas or circling overhead

BIRDS*

FAMILY	SPECIES NAME	COMMON NAME
Anatidae	*Chenonetta jubata*	Australian Wood Duck
Columbidae	*Ocyphaps lophotes*	Crested Pigeon
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis
Rallidae	*Porphyrio porphyrio*	Purple Swamphen
Charadriidae	*Vanellus miles*	Masked Lapwing
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo
Cacatuidae	*Eolophus roseicapillus*	Galah
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater
Meliphagidae	*Manorina melanocephala*	Noisy Miner
Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird

FAMILY	SPECIES NAME	COMMON NAME
Artamidae	*Cracticus tibicen*	Australian Magpie
Artamidae	*Cracticus torquatus*	Grey Butcherbird
Artamidae	*Strepera graculina*	Pied Currawong
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail
Corvidae	*Corvus orru*	Torresian Crow
Monarchidae	*Grallina cyanoleuca*	Magpie-lark
Timaliidae	*Zosterops lateralis*	Silvereye
Hirundinidae	*Hirundo neoxena*	Welcome Swallow

MAMMALS

FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Pteropodidae	*Pteropus Alecto****	Black Flying-fox	OW
Canidae	*Canis lupus familiaris***	Dog	W
Felidae	*Felis catus***	Cat	O
Leporidae	*Lepus capensis***	Brown Hare	O

REPTILES

FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Gekkonidae	*Hemidactylus frenatus***	House Gecko	O
Scincidae	*Lampropholis delicata*	Dark-flecked Garden Sunskink	O
Agamidae	*Intellagama lesueurii*	Eastern Water Dragon	O

AMPHIBIANS

FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	W
Bufonidae	*Rhinella marina***	Cane Toad	OW

5 DISCUSSION OF RECORDED & POTENTIALLY OCCURRING SCHEDULED COMMUNITIES, POPULATIONS AND SPECIES CONSERVATION SIGNIFICANCE

5.1 Endangered Populations

Endangered populations are listed under Schedule 1 of the *Biodiversity Conservation Act 2016*. No endangered populations occur within the site with the nearest being 'Koala population between the Tweed River and Brunswick River east of the Pacific Highway (Goldfuss, 1817). It is noted that the site occurs approximately 20km south of the Brunswick River and is well removed from this Endangered Population.

5.2 Threatened Flora Species

No flora species listed scheduled under the *Biodiversity Conservation Act 2016* was observed within the Study Area during survey efforts. Additionally, no species scheduled under the *Environment Protection and Biodiversity Conservation Act 1999* were recorded within the site.

A search of the NPWS 'Atlas of NSW Wildlife' (2020) determined that thirty-four species of threatened flora have been previously recorded within the locality (search area: North: -28.61; West: 153.57; East: 153.67 South: -28.71). Searches throughout the occurring vegetation communities within the Study Area were undertaken to locate the presence or absence of these species which are tabulated below.

It is considered that preferred habitat for the majority of the nominated species is absent from the proposed development area. Notwithstanding, searches were undertaken to locate the presence or absence of the tabled species. As the species were not recorded within the proposal envelope (or areas immediately adjacent), further assessment is considered unnecessary.

Table 4: Potentially Occuring Threatened Flora Species

Species	Preferred Habitat	BCA Status	EPBC Status	Expected Impact
Marsdenia longiloba	Clear Milkvine is known from scattered sites on the NSW north coast from Hastings River northwards to Mount Nebo in Queensland (Forster, 1996). Clear Milkvine grows in open eucalypt forest, or margins of subtropical and warm temperate rainforest, and in areas of rocky outcrops (Forster, 1996; DECC, 2005a). Associated species include *Eucalyptus crebra, E. microcorys, E. acmenoides, E. saligna, E. propinqua, Corymbia intermedia* and *Lophostemon confertus* (QDNR, 2000).	E1	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Allocasuarina defungens	The Dwarf Heath Casuarina is found in coastal areas of wet to dry, dense, low, closed heath land growing on Pleistocene-aged marine aeolian derived soils (Wilson & Johnson 1989). A few populations occur in coastal clay heath on bedrock soils, and on hinterland sandstone (Benwell & Steed 1997). These soils are humus podzols. The drier heath is on podzols with a sub-soil hard pan. Both soil types are subject to a high watertables during the rainy season (Benwell 1993).	E1	E	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Davidsonia jerseyana	The Davidson's Plum is restricted to the Brunswick and Tweed River catchments of the north coast of NSW. The southern-most confirmed record of the species is located near Mullumbimby. Records extend only a short distance inland on the Brunswick River. The northern-most and westernmost confirmed record is at Chillingham. There is an unconfirmed record further north near the border gate at Tomewin (Watson 1987). The Davidson's Plum is found in coastal and lowland subtropical rainforest and wet sclerophyll forest, often with an overstorey including *Lophostemon confertus* (Brush Box), *Araucaria cunninghamii* (Hoop Pine) and/or eucalypt species. Several sub-populations of the Davidson's Plum are known from areas of regrowth rainforest with a high percentage of Camphor Laurel, *Lantana camara* (Lantana) and other exotic weeds. Some trees are isolated in paddocks or in road reserves (McKinley & Stewart 1999).	E1	E	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Elaeocarpus williamsianus	The Hairy Quandong's habitat is subtropical to warm temperate rainforest, including regrowth areas. The Hairy Quandong occurs along the coastal range within Notophyll vine rainforests and wet sclerophyll ecotones on metasediment-derived soils (Hunter et al. 1991b). The species is typically found on steep and eroding slopes at low altitude in gullies, toe slopes, steep drops adjacent to creeks and the headwater areas of creeks (DECC 2004a; Floyd 1989).	E1	E	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Chamaesyce psammogeton	*Chamaesyce psammogeton* has been recorded from the NSW coast from Jervis Bay northwards and from Lord Howe Island (DECC, 2011). *Chamaesyce psammogeton* is a prostrate perennial herb which grows on foredunes and exposed sites on headlands (DECC, 2011).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.

Species	Preferred Habitat	BCA Status	EPBC Status	Expected Impact
Caesalpinia bonduc	*Caesalpinia bonduc* is distributed widely in the tropics and subtropics. Within NSW it has only been found on Lord Howe Island and the far north coast of mainland NSW. There are no known records from north-eastern NSW since the 1890's, when it was collected from Tintenbar and Murwillumbah Caesalpinia bonduc is currently found on Lord Howe Island at 2 locations in the north of the island, on sandy soil close to the shoreline. Plants of Caesalpinia bonduc that were previously recorded at a third location in the same vicinity could not be relocated in a recent survey. In 2001, one of the locations had 18 mature plants over an area of 0.24ha with a lone individual a further c.200m along the shore. The second location included only one individual (Hutton 2001).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Senna acclinis	This species occurs in coastal districts and adjacent tablelands of NSW from Illawarra in NSW to Queensland. Senna Acclinis grows on the margins of subtropical, littoral and dry rainforests. (OEH, 2019).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Desmodium acanthocladum	The Thorny Pea occurs mainly in the Lismore area of north-eastern NSW, but there are also records of the species from near Grafton, Coraki, Casino and the Mount Warning area (DECC, 2005a). The species has been recorded in two reserves —the Mount Warning National Park (though this is a very old record from 1898) and Andrew Johnston Big Scrub Nature Reserve (NSW NPWS, 2007). This species occurs within the Northern Rivers (NSW) Natural Resource Management Region. The Thorny Pea occurs on basalt-derived soils at low elevations, mainly along rivers (Harden, 1991), in dry rainforest and on the fringes of riverine subtropical rainforest (DECC, 2005a). [in DSEWPC, 2008:1]	V	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Archidendron hendersonii	This tree has been recorded from riverine and lowland subtropical rainforest and littoral rainforest from north Queensland, south to the Richmond River in north-east NSW. It is found on a variety of soils including coastal sands and those derived from basalt and metasediments (DECC, 2005).	V	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Xylosma terrae-reginae	This species is known from six populations in NE NSW north of Lismore where it occurs in association with Littoral and Sub-tropical Rainforest (NPWS, 2004). Of the six populations only two populations in conservation reserves (Broken Head and Brunswick Heads Nature Reserves). Individual populations are small and the best estimate of the total population in New South Wales is less than 250 mature individuals (NSW Scientific Committee, 2000).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.

Species	Preferred Habitat	BCA Status	EPBC Status	Expected Impact
Cryptocarya foetida	Stinking Cryptocarya is known from Iluka, NSW, to Fraser Island and east of Gympie, southern Queensland where it occurs within littoral rainforest, usually on sandy soils, but mature trees are also known on basalt soils. (DECC, 2005).	V	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development
Endiandra floydii	The Crystal Creek Walnut is known from Pimpama, just north of the Queensland Gold Coast, south to Byron Hills, six km south of Cape Byron, NSW. Several large populations are known. Two are in the ranges to the north of Murwillumbah, where numerous other smaller occurrences are also found. At least 50 individuals are known from the Urliup Road area (Barry & Thomas 1994) and 40–50 trees have been reported from Crystal Creek (R. Cremer pers. Comm.). A further concentration of plants is in Mooball National Park where nearly 80 individuals have been recorded (NPWS survey data, 1997). The Crystal Creek Walnut occurs in subtropical (including littoral) rainforest or wet sclerophyll forest. Most locations are on soils derived from paleozoic metamorphics, sometimes with basalt nearby. A small number of sites are on alluvium or sand. Sheltered locations are apparently preferred, and landforms including ridgelines, slopes, gullies and creek flats have been documented. The altitude varies between close to sea level up to 430 m above sea level (Floyd 1989).	E1	E	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Endiandra hayesii	The Rusty Rose Walnut has a restricted distribution in northern NSW and southern Queensland (Hyland 1989). Records of this species are clustered in the Border Ranges, Nightcap Ranges and surrounds, and at a few scattered near-coastal locations. Vegetation includes subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats (NPWS, 2004).	V	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Endiandra muelleri subsp. Bracteata	Rainforest or wet eucalypt forest, chiefly at lower altitudes (DECC, 2005).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Owenia cepiodora	This species is known from subtropical and dry rainforest on or near soils derived from basalt from the Richmond River north to just north of the Qld border (DEC, 2005; BSC, 2006).	V	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.

Species	Preferred Habitat	BCA Status	EPBC Status	Expected Impact
Tinospora tinosporoides	Arrow-head Vine occurs near the coast at Richmond River in northern NSW to Burleigh Heads National Park (NP) in Queensland where it is locally common rainforest on basalt and also occurs in complex notophyll vine forest (DSEWPC, 2008:1).	V		Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Rhodamnia rubescens	In New South Wales (NSW), *Rhodamnia rubescens* is currently known to occur from coastal districts north from Batemans Bay, approximately 280 km south of Sydney, to the Queensland (Qld) border. Populations of the species extend north to Maryborough, Qld. NSW populations of R. rubescens are mainly coastal and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000–1,600 mm (Benson and McDougall 1998). Populations and individuals of R. rubescens are often found in wet sclerophyll associations in rainforest transition zones and creekside riparian vegetation (Benson and McDougall 1998). *Rhodamnia rubescens* commonly occurs in all rainforest subforms except cool temperate rainforest. The species occupies a range of volcanically derived and sedimentary soils and is also a common pioneer species in eucalypt forests (Floyd 1989).	E4	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Rhodomyrtus psidioides	In New South Wales (NSW), *Rhodomyrtus psidioides* is currently known to occur from Broken Bay, approximately 30 km north of Sydney, to the Queensland (Qld) border. Populations of the species extend north to Gympie, Qld. NSW populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges. The species occurs in rainforest and its margins with sclerophyll vegetation, often near creeks and drainage lines. *Rhodomyrtus psidiodes* is a pioneer species in disturbed environments (Williams and Adam 2010) and is locally common in disturbed areas, such as regrowth and rainforest margins.	E4	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Syzygium hodgkinsoniae	Smooth-bark Rose Apple occurs in riverine rainforest on rich alluvial or basaltic soils, from the Richmond River in NSW to Gympie, Queensland, with a disjunct occurrence in north Queensland (Floyd, 1989). The species occurs mostly as scattered individuals along watercourses, where the habitat is frequently limited and degraded (Landmark Ecological Services, Ecograph & Terrafocus, 1999).	V	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Syzygium moorei	The Durobby occurs in warm, protected, fertile soils in riverine and gully rainforests at low altitudes, along sections of the Richmond, Brunswick and Tweed Rivers in NSW, as well as at three sites in Upper	V	V	Not recorded during site survey works. Unlikely to

Species	Preferred Habitat	BCA Status	EPBC Status	Expected Impact
	Mudgeeraba Creek and Upper Tallebudgera Creek in south-east Queensland (Floyd, 1989). Rose Apple is most commonly found in Subtropical Rainforest.			be significantly impacted upon as a result of the proposed development.
Diuris byronensis	This orchid is known from a single location only, at Byron Bay in north-east NSW. Only about 20 plants have been recorded (OEH, 2012). Occurs in low-growing grassy heath on clay soil (OEH, 2012).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Geodorum densiflorum	This orchid is found in dry sclerophyll forest, often on coastal sand, at lower altitudes, north from the Macleay River on the north coast of NSW (NPWS, 2004).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Oberonia complanata	In Australia the species occurs in Queensland and New South Wales. Within New South Wales, there are several historical collections (all pre 1917) of *Oberonia complanata* from Byron Bay and Lismore, and a collection from Coffs Harbour from 1961. Preferred habitat appears to be rainforest, but it can also occur in sclerophyll forest, coastal scrub and mangroves (NPWS, 2002).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Peristeranthus hillii	Found in north-eastern NSW, north from Port Macquarie, extending to north-eastern Queensland as far as the Bloomfield River. Restricted to coastal and near-coastal environments, particularly Littoral Rainforest and the threatened ecological community Lowland Rainforest on Floodplain (OEH, 2018).	V	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Phaius australis	This species is known from swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (NPWS, 2002).	E1	E	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Pterostylis nigricans	Occurs within coastal heathland with Heath Banksia (*Banksia ericifolia*), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soils (OEH, 2012).	V	-	Not recorded during site survey works. Unlikely to be significantly impacted

Species	Preferred Habitat	BCA Status	EPBC Status	Expected Impact
				upon as a result of the proposed development.
Drynaria rigidula	Occurs widely in eastern Queensland. In NSW it is only found north of the Clarence River, in a few locations at Maclean, Bogangar, Byron Bay, Mullumbimby, in the Tweed Valley and at Woodenbong. Usually found in rainforest but also in moist eucalypt and Swamp Oak forest (OEH, 2019).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Floydia praealta	The Ball Nut inhabits floristically-rich, tall, closed riverine to subtropical rainforest (Barry & Thomas 1994; Floyd 1989; Harden 1991, 2000; Quinn et al. 1995; Sheringham & Westaway 1995) or coastal scrub (Foreman 1995a).	V	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Grevillea hilliana	This species is known from small remnant patches of subtropical rainforest on basaltic soils in Brunswick and Tweed Heads (NPWS, 2002).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Macadamia tetraphylla	This species of nut tree is confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland where it occurs within subtropical rainforest, particularly on basaltic soils. (Williams, Harden and McDonald, UNE, 1984; DECC, 2005). The species is also commonly noted as a paddock tree on soils of basaltic influence and as an ornamental or orchard tree associated with residential and/or rural activities.	V	V	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Psilotum complanatum	Epiphyte in rainforest, often found growing from bases of other large clumps of epiphytes; rare in N.S.W., north from Ballina, also recorded at Port Macquarie (PlantNET, 2020)	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Randia moorei	Spiny Gardenia grows in subtropical, riverine, littoral and dry stunted rainforests (NSW DEC 2004b) along moist scrubby water courses at altitudes up to 360 m asl, with most records made from below 100 m asl (NSW DEC 2004b). Spiny Gardenia occurs on soils derived from basalt, shales, slate or alluvium (NSW DEC 2004b).	E1	E	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.

Species	Preferred Habitat	BCA Status	EPBC Status	Expected Impact
Acronychia littoralis	Scented Acronychia occurs from Fraser Island in Queensland to Port Macquarie in NSW. Most populations occur in NSW, between Ballina and Tweed Heads. In NSW, populations are conserved in Bongil Bongil NP, Bundjalung NP, Broken Head Nature Reserve (NR), Cape Byron NR, Brunswick Heads NR, Cudgen Lake NR and Cooloola NP. Scented Acronychia is found on sand in humid, high rainfall zones (greater than 1600 mm), within 2 km of the ocean. The species occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest and cleared land (Harden, 2002).	E1	E	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Melicope vitiflora	The species occurs in Queensland and reaches its southern limit in NSW, where it is restricted to the far north east corner of the State, in coastal areas around the Brunswick Heads and Broken Head. *Melicope vitiflora* grows in subtropical and littoral rainforest (NPWS 2003).	E1	-	Not recorded during site survey works. Unlikely to be significantly impacted upon as a result of the proposed development.
Niemeyera whitei	Rusty Plum occurs in the coast and adjacent ranges of northern NSW from the Macleay River into southern Queensland. Its distributional stronghold is on the mid north coast around Coffs Harbour. The species is found in gully, warm temperate or littoral rainforests and the adjacent understorey of moist eucalypt forest. It occurs on poorer soils in areas below 600 metres above sea level (OEH, 2019). The species was recorded within the northern portions of the subject site within rainforest. The species is well known to the site and is subject to routine monitoring. The species is well removed from the proposal footprint (>450m) and will not be impacted upon as a result of the proposal.	V	-	A large tree and several saplings recorded within rainforest in the northern portions of the subject site. These specimens have previously been recorded within the site and are subject to routine monitoring. These specimens are well removed from the proposal site and will not be impacted upon.

Note: E1 = Endangered (BCA, 2016); E = Endangered (EPBC 1999); E4A = Critically Endangered (BCA, 2016); CE = Critically Endangered (EPBC 1999); and V = Vulnerable (BCA, 2016 and EPBC 1999)

5.3 Threatened Fauna Species

A search of the NPWS 'Atlas of NSW Wildlife' (2020) has determined that forty-eight species of threatened fauna have been previously recorded within the locality (search area: North: -28.61; West: 153.57; East: 153.67; South: -28.71).

A review of available habitats and the ecology of the database listed species (i.e. range, preferred habitat, home range etc.) indicate that it is unlikely that all of these previously recorded species in the locality would rely on the habitats of the Study Area. Subsequently several such threatened species are considered unlikely to be significantly affected by a future development of the site for one or more of the following reasons:

- Core/favoured habitats were not recorded in the Study Area
- Resources used by the species are unlikely to be adversely affected or only likely to be minimally affected by a future proposal.

Details of such species requirements and reasons for not considering impacts to these species further are discussed below (**Table 5**). A number of threatened species have been excluded from discussion in the below table where they are considered reasonably unlikely occurrences and impacts are unlikely to be occasioned as a result of the proposal due to the following:

- Being a marine reptile or mammal (i.e. whale, turtle, seal).
- Being a pelagic seabird, wader bird or inter-tidal zone coastal bird (i.e. tern, godwit, oystercatcher).

For species considered a potential occurrence (based upon distribution, database recording, suitable habitat present etc.) or which were recorded within or directly adjacent the site during the survey period and for which it is considered that the species may be affected (i.e. impact on feeding, roosting, nesting, behaviour and associated habitat), the 'test of significance' is performed.

Notwithstanding, all the species tabled below were targeted during the fauna survey or were reviewed in the context of documented ecology and available habitats.

Table 5: Potentially Occurring Threatened Fauna Species

Species	Potential occurrence based upon known habitat & range	Notes	BCA Status	EPBC Status	Potential for the species or associated habitat to be impacted upon by proposal
Wallum Froglet (*Crinia tinnula*)	Unlikely	This species of wallum frog is found along drainage lines in sub-coastal wet heath, in acid paperbark (Melaleuca) swamps, and sedge swamps associated with sandy coastal plains (but rarely from around coastal lakes) and low slopes below 40m altitude and above areas of tidal influence (Ehmann, 1997; Meyer et al, 2006). The habitats in which the wallum froglet species breed are typically oligotrophic (i.e. nutrient poor), tannin-stained and acidic ((pH 4.3-5.2) [QPWS 2001; Meyer et al. 2006; McDonald et al, 2009; Hines et al, 2004). The coastal distribution occurs as far north as Litabella National Park on the southeast coast of Queensland south to Kurnell in mid-eastern New South and also upon a number of offshore islands including Fraser Island, Bribie Island, Moreton Island and North Stradbroke Island (BCC, 2010). A regionally significant population of the species is noted to occur within a wide variety of habitats investigated in association with the Tugun Bypass SIS (PB, 2004; Hero et al, 2001). Known habitat broadly encompasses the following vegetation communities: Slashed Heathland, Wet Heathland, Swamp Mahogany Forest, Swamp Mahogany–Brushbox Forest, Littoral Rainforest, Swamp Paperbark Forest and other moist forest types. Although the species is known to occur within the, preferred habitat for the Wallum Froglet is considered absent from the site. The species was not recorded during survey efforts of the Study Area. It is considered unlikely that the proposal will have a significant impact upon this species.	V	-	Favoured habitat absent. Unlikely to be significantly impacted upon as a result of the proposed development.
Green and Golden Bell Frog (*Litoria aurea*)	Unlikely	This species is restricted to isolated coastal populations between Brunswick Heads and East Gippsland where it inhabits marshes, dams and stream sides, particularly those containing bullrushes *Typha* spp. or spikerushes *Eleocharis* spp (NPWS, 1999). Preferred habitat for this species is considered absent from the Study Area. The species was not recorded during survey efforts of the Study Area and has rarely been recorded within the region in recent years. Unlikely to be significantly impacted by the proposal.	E1	V	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Olongburra Frog *(Litoria olongburensis)*	Unlikely	The Wallum Sedge Frog is found in ephemeral, seasonal and permanent wetlands with emergent reeds, ferns and/or sedges, in undisturbed coastal wallum swamps. Griffith and colleagues (2003) describe wallum as sandmass heathland and shrubland, and various forest, woodland, sedgeland and grassland communities (Bantianoff & Elsol 1989; Coaldrake	V	V	Favoured habitat absent. Unlikely to be significantly impacted as a

		1961). While most common in swamps, the Wallum Sedge Frog may also be found around creeks and freshwater lakes in coastal wallum. At swamp sites, the Wallum Sedge Frog can be found sheltering amongst sedges, reeds and ferns all year round (Anstis 2002; Ehmann 1997; Ingram & Corben 1975; James 1996; Lewis & Goldingay 2005; Liem & Ingram 1977; Neilson 2000). Although the species is known to occur within the, preferred habitat for the Wallum Sedgefrog is considered absent from the site. The species was not recorded during survey efforts. It is considered unlikely that the proposal will have a significant impact upon this species.			result of the proposed development.
Wompoo Fruit-Dove (*Ptilinopus magnificus*)	Unlikely	This species is confined to mature rainforest and adjacent wet sclerophyll environments in eastern Australia from Cape York to around Coffs Harbour. As an obligate frugivore it requires a high availability of fruiting materials which it generally feeds on in the high canopy (Recher et al, 1995). Preferred habitat for the Wompoo Fruit-dove is considered absent from the site. The species was not recorded during fauna survey works of the site. Additionally, no nests were observed within the site during fauna survey works. It is considered unlikely that the proposed development will have a significant impact upon the Wompoo Fruit-dove.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Rose-crowned Fruit-Dove (*Ptilinopus regina*)	Unlikely	This species generally occurs within sub-tropical rainforest, camphor laurel and occasionally wet sclerophyll and swamp forests which contain suitable fruiting species for foraging (DEC, 2005; Recher et al, 1995). As an obligate frugivore a high proportion of fruiting species (figs, lillipillis, laurels etc.) is necessary and as such rainforest habitats are favoured. The species is considered a partial migrant and moves north in autumn/winter and returning in spring/summer to breed (Recher et al, 1995). Preferred habitat for the Rose-crowned Fruit-dove is considered absent from the site. The species was not recorded during fauna survey works of the site. Additionally, no nests were observed within the site during fauna works. It is considered unlikely that the proposed development will have a significant impact upon the Rose-crowned Fruit-dove.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Superb Fruit-Dove (*Ptilinopus superbus*)	Unlikely	This species is known from rainforest and adjacent eucalypt forests which contain suitable fruiting species for foraging (DEC, 2005; Recher et al, 1995). As an obligate frugivore a high proportion of fruiting species (figs, palms, lillipillis, laurels etc) is necessary and as such rainforest habitats are favoured where the species spends most of its time in the canopy. The species is considered a partial migrant and moves north in autumn/winter and returning in spring/summer to breed (Recher et al, 1995).	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.

		Preferred habitat for the Superb Fruit-dove is considered absent from the site. The species was not recorded during fauna survey works of the site. Additionally, no nests were observed within the site during fauna works. It is considered unlikely that the proposed development will have a significant impact upon the Superb Fruit-dove.			
Marbled Frogmouth (*Podargus ocellatus*)	Unlikely	This species favours prefers subtropical or warm-temperate rainforest containing deep, wet, sheltered gullies dominated by stands of Bangalow Palms and/or dense rainforest understorey in SEQld and NENSW (DEC, 2005; Smith et al, 1994; Milledge, 1983). Tracking studies undertaken by Smith et al (1994) indicates that the species occupies a moderately large home range (8-10 hectares) which centres around a creek or gullyline although movements were greatly restricted during the breeding season. Roosts sites are in, or on the margins of, rainforest, frequently associated with vines (Smith *et al.*, 1998). Preferred habitat for the marbled frogmouth is considered to be absent from the site and the species was not recorded during fauna survey works. It is considered unlikely that the proposed development will have a significant impact upon the marbled frogmouth.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Black-necked Stork (*Ephippiorhynchus asiaticus*)	Unlikely	The species is generally associated with wetlands, mudflats, mangroves, swamps and floodplains while it may also sometimes be found in open woodland environs where a grassy understorey is present (NPWS, 2002, Readers Digest, 2002; DEC, 2005). Irrigated lands are also occasionally a foraging resource and it has also been recorded foraging in artificial wetlands of sewerage treatment plants (ERM, 2001). The species has also been recorded foraging within grassed paddocks and pasture areas in Cedar Creek, Mudgeeraba and Coomera (pers. Obs.). Preferred habitat for the Black-necked Stork is considered to be absent from the site and the species was not recorded during fauna survey works. It is considered unlikely that the proposed development will have a significant impact upon the species.	E1	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Australasian Bittern (*Botaurus poiciloptilus*)	Unlikely	The Australasian Bittern inhabits terrestrial and estuarine wetlands, generally where there is permanent water. The species prefers wetlands with dense vegetation, including sedges, rushes and reeds. (Marchant & Higgins 1990; Garnett 1992). Freshwater is generally preferred, although dense saltmarsh vegetation in estuaries and flooded grasslands are also used by the species (Smith *et al.* 1995) [in NPWS, 1999: 2-3]. Given the absence of densely vegetated wetlands areas, favoured habitat for the Australasian Bittern is considered absent from the site. The species has not been recorded within the site survey efforts. It is considered unlikely that the proposal will have a significant impact upon this species.	E1	E	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.

Black Bittern (*Ixobrychus flavicollis*)	Unlikely	The species is widely distributed throughout the coastal regions of Australia but is more common in the northern extent of the country. Within its distribution, the species shows a preference for densely vegetated areas within terrestrial and aquatic wetlands. It has been recorded from a variety of vegetation types (including grassland, mangroves, wet sclerophyll forest, rainforest) where permanent water is present (Marchant & Higgins, 1990; Simpson & Day, 1996; NPWS, 2001). In northern NSW black bitterns are most often recorded in riparian habitats along fresh or brackish streams, although the species is also known to utilise drains, permanently inundated swamp forest, and freshwater wetlands (Sandpiper Ecological Surveys, 2003). Given the absence of densely vegetated wetlands areas, favoured habitat for the Black Bittern is considered absent from the study area. The species has not been recorded within the site during survey efforts. It is considered unlikely that the proposal will have a significant impact upon this species.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
White-bellied Sea-eagle (*Haliaeetus laucogaster*)	Unlikely	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been recorded in (or flying over) a variety of terrestrial habitats (Marchant & Higgins 1993). The White-bellied Sea-Eagle feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal (del Hoyo et al. 1994; Ferguson-Lees & Christie 2001; Marchant & Higgins 1993; Rose 2001a). Expansive favoured habitat for the Sea-eagle occurs in the locality (in association with the foreshore and river estuaries such as Belongil Creek, Tallow Creek). Preferred foraging habitat is considered absent from the site due to the absence of suitable waterbodies and the species was not recorded during survey efforts. Large stick nests were not observed within the site. It is considered unlikely that the proposal will have an impact upon this species.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Little Eagle (*Hieraaetus morphnoides*)	Possible	The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used (Marchant and Higgins 1993; Aumann 2001a). The Little Eagle is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment (Marchant and Higgins 1993). It occurs as a single population throughout NSW. The population in New Guinea is now classified as a separate species, the Papuan Booted Eagle *Hieraaetus weiskei* (Lerner and Mindell 2005). The site may fall within the species hunting range although the species has not been recorded within the Study Area. No stick nests suitable for this species was observed within	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.

		the site. It is considered unlikely that the proposal will have a significant impact upon this species.			
Square-tailed Kite (*Lophoictinia isura*)	Possible	This species typically prefers the coastal forested and wooded lands of tropical and temperate Australia where it appears to occupy large hunting ranges of more than 100km^2 (Marchant & Higgins 1993; NPWS, 1999; DEC, 2005). 'It particularly favours productive forests on the coastal plain, box-ironbark-gum woodlands on the inland slopes, and Coolibah/River Red Gum on the inland plains (Marchant & Higgins 1993). It also forages over coastal heathlands, and often near openings and edges of forest. A common feature of the kite's habitat is the presence of profuse eucalypt blossom and attendant nectivorous/passerine birds which are the favoured prey of the kite (Readers Digest, 2002, NPWS, 1999). In eastern NSW, neighbouring nests of the Square-tailed Kite are about 13 km apart, with a density of one pair per 170 km^2, and home range of roughly 50 km^2 (Lutter *et al.* 2004). The site may fall within the species large hunting range although the Kite was not recorded during survey efforts of the site. Large stick nests indicative of a raptor was not observed. It is considered highly unlikely that the proposal will have a significant impact upon the Square-tailed Kite.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Eastern Osprey (*Pandion cristatus*)	Unlikely	This species is associated with waterbased habitats including estuaries, coastal wetlands, rivers and streams. The Osprey is predominately a coastal raptor frequenting estuaries, bays, inlets, islands and rocky cliffs within all Australian states except for Tasmania and sporadically within Victoria (DEC, 2005; NPWS, 2002). It is noted however, that the species sometimes inhabits inland islands (Pizzey and Knight, 1997; Readers Digest, 2002). Within suitable environment it usually constructs a nest in an overhanging large tree or upon elevated man-made structures such as platforms or telegraph poles. Expansive favoured habitat for the Osprey occurs in the locality (in association with the foreshore and river estuaries such as Belongil Creek, Tallow Creek). Preferred foraging habitat is considered absent from the Study Area due to the absence of suitable waterbodies and the species was not recorded during survey efforts. Additionally, no Osprey nests were noted on the site. It is considered unlikely that the proposal will have an impact upon this species.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development
Brolga (*Grus rubicunda*)	Unlikely	The Brolga inhabits the large open swamplands/wetlands of coastal and subtropical coastal Australia where it may form flocks of several hundred individuals during the breeding season (Readers Digest, 2002). Studies conducted in southern NSW and Northern Victoria (Charles Sturt University, 2000) indicates that most Brolga breeding sites were large (>50 ha) remnant wetlands with extensive areas of water around 30 cm deep. More than 90% of breeding sites were dominated by Canegrass (*Eragrostis australasica*, *E. infecunda*) or Spike-rushes (*Eleocharis* species), with emergent vegetation cover usually around 25% and 90 cm in height. DEC (2005) notes that the species may also forage within grassed paddocks or ploughed fields.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development

		Preferred habitat for the Brolga is considered absent from the site and is unlikely to be significantly impacted upon as a result of the proposed development.			
Pale-vented Bush-hen (*Amaurornis moluccana*)	Unlikely	This species favors coastal rivers and inlets from the Clarence River, north. It prefers densely overgrown margins of permanent terrestrial freshwater wetlands such as creeks and rivers, billabongs, ponds, swamps, waterholes, dams, lakes and roadside ditches (Muranyi and Baverstock, 1996). Three Bush-hens were recorded from Swamp Mahogany Forest in areas NE of the Cobaki Broadwater in association with fauna survey works undertaken in association with the Tugan Bypass SIS (Ecopro, 2004). PB (2008) has also recorded the bush hen at Banora Point within early regrowth rainforest west of Martinelli Avenue. Given the absence of densely vegetated wetlands areas, favoured habitat for the Bush-hen is considered absent from the Study Area. The species has not been recorded within the site during recent or previous survey efforts. It is considered unlikely that the proposal will have a significant impact upon this species.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development
Bush Stone-curlew (*Burhinus glallarius*)	Possible	In NSW, Bush Stone-curlews occur in lowland grassy woodland and open forest. Habitat is described by broad ground and understorey structural features and is not necessarily associated with any particular vegetation communities. In general, habitat occurs in open woodlands with few, if any, shrubs, and short, sparse grasses of less than 15cm in height, with scattered fallen timber, leaf litter and bare ground present. In coastal areas, structurally similar elements of tidal and estuarine communities provide suitable habitat, for example Bush Stone curlews are recorded within Casuarina woodlands, saltmarsh and mangroves (Price 2004). The important structural elements of Bush Stone-curlew habitat appear to be: o a low sparse ground cover o some fallen timber and leaf litter o a general lack of a shrubby understorey o open woodlands (DECC, 2006: 8) Foraging however, has been noted to occur over a broader spectrum of habitats including paddocks, grasslands, domestic areas (gardens, sports fields, [golf courses, residential areas pers. Obs] etc), estuarine areas (mudflats, saltmarsh, mangrove forest, swamp oak, melaleuca forest) (NPWS, 1999; 2006). As the species utilizes a wide range of habitats (including modified residential areas) it is considered most of the site represents potential habitat. During the survey period the curlew was not recorded via diurnal and nocturnal investigations, heard vocalising or encountered in response to amplified call playback. It is considered unlikely that the proposal will have a significant impact upon this species.	E1	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development

Beach Stone-curlew (*Esacus magnirostris*)	Unlikely	The beach stone-curlew is usually found on open, undisturbed beaches, islands, reefs, and estuarine intertidal sand and mudflats, preferring beaches with estuaries or mangroves nearby. However, this species also frequents river mouths, offshore sandbars associated with coral atolls, reefs and rock platforms, and coastal lagoons. The beach stone-curlew has been observed around the north coast of Australia and associated islands from Derby in Western Australia to the Manning River in New South Wales. The species has largely disappeared from the south-eastern part of its former range, and is now rarely recorded on ocean beaches in New South Wales. Preferred habitat for the Beach Stone-curlew is considered absent from the site. It is considered highly unlikely that the proposal will have a significant impact upon this species.	E4A	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Comb-crested Jacana	Unlikely	This species inhabits permanent wetlands with a good surface cover of floating vegetation, especially water-lilies It occurs throughout coastal Australia and well inland in the north from the Kimberley to Sydney (DEC, 2005). Preferred habitat for the Comb-crested Jacana is considered absent from the site. The species was not recorded on site during site survey efforts and is considered unlikely to be significantly impacted upon as a result of the proposed development.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	Unlikely	Glossy Black Cockatoos are uncommon parrots found in scattered localities in the forests and woodlands of eastern Australia and Kangaroo Island (Forshaw, 1981). The eastern subspecies of Glossy Black Cockatoos seems thinly distributed through its range with the highest densities occurring in south-eastern Queensland and north-eastern New South Wales (Forshaw, 1989). The main habitat of the eastern subspecies is *Eucalyptus* woodlands and forest with moderate-high densities of *Allocasuarina* which are required for feeding (Clout, 1989; Park & Borsboom, 1996; Forshaw & Cooper, 1989; Crome & Shields, 1992; Cleland & Sims, 1968; Garnett, 1992b; Blakers *et al*, 1984). Suitable senescent trees (large hollow within a live or dead Eucalypt: 10-20m, Depth: 40-120cm, Entry: ~21cm: Inside Dia: ~23cm (Forshaw, 1981; Gibbons & Lindenmayer, 2002)) are also required for nesting. Preferred substantial areas of eucalypt forest/woodland habitat containing feed trees (*i.e. Allocasuarina spp.*) are absent from the site. Additionally, no suitable sized hollows were recorded within the site. Survey included dusk avifauna searches and dusk amplified call playback which did not locate the species during the survey period. It is considered unlikely that the proposed development will have a significant impact upon this species.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Coxen's Fig-Parrot (*Cyclopsitta*	Unlikely	The small, predominantly green Coxen's Fig Parrot is found wherever fig trees are present in lowland and upland forest types, riparian corridors, farmland and urban environments	E4A	E	Favoured habitat absent. Unlikely to

diophthalma coxeni)		(Coxen's Fig-Parrot Recovery Team 2001). Seeds of native figs are the major food source of this endangered bird species (Forshaw 1981, Romer and Spittall 1994, Pizzey and Knight 1997). The Moreton Bay Fig (*Ficus macrophylla*) and Green-leaved Strangler Fig (*F. watkinsiana*) are preferred species. Most records of Coxen's Fig-Parrot have been taken within small remnant stands, forest edges (Holmes 1994) or thin strips of gallery forest (Norris 1964). Subtropical rainforest, dry rainforest, sclerophyll forest and subtropical rainforest are preferred nesting sites (Coxen's Fig-Parrot Recovery Team 2001). High trees within or near the edge of rainforest are suitable for nesting. Coxen's Fig-Parrot is estimated to occur in four subpopulations: greater Bundaberg region, Maleny/Imbil/Kin Kin Creek area, the Qld/NSW border area (Lamington National Park, Whian Whian State Forest, Alstonville plateau), and the upper Hastings River catchment. This estimate is considered to be of low reliability (i.e. there is uncertainty about the number of subpopulations and the extent of genetic separation between subpopulations) (Garnett & Crowley 2000 in DSEWPC, 2013). Most recent records of the species are recorded from the Lamington Plateau (Qld) with only seven unconfirmed sightings recorded from NSW since 1981. It is estimated that the remaining wild population of the species may be less than 100 individuals (DSEWPC, 2013). Preferred habitat (rainforest containing Figs) is absent from the subject site and the species was not recorded during survey efforts of the site. It is considered unlikely that the proposed development will have a significant impact upon this species.			be significantly impacted as a result of the proposed development.
Diamond Firetail (*Stagonopleura guttata*)	Unlikely	The Diamond Firetail is a brightly coloured finch that occupies eucalypt woodlands, forests and mallee where there is a grassy understorey. Firetails build bottle-shaped nests in trees and bushes, and forage on the ground, largely for grass seeds and other plant material, but also for insects (Blakers et al. 1984, Read 1994). Favoured eucalypt woodland containing a grassy understorey is considered absent from the site. The species was not recorded during survey efforts of the site. It is considered unlikely that the proposed development will have a significant impact upon this species.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Little Lorikeet (*Glossopsitta pusilla*)	Unlikely	The distribution of the Little Lorikeet extends from just north of Cairns, around the east coast of Australia, to Adelaide. In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (Barrett *et al*. 2003). There is no evidence of regular migration, but Little Lorikeets are generally considered to be nomadic (Higgins 1999), with irregular large or small influxes of individuals occurring at any time of year, apparently related to food availability. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. In south-east Queensland (Smyth *et al*. 2002), Little Lorikeets were more likely to occupy forest sites with relatively short to intermediate logging	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.

		rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires" (DECC, 2009). Although extensive sclerophyll/eucalypt forests are absent from the site and adjacent areas, the residual Paperbark and Swamp Mahogany trees may provide foraging resources for the species. The site is well removed from known breeding grounds of the little lorikeet. The distance of the site from preferred foraging areas proximate to the Great Dividing Range reduces the importance of the site for the little lorikeet which was not recorded. It is considered unlikely that the proposal will significantly impact the Little Lorikeet.			
Eastern Grass Owl (*Tyto longimembris*)	Unlikely	This species is generally recorded within tussock-grasslands but has also been noted to occur within heathland, swamps, coastal dunes, tree-lined creeks, treeless plains, mangrove fringes, grassy gaps between trees and crops and sugar cane plantation (Garnett and Crowley 2000; Pizzey and Knight, 1997). Within these habitats it sources a wide range of prey including birds, insects and terrestrial mammals. However, it feeds predominately on rodents and its population numbers can fluctuate wildly with the rise and fall of prey populations (Olsend and Doran, 2002). The fall of primary prey species following plague events (during which owl breeding increases) can result in widespread dispersal by the Owls with starvation also noted as the forage base reduces (Debus et al, 1998). Preferred habitat for the Eastern Grass Owl is considered absent from the site. The species was not recorded during recent or previously conducted fauna surveys and is considered unlikely to be significantly impacted upon as a result of the proposal.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Masked Owl (*Tyto novaehollandiae*)	Possible	The Masked Owl lives in eucalypt forests and woodlands from the coast, where it is most abundant, to the western plains (Kavanagh 2002b in NPWS, 2005). Within suitable habitat that species occupies a range of 5-10km^2 where it forages mostly upon rodents and marsupials, although this may be supplemented by bandicoots, arboreal mammals (Sugar Glider, Common Ringtail Possum) and some birds with introduced rodents and rabbits becoming important in disturbed environments (Debus, 1993, Kavanagh, 1996; NPWS, 2005). Habitats containing stands of large, hollow bearing eucalypts are also critical to roosting and nesting (NPWS, 2005; Kavanagh and Murray, 1996). Although the site may fall within the hunting range for the Masked Owl, it is unlikely to represent significant habitat within its home range given the small size of the site (in comparison to the species home range). Suitable hollows were noted recorded within the site. The species was not recorded during nocturnal survey efforts of the site. It is considered unlikely that the proposal will have a significantly impact upon the Masked Owl.	V	-	This species is considered unlikely to be significantly affected by the proposed development

Sooty Owl (*Tyto tenebricosa*)	Possible	This species is known predominantly from dry, subtropical and warm temperate rainforest and wet sclerophyll forest of the coastal, escarpment and eastern tablelands regions of NSW (Kavanagh 2002; DEC, 2005). The owl is reported as occupying the easternmost one-eighth of NSW (Debus 1994; DEC, 2005). Within this habitat it feeds largely on mammals ranging from small terrestrial species to medium sized arboreal species such as the Common Ringtail Possum, Sugar Glider, Bush Rat and Brown Antechinus (DEC, 2005; Lundie-Jenkins, 1992). Nesting occurs in large hollow trees which are mostly Eucalypts but can include Moreton Bay Figs and Giant Stinging Trees (DEC, 2005). A very large home range has been estimated as "200-800 ha according to habitat productivity; measured as 3000 ha (1000 ha actually used) for one unmated, nonbreeding individual in marginal habitat, and 450+ ha for one adult female in continuous habitat of mesic gullies within dry forest (Kavanagh 1997, Kavanagh and Jackson 1997 in DEC, 2005: 12). Kavanagh & Stanton (2002) further note that small (<200 ha) fragments do not provide a significant reservoir for populations of large forest owl (Sooty, Powerful, Masked) species. The species was not recorded during the recent or previous survey efforts of the Although the site may fall within the hunting range for the Sooty Owl, it is unlikely to represent significant habitat within its home range given the small size of the site and paucity of suitable forest/woodland areas. No suitable hollow bearing trees were observed within the subject site. Reviewing the above, it is considered that no significant impact will arise upon the sooty owl as a result of the proposed development.	V	-	This species is considered unlikely to be significantly affected by the proposed development
White-eared Monarch (*Carterornis leucotis*)	Unlikely	This species generally occurs within Coastal/Subtropical/Littoral Rainforests and occasionally Eucalypt/Riparian Forest, Mangroves and Swamp Sclerophyll with mesomorphic understorey along the eastern coast of Australia from Cape York to the Tweed River (Readers Digest, 2002; DEC, 2005). In NSW, White-eared Monarchs occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest. • They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads. • They are highly active when foraging, characteristically sallying, hovering and fluttering around the outer foliage of rainforest trees. They are usually observed high in the canopy or subcanopy Preferred habitat for the White-eared Monarch is considered absent from the site and is unlikely to be significantly impacted upon as a result of the proposed development.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.

Spotted-tailed Quoll (*Dasyurus maculatus*)	Unlikely	The species has been recorded from a wide range of habitats such as rainforest, open forest, woodland, coastal heathland, and inland riparian forest (Edgar and Belcher, 2002; Forest Practices Board, 2002). Additional habitat requirements include suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) and an abundance of food (such as birds and small mammals) (NSWNPWS, 1999; Edgar & Belcher, 2001; Belcher, 2000; Jones & Ross, 1996). Habitat range for males has been estimated to be as large as 2000-2200 hectares per individual, while for females, which are more protective of their dens, this value is considerably less at between 700-850 hectares per individual (Belcher, 2000; NPWS, 1999). In addition, Quolls are known to frequently swap dens and disperse large distances on any one night. Given the modified and fragmented nature of the site, suitable habitat for the quoll is considered absent. Furthermore, rocky outcrops/cave areas providing potential denning and latrine sites were not encountered on the site. It is considered unlikely that the proposal will have a significant impact upon the spotted-tailed quoll.	V	E	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Common Planigale (*Planigale maculata*)	Unlikely	This species is known to 'inhabit a broad range of habitats incorporating a dense ground cover layer including rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas (Redhead in Strahan, 2002; Lewis, 2005). In northern NSW, it has been suggested that their distribution often corresponds with the low lying flat and undulating areas of the coastal plains often near intensively settled areas (Gilmore and Parnaby 1994 in Lewis, 2005). A small population of the species has been recently recorded on the northern banks of the Cobaki Broadwater in association with Swamp Mahogany/Brushbox Forest (Ecopro, 2004; Lewis Ecological Surveys, 2004). A population of Planigales is also known further south of the site within the Koala Beach development where the species has been recorded within Brushbox Forest, Tall Eucalypt dominated Wet Sclerophyll Forest, Swamp Forest, Regrowth Eucalypt Forest and utilising artificial habitats within recorded habitats (AKF, 2005; TSC, 2007). Habitat features that appear most important to the local Planigale population include: i) Dense or scattered tree canopy-cover; ii) Dense ground-cover vegetation; and iii) Areas within or adjacent to low-lying sites subject to seasonally wet conditions, with occasional inundation for short periods (AKF, 2005). Preferred habitat for the Common Planigale is considered absent from the site given the absence of dense ground cover of litter and connected bushland. It is considered unlikely that the proposed development will have a significant impact upon the Common Planigale.	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Koala (*Phascolarctos cinereus*)	Possible	This species primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be	V	V	Unlikely to be significantly impacted upon as a result of the

		favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000). Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (*Eucalyptus microcorys*), Forest Red Gum (*E. tereticornis*), Scribbly Gum (*E. racemosa*), Grey Gum (*E. propinqua*), Red Mahogany (*E. resinifera*) and White Stringybark (*E. tindaliae*). Further research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (*E. robusta*) and Blue Gum (*E. tereticornis*) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh-Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (*E. tereticornis*), Tallowwood (*E. microcorys*) and/or Grey Gum (*E. propinqua*) comprise secondary habitat or primary habitat depending on the density of the latter two species. Phillips & Callaghan (1998) also noted Tallowwood to be a primary browse species and two types of Grey Gum (*E. propinqua, E. biturbinata)* to be secondary browse species in Currumbin. Recent studies (Biolink, 2007) indicate that *Eucalyptus tereticornis, E. microcorys* and *E. propinqua/E. biturbinata* are the most preferred koala food trees throughout the Gold Coast LGA. Within the Tweed Coast Swamp Mahogany *Eucalyptus robusta* and Forest Red Gum *E. tereticornis* are the most preferred tree species with Tallowwood *E. microcorys* and Grey Gum *E. propinqua* being the next most preferred (Biolink, 2011). Recent studies (Biolink, 2012) notes Swamp Mahogany (*E. robusta*), Forest Red Gum (*E. tereticornis*) and Tallowwood (*Eucalyptus microcorys*) being primary food tree species with Grey Gum (*E. propinqua*) being a secondary food tree species within Byron Shire. Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists, and they may attack during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]). A review of a number of published scientific reports notes that Koala density generally ranges between 0.02 and 1.26 animals per hectare. Densities are considered to vary dependent upon habitat quality, size, connectivity, presence of impediments to movement (stock fences, dogs, roads etc).			proposed development. 'Test of Significance' conducted.

Source	Study Location	Habitat Type	Additional Comments	Koala/ha
Dique et al, 2003	Southeast QLD Pine Rivers Shire	Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics	Stratified by two habitat descriptions 'urban' and 'bushland'	0-0.76
Dique et al, 2004	Southeast QLD Koala Coast ~375sqm of Redland, Logan and Brisbane City shires	Eucalypt Forests. Predominately RE 12.9-10.4 & 12.11.5	Study stratified by habitat descriptions: 'urban', 'remnant bushland', 'bushland' and 'other'. Remnant and bushland areas further stratified by proximity to the centre of the study area (high density=close to centre, low density=further away)	Range 0.02-1.26 Urban: 0.17 +/- 0.013 High remnant: 0.70 +/- 0.023 Low remnant: 0.20 +-/0.014 High bushland: 0.30+/-0.006 Low bushland: 0.11 +/-0.007 Other: 0
White and Kunst 1990	Southeast QLD Sheldon	Eucalypt Forest		0.4 (0.3-0.46)
Sullivan et a 2004	Southwest QLD	Eucalypt Forest/woodland within the mulgalands	Habitat stratified by floristics and landzone.	0.0007-2.513

			Biolink 2007	Coombabah Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per *Dique, 2003; EPA, 2005.*	0.22+/-0.04			
			Biolink 2007	Coomera-Pimpama Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per *Dique, 2003; EPA, 2005.*	0.23+/-0.03			
			Although suitable habitat (Eucalypt forest) is considered to be absent from the site, several favoured foraging trees (*Eucalyptus robusta*) is present (although scarce). No koalas were recorded during the survey via diurnal searches, nocturnal spotlighting, amplified call playback or trunk basal searches for scats. Additionally, no scratch marks indicative of a Koala was observed on smooth barked trees. The proposal seeks to retain all six (6) Swamp Mahogany (*Eucalyptus robusta*) within the development site. Reviewing the above, it is considered unlikely that the proposal will have a significant impact upon the local Koala population. Nevertheless, a 'Test of Significance' was conducted for this species.					

Long-nosed Potoroo (*Potorous tridactylus*)	Unlikely	Long-nosed Potoroos are generally restricted to areas with an annual rainfall greater than 760 mm where they inhabit dry and wet sclerophyll forests and woodland with a heathy understorey (Johnson in Strahan, 2002; DEC, 2005). The preferred habitat in north eastern NSW is dry and wet open shrubland (Mason 1997, DEC, 2005, Johnston in Strahan, 2002). In all habitats the species requires relatively thick groundcover growing on friable soils (Bennett, 1993). Within these areas the Potoroo digs for its food the main component of which is hypogeal fungi with other important items including hard-bodied arthropods, vascular plant tissues, seeds and fleshy fruits (Bennett & Baxter, 1989; Claridge et al, 1993). Required habitat (forested areas containing dense understorey elements in the form of ferns and shrubs) is considered absent from the site. It is considered unlikely that the proposed development will have a significant impact upon this species.	V	V	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Grey-headed Flying Fox (*Pteropus poliocephalus*)	Likely	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). All vegetated areas of the site represent potential foraging habitat for this wide-ranging species, although similar habitat occurs in abundance throughout the locality at a much larger scale (i.e. Cumbebin Swamp Nature Reserve, Arakwal National Park, Tyagarah Nature Reserve, private allotments etc.). No evidence of roosting on the site was observed with the nearest known flying-fox roost camp occurring ~1km north of the site along Middleton Street (DoEE, 2020). It is considered highly unlikely that this colony would be affected by the proposal. Whilst not recorded during site survey efforts, it is considered likely that the species would utilise areas of the site during peak flowering and fruiting periods (i.e. paperbarks, eucalypts, ornamental species etc.).	V	V	Species likely to utilise site during flowering periods. No roosting sites recorded. 'Test of Significance' conducted.

		The proposal will result in minor loss of potential foraging resources for the species. Given the abundance of forage species in the locality and the species is capable of travelling extensive distances to forage, it is considered unlikely that the proposed development will significantly impact the Grey-headed Flying-fox. Nevertheless, a test of significance was conducted for this species given the likely occurrence of this species within the site (refer to the later sections of the report).			
Common Blossom-bat (*Syconycteris australis*)	Possible	This species is one of the smallest members of the flying fox family (Pteropodidae) and is considered to be a specialist pollen feeder favouring Banksia, Melaleuca, Callistemon and certain species of Eucalypt (Strahan eds, 2002). Required habitats include Coastal rainforest, heathlands and Melaleuca swamps. Roosting is noted to occur in Littoral Rainforest with foraging occurring in proximate heathland and melaleuca forest primarily on the flowers of *Banksia integrifolia* (Law, 1993; 1994; 1996). Potential habitat is considered to occur in all forested areas of the site which includes paperbarks and eucalypts. Given the abundance of preferred foraging material within the locality and the absence of roosting sites, it is considered unlikely that the proposed development will have a significant impact upon the Common Blossom Bat.	V	-	This species is considered unlikely to be significantly affected by the proposed development.
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	Possible	This species of bats utilises most habitats across its wide distribution and hunts over the canopy in forested areas and lower within mallee or open country (DECC, 2005). Roosting may occur within hollow trees and buildings and also within caves and derelict mines (NPWS, 2004; Richards in Van Dyck and Strahan, 2008). DECC (2005) notes that in treeless areas the sheathtail bat is known to utilise mammal burrows. Although the site may fall within the fly way zone for the species between habitats of the locality, is not considered important for the species given its small size and abundance of similar habitats within the locality. No roosting sites were observed on site during site inspection. It is considered unlikely that the proposed development will significantly impact the species given the minor loss of potential habitat in comparison to the available habitat within the locality.	V	-	This species is considered unlikely to be significantly affected by the proposed development.
Eastern Freetail-bat (*Mormopterus norfolkensis*)	Possible	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. This species forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	V	-	This species is considered unlikely to be significantly affected by the

		All forested areas of the site are considered to represent potential Eastern Free-tail Bat habitat although roosting sites were not observed. It is considered unlikely that the proposal will have a significant impact upon this species given the availability of suitable habitat within the locality.			proposed development.
Little Bentwing-bat (*Miniopterus australis*)	Likely	This species utilises well-timbered habitats including rainforest, *Melaleuca* swamps and dry sclerophyll forests where it It feeds on insects within the canopy and requires caves, mines, stormwater drains and/or tree hollows to roost (Strahan eds, 2002). In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (*M. schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young. All forested areas of the site are considered to represent potential habitat for the Little Bentwing bat, although roosting sites were not observed. The species is regularly recorded within the region (pers obs.). Given the abundance of similar habitats within the locality, it is considered unlikely that the proposed development will significantly impact the species. As the species is likely to utilise the site, a test of significance was conducted for the species (refer to the later sections of the report).	V	-	Species likely to utilise the site. No roosting sites recorded. 'Test of Significance' conducted.
Eastern Bentwing-bat (*Miniopterus oceanensis*)	Possible	This species usually forages on insects within intact, well timbered forest complexes and have been found to roost within caves, tunnels, stormwater culverts or disused mining areas (Strahan eds, 2002; DEH, 2005). They utilize a broad range of habits including wet and dry sclerophyll forest, open woodland, paperbark forests, rainforests and open grasslands (North & Pasic, 2006). Twelve known maternity roost sites occur within its distribution ranging from tens of thousands to >100000 individuals. The known large roost sites are located in limestone and sandstone caves, abandoned gold mines, concrete bunkers and lava tubes. Outside the breeding season the eastern bentwing often selects cool areas within caves, mines, tunnels, drains and bridges (Hoye & Hall in Van Dyck & Strahan, 2008). All forested habitats of the site represent potential habitat for the Eastern Bentwing which is also known to forage over modified habitats such as grasslands although significant roosting/breeding areas are considered to be absent. Given the small nature of proposed disturbance in comparison to the available habitat within the locality, it is considered unlikely that the proposal will have a significant impact upon this species.	V	-	This species is considered unlikely to be significantly affected by the proposed development.
Southern Myotis (*Myotis macropus*)	Unlikely	The Myotis roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water (NPWS, 2002; Richards, 2002). Breeding colonies may consist of 10-15 individuals or occasionally up to several hundred.	V	-	This species is considered unlikely to be

		Within breeding colonies small clusters are made where a male establishes a territory from which other males are actively excluded and breeding females are protected. Outside of breeding males roost solitarily within a defended zone or established a small group of up to 20 males. Preferred habitat (permanent waterbodies) is absent from the site. The drainage line along the eastern boundary of the site is heavily infested with weeds with open water not visible. No roosting sites were observed. It is considered unlikely that the proposed development will have a significant impact upon this species.			significantly affected by the proposed development.
Eastern Long-eared Bat (*Nyctophilus bifax*)	Possible	This species of bat inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest with coastal rainforest and patches of coastal scrub particularly favoured (DEC, 2005; NPWS, 2002). Roosting occurs within tree-hollows, under bark and/or palm fronds and within dense foliage with a seasonal shift in roost sites from rainforest edges (summer) to the rainforest interior (winter) (NPWS, 2002; Parnaby in Strahan, 2002; Lunney et al, 1995). All forested areas of the site are considered to represent potential Eastern Long-eared Bat habitat although roosting sites were not observed. It is considered unlikely that the proposal will have a significant impact upon this species given the availability of suitable habitat within the locality.	V	-	This species is considered unlikely to be significantly affected by the proposed development.
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	Possible	This species of bat favours the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland but also extends to the coast over much of its range (DEC, 2005, Hoye & Richards in Strahan eds, 2002). Within this range it favours tall wet forest including creek/river corridors although it will also utilise a variety of other habitats such ranging from dry eucalypt woodlands to rainforest (DEC, 2005, Hoye & Richards in Strahan eds, 2002). This species is noted to favour roosts within tree hollows although it has also been recorded within buildings (DEC, 2005, Hoye & Richards in Strahan eds, 2002). Radiotracking within Bundjalung National Park noted the species to roost exclusively within Melaleuca quinquenervia (Campbell, 2001). All forested areas of the site are considered to represent potential Greater Broad-nosed Bat habitat although roosting sites were not observed. It is considered unlikely that the proposal will have a significant impact upon this species given the availability of suitable habitat within the locality.	V	-	This species is considered unlikely to be significantly affected by the proposed development.
Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)	Unlikely	In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat	V	-	Favoured habitat absent. Unlikely to be significantly impacted as a

		becomes dominant, and Eastern Chestnut Mouse numbers drop again. Feeds at night via runways through the grassy and sedge understorey, within an area of less than half a hectare. It has a broad diet of grass stems, invertebrates, fungi and seeds, with the relative significance of each component varying seasonally Potential habitat for the Eastern Chestnut Mouse is considered absent from the subject site given the absence of wet heath. It is considered unlikely that the proposed development will significantly impact the species.			result of the proposed development.
Southern Pink Underwing Moth (*Phyllodes imperialis southern subspecies*)	Unlikely	*Phyllodes imperialis* southern ssp. ANIC 3333 is distributed from Nambour, south-east Queensland, to Dorrigo in northern NSW (Clarke & Spier-Ashcroft, 2003). It is currently known from five locations of which Mary Cairncross Scenic Reserve near Maleny (Queensland) contains the only confirmed breeding habitat (NSW Scientific Committee, 2003). In Australia, the northern subspecies of P. imperialis occurs in rainforest in northeastern Queensland. Other subspecies occur in Papua-New Guinea, Solomon Islands, Vanuatu and New Caledonia. This subspecies occurs within the Burnett Mary and South East (Queensland) and Northern Rivers (NSW) Natural Resource Management Regions. The subspecies occurs below altitudes of 600 m in undisturbed subtropical rainforest in association with the vine *Carronia multisepalea*. Preferred habitat for the Pink Underwing Moth is considered to be absent from the site as rainforest and Carronia multisepalea was not recorded. The species was not recorded during site survey efforts. It is considered unlikely that the proposed development will have a significant impact upon the species.	E1	-	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.
Mitchell's Rainforest Snail (*Thersites mitchellae*)	Unlikely	This species was formally widely distributed on coastal alluvia between the Richmond and Tweed Rivers (Stanisic, 1998, 2000; NSWNPWS, 2001). NPWS previously funded surveying within northern NSW to determine the extant distribution of the species in relation to its historical distribution. Surveys conducted (1998-2000) have provided limited success with only one robust population being recorded within the region at Stotts Island and evidence of marginal populations present at four additional sites (Stanisic 1998, 2000). An additional population was more recently discovered within Swamp Sclerophyll Forest in Kingscliff (Planit 2002, Stanisic 2003). Within its range the species is restricted to lowland subtropical rainforest and swamp sclerophyll forest with a rainforest understorey, typically on alluvial soils with a basaltic influence (NPWS, 2001, Stanisic 2002). Although marginal potential habitat occurs on site in association with the Paperbark Swamp Forest, these areas lack the rainforest elements in the understory which is required for this species. Surveys failed to record the species (or shells). Reviewing the above, it is considered unlikely that the species will be significantly impacted upon as a result of the species.	E1	CE	Favoured habitat absent. Unlikely to be significantly impacted as a result of the proposed development.

Note: E1 = Endangered (BCA, 2016); E = Endangered (EPBC 1999); E4A = Critically Endangered (BCA, 2016); CE = Critically Endangered (EPBC 1999); and V = Vulnerable (BCA, 2016 and EPBC 1999)

5.4 Areas of Outstanding Biodiversity Value

Areas of Outstanding Biodiversity Value (AOBV) listed under the *Biodiversity Conservation Act 2016* include:

- Wollemia nobilis (the Wollemi pine)
- Little penguin population in Sydney's North Harbour

The proposal will not impact upon any of these AOBV.

5.5 Wetlands and Waterways

The site is not mapped as containing EcoWetland on Byron's LEP Environmental Values Mapping (refer to **Figure 9**). Site inspection revealed no areas considered to be reflective of a wetland occurs within, or immediately adjacent the subject site. Additionally, there are no natural waterways and/or waterbodies occurring within the subject site. It is noted that a constructed drainage line occurs along the eastern boundary of the site, although significantly clogged with weeds. This drainage line will be retained.

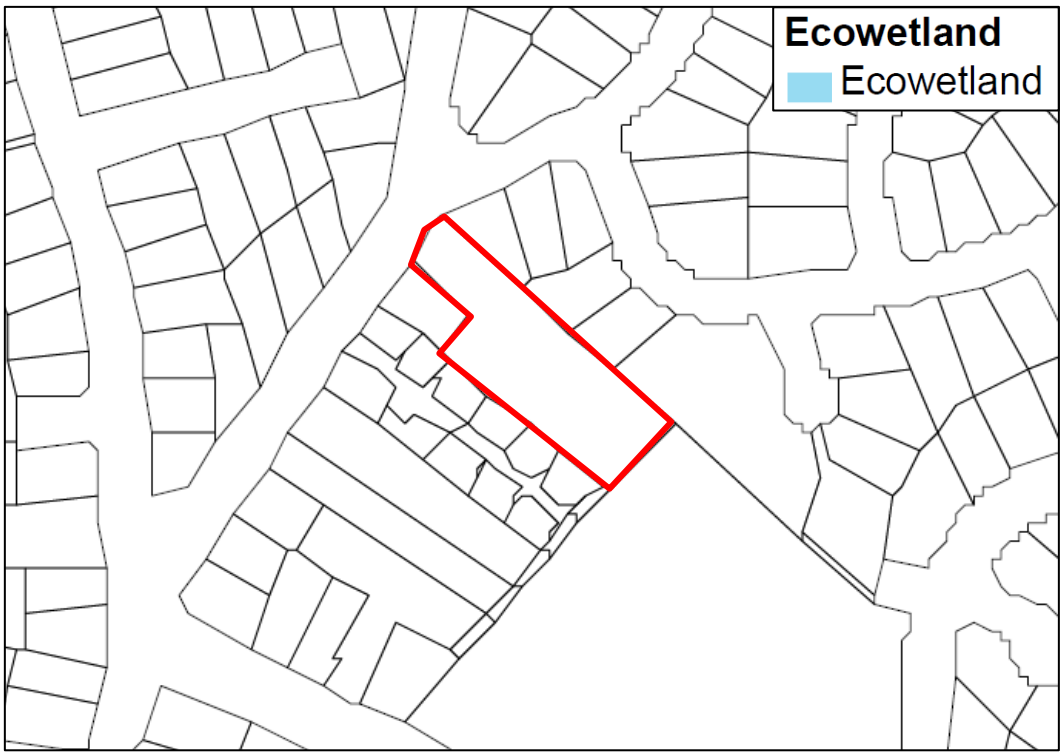


Figure 9: Byron Shire Environmental Values Mapped [Ecowetlands] (Source: BSC, 2012)

State Environmental Planning Policy (Coastal Management) 2018, known as the Coastal Management SEPP, defines the coastal zone and establishes state-level planning priorities and development controls to guide decision making for development within the coastal zone. The Coastal Management SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone.

No areas of the site is mapped as occurring within a 'Coastal Wetlands' or 'Proximity Area for Coastal Wetlands' (**Figure 10**).

Figure 10: Mapped Coastal Wetland Areas Surrounding the Site (Source: DPE, 2020)

5.6 Fauna Corridors and Linkage

Wildlife corridors can be defined as 'retained and/or restored systems of (linear) habitat which, at a minimum enhance connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation' (Wilson & Lindenmayer, 1995). Corridors can assist ecological functioning at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions (Parsons Brinkerhoff, 2005).

Corridors serve a number of different functions in terms of biodiversity conservation including:

- providing increased foraging area for wide-ranging species;
- providing cover for movement between habitat patches, particularly for cover dependent species and species with poor dispersal ability and enhancing the movement of animals through sub-optimal habitats;
- reducing genetic isolation by maintaining continuity between sub-populations in a metapopulation and thereby preventing and /or reversing localised extinction;
- facilitating access to a mix of habitats and successional stages to those species which require them for different activities (for example, foraging or breeding);
- providing refuge from disturbances such as fire;

- providing habitat in itself (Wilson, A. & Lindenmayer 1995; Lindenmayer, 1994; Bennett, 1999).

How species use the corridor network will depend largely on the home and activity ranges of the species, their habitat requirements and the ecological characteristics of the corridor. For example, some large or mobile species may make direct movements through the corridor network, moving from one patch of habitat to another. These direct movements may be on the scale of a foraging expedition or a migration (Bennett 1990b). Other species may have movements by single individuals punctuated by pauses in the corridor, which can last anything from a small foraging or resting bout to weeks and even months. If the corridor contains sufficient resources to maintain a population, then continuity through the corridor may be through gene flow through the resident population (Bennett 1990b; Wilson, A. & Lindenmayer 1995).

For example, a mobile species with a large home range (i.e. koala) may regularly traverse a corridor to move between favoured feeding grounds or in attempt to access mates, whereas a species with a comparably minor home range (i.e. antechinus) may spend its entire life within a portion of the same corridor.

The site is not located within Byron Shire Council's Wildlife Corridor Mapping (refer **Figure 11**). A review of the modified residual and fragmented habitats of the site and locality indicates that the site is not likely to perform a significant terrestrial dispersal function and as such it is considered unlikely that redevelopment would create any significant dispersal barriers for terrestrial fauna species than what is already present.

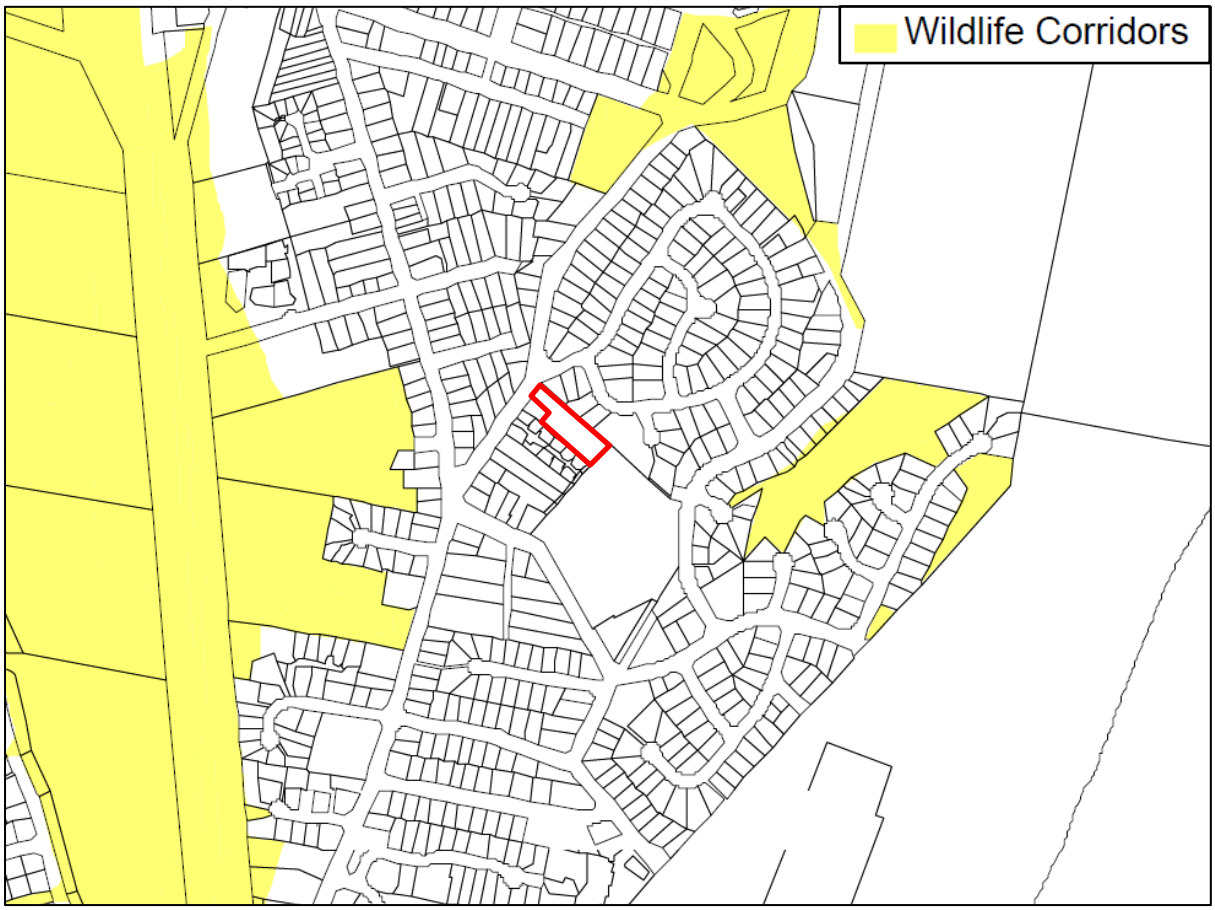


Figure 11: Byron Shire Environmental Values Mapping [Wildlife Corridors] (Source: BSC, 2012)

Large-scale local fauna movement within the locality occurs in association with protected areas of the locality (i.e. Cumbebin Swamp Nature Reserve, Arakwal National Park, Tyagarah Nature Reserve etc.) as well as forested areas along Belongil Creek and larger farming properties to the further to the west. The subject site is well removed from these noted areas.

Localised fauna movement opportunities are likely to occur at the rear of the site through the vegetated areas of Cape Byron Estate Retirement Village and Council's Park (Lot 86 DP708473). The proposed weeds control and compensatory plantings is likely to benefit these areas.

With regard to the above it is considered unlikely that the proposed development will have an impact upon the existing fauna corridor/dispersal values of the site such that such that its existing dispersal function is significantly diminished.

5.7 Other Ecologically Significant Features

5.7.1 Hollow Bearing Trees

The loss of hollow bearing trees has been identified as the most significant cause of biodiversity reduction in timber production forests of eastern Australia (Smith *et al*, 1994) with the subsequent adequate management of the hollow tree resource being critical to achieving Commonwealth and State conservation objectives (National Forest Policy Statement, 1992; Nature Conservation Act, 1992). Gibbons and Lindenmayer (2002) estimate that 303 native vertebrate species utilize tree hollows of which approximately 100 are listed as rare or threatened within State or Commonwealth Legislation. Research conducted by the Department of Natural Resources (1998) estimates that 134 of these species potentially utilize tree hollows in SE Queensland. Given that hollow bearing potential is low for Eucalypts below 120-180 years of age (with older trees required for larger fauna) and the fact that many species require a variety of different hollows within their home range (particularly arboreal mammals), hollow bearing trees represent a limited ecological resource (Gibbons & Lindenmayer, 2002; DNR, 1998-1999; Strahan, 2002; Ball, Lindenmayer & Possingham, 1999).

No hollow bearing trees were observed within the subject site.

5.8 Byron Shire Environmental Values Mapping

Byron Shire Council has a range of environmental mapping which is used to identify areas of environmental value for planning and conservation purposes. This mapping has been produced by Council through the Flora and Fauna Study 1999, the Biodiversity Conservation Strategy 2004 and subsequent reviews, as well as mapping data provided by organisations such as National Parks and Wildlife Service (now Office of Environment and Heritage) and Department of Primary Industries (BSC, 2012).

5.8.1 High Conservation Value Vegetation

High conservation value vegetation (HCV) is the name given to areas of land identified as containing important environmental values. These areas are calculated and mapped using the methodology adopted in Council´s Byron Biodiversity Conservation Strategy (2004). HCV often contains threatened species and Endangered Ecological Communities protected by State and/or Commonwealth legislation. No areas of the subject site have been mapped as containing HCV Vegetation (**Figure 12**).

Figure 12: Byron Shire Environmental Values Mapping [High Conservation Value Vegetation] (Source: BSC, 2012)

5.8.2 Wildlife Corridors

Wildlife corridors have been developed to identify important links across the landscape to encourage the movement of flora and fauna species. Byron shire wildlife corridors were developed as part of the Byron Biodiversity Conservation Strategy and are based on wildlife corridor mapping produced by National Parks and Wildlife Service (NPWS). The NPWS mapping was refined by ecologists and botanists involved in the production of the Biodiversity Conservation Strategy based on detailed knowledge of the Byron shire landscape and the ecology of local fauna and flora species (BSC, 2012).

A discussion on wildlife corridors for the subject site is has been discussed in **Section 5.6** of this report.

5.8.3 Koala Habitat

The site has not been mapped as containing any Koala habitat (**Figure 13**). Refer to **Section 6.1.2** and **Table 5** of this report for more detailed Koala discussions.

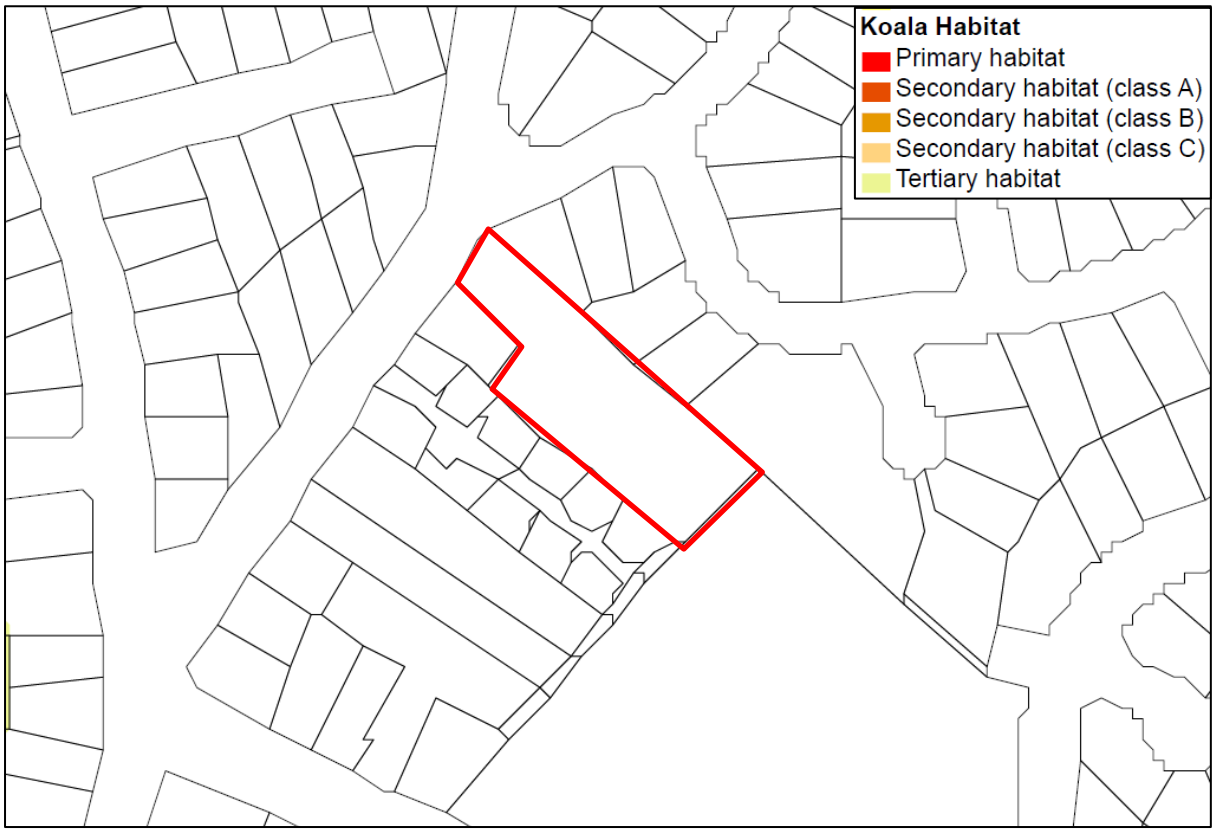


Figure 13: Byron Shire Environmental Values Mapping [Koala Habitat] (Source: BSC, 2012)

5.8.4 Key Fish Habitats

Key fish habitat mapping was developed in 2007 by the Department of Primary Industries across the state. Key Fish Habitats are those aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations and the survival and recovery of threatened aquatic species. Key Fish Habitat includes all marine and estuarine habitats up to highest astronomical tide level (that reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank.

No areas of the site occur within mapped key fish habitat areas (**Figure 14**).

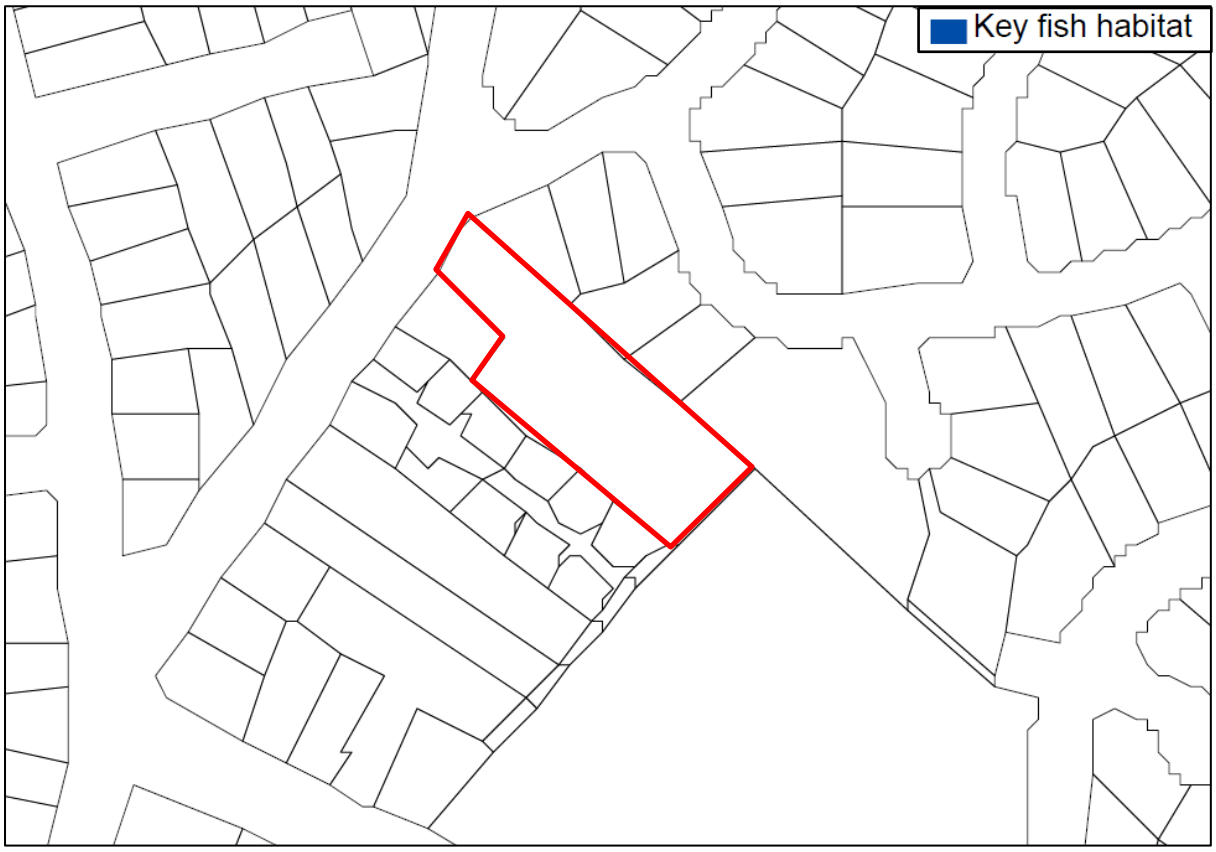


Figure 14: Byron Shire Environmental Values Mapping [High Conservation Value Vegetation] (Source: BSC, 2012)

5.8.5 Threatened Fauna Habitat

Threatened Fauna Habitat mapping displays areas of vegetation that provide habitat or potential habitat for key threatened fauna species. This map layer is based on Key Fauna Habitat modelling undertaken by National Parks and Wildlife Service. The map layer displays areas of vegetation with their centre located in modelled fauna habitat for select key threatened fauna species known from the Shire (BSC, 2012).

No areas of the site occur within mapped threatened fauna habitat areas (**Figure 15**).

Figure 15: Byron Shire Environmental Values Mapping [Threatened Fauna Habitat] (Source: BSC, 2012)

5.8.6 Eco Wetland Habitat

Eco wetlands include areas identified in the previous State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14) as well as other important wetland areas including mangroves, saltmarsh, swamps, lagoons, estuaries and floodplain complex forest (BSC, 2012).

As discussed within **Section 5.6**, no areas of the site have been mapped as containing EcoWetland (refer **Figure 6**). Discussions regarding Coastal Wetlands have also been discussed within **Section 5.6**.

6 STATUTORY CONSIDERATIONS – TEST OF SIGNIFICANCE (SECTION 7.3 OF THE BIODIVERSITY CONSERVATION ACT 2016)

Further to the provisions of Section 7.3 of the *Biodiversity Conservation Act* 2016, the 'test of significance' is applied to assess any potentially adverse impacts of the site-proposal on threatened species, populations and/or communities occurring within the site or surrounding locality.

Note that threatened species, populations and/or communities have been excluded from this assessment where:

- No direct observations of threatened species, populations or communities were made on the site during survey works;
- No previous sightings of threatened species, populations or communities within a 10-kilometre radius of the site have been registered within the Bionet database and scheduled under the *Biodiversity Conservation Act 2016*;
- An abundance of primary habitat requirements for said species are not located on or within the locality of the proposal (refer previous sections); and
- Potential habitat (feeding, roosting, nesting or refuge) will not be or will be minimally affected by the proposal (refer previous sections).

As the recorded scheduled flora species are well removed from the proposal footprint, it is considered highly unlikely that any impacts would arise upon these individuals. No 'Test of Significance' were conducted for these recorded species.

As such it is considered that, of the scheduled species, populations and/or communities described previously within this report, the following eight species of threatened were recorded on the site (or nearby) and may have the potential to be significantly affected through any development of the site.

Table 6: Threatened Species, Populations and/or Communities Subject to the 'Test of Significance'

Ecological Communities	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion (Vegetation Community 1)
Populations	N/A
Flora	N/A
Fauna	Grey-headed Flying-fox (*Pteropus poliocephalus*)
	Little Bent-wing Bat (*Miniopterus australis*)
	Koala (*Phascolarctos cinereus*)

6.1 Significant impact criteria in accordance with the BC Act 2016

As previously stated within Section 2.8, local development proposals that do not exceed the Biodiversity Offset Threshold are still required to carry out a 'test of significance'.

(1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

6.1.1 Endangered Ecological Communities

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion

a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

N/A for Endangered Ecological Communities.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

DEC (2007) notes the following with regard to EECs:

Ecological communities are usually defined by two major components – the geographical distribution and the species composition which influences the physical structure and ecological function of the ecological community. The relative importance of the geographical distribution and the species composition varies according to the specific listed ecological community. Hence this factor provides for consideration of two criteria:
(i) local occurrence of the ecological community
(ii) modification of the ecological community's composition.

Interpretation of key terms used in this factor:
Local occurrence: the ecological community that occurs within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

Risk of extinction: similar to the meaning set out in factor (a), this is the likelihood that the local occurrence of the ecological community will become extinct either in the short-term *or* in the long-term as a result of direct or indirect impacts on the ecological community, and includes changes to ecological function.

Composition: both the plant and animal species present, and the physical structure of the ecological community. Note that while many ecological communities are identified primarily by their vascular plant composition, an ecological community consists of all plants and animals as defined under the TSC and FM Acts that occur in that ecological community.

It is considered that Vegetation Community 1: Paperbark Swamp Forest of the Coastal Lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (PCT 1064) may be reflective of the above listed EEC as described by the Scientific Committee (subject to the limitations and discussion provided in **Section 3.2.1** above). For the purpose of this report, it will be considered that this Vegetation Community is the abovementioned EEC.

This potential EEC will be impacted through the loss of ~904sqm of Community 1 for driveway construction and allotment development.

Thirteen native trees associated with this community are proposed to be removed (refer to **Appendix 3**).

Reviewing Byron Shire Council's Vegetation Mapping (refer to **Figure 16**), Paperbark communities are common within areas west of the site and throughout the locality.

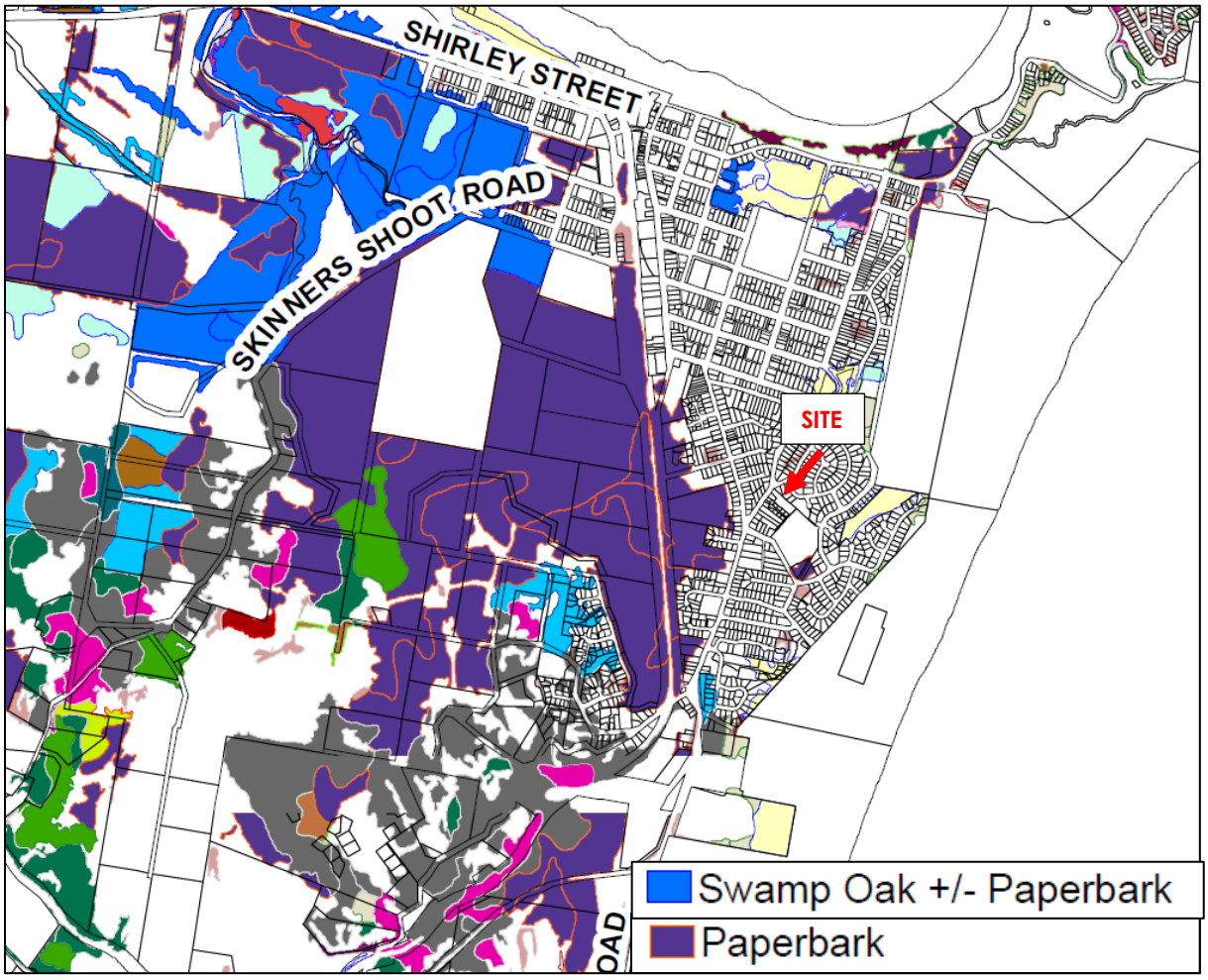


Figure 16: Byron Shire Vegetation Mapping Illustrating Mapped Paperbark Forest within the Locality

It is noted that ~6000sqm of similar Paperbark Forest type community occurs immediately adjacent the site within Council's Park and Cape Byron Estate Retirement Village.

In addition to the above, the Byron Flora and Fauna Study (1999) prepared for Byron Shire Council notes that there is over 1750ha of Swamp Sclerophyll Forest occurring within the Shire (refer to **Figure 17**).

SWAMP SCLEROPHYLL FOREST	
Swamp Sclerophyll Forest	126.54
Mixed Eucalypt spp.	199.15
Paperbark	1115.05
Swamp Mahogany/Swamp Box	132.30
Swamp Oak +/- Paperbark	181.73

Figure 17: Swamp Sclerophyll Forest Areas within Byron Shire (Source: Byron Flora and Fauna Study, 1999)

As previously discussed, assessable native trees which are required to be removed to facility the development will be compensated via replacement planting (minimum 62 plants proposed to be planted) in accordance with Council's *Development Control Plan – Chapter B2 – Preservation of Trees and Other Vegetation* within the locality. Details regarding the proposed landscaping works are provided within the Statement of Landscape Intent prepared for the proposal.

Given that the vegetation community proposed for removal is already suffering from edge effects (occurring as fragmented copses of vegetation within an existing yard or at the edge of exotic grassland); extremely disturbed given the dominance of weeds within the understory (in particularly Singapore Daisy and exotic grasses), and the absence of a native shrub layer, as well as the large extent of the EEC locally (over 1750ha of Swamp Sclerophyll Forest occurring within the Shire), it is considered that the loss will not place the local occurrence of this EEC at risk of extinction, nor will the actions proposed substantially and adversely modify the composition of the community such that its local occurrence is likely to be placed at risk of extinction.

Likelihood of Local Extinction

With regard to the above it is therefore considered that the action proposed is unlikely to modify or adversely affect the EEC such that its local occurrence is placed at risk of extinction.

c. in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Habitat for a given threatened species, community or population is considered to be an area containing similar known (documented) habitat preferences for that species within the species' geographic distribution.

In assessing whether a significant area of the habitat of a threatened species, population or ecological community is to be modified or removed the following should be considered:

- The geographic range of the threatened species, population or ecological community and its known or documented occurrence within the region and locality;
- The relative scale and value of the habitat within the region and locality;
- The importance of the habitat (i.e. relationship to life cycle, reproductive success etc.).

DEC (2005) indicates that a "quantitative and qualitative approach to assessing the extent to which habitat is likely to be removed or modified/degraded should consist of the following steps:

- an assessment of the amount of habitat of the threatened species, population or ecological community that occurs within the locality;
- an assessment of the amount of habitat of the threatened species, population or ecological community that occurs within the study area;
- an estimation of the area and quality that the habitat of the study area represents in relation to the local distribution of that habitat;
- An estimation of the area and quality of the habitat of the study area which is to be removed or modified by the proposed development or activity;
- a calculation of the amount of the habitat of the region that will be removed or modified by the proposed development, activity or action or indirectly by longer term impacts from the proposed development such as increased predation weed invasion, salinity etc;

- An estimation of the area and quality of the habitat of the region that will be removed or modified by the proposed development, activity or action; and
- an assessment of the ecological integrity of the habitat to be affected and of the habitat which will remain"

Within the site it is considered that Community 1 represent potential habitat for the recorded EEC. This community covers ~996sqm of the site.

The proposed development will result in the removal/modification of ~904sqm of Community 1, including thirteen trees (refer to Arborist report for details).

It is noted that over 1750ha of Swamp Sclerophyll Forest occurs within the shire.

As such, it is considered unlikely that the area of habitat to be modified represents a significant area of habitat in relation to the local and regional distribution of those listed habitats.

Reviewing the above and (a) and (c) as previously discussed, the areas to be modified are not considered to represent a 'significant area of habitat' for the recorded or potentially occurring threatened species or occurring endangered ecological communities.

In assessing the potential for habitats of threatened species, populations or ecological communities to become fragmented or isolated to such an extent that the long-term survival of the said species, population or community is at risk, the following is to be considered:

- 'Interconnecting or proximate areas of habitat' (which may be at risk of being fragmented or isolated from other habitat areas) are considered to be two or more habitat areas where currently an individual can move between the two. Such areas could become 'isolated' in the event that the development negates future potential movement of individuals between the two habitats. This could occur through the clearance of habitat, creation of physical impediments (i.e. roads, fences) or potential impacts to behaviour (fauna) which may restrict future movements.

- For threatened species, in reviewing whether isolation may occur, consideration must be given to the movement values of the site and surrounds for particular species, the mobility of threatened species, connectivity of habitats within and external to the site and the degree to which the proposal may significantly disrupt these patterns.

- Consideration should be given to the dispersal and genetic exchange mechanisms of individual species and whether the isolation of currently interconnecting or proximate areas of habitat for threatened species, communities or populations will adversely affect the maintenance of gene flow and the ability to sustain viable populations (DEC, 2005).

As discussed, it is considered that the works are of a small nature, occurring within an urbanised area with similar development types surrounding the site and are therefore unlikely to significantly affect the dispersal function of any terrestrial corridors or key habitats. As previously discussed, the site does not occur within a recognised wildlife corridor (refer to **Section 5.6**).

d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

N/A. No areas of outstanding biodiversity value occur within proximity to the proposal site.

e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Refer to the Fauna section below for the Key Threatening Process Table.

6.1.2 Threatened Fauna

FAUNA – GREY-HEADED FLYING FOX & KOALA

a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The National Parks and Wildlife Service (NPWS) describe a local population as one "*that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary of the study area can be demonstrated.*"

DECC (2007) & DPI (2008) further expands the local population definition to include:

- The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.

- The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.

- The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time.

DECC (2007) & DPI (2008) further states that the key assessment for this component is the "risk of extinction of the local population. The risk of extinction will increase if any factor operates to reduce population size or reproduction success." It is further noted that any known or presumed local population should be assumed to be viable for the purpose of this assessment unless otherwise proven.

Megachiropterans (Grey-headed Flying-fox)

Local Population

As the noted mega-bat species is wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part of populations within the wider region.

Grey-headed Flying Fox (*Pteropus poliocephalus*)

Although not recorded during survey efforts of the site, it is considered likely that the species would utilise the site during peak flowering and fruiting periods. The Bionet database contains forty-seven (47) records of this species within 10 kilometres from the centre of the site.

Stages of lifecycle potentially affected by development

Species	Habitat Preference	Roosting/Breeding
Grey-headed Flying-fox	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-	This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). Camps provide resting habitat, sites of social interactions and refuge for animals during significant

Species	Habitat Preference	Roosting/Breeding
	foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000).	phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). "Roosting habitat critical to survival: Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Greyheaded Flying-foxes. Roosting habitat that: 1. is used as a camp either continuously or seasonally in > 50% of years 2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months) 3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009)

The proposal will result in a minor reduction of potential forage resources within the locality for this species (loss of ~904sqm of potential foraging material). As the species is capable of travelling long distances in search of food, and similar type of foraging material are abundant within the locality (i.e. Cumbebin Swamp Nature Reserve, Arakwal National Park, Tyagarah Nature Reserves, forested areas along Belongil Creek, private properties etc.). No roosting sites occurs within, or within close proximity to the site with the nearest camp occurring ~1km north of the site along Middleton Street (DoEE, 2020). Compensatory planting measures as discussed within this report will ensure there is no net loss of foraging material within the locality.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the discussed megabat to the point that they are at risk of extinction.

Microchiropterans (Little Bent-wing Bat

Local Population

As the noted micro-bat species is considered to be wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part of populations within the wider region

Little Bent-wing Bat (*Miniopterus australis*)

The species is regularly encountered throughout the locality (pers obs.) and likely to utilize the site as a 'fly-zone'. The Bionet database contains thirty-five (35) records of this species within 10km of the site.

Species	Habitat Preference	Roosting/Breeding
Little Bentwing Bat	This species utilises well-timbered habitats including rainforest, *Melaleuca* swamps and dry sclerophyll forests where it feeds on insects within the canopy.	DECC (2005) note the following particulars with regard to the little bentwing bat: • Maternity colonies form in spring. Males and juveniles disperse in summer. • Only five nursery sites /maternity colonies are known in Australia. • 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 • They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. • In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (*M. schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young.

Habitat loss is a major threat affecting more than half of the threatened species in Australia. While bats are not necessarily dependent on large areas of uncleared habitat for their roosting habitat, they range over relatively large areas and thus require large areas of habitat for foraging (Lunney et al. 1988, Lumsden et al. 1994, Pavey 1995).

A review of existing habitats indicates that the site provides potential habitat (all forested areas of the site) for the Little Bentwing Bat. No suitable roosting sites (suitable culverts, bridges, hollows etc.) occurs within the development site. More than 500ha of potential foraging habitat occurs for this species in association with Arakwal National Park, Cumbebin Nature Swamp Reserve, forested areas along Belongil Creek and larger farming properties.

As the species are wide ranging and the proposal will result in only a minor modification of potential foraging habitat. It is considered unlikely that a significant impact would occur upon as a result of the proposal. Compensatory planting measures as discussed within this report will ensure there is no net loss of habitat within the locality.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the discussed micro-bats to the point that they are at risk of extinction.

Koala

Local Population

As the koala is considered to be wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part of populations within the wider region. The Bionet database contains four-hundred and thirty-nine (439) records of this species within 10km of the site.

The *Byron Coast Comprehensive Koala Plan of Management* (BCCKPOM, 2015) notes the following trees as preferred foraging resources within Byron Shire:

Table 7: Preferred Koala Food Trees (Source: BCCKPOM, 2012)

	Common Name	Scientific Name
Primary	Tallowwood	*Eucalyptus microcorys**
	Forest Red Gum	*Eucalyptus tereticornis***
	Swamp Mahogany	*Eucalyptus robusta***
Secondary	Small fruited Grey Gum	*Eucalyptus propinqua*
	Scribbly Gum	*Eucalyptus racemosa subsp. racemosa*

* Tallowwood *Eucalyptus microcorys* is considered a secondary food tree on lower nutrient erosional soils – see Habitat Study (Biolink, 2012)
** includes naturally occurring *E. tereticornis* x *E. robusta* hybrid

Although suitable habitat (eucalypt forest) is absent from the site, several favoured foraging trees (*Eucalyptus robusta*) were noted (although generally scarce).

As previously noted within **Section 5.8.3**, the Byron Shire Environmental Values Mapping does not map the site as containing Koala habitat. Additionally, the Byron Coast Koala Habitat Study does not map the site (or surrounding areas) as containing Koala habitat (refer to **Figure 18**).

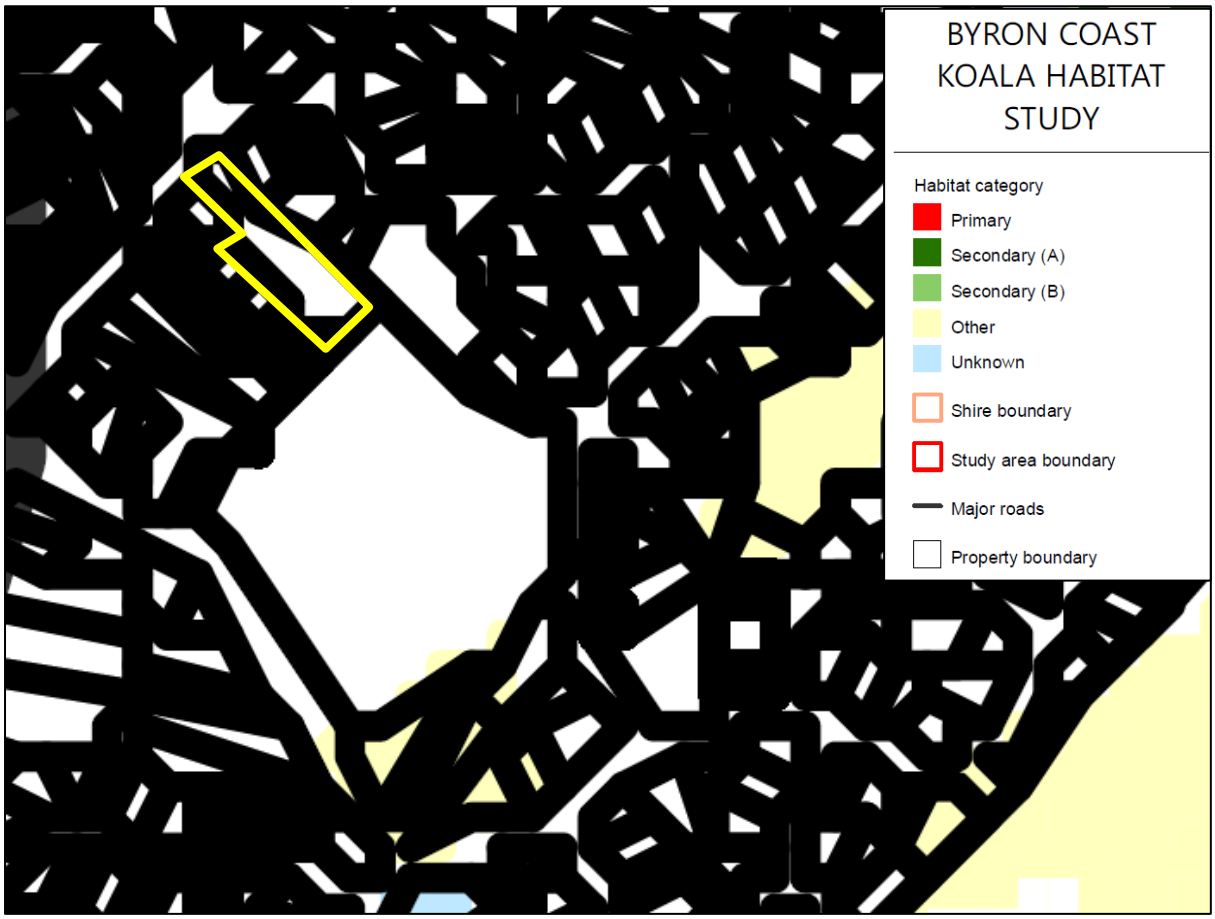


Figure 18: Koala Habitat Mapping (Biolink, 2012)

Additionally, The Byron Coast Comprehensive Koala Plan of Management has not mapped the site as occurring within a Koala Management Precinct (BCCKPoM, 2015).

Koala surveys conducted over the site, and areas immediately adjacent to the site failed to yield any evidence of koala usage (directly or indirectly).

To summerise the above and the site survey, evidence of koala activity was recorded as follow:

- Searches around the base of trees did not yield koala scats;
- No koalas were heard responding to amplified call playback; and
- No Koalas were observed during diurnal and nocturnal (spotlighting) searches.

Bionet Koala records within the vicinity of the site have been mapped within **Figure 19** below. Although there are several records within close proximity to the site (<200m), it is noted that no Koalas have been recorded within the subject site.

Figure 19: Bionet Koala Records Proximate to the Site (Bionet, 2020)

While the site is considered to not represent core koala habitat, it is considered that on the odd occasion a koala may occasionally traverse the site while traversing across the broader landscape.

All six (6) Preferred Koala Feeds Trees (*Eucalyptus robusta*) recorded within the site are proposed to be retained. The proposal has been carefully designed to ensure all Swamp Mahogany within the site will be retained. It is noted that no scats (or Koalas) were recorded underneath these trees.

Given the small scale of clearing and development proposed within an urbanised area, limited potential koala habitat occurring (which yielded no evidence of koala usage), and the compensatory plantings measures proposed, it is considered unlikely that the proposal will have a significant impact upon this species.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the Koala to the point that it is at risk of extinction.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

N/A for threatened fauna.

c. in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The proposed development will result in the removal of ~904sqm of vegetation (primarily consisting of Paperbarks and planted species). It is noted that an additional ~2782sqm of modified/cleared areas (Community 2) of the site will also be impacted upon as a result of the proposal.

The entire site provides potential foraging habitat for the Little Bent-wing Bat, although so does the majority of the locality, in particularly the surrounding Reserves/Conservation Areas, and expansive areas of forested areas. No roosting site were recorded or will be impacted upon as a result of the proposal.

All forested areas of the site (~996sqm) is considered to provide potential foraging material for the Grey-headed Flying Fox, although similar type flowering and fruiting species are abundant within the locality.

As previously stated, the site is noted considered to represent significant koala habitat given the modified and fragmented nature of the bushland. Such assumptions have been supported by Council Mapping which does not nominate the site as containing Koala Habitat. Nevertheless, the proposal has been carefully designed to retain all six (6) Swamp Mahogany (*E. robusta*) within the development site.

As previously discussed, it's considered that the proposal will not isolate potential habitat for the discussed occurring or potentially occurring threatened fauna or introduce a barrier to dispersal such that the long-term survival of the reviewed species is at risk.

The proposed tree removal is proposed to be compensated via replacement trees in accordance with Council's Tree Preservation Order. These 'protected trees' proposed to be removed are described within the Arborist Report prepared for the proposal (refer to **Appendix 3**). Further details regarding the proposed compensatory plantings measures are provided within **Section 7.2** below.

These areas (to be modified) are not considered to represent a 'significant area of habitat' for potentially occurring threatened species.

Reviewing the above, it is considered that the proposed development will not result in the removal or modification of a significant area of habitat for threatened fauna species.

d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

N/A. No areas of outstanding biodiversity value occur within proximity to the proposal site.

e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The *Biodiversity Conservation Act 2016* defines a 'threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities.' Accordingly, Key Threatening Processes are nominated within Schedule 4 of the Act and include the following (online @ https://www.legislation.nsw.gov.au/#/view/act/2016/63/sch4):

Table 8: BCA Key Threatening Processes

THREATENING PROCESS	COMMENT
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, *Manorina melanocephala*	Not applicable
Alteration of habitat following subsidence due to longwall mining	Not applicable
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Not applicable
Anthropogenic climate change	Not applicable
Bushrock removal	Not applicable
Clearing of native vegetation	The proposed development will involve clearing of some native vegetation (including clearing of one or more strata within a stand of native vegetation). The NSW Scientific Committee notes in their final determination that 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biological diversity and includes impacts such as the following: • Destruction of habitat results in loss of local populations of individual species • Fragmentation • Expansion of dryland salinity • Riparian zone degradation • Increased greenhouse gas emissions • Increased habitat for invasive species • Loss of leaf litter layer • Loss or disruption of ecological function • Changes to soil biota (NSW Scientific Committee, 2001) However, a review of this report notes that clearance will primarily occur in an area which has already been largely cleared/modified with residual native vegetation and ornamental plantings also proposed to be removed. These clearing works will be compensated via offset plantings as per Council's Tree Preservation Order and recommendations provided within the Arborist Report (**Attachment 3**). There will be no 'net loss of vegetation' as a result of the proposal. It is considered that the level of clearing proposed is unlikely to significantly impact upon the viability of threatened fauna species and

	habitat values available within the site and surrounding locality.
Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*)	Not applicable
Competition and habitat degradation by feral goats (*Capra hircus*)	Not applicable
Competition from feral honey bees (*Apis mellifera*)	Not applicable
Death or injury to marine species following capture in shark control programs on ocean beaches	Not applicable
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	Not applicable.
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	Not applicable
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Not applicable
Herbivory and environmental degradation caused by feral deer	Not applicable
Importation of red imported fire ants (*Solenopsis invicta*)	Not applicable
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	Not applicable
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Not applicable
Infection of native plants by *Phytophthora cinnamomi*	Not applicable
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	Not applicable
Introduction of the large earth bumblebee (*Bombus terrestris*)	Not applicable
Invasion and establishment of exotic vines and scramblers	Several exotic vines were recorded onsite. These species should be removed in association with the proposal where they occur within the work zone or during routine restoration works (i.e. weed control).
Invasion and establishment of Scotch broom (*Cytisus scoparius*)	Not applicable
Invasion and establishment of the cane toad (*Bufo marinus*)	The cane toad was recorded onsite during survey works. The proposal is unlikely to increase the impacts of this listed threatening process.
Invasion of native plant communities by African Olive *Olea europaea* L. subsp. *cuspidata*	Not applicable
Invasion, establishment and spread of *Lantana camara*	Not applicable
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)	Not applicable
Invasion of native plant communities by exotic perennial grasses	Several exotic grass species were recorded on site. These should be removed in association with the proposal where it occurs within the works zone.
Invasion of the yellow crazy ant (*Anoplolepis gracilipes* (Fr. Smith)) into NSW	Not applicable
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Not applicable
Loss of hollow-bearing trees	Not applicable
Loss or degradation (or both) of sites used for hill-topping by butterflies	Not applicable

Predation and hybridisation of feral dogs (*Canis lupus familiaris*)	Dogs are well known from the locality. The proposal is unlikely to increase the impacts of this listed threatening process.
Predation by the European red fox (*Vulpes vulpes*)	Not applicable
Predation by the feral cat (*Felis catus*)	Cats are well known within the locality. The proposal is unlikely to increase the impacts of this listed threatening process.
Predation by *Gambusia holbrooki* Girard, 1859 (plague minnow or mosquito fish)	Not applicable
Predation by the ship rat (*Rattus rattus*) on Lord Howe Island	Not applicable
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)	Not applicable
Removal of dead wood and dead trees	Not applicable

Reviewing the above, it is considered that the proposed works will not have any significant impacts in accordance with the 'test of significance'.

A Species Impact Statement (SIS) would not be required for the proposal.

6.2 SEPP Koala Habitat Protection 2019 Assessment *

On 1st March 2020 the new 2019 Koala SEPP (Koala Habitat Protection) commenced which replaces the previous SEPP 44 Koala Habitat Protection (1995).

The majority of the site is mapped as occurring within the 'Koala Development Application Map' and 'Site Investigation Area for Koala Plans of Management' (refer to **Figure 20**).

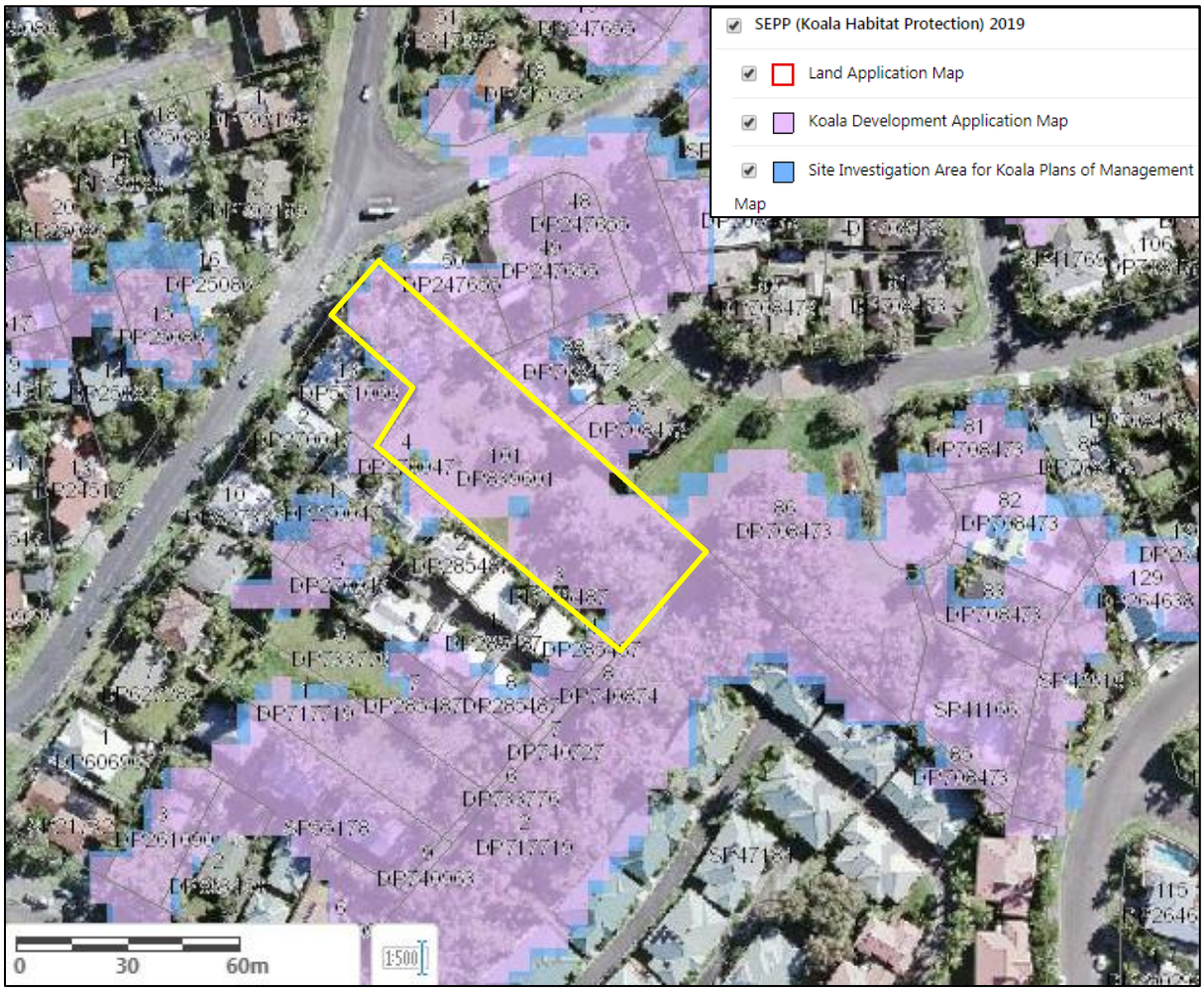


Figure 20: SEPP Koala Habitat Protection 2019 Mapping

The SEPP requires the following with regard to development proposals:
9 Development assessment process—no approved koala plan of management for land
(1) This clause applies to land to which this Policy applies if the land—
(a) is identified on the Koala Development Application Map, and
(b) has an area of at least 1 hectare (including adjoining land within the same ownership), and
(c) does not have an approved koala plan of management applying to the land.

SITE ASSESSMENT:

The site (land) is identified on the Koala Development Application Map and has an area of at least one hectare and
does not have an approved KPOM. Therefore, the development assessment process applies.
(2) Before a 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.
core koala habitat means—
(a) an area of land where koalas are present, or
(b) an area of land—

(i) which has been assessed by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable koala habitat, and
(ii) where koalas have been recorded as being present in the previous 18 years.

Comment: The site is <1ha in area. Therefore, SEPP Koala Habitat Protection 2019 does not relate to the proposed development land.

* Since the initial lodgement of the D.A, SEPP (Koala Habitat Protection) 2019 has now been repealed and replaced by SEPP (Koala Habitat Protection) 2020. SEPP (Koala Habitat Protection) 2020 has reverted back to the former SEPP No. 44 – Koala Habitat Protection (SEPP 44). As there were no koalas recorded within the subject site, the site is not considered to represent 'Core Koala Habitat' as defined by the SEPP. Therefore, no Koala Management Plan is required for the proposal.

7 SITE IMPACTS

This section of the report reviews the development proposal and likely resultant impact to flora, fauna and habitat value.

7.1 Significance of Impacts to Threatened Species and/or Communities

DEC (2005 & 2008) outline assessments relating to the significance of impacts of actions to threatened species, communities and populations. DEC (2005) notes that evaluation of impacts should involve not only the magnitude and extent of impacts, but also the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected.

Impacts are considered more significant if:

- Areas of high conservation value are affected.
- Individual animals and/or plants and/or subpopulations that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- Habitat features that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- The impacts are likely to be long-term in duration.
- The impacts are likely to be permanent and irreversible.

In this instance it is noted that the development will occur on a 3,816m^2 residential allotment which has been largely maintained with only scattered planted vegetation and a small pocket of residual remnant vegetation remaining. Consequently, no threatened flora or fauna, or EECs are expected to be significantly impacted upon as a result of the development. Additionally, no endangered populations or AOBVs occur on site. Given its small size, historical modification and scarcity of tree cover it is considered that the site does not to represent significant habitat. Compensatory plantings measures will ensure there is no net loss of vegetation occurring within the locality.

7.2 Impacts to Vegetation

Clearing of vegetation (both native and exotic) will be the major direct impact associated with the intended development although this clearing will be restricted to largely modified residential gardens and scattered ornamental species. A small pocket of trees within the eastern corner largely comprised of Paperbarks is proposed to be removed which are considered to provide potential foraging resources for locally occurring fauna, although it is noted that similar type vegetation occurs in abundance

throughout the locality and greater region. As discussed in this report it is considered that these works will unlikely have a significant environmental impact in the context of the planning scheme.

A summary of the proposed clearing rates for described communities associated with the proposal is tabulated below:

Table 9: Approximate Clearing of Vegetation Communities as a Result of the Proposal

Mapped Community	EEC?	Approx. extent within site (HA)	Approx. extent to be cleared (HA)
Vegetation Community 1: Paperbark Swamp Forest of the Coastal Lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (PCT 1064)	Yes*	0.0996	0.0904
Vegetation Community 2: Modified / Cleared Areas with Garden Beds, Ornamental Species and Weeds	No	0.2820	0.2782

*subject to the limitations and discussions of Section 3.2.1

An Arboricultural Impact Assessment (refer to **Appendix 3**) has been prepared for the proposal. The arborist has assessed the protected trees (in accordance with Council's Tree Preservation Order) and has provided recommendations on the most suitable way to remove these trees and protect external retained trees.

A table (refer to **Table 10**) has been prepared which illustrates the compensatory plantings required based on assessable trees assessed by the Arborist (as per Chapter B2 – Preservation of Trees and Other Vegetation of *Byron Development Control Plan 2014*) required to be removed (as determined by the Project Arborist).

Details illustrating the proposed compensatory works have been provided within the Statement of Landscape Intent prepared for the project.

Table: 10: Compensatory Plantings Requirements Based on Tree Removal (Refer to Arborist Report for Details)			
Tree #	**Species**	**Comments**	**Compensatory Plantings Required**
1	*Callitris columellaris*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
2	*Eucalyptus robusta*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
3	*Eucalyptus robusta*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
4	*Melaleuca quinquenervia*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
5	*Cupaniopsis anacardioides*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
6	*Eucalyptus robusta*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
7	*Eucalyptus robusta*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
8	*Viburnum odoratissimum*	Exotic Tree. External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	1
9	*Melaleuca sp. (Callistemon salignus)*	Planted tree within the works area and is proposed to be removed. Native tree.	5
10	*Grevillea robusta*	Planted tree within the works area and is proposed to be removed. Native tree.	1
11	Group of *Archontophoenix alexandrae*	Species listed in Appendix B2. – Undesirable Vegetation Species.	-
12	*Archontophoenix cunninghamiana*	Within the works area and is proposed to be removed. Native tree.	5
13	*Eucalyptus robusta*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
14	*Eucalyptus robusta*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
15	*Melaleuca quinquenervia*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
16	*Melaleuca quinquenervia*	Within the works area and is proposed to be removed. Native tree.	5
17	*Melaleuca quinquenervia*	Within the works area and is proposed to be removed. Native tree.	5
18	*Melaleuca quinquenervia*	Within the works area and is proposed to be removed. Native tree.	5
19	*Melaleuca quinquenervia*	Within the works area and is proposed to be removed. Native tree.	5
20	*Melaleuca quinquenervia*	Within the works area and is proposed to be removed. Native tree.	5
21	*Glochidion sumatranum*	Within the works area and is proposed to be removed. Native tree	5
22	*Archontophoenix alexandrae*	Species listed in Appendix B2. – Undesirable Vegetation Species.	-

Table: 10: Compensatory Plantings Requirements Based on Tree Removal (Refer to Arborist Report for Details)			
Tree #	**Species**	**Comments**	**Compensatory Plantings Required**
23	*Melaleuca quinquenervia*	Within the works area and is proposed to be removed. Native tree.	5
24	*Melaleuca quinquenervia*	Within the works area and is proposed to be removed. Native tree.	5
25	*Glochidion sumatranum*	Within the works area and is proposed to be removed. Native tree.	5
26	*Melicope elleryana*	Within the works area and is proposed to be removed. Native tree.	5
27	*Melaleuca quinquenervia*	External to the proposed works footprint. To be retained and protected in accordance with AS 4970-2009 and/or Arborist recommendations.	-
Total Compensatory Plantings Required			**62**

Trees #1 & #2

Tree #3

Trees #9 - #12

Tree #4

	
Trees #13 & #14	Planted Vegetation Proximate to Dwelling
	
Tree #15 with Alexandra Palm Proximate	Trees #24 - #26
	
Trees #22 & #23	*Trees #17 - #23*

As discussed in this report, it is considered that these works will not have a significant environmental impact given that the majority of the development footprint occurs in modified/cleared areas and the proposed vegetation to be removed is fragmented and/or occur within areas at the edge of existing contagious remnant. Compensatory measures in accordance with Chapter B2 – Preservation of Trees

and Other Vegetation of *Byron Development Control Plan 2014* is proposed to occur as a part of the proposed landscape works within the site.

7.3 Impacts to Fauna Habitat

Typical additional impacts associated with development on fauna and associated habitat include:

- Overall loss of standing biomass and reduction in flora species abundance/diversity
- Mortality as a result of construction activities (removal/disturbance of nests, hollows, burrows and general habitat)
- Loss of habitat complexity from the clearance zones including loss of potential foraging and nesting/roosting resources
- Increased potential from 'edge effects' to retained remnants (on or offsite)
- Disturbance of species behaviour (i.e. some species are less tolerant to human presence or a higher level of human activity and may abandon currently utilized habitats)
- Reduction of potential fauna movement linkages throughout the overall landscape
- Alteration to the fauna assemblage (some species tolerant to modified habitats (i.e. rats, minors, crows etc.) may dominant the newly created niches and displace species from adjacent vegetated remnants)

In this instance, it is considered that only a minor loss of native foraging resources, potential refuge habitat and potential nesting/breeding sites will occur as the development footprint will be restricted to a relatively small area (~0.37ha) of largely disturbed, non-native vegetation, with no hollow bearing trees will be removed. It is noted that such is consistent with the planning intent for the site and will proceed in a similar manner to surrounding properties.

It is also considered that a significant increase in 'edge effects' (and potential associated behavioural alteration through the establishment of a new edge) or significant reduction of terrestrial fauna movement through the landscape is unlikely to occur due to the currently fragmented nature of the vegetation on the existing house site, the absence of significant fauna corridors and the surrounding pattern of development along the street.

7.4 Fauna Mortality/Injury

Any level of construction undertaken has the potential to kill or injure fauna species. Whilst potential does exist for dispersal of numerous species (particularly avifauna) to retained habitats, less dispersive species or species not tolerant to a surrounding human interface may become trapped within the construction zone.

7.5 Establishment of Weeds

Weed invasion occurs when unwanted or exotic plants become established in native bushland via natural dispersal vectors such as wind, water, insects, birds and other animals, however, humans are by far the most effective and efficient vector of plants (Coutts-Smith and Downey, 2006; Randall, 2007 in TSSC, 2010). Humans may facilitate the direct introduction weeds by inappropriate garden dumping, via vehicles, imported agricultural products and stock rotation/movement. The potential impacts of weed invasion in Australia are well documented and summarized in TSSC (2010) including:

Genetic effects
Environmental weeds cause a decline in the number of genetically distinct sub-populations that make up a native species. It is reasonable to conclude that an associated reduction in the genetic diversity of the affected species is likely to result. The invasion of weeds may also affect the genetic diversity of native species through cross breeding or hybridisation, whereby foreign genes are introduced into local plant populations

Introduction of diseases
The introduction of weeds often results in the introduction of pathogens (fungi, nematodes, bacteria and viruses) that are associated with these plants in their natural range (ILDA, 2009).

Competition for resources
Competition between species is inevitable when more than one species occupy the same niche and have similar requirements for a limited resource (Cadotte, 2007). Weeds are known to compete with native plants for limited resources such as moisture, nutrients, sunlight, pollinators and space (Csurches and Edwards, 1998; Blood, 2001; Brunskill, 2002).

Prevention of recruitment
Growth of weeds can be sufficiently vigorous to reduce or prevent the establishment of native plant species (Csurches and Edwards, 1998)

Alteration of ecosystem processes
Invasive weeds are also capable of altering various ecosystem processes such as geomorphological processes, hydrological cycles, nutrient dynamics and disturbance regimes (Csurches and Edwards, 1998). Alterations to ecosystem processes can potentially influence many if not all species within a community (Vranjic et al., 2000).

Changes to abundance of indigenous fauna
Weeds that become invasive can both directly and indirectly change the abundance of indigenous fauna. Fauna such as the Richmond Birdwing Butterfly and *Petrogale persephone* (Proserpine Rock Wallaby) are directly impacted by escaped garden plants, Dutchman's Pipe (*Aristolochia elegans*) and Pink Periwinkle (*Catharanthus roseus*), respectively, both of which are attractive as a food source and yet toxic to them when consumed (Watts and Vidler, 2006). Indirectly, weeds impact indigenous fauna by altering the availability of suitable habitat, including food and shelter, and by creating habitats that harbour other pest species that can, in turn, have a detrimental effect.

As discussed in this report, weeds are abundant within, and proximate to the site. To minimise the potential future impact of unmitigated continued spread of these species it is considered appropriate that the existing infestation be eradicated in association with the proposed works where they occur within the development footprint, or areas proposed for compensatory plantings. A Weed Management Plan should be prepared and implemented as a part of the contractor's CEMP.

8 MEASURES TO AVOID AND MINIMISE ECOLOGICAL IMPACTS

8.1 Protection and Avoidance

Reviewing the ecological integrity of vegetation associations and fauna habitat present on the site, the proposed development is unlikely to impose a significant impact on the environmental values of the locality. No significant habitats, poorly conserved ecosystems, significant flora species or significant fauna species (or associated important habitat) were recorded onsite which would warrant redesign of the proposal to include covenants or parkland for ecological protection purposes.

8.2 Mitigation Measures

The following measures are proposed to mitigate potential impacts associated with the proposed development:

8.2.1 Impact of Vegetation and Habitat Clearing

Disturbance to vegetation as described in this report will be unavoidable to deliver the development as proposed. To ensure that clearing impacts do not occur outside of the designated clearance zones (i.e. within offsite areas) it will be necessary to clearly identify and mark the boundaries of the clearance zone prior to construction similar to the below:

Retained native vegetation (individual trees and copses of vegetation) proximate to works which are not subject for removal are to be clearly managed during construction activities in accordance with the Arborist Report prepared for the proposal (Refer to **Appendix 3**).

Within the designated clearance zone identification of areas to be cleared are to be pre-assessed by an experienced wildlife spotter/catcher. This pre-assessment shall allow for an inventory of trees bearing birds nests and/or hollows to be undertaken prior to felling works [none noted during ecological assessment]. A wildlife spotter catcher is to be utilized during clearing of the site to ensure safe dispersal and relocation of any encountered native fauna within the residential property.

8.2.2 Offsets and Compensatory Works

No offsets are triggered in accordance with the Biodiversity Offsets Scheme.

Compensatory planting measures are proposed as per *Byron Shire Development Control Plan (2014) – Chapter B2 – Preservation of Trees and Other Vegetation*. This has been discussed within **Section 7.2** of this report and within **Appendix 3**.

No nest boxes are required to be installed as no hollow-bearing trees will be removed as a part of the proposal.

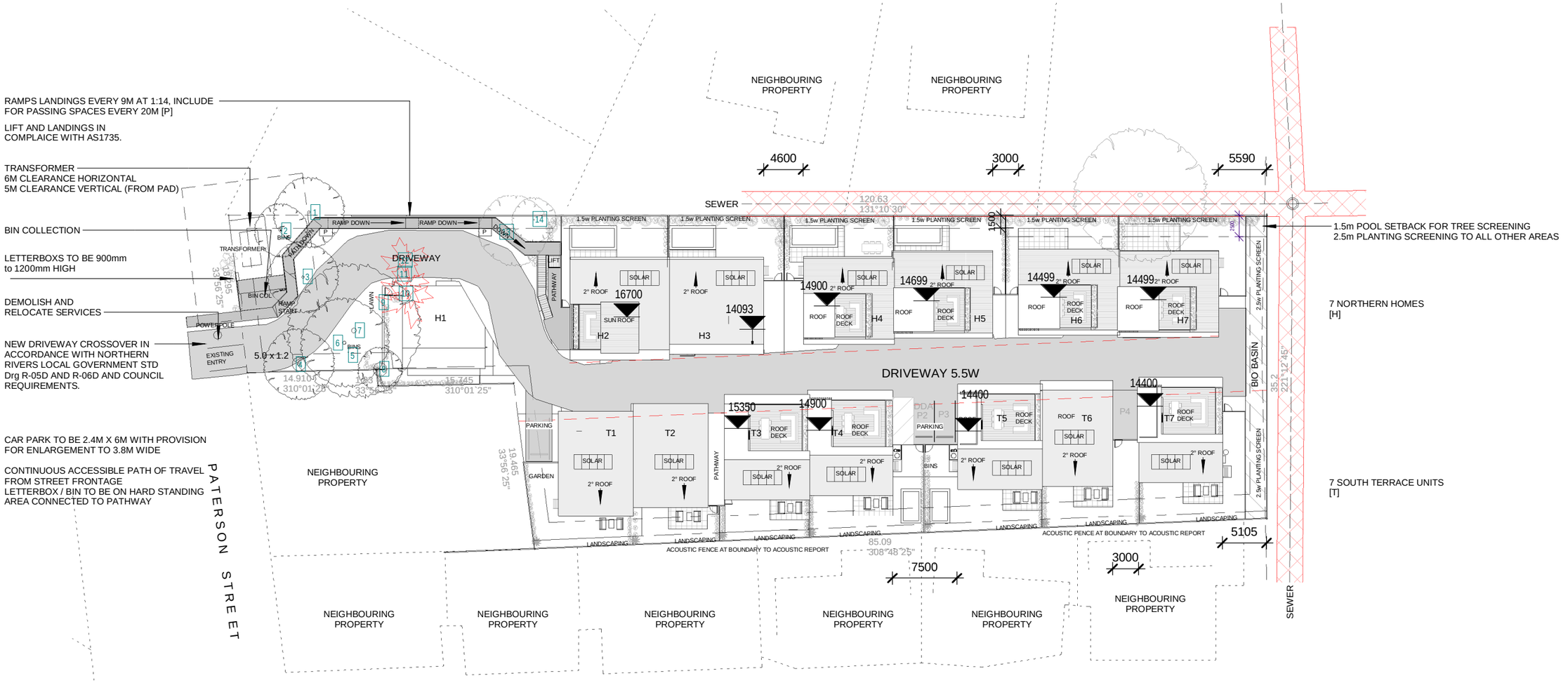
9 APPENDICES

Appendix 1 – Proposal Plans
Appendix 2 – NSW Bionet Database Records (2020)
Appendix 3 – Arboricultural Impact Assessment Report
Appendix 4 – BOSET Report Prepared for the Site

PLANIT
CONSULTING

Attachment 1

Proposal Plans (Prepared by Chris Clout Design)



LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

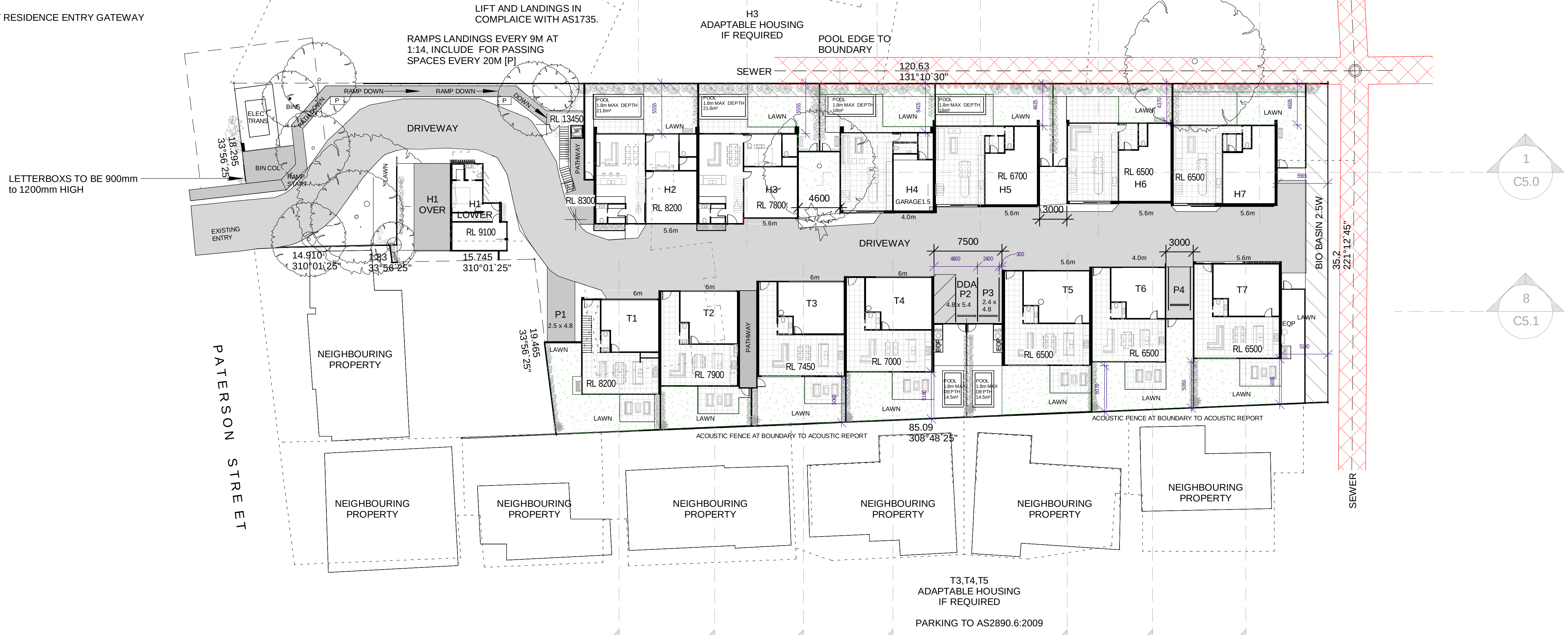
CHRISCLOUTDESIGN
www.chriscloutdesign.com.au
PO BOX 135, NOOSAVILLE, QLD 4566
E: info@chriscloutdesign.com.au
P: (07) 54748 107
F: (07) 54748 108 BSA LICENCE: 1127508

GENERAL NOTES:
Use written dimensions only. DO NOT scale drawings. Contractors to verify all dimensions on site prior to commencing works. Site location in accordance with engineers details. These drawings are to be read in conjunction with engineers design and details, the accompanying building specification and schedule of finishes. If in doubt, please request clarification. DO NOT ASSUME.

CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: PROPOSED SITE / ROOF PLAN
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.2 - D

PATERSON STREET RESIDENCE ENTRY GATEWAY



GROUND FLOOR PLAN

SCALE: 1 : 500

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

SETBACK DIMS

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

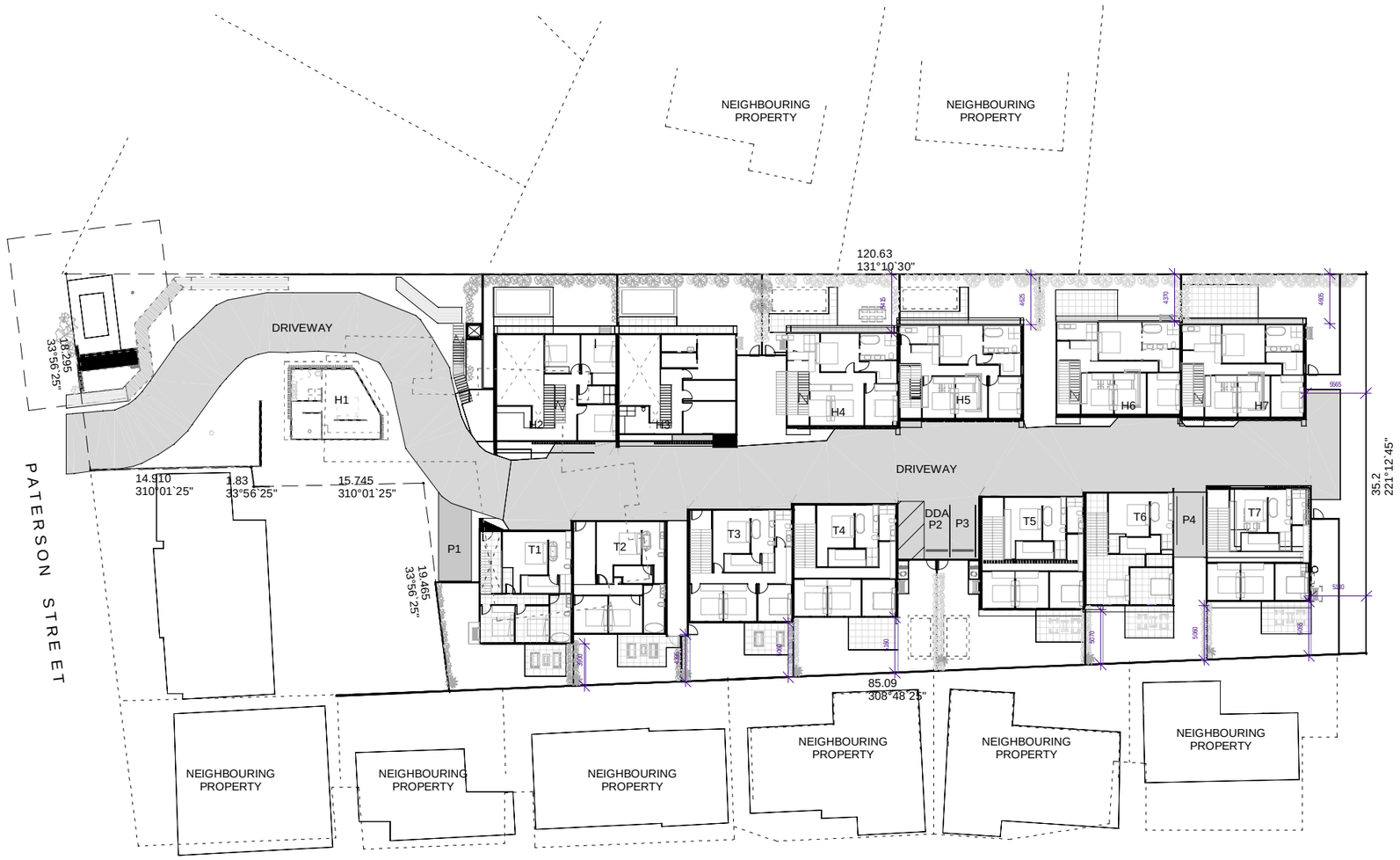
CHRISCLOUTDESIGN

www.chrisclouddesign.com.au
PO BOX 135, NOOSAVILLE, QLD 4566
E: info@chrisclouddesign.com.au
P: (07) 54748 107
F: (07) 54748 108 BSA LICENCE: 1127508

GENERAL NOTES:
Use written dimensions only. DO NOT scale drawings. Contractors to verify all dimensions on site prior to commencing works. Site location in accordance with engineers details. These drawings are to be read in conjunction with engineers design and details, the accompanying building specification and schedule of finishes. If in doubt, please request clarification. DO NOT ASSUME.

CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: GROUND FLOOR PLAN
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.2.1 - D



UPPER FLOOR PLAN

SCALE: 1 : 500

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

SETBACK DIMS

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR = **764.5m²**

SITE NET TOTAL - UPPER FLOOR = **1074.3m²**

GRAND NET TOTAL = **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

CHRISCLOUTDESIGN

www.chriscloutdesign.com.au
PO BOX 135, NOOSAVILLE, QLD 4566
E: info@chriscloutdesign.com.au
P: (07) 54748 107
F: (07) 54748 108 BSA LICENCE: 1127508

GENERAL NOTES:
Use written dimensions only. DO NOT scale drawings. Contractors to verify all dimensions on site prior to commencing works. Site location in accordance with engineers details. These drawings are to be read in conjunction with engineers design and details, the accompanying building specification and schedule of finishes. If in doubt, please request clarification. DO NOT ASSUME.

CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: UPPER FLOOR PLAN
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.2.2 - D

PLANIT
CONSULTING

Attachment 2

NSW Bionet Database Records (2020)

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) Entities in selected area [North: -28.61 West: 153.57 East: 153.67 South: -28.71] returned a total of 3,587 records of 100 species.

Report generated on 23/03/2020 3:34 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3137	*Crinia tinnula*		Wallum Froglet	V,P		108	
Animalia	Amphibia	Hylidae	3166	*Litoria aurea*		Green and Golden Bell Frog	E1,P	V	1	
Animalia	Amphibia	Hylidae	3202	*Litoria olongburensis*		Olongburra Frog	V,P	V	25	
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*		Loggerhead Turtle	E1,P	E	106	
Animalia	Reptilia	Cheloniidae	2007	*Chelonia mydas*		Green Turtle	V,P	V	115	
Animalia	Aves	Phaethontidae	0107	*Phaethon rubricauda*		Red-tailed Tropicbird	V,P	C	1	
Animalia	Aves	Columbidae	0025	*Ptilinopus magnificus*		Wompoo Fruit-Dove	V,P		10	
Animalia	Aves	Columbidae	0021	*Ptilinopus regina*		Rose-crowned Fruit-Dove	V,P		13	
Animalia	Aves	Columbidae	0023	*Ptilinopus superbus*		Superb Fruit-Dove	V,P		2	
Animalia	Aves	Podargidae	0314	*Podargus ocellatus*		Marbled Frogmouth	V,P		4	
Animalia	Aves	Procellariidae	0929	*Macronectes giganteus*		Southern Giant Petrel	E1,P	E	39	
Animalia	Aves	Procellariidae	0937	*Macronectes halli*		Northern Giant-Petrel	V,P	V	6	

Animalia	Aves	Procellariidae	8684	*Pterodroma leucoptera leucoptera*	Gould's Petrel	V,P	E	1
Animalia	Aves	Procellariidae	8993	*Pterodroma neglecta neglecta*	Kermadec Petrel (west Pacific subspecies)	V,P	V	1
Animalia	Aves	Procellariidae	0955	*Pterodroma nigripennis*	Black-winged Petrel	V,P		1
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P		32
Animalia	Aves	Ardeidae	0197	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	3
Animalia	Aves	Ardeidae	0196	*Ixobrychus flavicollis*	Black Bittern	V,P		14
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P	C	13
Animalia	Aves	Accipitridae	0225	*Hieraaetus morphnoides*	Little Eagle	V,P		2
Animalia	Aves	Accipitridae	0230	*^^Lophoictinia isura*	Square-tailed Kite	V,P,3		3
Animalia	Aves	Accipitridae	8739	*^^Pandion cristatus*	Eastern Osprey	V,P,3		24
Animalia	Aves	Gruidae	0177	*Grus rubicunda*	Brolga	V,P		1
Animalia	Aves	Rallidae	0053	*Amaurornis moluccana*	Pale-vented Bush-hen	V,P		33
Animalia	Aves	Burhinidae	0174	*Burhinus grallarius*	Bush Stone-curlew	E1,P		14
Animalia	Aves	Burhinidae	0175	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		15
Animalia	Aves	Haematopodidae	0131	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		6

Animalia	Aves	Haematopodidae	0130	*Haematopus longirostris*	Pied Oystercatcher	E1,P		37
Animalia	Aves	Jacanidae	0171	*Irediparra gallinacea*	Comb-crested Jacana	V,P		13
Animalia	Aves	Scolopacidae	0161	*Calidris ferruginea*	Curlew Sandpiper	E1,P	CE,C,J,K	1
Animalia	Aves	Scolopacidae	0165	*Calidris tenuirostris*	Great Knot	V,P	CE,C,J,K	3
Animalia	Aves	Laridae	0972	*Gygis alba*	White Tern	V,P		1
Animalia	Aves	Laridae	0120	*Onychoprion fuscata*	Sooty Tern	V,P		2
Animalia	Aves	Laridae	9926	*Procelsterna cerulea*	Grey Ternlet	V,P		1
Animalia	Aves	Laridae	0117	*Sternula albifrons*	Little Tern	E1,P	C,J,K	12
Animalia	Aves	Cacatuidae	0265	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		3
Animalia	Aves	Psittacidae	8028	*^Cyclopsitta diophthalma coxeni*	Coxen's Fig-Parrot	E4A,P,2	E	1
Animalia	Aves	Tytonidae	0252	*^^Tyto longimembris*	Eastern Grass Owl	V,P,3		13
Animalia	Aves	Tytonidae	0250	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		5
Animalia	Aves	Tytonidae	9924	*^^Tyto tenebricosa*	Sooty Owl	V,P,3		1
Animalia	Aves	Monarchidae	0376	*Carterornis leucotis*	White-eared Monarch	V,P		9
Animalia	Aves	Estrildidae	0652	*Stagonopleura guttata*	Diamond Firetail	V,P		8
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	3

Animalia	Mammalia	Dasyuridae	1045	*Planigale maculata*	Common Planigale	V,P		20
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*	Koala	V,P	V	439
Animalia	Mammalia	Potoroidae	1175	*Potorous tridactylus*	Long-nosed Potoroo	V,P	V	5
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	47
Animalia	Mammalia	Pteropodidae	1294	*Syconycteris australis*	Common Blossom-bat	V,P		9
Animalia	Mammalia	Emballonuridae	1321	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		1
Animalia	Mammalia	Molossidae	1329	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		31
Animalia	Mammalia	Vespertilionidae	1336	*Nyctophilus bifax*	Eastern Long-eared Bat	V,P		39
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		5
Animalia	Mammalia	Muridae	1466	*Pseudomys gracilicaudatus*	Eastern Chestnut Mouse	V,P		2
Animalia	Mammalia	Dugongidae	1558	*Dugong dugon*	Dugong	E1,P		3
Animalia	Mammalia	Otariidae	1543	*Arctocephalus forsteri*	New Zealand Fur-seal	V,P		1

Animalia	Mammalia	Otariidae	1882	*Arctocephalus pusillus doriferus*	Australian Fur-seal	V,P		1
Animalia	Mammalia	Balaenopteridae	1575	*Megaptera novaeangliae*	Humpback Whale	V,P	V	7
Animalia	Insecta	Noctuidae	I021	*Phyllodes imperialis southern subspecies*	Southern Pink Underwing Moth	E1	E	8
Animalia	Insecta	Nymphalidae	I024	*Argynnis hyperbius*	Laced Fritillary	E1	CE	1
Animalia	Insecta	Petaluridae	I007	*Petalura gigantea*	Giant Dragonfly	E1		2
Animalia	Insecta	Petaluridae	I138	*Petalura litorea*	Coastal Petaltail	E1		7
Animalia	Gastropoda	Camaenidae	I002	*Thersites mitchellae*	Mitchell's Rainforest Snail	E1	CE	176
Plantae	Flora	Apocynaceae	1233	*Marsdenia longiloba*	Slender Marsdenia	E1	V	2
Plantae	Flora	Casuarinaceae	8980	*Allocasuarina defungens*	Dwarf Heath Casuarina	E1	E	1146
Plantae	Flora	Cunoniaceae	10943	*^Davidsonia jerseyana*	Davidson's Plum	E1,2	E	37
Plantae	Flora	Elaeocarpaceae	2575	*^^Elaeocarpus williamsianus*	Hairy Quandong	E1,3	E	5
Plantae	Flora	Euphorbiaceae	9851	*Chamaesyce psammogeton*	Sand Spurge	E1		1
Plantae	Flora	Fabaceae (Caesalpinioideae)	1877	*Caesalpinia bonduc*	Knicker Nut	E1		1

Plantae	Flora	Fabaceae (Caesalpinioideae)	8772	*Senna acclinis*	Rainforest Cassia	E1		1
Plantae	Flora	Fabaceae (Faboideae)	2833	*Desmodium acanthocladum*	Thorny Pea	V	V	1
Plantae	Flora	Fabaceae (Mimosoideae)	7757	*Archidendron hendersonii*	White Lace Flower	V		55
Plantae	Flora	Flacourtiaceae	3114	*Xylosma terrae-reginae*	Queensland Xylosma	E1		22
Plantae	Flora	Lauraceae	3477	*Cryptocarya foetida*	Stinking Cryptocarya	V	V	243
Plantae	Flora	Lauraceae	8948	*Endiandra floydii*	Crystal Creek Walnut	E1	E	36
Plantae	Flora	Lauraceae	3491	*Endiandra hayesii*	Rusty Rose Walnut	V	V	11
Plantae	Flora	Lauraceae	8480	*Endiandra muelleri subsp. bracteata*	Green-leaved Rose Walnut	E1		32
Plantae	Flora	Meliaceae	3682	*Owenia cepiodora*	Onion Cedar	V	V	5
Plantae	Flora	Menispermaceae	3691	*Tinospora tinosporoides*	Arrow-head Vine	V		15
Plantae	Flora	Myrtaceae	4283	*Rhodamnia rubescens*	Scrub Turpentine	E4A		23
Plantae	Flora	Myrtaceae	4284	*Rhodomyrtus psidioides*	Native Guava	E4A		14
Plantae	Flora	Myrtaceae	4290	*Syzygium hodgkinsoniae*	Red Lilly Pilly	V	V	22

Plantae	Flora	Myrtaceae	4292	*Syzygium moorei*	Durobby	V	V	49	
Plantae	Flora	Orchidaceae	14732	*^Diuris byronensis*	Byron Bay Diuris	E1,P,2		58	
Plantae	Flora	Orchidaceae	6672	*^Geodorum densiflorum*	Pink Nodding Orchid	E1,P,2		125	
Plantae	Flora	Orchidaceae	6990	*^Oberonia complanata*	Yellow-flowered King of the Fairies	E1,P,2		1	
Plantae	Flora	Orchidaceae	4479	*^Peristeranthus hillii*	Brown Fairy-chain Orchid	V,P,2		1	
Plantae	Flora	Orchidaceae	4480	*^Phaius australis*	Southern Swamp Orchid	E1,P,2	E	20	
Plantae	Flora	Orchidaceae	7324	*^Pterostylis nigricans*	Dark Greenhood	V,P,2		26	
Plantae	Flora	Polypodiaceae	8156	*^^Drynaria rigidula*	Basket Fern	E1,3		2	
Plantae	Flora	Proteaceae	5354	*Floydia praealta*	Ball Nut	V	V	5	
Plantae	Flora	Proteaceae	5372	*Grevillea hilliana*	White Yiel Yiel	E1		1	
Plantae	Flora	Proteaceae	5446	*Macadamia tetraphylla*	Rough-shelled Bush Nut	V	V	31	
Plantae	Flora	Psilotaceae	8164	*^^Psilotum complanatum*	Flat Fork Fern	E1,3		1	
Plantae	Flora	Rubiaceae	8297	*Randia moorei*	Spiny Gardenia	E1	E	1	
Plantae	Flora	Rutaceae	6457	*Acronychia littoralis*	Scented Acronychia	E1	E	20	
Plantae	Flora	Rutaceae	8658	*Melicope vitiflora*	Coast Euodia	E1		3	
Plantae	Flora	Sapotaceae	11957	*Niemeyera whitei*	Rusty Plum, Plum Boxwood	V		20	

Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*	Little Bent-winged Bat	V,P	35	
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P	5	

PLANIT
CONSULTING

Attachment 3

Arboricultural Impact Assessment Report (Prepared by Peter Gray)

Arboricultural Impact Assessment Report

103 Paterson St, Byron Bay

Client:
Planit Consulting
11-13 Pearl St
Kingscliff.
NSW 2487.

Report compiled by
Northern Tree Care
ABN 73 674 526 681

6 Abalone Place Ballina
NSW 2478.
Ph 0414 186161

Revised 19 Mar 2021

Contents

1. Introduction

Peter Gray has compiled this report on request from Planit Consulting who are managing the development of the land at 103 Paterson St, Byron Bay Lot 101 in DP 839601. The land is in a residential area of Byron Bay. The property owners propose to demolish the existing dwelling on the land and construct 14 new dwelling spaces.

There are a number of trees growing on and adjacent to the property that will be affected by the proposed development.

A development application has been made to Byron Shire Council and Council has issued a Request for Further Information that raised some concerns regarding the extent of tree removal from the site. Following the RFI, some changes have been made to the proposal that would increase the number of trees proposed to be retained in the development.

2. Scope

This report describes the trees growing on the land and adjacent properties that have the potential to be affected by the proposed development. The health, condition and retention value of the trees is assessed. The potential impact of the proposed development on the trees is considered and recommendations for the management of the trees in the development are made. Where trees are retained in the development, recommendations for their protection during development are made.

3. Method

The trees were assessed visually from the ground. The diameter at breast Height (DBH) was measured at 1.4 m above the ground. The height of the trees was measured using a hypsometer. The methods recommended in the Australian Standard *AS 4970-2009 Protection of trees on development sites* were used to assess the trees.

The health and condition of the trees was assessed using the Visual Tree Assessment method (Mattheck & Breloer 2003). This is a method of assessing trees using the body language or shape and features of the tree to indicate its condition. These tree shapes or body language are a reliable indicator of the underlying condition of that part of the tree. The trees were identified using the signs and features present at the time of inspection.

The information in this report is derived from a site visit carried out on 16th March, 2020 by Peter Gray of Northern Tree Care and from plans supplied by Planit Consulting. The plans are:

- *Paterson St*. Chris Clout Design. Revision 4. 21/2/21.
- *2020.03.05 Tree Section*. Chris Clout Design.

4. Description

The subject property is located in a residential area of Byron Bay (see Attachment 1. Location Plan). The land is zoned R2 Medium Density Residential. The land fronts Paterson St to the west and slopes down to a lower section. There is a block of residential units on the southern side of the property and residences and a public reserve on the northern and eastern side. There is an existing residence on the higher area near Paterson St. A concrete driveway runs down the northern side of the site to access the lower area (see Attachment 2. Aerial Photo).

The soil on the elevated section is clay loam and the soil in the lower section is clay subject to waterlogging. There are a number of planted and naturally grown trees on the site. The garden around the existing residence has a number of planted trees including Palm trees as well as naturally grown mature aged Swamp Mahogany.

The vegetation of the lower section is mainly Broad Leaf Paperbark with some Cheese trees and Alexander Palms. One of the trees subject of this report is growing on a Council reserve to the north.

The trees are described in detail in **Table 1. Tree Data** below.

Table 1. Tree Data

Tree #	Name	Condition	Height m	DBH mm	DLT mm	Crown m	TPZ m	Comments
1	Coastal Cypress *Callitris columellaris*	Good	9	600	630	4	7.2	Growing on the adjoining property
2	Swamp Mahogany *Eucalyptus robusta*	Good	16	440	500	5	5.3	Dead sticks in the crown
3	Swamp Mahogany *Eucalyptus robusta*	Good	16	440	500	6	5.3	Dead stick in the crown
4	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	9	330	400	6	4.0	Small tree growing beside the existing driveway
5	Tuckeroo *Cupaniopsis anacardioides*	Good	9	130	150	2	2.0	Small tree
6	Swamp Mahogany *Eucalyptus robusta*	Good	12	250	320	4	3.0	Small tree
7	Swamp Mahogany *Eucalyptus robusta*	Good	19	550	650	8	6.6	Large mature tree
8	Sweet Vibernum *Vibernum oderissimum*	Fair	7	300	330	5	3.6	Planted exotic species
9	Paperbark *Melaleuca* sp	Fair	4	210	250	4	2.5	Planted tree

Tree #	Name	Condition	Height m	DBH mm	DLT mm	Crown m	TPZ m	Comments
10	Silky Oak *Grevillea robusta*	Poor	16	280	330	4	3.4	Planted tree
11	Alexander Palm *Archontophoenix alexandrae*	Good	8	250	-	4	3.0	Group of palms
12	Bangalow Palm *Archontophoenix cunninghamiana*	Good	7	200	-	4	3.0	3 stemmed tree
13	Swamp Mahogany *Eucalyptus robusta*	Good	23	660	750	8	7.9	Mature tree beside the existing drive
14	Swamp Mahogany *Eucalyptus robusta*	Good	16	480	520	5	5.8	Close to the northern boundary
15	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	11	630	700	8	7.6	Decurrent form
16	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	10	730	800	12	8.8	Decurrent form
17	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	8	550	600	14	6.6	Medium sized tree
18	Broad Leaf Paperbark *Melaleuca quinquenervia*	Fair	6	200	250	5	2.4	Small suppressed tree with vine
19	Broad Leaf Paperbark *Melaleuca quinquenervia*	Fair	12	500	550	6	6.0	Leaning vine in crown
20	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	9	680	-	14	8.2	Large spreading tree
21	Cheese Tree *Glochideon sumatranum*	Fair	5	280	-	5	3.4	Leaning, suppressed
22	Alexander Palm *Archontophoenix alexandrae*	Good	7	280	-	3	2.5	Undesirable species
23	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	9	410	420	6	4.9	Water vine in crown
24	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	9	340	+	6	4.1	Medium sized tree in a group
25	Cheese Tree Glochideon sumatranum	Good	8	380	-	3	4.6	Small tree
26	Pink Euodia Melicope elleryana	Good	6	140	-	4	2.0	Small tree
27	Broad Leaf Paperbark *Melaleuca quinquenervia*	Fair	7	560	-	10	6.7	Growing on the adjacent reserve.

Harden et al 2009: Brooker and Kleinig 1999.

5. Tree Significance

When considering the retention value of trees, two major issues were considered. They are the significance of the tree and its estimated life expectancy.

When assigning a value to the significance of the tree, a number of factors should be considered (Moreton 2003). The significant outcomes have been determined in 6. Tree Retention Values.

Table 2. Significance of Tree in the Landscape.

Tree #	Name	Condition	Vigour	Protected	Environmental value	Amenity value	Significance
1	Coastal Cypress *Callitris columellaris*	Good	Good	Yes	Very High	High	Significant
2	Swamp Mahogany *Eucalyptus robusta*	Good	Good	Yes	High	High	Very High
3	Swamp Mahogany *Eucalyptus robusta*	Good	Good	Yes	High	High	Very High
4	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	Good	Yes	High	Medium	High
5	Tuckeroo *Cupaniopsis anacardioides*	Good	Good	Yes	High	Medium	High
6	Swamp Mahogany *Eucalyptus robusta*	Good	Poor	Yes	High	Medium	High
7	Swamp Mahogany *Eucalyptus robusta*	Good	Good	Yes	High	High	Very High
8	Sweet Vibernum *Vibernum oderissimum*	Fair	Poor	No	Low	Low	Low
9	Paperbark *Melaleuca* sp	Fair	Poor	Yes	Medium	Low	Low
10	Silky Oak *Grevillea robusta*	Poor	Poor	No	Medium	Medium	Low
11	Alexander Palm *Archontophoenix alexandrae*	Good	Good	No	Low	Medium	Low
12	Bangalow Palm *Archontophoenix cunninghamiana*	Good	Good	Yes	High	Medium	Moderate
13	Swamp Mahogany *Eucalyptus robusta*	Good	Good	Yes	High	High	Very High
14	Swamp Mahogany *Eucalyptus robusta*	Good	Good	Yes	High	Medium	Very High
15	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	Good	Yes	High	Medium	High
16	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	Good	Yes	High	Medium	High

Significance (continued).

Tree #	Name	Condition	Vigour	Protected	Environmental value	Amenity value	Significance
17	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	Good	Yes	High	Medium	High
18	Broad Leaf Paperbark *Melaleuca quinquenervia*	Fair	Good	Yes	High	Medium	High
19	Broad Leaf Paperbark *Melaleuca quinquenervia*	Fair	Good	Yes	High	Medium	High
20	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	Fair	Yes	High	Low	Moderate
21	Cheese Tree *Glochideon sumatranum*	Fair	Good	No	Low	Low	Very Low
22	Alexander Palm *Archontophoenix alexandrae*	Good	Good	Yes	High	Medium	High
23	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	Good	Yes	High	Medium	High
24	Broad Leaf Paperbark *Melaleuca quinquenervia*	Good	Good	Yes	High	Low	Moderate
25	Cheese Tree Glochideon sumatranum	Good	Good	Yes	High	Low	Moderate
26	Pink Euodia Melicope elleryana	Good	Good	Yes	High	Low	Moderate
27	Broad Leaf Paperbark *Melaleuca quinquenervia*	Fair	Good	Yes	High	High	High

6. Tree Retention Value

		Landscape Significance Rating						
		1 Significant	2 Very High	3 High	4 Moderate	5 Low	6 Very Low	7 Insignificant
Estimated Life Expectancy	> 40 yrs	High Retention Value			Moderate Retention Value		Low Retention Value	
	15-40 yrs	# 1	# 2, 3, 7, 13, 14	# 4, 5, 6, 15, 16, 17, 18, 19, 22, 23, 27	# 12, 20, 24, 25, 26	# 8, 9, 10, 11	# 21	
	5-15 yrs							
	< 5 yrs				Very Low Retention Value			
	Dead							

Ref: Modified from Couston, Howden (2001).

Where trees have a high retention value they should be retained if possible. Where the development is considered to be more important than the trees they may be removed (Barrell 2006).

7. Appraisal

The proposal is to demolish the existing buildings on the site and four new homes and seven units on the site (see Attachment 3. Strata Layout). There were 27 trees identified on the site of which 16 are proposed to be removed. The location of the proposed buildings on the elevated western side of the site may be adjusted to reduce the impact of the development on the trees. This report assesses the potential impact on the trees as the development is currently planned.

Tree # 1
Coastal Cypress *Callitris columellaris*.
This is a mature aged tree growing on the adjoining property. The proposed encroachment into the TPZ of this tree is 7% (Rasbund 2020). This is a minor encroachment according to the Australian Standard *AS 4970-2009 Protection of trees on development sites Sect 3.3.2 Minor encroachment*.

Tree # 2
Swamp Mahogany *Eucalyptus robusta*.
This is a mature aged tree growing close to a recently made driveway. The proposed buildings including the electricity transformer will encroach into the TPZ of this tree. The theoretical encroachment is 19% which is a major encroachment according to the Australian Standard *AS 4970-2009 Protection of trees on development sites Sect. 3.3.3 Major encroachmen*t. It is proposed to construct the transformer on top of the existing soil grade. There will be some excavation to connect the power services but the actual encroachment into the TPZ of this tree will not cause it to become unviable.

Tree # 3
Swamp Mahogany *Eucalyptus robusta*.
This is a mature aged tree growing close to a recently made driveway. The theoretical encroachment into the TPZ of this tree is 37%. This is a major encroachment. The majority of the encroachment activity will be to construct the driveway. This will require excavation for the driveway. The tree is growing on top of a bank and there is already a drop of around 1 m down to where the new driveway will be built. Consequently the tree root activity in this area is much less than would be normally expected. The actual loss of roots and area available to the tree is therefore much less than the 37% encroachment would signify.

It is proposed to construct a walkway near this tree. The walkway will be built above the ground with minimal pier footings used for the foundations. There will be minimal impact on the tree from the proposed walkway.

The construction of the driveway as proposed will not cause this tree to become unviable.

Tree # 4
Broad Leaf Paperbark *Melaleuca quinquenervia*.
Small tree growing close to the proposed new driveway. There is an existing driveway close

to the tree. The proposed theoretical encroachment into the TPZ of this tree is 35%. Since there is already a driveway in this location the impact on the tree is likely to be minimal.

Tree # 5
Tuckeroo Cupaniopsis anacardioides.
This is a small tree that has established under the larger Swamp Mahogany (tree # 7). It is tall and has a small canopy. The proposed new driveway will not encroach into the TPZ of this tree.

Tree # 6.
Swamp Mahogany Eucalyptus robusta.
This is a young mature aged tree that has established under the larger Swamp Mahogany (tree # 7). It is tall with a small canopy. The driveway is currently proposed to be constructed close to this tree. The theoretical encroachment into the TPZ of this tree is 10% which is a minor encroachment.

Tree # 7
Swamp Mahogany Eucalyptus robusta.
This is a large mature aged tree. The design for the new residence H1 has been extensively modified to reduce the impact on this tree. There is an retaining wall proposed to be built to the east of the tree that will encroach into the TPZ of the tree. The encroachment is 21%. There is also a theoretical encroachment of the new driveway. The excavation to construct the road is minimal however. The total encroachment into the tree is a major encroachment according to the Australian Standard AS 4970-2009 Protection of trees on development sites. There is an area available to the tree to grow roots to compensate for roots lost during construction. There is no encroachment into the SRZ. The construction of the development as proposed will not cause this tree to become unviable.

Tree # 8
Sweet Viburnum Viburnum odoratissimum
This is an exotic species growing close to the southern boundary. It is a planted exotic specimen in poor condition.

Tree # 9
Paperbark Melaleuca sp.
This is a small planted tree. It is growing in the footprint of the proposed driveway.

Tree # 10
Silky Oak Grevillea robusta
This is a planted specimen. It is in poor condition. It is growing in the footprint of one of the proposed houses.

Tree # 11
Alexander Palm *Archontophoenix alexandrae.*

This is a group of planted palm trees. This is listed as an undesirable species in Byron Shire Council's DCP 2014 Chapter B2 Protection of Trees and Other Vegetation. The trees are growing in the footprint of one of the proposed houses.

Tree # 12
Bangalow Palm Archontophoenix cunninghamiana
This is a tree that has grown three stems. It is considered to be a single tree as the three stems have arisen from a single seed. This tree is likely to have been planted. It is growing in the footprint of the proposed H1 residence.

Tree # 13
Swamp Mahogany Eucalyptus robusta.
This is a mature aged tree growing close to a recently made driveway. The proposed development will encroach into the TPZ of this tree by 21%. This is a major encroachment. There is an area available to the tree to grow new roots to compensate for the loss of roots during construction. The construction of the development as proposed will not cause this tree to become unviable.

Tree # 14
Swamp Mahogany Eucalyptus robusta.
This is a mature aged tree growing close the northern boundary. The proposed development will encroach into the TPZ of this tree by 21%. This is a major encroachment. There is an area available to the tree to grow new roots to compensate for the loss of roots during construction. The construction of the development as proposed will not cause this tree to become unviable.

Tree # 15
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a mature aged tree growing on the lower section of the property. It is growing close to the proposed houses. It is proposed to retain this tree. There is a requirement to fill the area around the tree. The fill depth near the tree will be approximately 800 mm. The SRZ will not be filled. A pump system will be installed to pump out water that may accumulate during heavy rain.

The foundations of the adjacent buildings will be constructed in the fill material and will not be in the natural ground. It is proposed to use blue metal cracker dust to fill the area in the TPZ of this tree. This material will allow the movement of air and water through the material, will not form a soil interface and will not expand and contract with changes to moisture content.

The theoretical encroachment into the TPZ of this tree is 85%. It is estimated that the chances of survival for this tree over the next 5 years is around 70%. If the tree fails it will not cause damage to the surrounding properties and the location of the landscaping makes it extremely unlikely to cause harm to any resident or visitor.

Tree # 16
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a mature aged tree growing on the lower section of the property. It is growing close to the proposed houses.

Tree # 17
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a mature aged tree growing on the lower section of the property. It is growing close to the proposed houses.

Tree # 18
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a small suppressed tree growing on the lower section of the property. It is growing in the footprint of the proposed driveway.

Tree # 19
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a mature aged tree growing on the lower section of the property. It is growing in the footprint of the proposed driveway.

Tree # 20
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a mature aged tree growing on the lower section of the property. It is growing close to a proposed house.

Tree # 21
Cheese Tree Glochideon sumatramum.
This is a small tree in poor condition. It is growing in the footprint of the proposed driveway.

Tree # 22
Alexander Palm Archontophoenix alexandrae.
This is listed as an undesirable species. It is growing in the footprint of a proposed residence.

Tree # 23
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a mature aged tree growing on the lower section of the property. It is growing in the footprint of the proposed residence.

Tree # 24
Broad Leaf Paperbark Melaleuca quinquenervia.
This is a mature aged tree growing on the lower section of the property. It is growing in the footprint of the proposed residence.

Tree # 25

Cheese Tree Glochideon sumatranum.

This is a small tree. It is growing in the footprint of a proposed house.

Tree # 26

Pink Euodia Melicope elleryana.

Small tree growing in the footprint of a proposed house.

Tree # 27

Broad Leaf Paperbark Melaleuca quinquenervia.

This tree is growing on the adjoining reserve. The branches encroach over the boundary into the subject property. There is no encroachment into the TPZ of this tree.

8. Recommendations

It is recommended that the development be constructed as proposed. Trees # 8, 9, 10, 11, 12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, and 26 should be removed to allow construction of the development. Trees # 1, 2, 3, 4, 5, 6, 7, 13, 14 and 15 should be retained in the development and protected during construction. The details of the recommended protection measures are given in **9. Tree Protection**.

Byron Shire Council has a 'No Net Vegetation Loss' Policy. Where trees are removed, replacement trees are required to be replaced. Guidelines for the replacement ratios are given in Byron Shire Council's DCP 2014 Chapter B2 Preservation of Trees and Other Vegetation Sect. B2.2.2 Note. A table with the recommended replacement ratios is shown in Table 4 below

Table 4. Replacement Tree Ratios

Tree #	Name	Replacement Ratio
8	Sweet Viburnum	1:1
9	Paperbark (planted non local)	1:5
10	Silky Oak	1:1
11	Alexander Palm	0
12	Bangalow Palm	1:5
16	Broad Leaf Paperbark	1:5
17	Broad Leaf Paperbark	1:5
18	Broad Leaf Paperbark	1:5
19	Broad Leaf Paperbark	1:5
20	Broad Leaf Paperbark	1:5
21	Cheese Tree	1:5
22	Alexander Palm	0
23	Broad Leaf Paperbark	1:5
24	Broad Leaf Paperbark	1:5
25	Cheese Tree	1:5
26	Pink Euodia	1:5
Total Number of replacement trees		**62**

Table 4. Replacement Tree Species.

Coastal Wattle *Acacia longifolia*	Cheese Tree *Glochideon ferdinandi*
Lilli Pilli *Acmena smithii*	Bleeding Heart *Homalanthus populifolius*
Red Ash *Alphitonia excelsa*	Ribbon Grass *Lomandra longifolia*
Bangalow Palm *Archontophoenix cunninghamiana*	Swamp Terpentine *Lophostemon suaveolens*
Swamp Banksia *Banksia robur*	Cabbage Palm Tree *Livistona australis*
Tuckeroo *Cupaniopsis anacardioides*	Willow Bottlebrush *Melaleuca salicina*
Blue Flax Lilli *Dianella caerulea*	Prickly Leaf Tea Tree *Melaleuca styphelioides*
Large Leaf Hop Bush *Dodanea triquetra*	Brown Pine *Podocarpus elatus*
Blueberry Ash *Elaeocarpus reticulatus*	Scentless Rosewood *Synoum glandulaosum*
Tall Saw Sedge *Gahnia clarkei*	Lilli Pilli *Syzygium* sp.

The list of trees is not exhaustive and other suitable species may be utilized. Not all of the species shown in the list must be planted. It is recommended that a mix of species be used. The location of a suitable planting zone will be determined by the Landscape Architect.

The planting stock should be sourced from a local reputable nursery and in 1 litre pots. The new plantings should be protected with tree guards and mulched.

Further Recommendations

Where trees are required to be pruned to give clearance to the new buildings, the pruning should be done in accordance with the recommendations of the Australian Standard AS 4373-2007 Pruning of amenity trees and carried out by an Arborist qualified to a minimum of AQF 3 in Arboriculture.

The fill material used in the TPZ of tree # 15 must be blue metal cracker dust. This material will allow for best chance of survival of this tree in the development as proposed. A pump system should be installed to allow excess water to be removed from around the tree during times of heavy rainfall.

9. Tree Protection

The trees retained on the site should be protected during construction in accordance with the recommendations of the Australian Standard *AS 4970-2009 Protection of trees on development sites*. The Standard sets out a Tree Protection Zone that is calculated to be an area around the tree with a radius of 12 x diameter at breast height (DBH). The TPZ has a minimum of 2 m and maximum of 15 m. The TPZ should be protected during construction as effectively as is practicable.

The Standard lists activities that are prohibited in the TPZ. They are:

a. Machine excavation
b. excavation for silt trenching
c. cultivation
d. storage
e. preparation of chemicals, including preparation of cement products
f. parking of vehicles and plant
g. refuelling
h. dumping of waste
i. wash down and cleaning of equipment
j. placement of fill
k. lighting of fires
l. soil level changes
m. temporary or permanent installation of utilities and signs and
n. physical damage to the tree.

The proposed construction of the development is proposed to be undertaken within the TPZ of some of the trees on the site. In order to ensure that the trees remain viable it is important to protect them during construction. The Standard provides for a temporary fence to be installed around the TPZ of trees on development sites. In this development it is recommended that a 1 m high visibility plastic mesh fence be installed so as to protect as much of the TPZ as is practicable. The location of the protective fencing is shown in Attachment 7. Protective Fencing. An example of a suitable temporary fence is shown in Figure 1. below.

Figure 1. Example of protective fencing

10. Disclaimer

The information contained in the report is true and accurate to the best knowledge of the author. Best professional judgement was used to make recommendations. However the author of this report is not responsible for any action taken or not taken in reliance on it.

11. References

Brooker M. Kleinig D. 1999. *Field Guide to Eucalypts*. Bloomings Books. Hawthorn.

Harden G. MacDonald W. Williams J. 2009. *Rainforest Trees and Shrubs.* Gwen Harden Publishing. Nambucca Heads.

Mattheck C. Breloer H. 2003. *The Body Language of Trees*. TSO. London.

Moreton A. 2003. *Criteria for Assessment of Landscape Significance.* 7th National Street Tree Symposium 2006.

Rasband W. *ImageJ*. National Institute of Health. USA.
Accessed 12/3/2021.
http://imagej.nih.gov.ij

Standards Australia. 2007. *AS 4373 -2007 Pruning of Amenity Trees.* Australian Standards. Sydney.

Standards Australia. 2009. *AS 4970 Protection of Trees on Development Sites.* Australian Standards. Sydney.

12. About the Author

This report was compiled by Peter Gray of Northern Tree Care. The author is an arborist who has been providing Arboricultural Reports for Local Government, State Government and private clients for over 20 years. His qualifications include:

Graduate Certificate of Arboriculture (AQF 8)

Diploma of Arboriculture (AQF 5)

Diploma of Horticulture (Arboriculture)

Quantified Tree Risk Assessment (QTRA)

Tree Risk Assessment Qualification (ISA)

VALID Tree Risk-Benefit Validator.

Peter Gray is an AQF level 8 Consulting Arborist general member No. 2344 with Arboriculture Australia. He is a trained and registered practitioner of Quantified Tree Risk Assessment (QTRA) Registered User number 980. In 2020 he was appointed as a director to the board of Arboriculture Australia.

I declare that I have compiled this report impartially using best professional judgement. I have no financial interest in the outcome of the report.

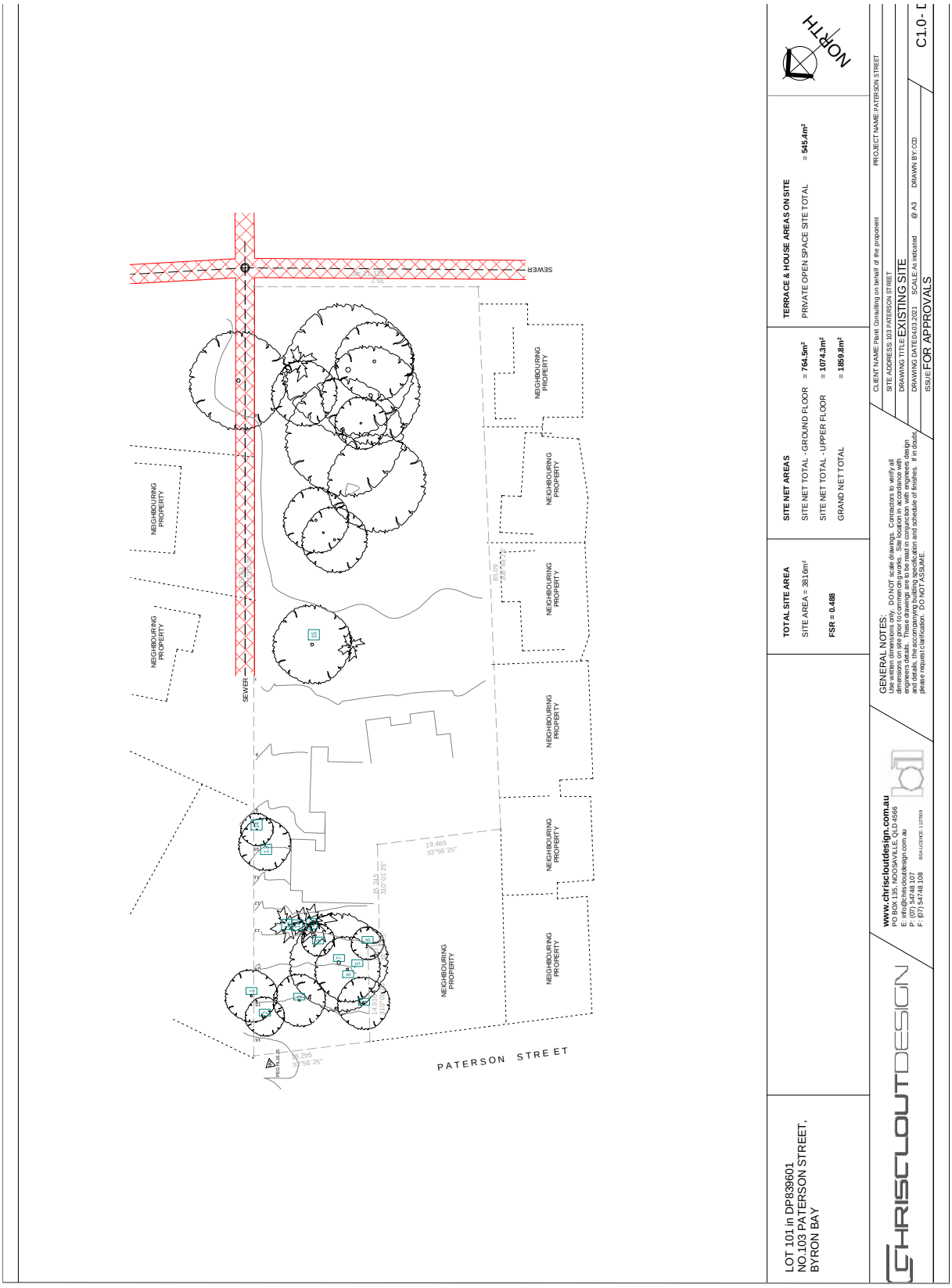
Signed Peter Gray, Northern Tree Care

19 Mar 2021

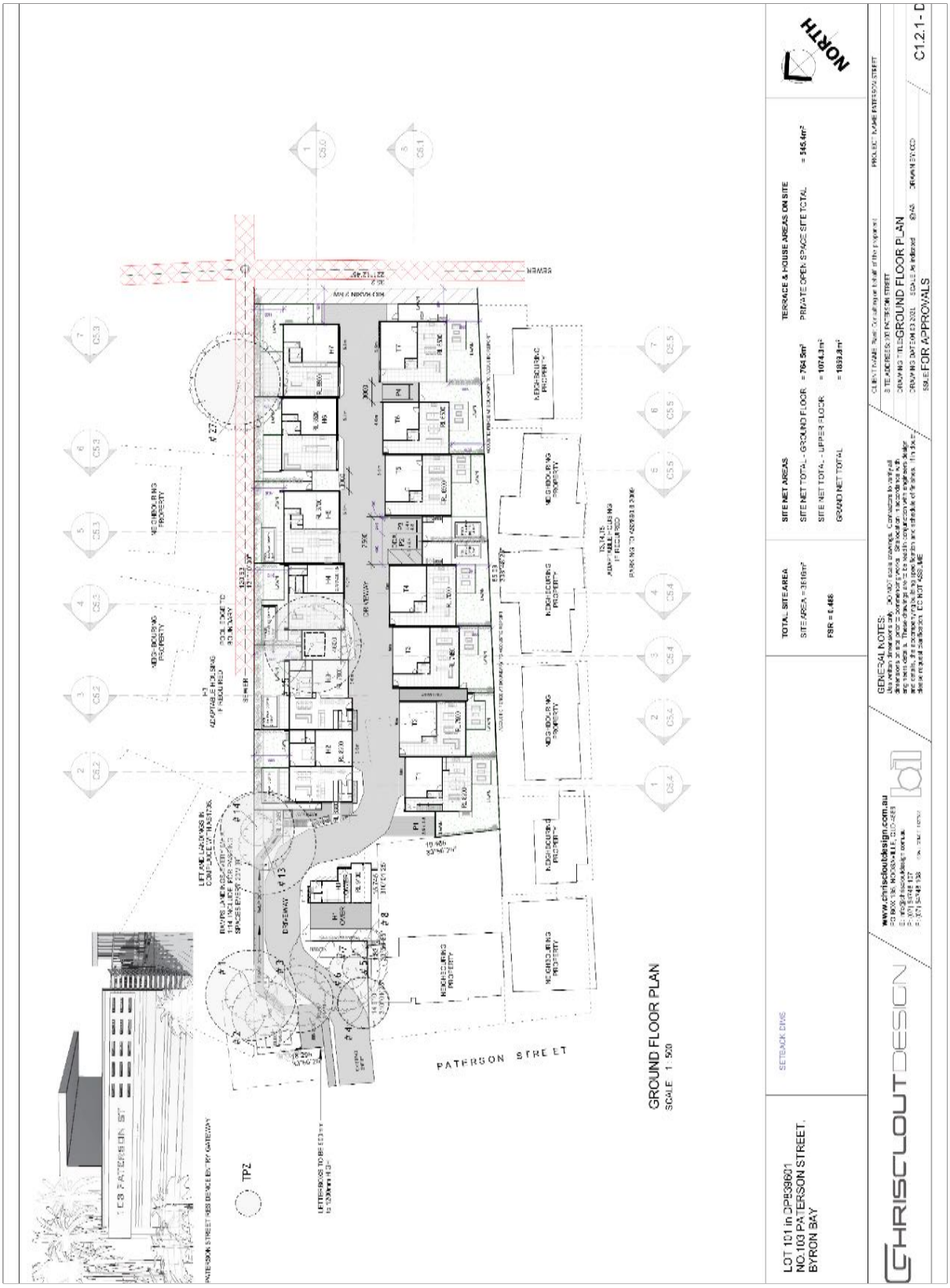
13. Attachment 1. Location Plan

14. Attachment 2. Aerial Photo

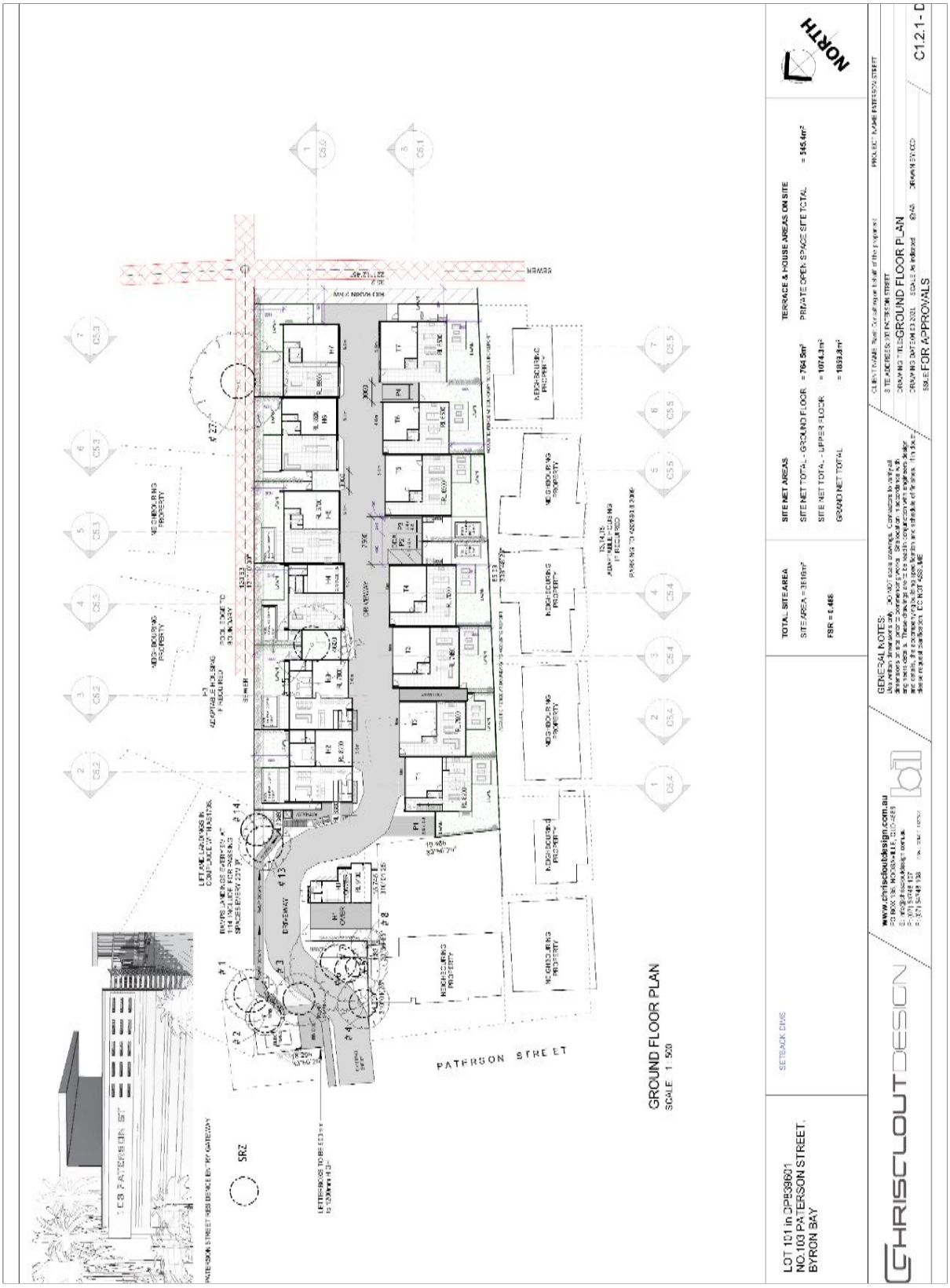
15. Attachment 3. Site Plan



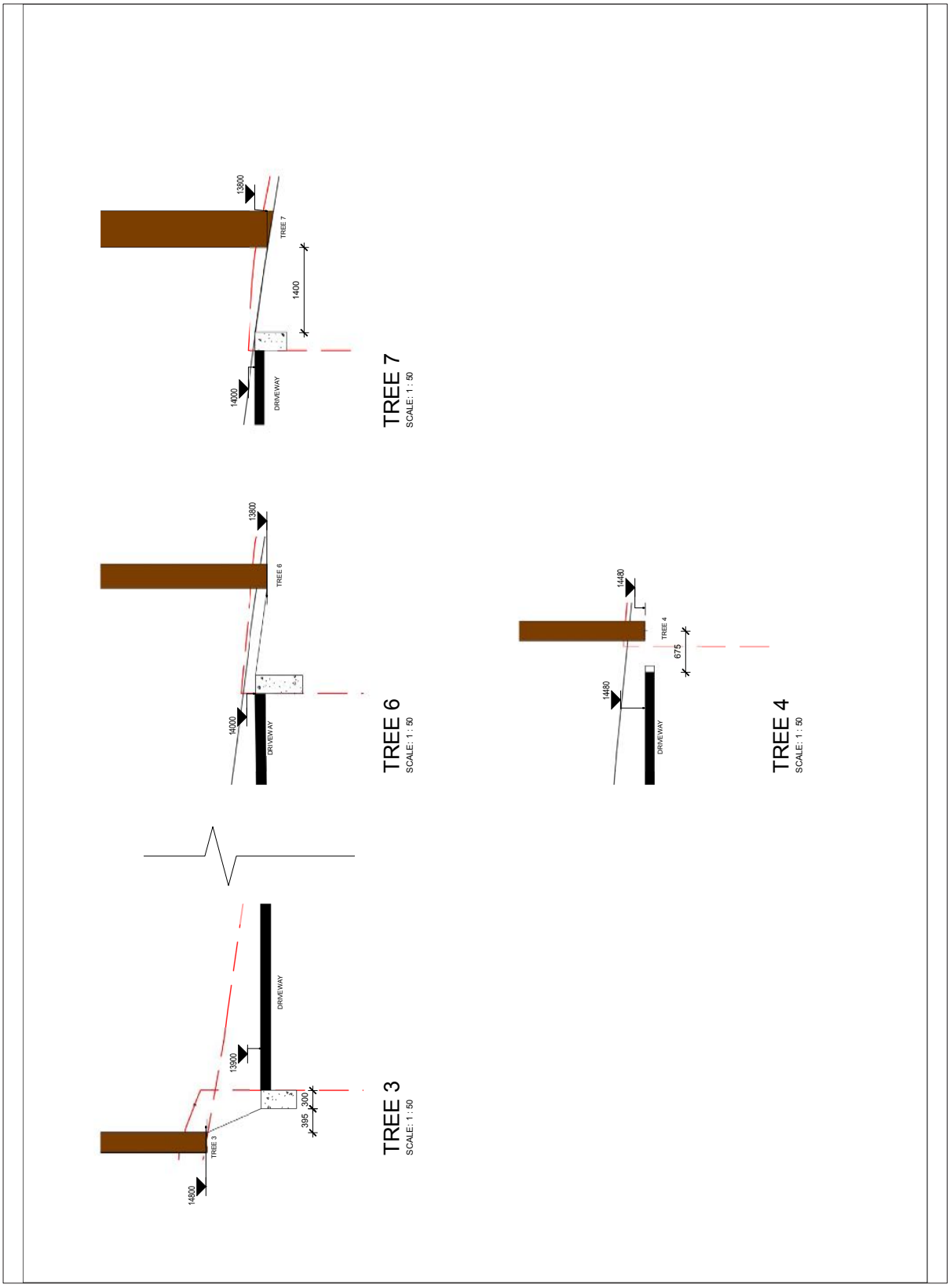
16. Attachment 4. Proposed Buildings and TPZ



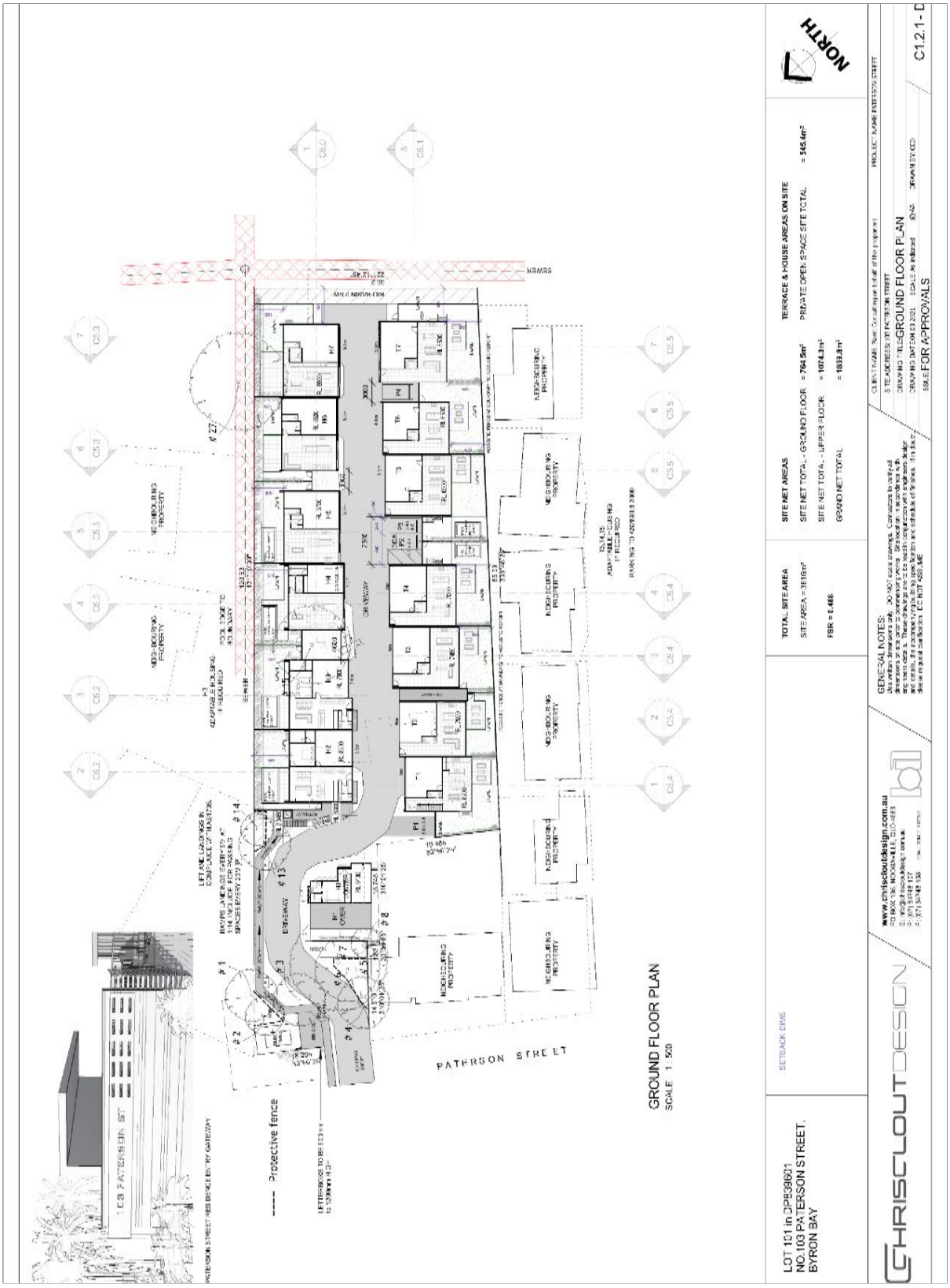
17. Attachment 5. Proposed Building and SRZ



18. Attachment 6. Tree Soil Levels



19. Attachment 7. Protective Fencing



20. Attachment 8. Photos

Photo 1. Tree # 1
Coastal Cypress

Photo 2. Tree # 3
Swamp Mahogany

Photo 3. Tree # 4
Paperbark

Photo 4. Tree # 5, 6 & 7

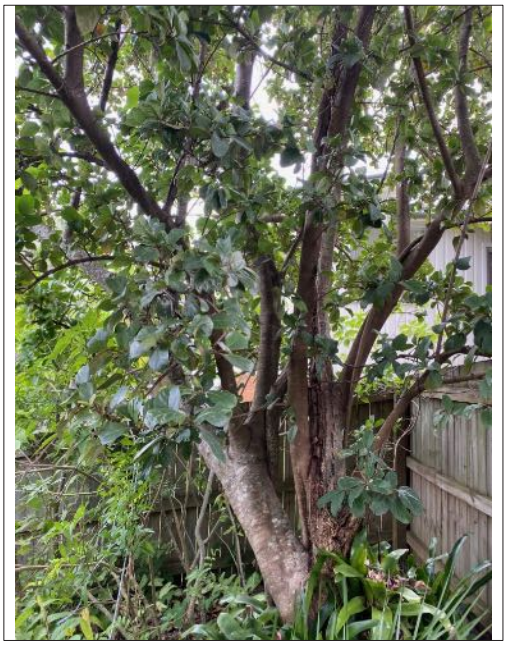


Photo 5. Tree # 8
Sweet Virburnum

Photo 6. Tree # 10 & 11

Photo 7. Tree # 12
Bangalow Palm

Photo 8. Tree # 5, 6 & 7

Photo 9. Tree # 15
Paperbark

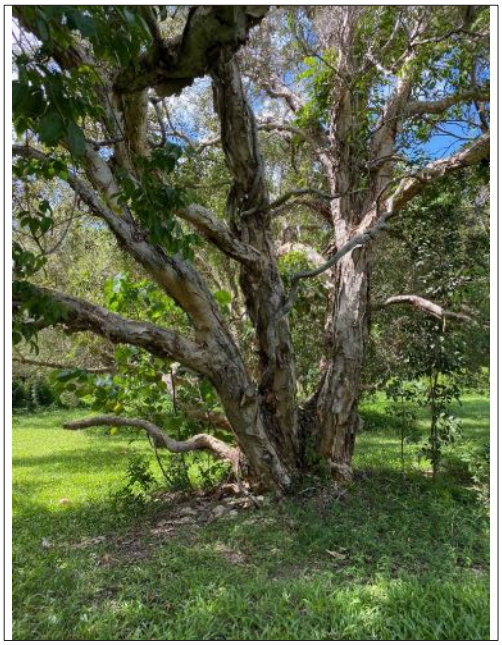


Photo 10. Tree # 16
Paperbark

Photo 11. Tree # 17
Paperbark

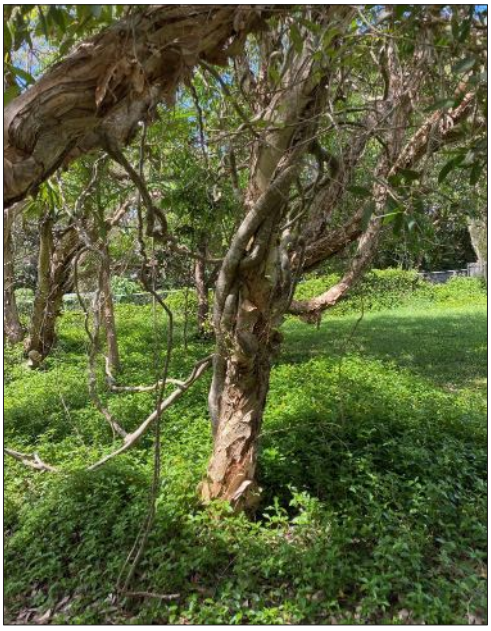


Photo 12. Tree # 18

Paperbark

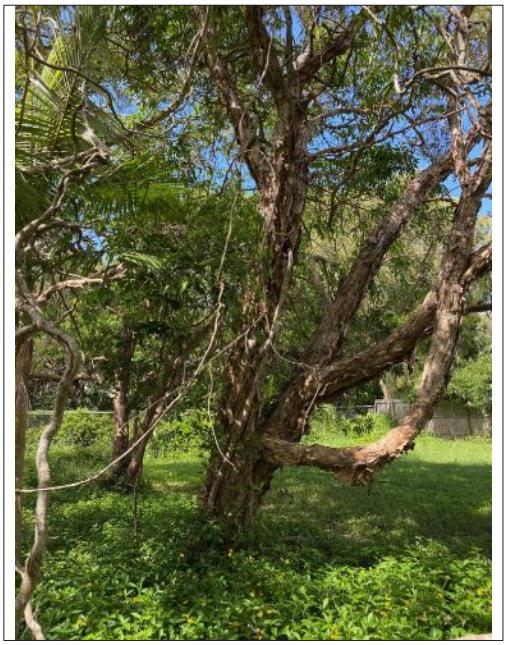


Photo 13. Tree # 19
Paperbark

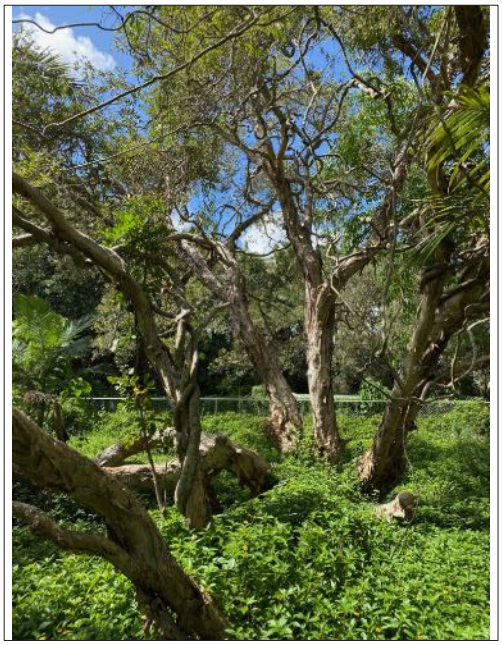


Photo 14. Tree # 20
Paperbark

Photo 15. Tree # 21
Cheese Tree

Photo 16. Tree # 23

Paperbark

Photo 17. Tree # 24
Paperbark

Photo 18. Tree # 25 & 26
Paperbark

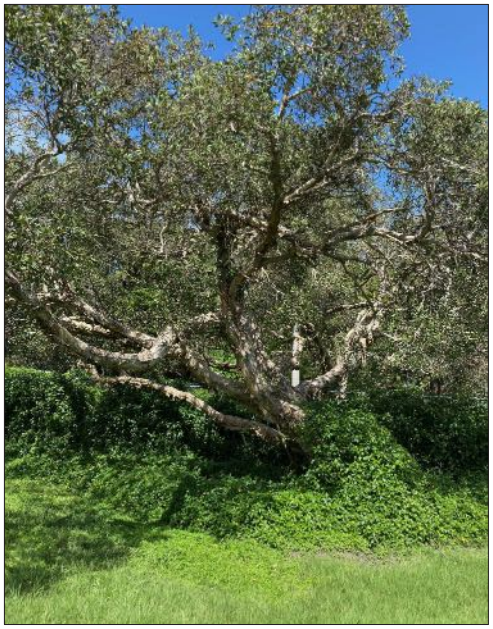


Photo 19. Tree # 27
Paperbark

Photo 20. Tree # 27

Paperbark

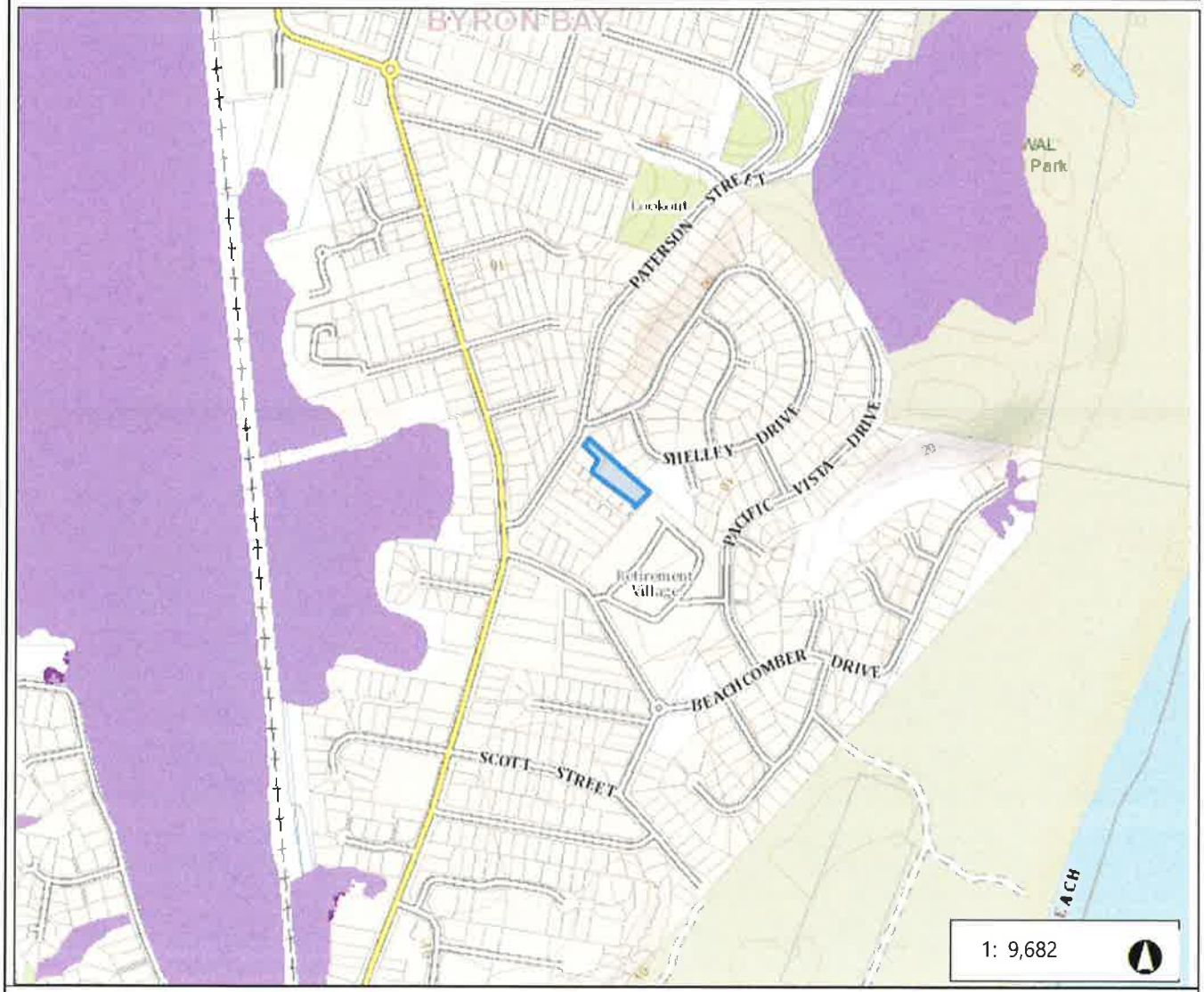
PLANIT
CONSULTING

Attachment 4

BOSET Report Prepared for the Site

NSW GOVERNMENT

Biodiversity Offset Scheme (BOS) Entry Threshold Map



491.8 0 245.91 491.8 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days

Notes

NSW GOVERNMENT

Biodiversity Values Map and Threshold Report

Results Summary

Date of Calculation	23/03/2020 3:39 PM		**BDAR Required***
Total Digitised Area	0.27	ha	
Minimum Lot Size Method	LEP		
Minimum Lot Size	0.06	ha	
Area Clearing Threshold	0.25	ha	
Area clearing trigger Area of native vegetation cleared	Unknown #		Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	no		no
Date of the 90 day Expiry	N/A		

*If BDAR required has:

- at least one 'Yes': you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
- 'No': you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is '"likely to significantly affect threatened species' as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.

Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared - refer to the BOSET user guide for how to do this.

On and after the 90 day expiry date a BDAR will be required.

Disclaimer

This results summary and map can be used as guidance material only. This results summary and map is not guaranteed to be free from error or omission. The State of NSW and Office of Environment and Heritage and its employees disclaim liability for any act done on the information in the results summary or map and any consequences of such acts or omissions. It remains the responsibility of the proponent to ensure that their development application complies will all aspects of the *Biodiversity Conservation Act 2016.*

The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

Acknowledgement

I as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature _____ Date: 23/03/2020 03:39 PM