



UPDATED TERRESTRIAL FLORA AND FAUNA ASSESSMENT

3-LOT Residential Subdivision
LOT 16 DP856265 @ 225 TERRANORA ROAD, TERRANORA

Prepared for WRENN PTY LTD

MARCH 2023



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Project Details

Project Name	Planning Proposal 3-Lot Residential Subdivision Lot 16 DP856265 @ 225 Terranora Road, Terranora
Client	Wrenn P/L
Client Project Manager	Josh Townsend
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1 Introduction

Planit Consulting has been commissioned by Wrenn P/L to prepare an updated Terrestrial Flora and Fauna Assessment over approximately 10ha of vacant land situated at 225 Terranora Road, Terranora (refer Figure 1). Planit has previously (2015) performed a flora and fauna assessment over the site which was utilised within the planning and constraints analysis leading to a previous Gateway Determination (Reference No. PP_2017_TWEED_003_01). Throughout the historic reviews prepared, the 'R5 zone footprint', which would enable large lot residential development, has largely been agreed upon. The extent of the R5 zone footprint has been refined on the basis of recent site inspections and assessment against the Northern Councils E Zone Review Final Recommendations Report. Notwithstanding, the available density within the residential zoned footprint has been disputed.

On 26 August 2020, through a Rezoning Review Record of Decision, the NRPP ultimately determined that:

'The proposal has strategic and site-specific merit but with the latter being subject to clearer definition of the intended development and greater clarity about certain technical matters which are addressed the Gateway conditions.'

Following several re-designs and rounds of negotiation with the relevant assessing authority a reduced impact design has been determined which reduces the proposed number of residential allotments from 9 to 3. This updated report reassesses the impact of the reduced subdivision on the observed flora and fauna values of the property previously established through 2004, 2015 and 2016 surveys and concludes that the proposal will not have a significant impact upon the ecological values of the site.

The previously prepared 8-part test of significance (2004) and 7-part test of significance (2015) has been updated to reflect the current Section 7.3 Test of Significance requirements of the *Biodiversity Conservation Act 2016*. A draft Environmental Management Plan (including weed and rehabilitation management) has also been prepared to reduce the current negative impacts of exotic plant growth within forested habitat to be retained around the perimeter of the three new residential lots.

1.1 Aims of Study

The aim of this report is to re-examine the site and update the Terrestrial Flora and Fauna Assessment prepared by Planit in 2015 and Aspect North in 2004 in the context of a reduced development proposal from nine residential lots to three residential lots. This includes describing the terrestrial flora and fauna habitat of the site and examine the potential for the occurrence of threatened species, populations, their habitats or endangered ecological communities and the potential impact of the proposal on ecological values in accordance with relevant legislation including:

- Review and briefly ground-truth the existing flora, vegetation communities, fauna assemblage and associated habitats as documented within previous studies,
- Determining the occurrence, or likely occurrence, threatened species, populations, their habitats or endangered ecological communities as a result of site survey and literature review,
- Undertake the 5-part test of significance pursuant to Section 7.3 of the *Biodiversity Conservation Act 2016*,
- Undertake a review of the proposal against the Koala Development Assessment Pathway outlined in the Tweed Coast Koala Comprehensive Plan of Development,
- Describe the potential direct and indirect impacts of the proposal on existing terrestrial flora and fauna values,
- Propose amelioration measures to mitigate potential impacts upon the terrestrial flora and fauna values of the site.

1.2 Report Structure

The structure and content of this flora and fauna assessment is as follows:

- Section 1: Introductory statement
- Section 2: Details the site description, location and outlines general background information.
- Section 3: Details the methodology for flora survey and resultant species, community descriptions and mapping.

- Section 4: Details the methodology for fauna survey and resultant species records and descriptions of the recorded assemblage.
- Section 5: Describes and discusses the recorded and occurring endangered communities, endangered populations, threatened species, wetlands and waterways, and fauna corridors.
- Section 6: Contains the statutory assessments of significance (5-part test) pursuant to the *Biodiversity Conservation Act 2016* and Tweed Coast Comprehensive Koala Plan of Management assessment.
- Section 7: Describes the potential impacts of the proposed development on the recorded flora and fauna values.
- Section 8: Describes the design, management and enhancement measures incorporated into the proposed development to avoid, mitigate and compensate for the impacts of the proposed development on flora and fauna habitat.

2 Site Description & Location

The site subject to this assessment incorporates 225 Terranora Road, Terranora which covers an area of 10.19ha. The site is irregular in shape and is bordered by existing rural residential allotments to the north and larger rural properties to the west, south and east.

Current improvements are limited to fencing, vehicle tracks and a shed with a powerline easement present in the east. The northern areas incorporate an open terraced area created through previous quarrying which is largely cleared of native vegetation. The fringing areas to the west, south and southeast are occupied by a variety of Camphor Laurel dominated forest, early regrowth rainforest with camphor laurel co-dominant or dominant, or lowland rainforest (west and southeast). Weed species are prevalent across all investigated areas.

The land is undulating, with a general north-east to south-east slope ranging from 10% – 30% with some isolated steeper sections in the south.

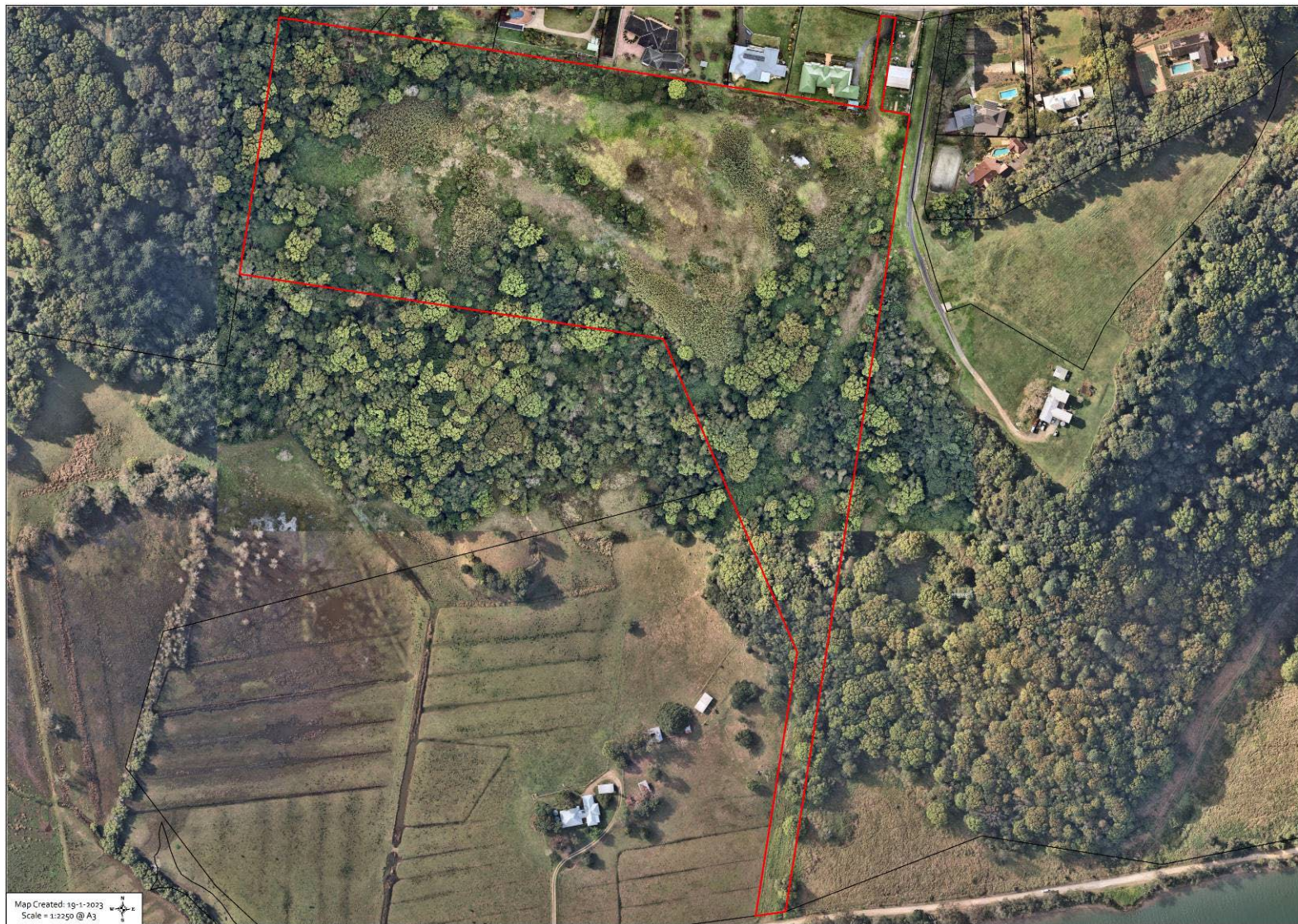


Figure 1: Subject Site Aerial (Source: Nearmap, 2022)

The Tweed Shire Environment Mapping (refer to Figure 2) notes that the site is mapped as 'Substantially Cleared of Native Vegetation', small areas which have not been assessed and the forested/bushland areas nominated as Camphor Laurel Dominant Closed to Open Forest. Field survey has confirmed that this is considered to be a relatively accurate representation of the residual vegetation which is dominated by exotic/non-native species, although approximately 1.37ha of the mapped Camphor Laurel, whilst containing Camphors, is dominated, or at least codominated by native rainforest species in the canopy. Such areas are more accurately defined as Lowland Rainforest (refer Figures 3, 4 and 9).

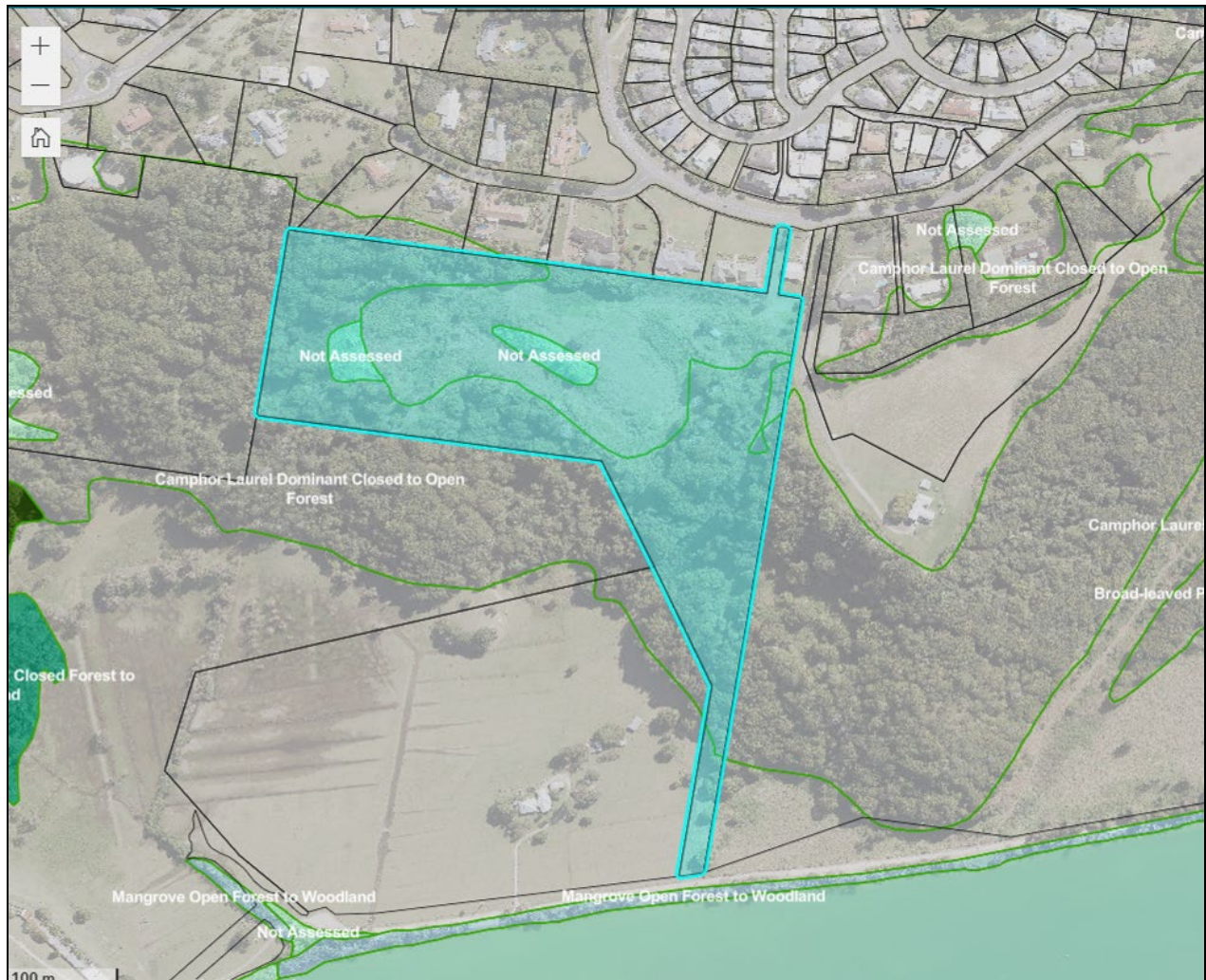


Figure 2: Tweed Council Environmental Mapping (Source: <http://tweedsc.maps.arcgis.com/apps/webappviewer/index.html>)

In 2023 additional site inspections were performed (following previous 2004, 2015, 2016 efforts) in association with the preparation of a draft Environmental Management Plan (including weed management and rehabilitation). An updated map has been at a site scale more accurately delineating areas containing predominately native trees in the canopy (regardless of maturity) from exotic trees in the canopy (camphor laurel). This map is displayed in Figure 3.

2.1 Project Description

The project incorporates a 4x lot subdivision, including 3x large lot residential lots and 1x residue lot, intended to be a Community Lot encompassing the remaining land, including land of ecological significance. The intended outcome is detailed on Figure 4 (concept plan) and described in greater detail as follows.

- Proposed Lot 1 – Comprising a minimum lot size of 1ha, proposed Lot 1 is positioned at the western end of the land identified as R5 Large Lot Residential. An indicative development envelope has been identified measuring 20m x 35m, and is proposed to accommodate a future dwelling, water tank/s and the like. The development

envelope involves a gentle topographic fall from north to south, supporting the long axis of a future dwelling along the lands contour, reducing earthworks and harnessing the visual outlook.

An additional envelope is identified to the southwest to accommodate the on-site sewage management system (OSSM) land application area. The land application area envelope has been positioned as the preferred location when considering previous geotechnical test areas.

- Proposed Lot 2 – Is positioned as the 'central' of the 3x large lot residential lots and involves a site area greater than 1ha. An indicative development envelope has been identified measuring 20m x 35m, and is proposed to accommodate a future dwelling, water tank/s and the like. The development envelope is predominately flat, however tapers away at the southern and western edges. The gentle gradient is unlikely to result in a need for extensive or excessive earthworks to accommodate a future dwelling.
An additional envelope is identified to the east to accommodate the OSSM land application area. The land application area envelope has been positioned as the preferred location when considering previous geotechnical test areas.
- Proposed Lot 3 – Is positioned as the easternmost lot within the large lot residential zoning sought. Measuring over 1ha in size, an indicative development envelope has been identified measuring 20m x 35m, and is proposed to accommodate a future dwelling, water tank/s and the like. The development envelope involves a gentle topographic fall from east to west, which is not anticipated to necessitate any earthworks of significance or a specific construction type when accommodating a future residential use.
An additional envelope is identified to the south to accommodate the OSSM land application area. The land application area envelope has been positioned as the preferred location when considering previous geotechnical test areas.
- Residue Lot – The proposed Residue Lot accommodates the remaining 5.87ha of the site. Whilst the Residue Lot includes land currently identified for rural purposes, its primary purpose is for the conservation of an ecological 'belt' running east-west through the site. This outcome consolidates the area of environmental quality, allowing land management within a single land holding. The Residue Lot is coupled with a draft Environmental Management Plan and draft Neighbourhood Management Statement to guide environmental embellishment and maintenance.

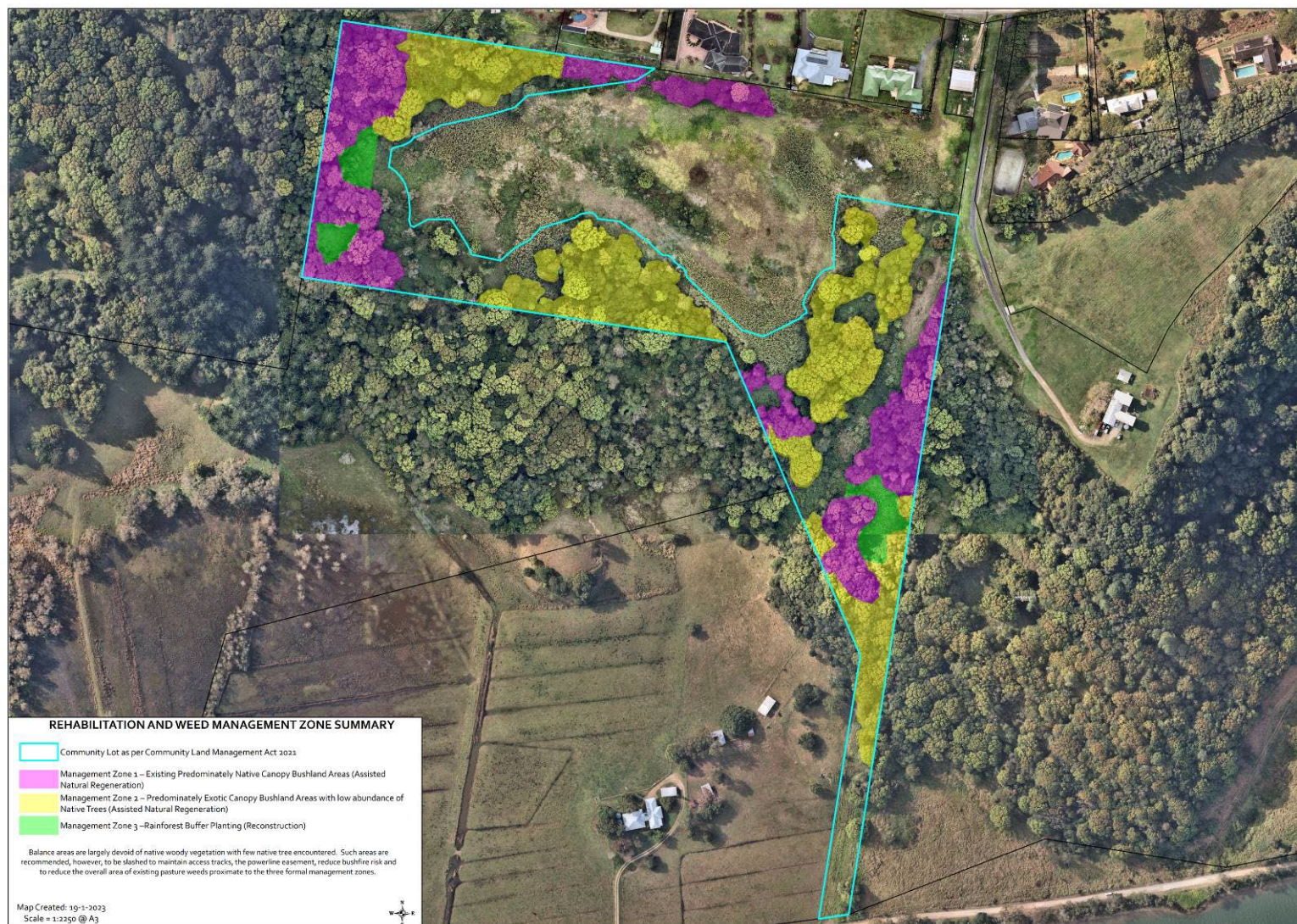


Figure 3: Vegetated Areas Delineated By Native Or Exotic Canopy Dominance (Refer Attachment 1 of Draft EMP)

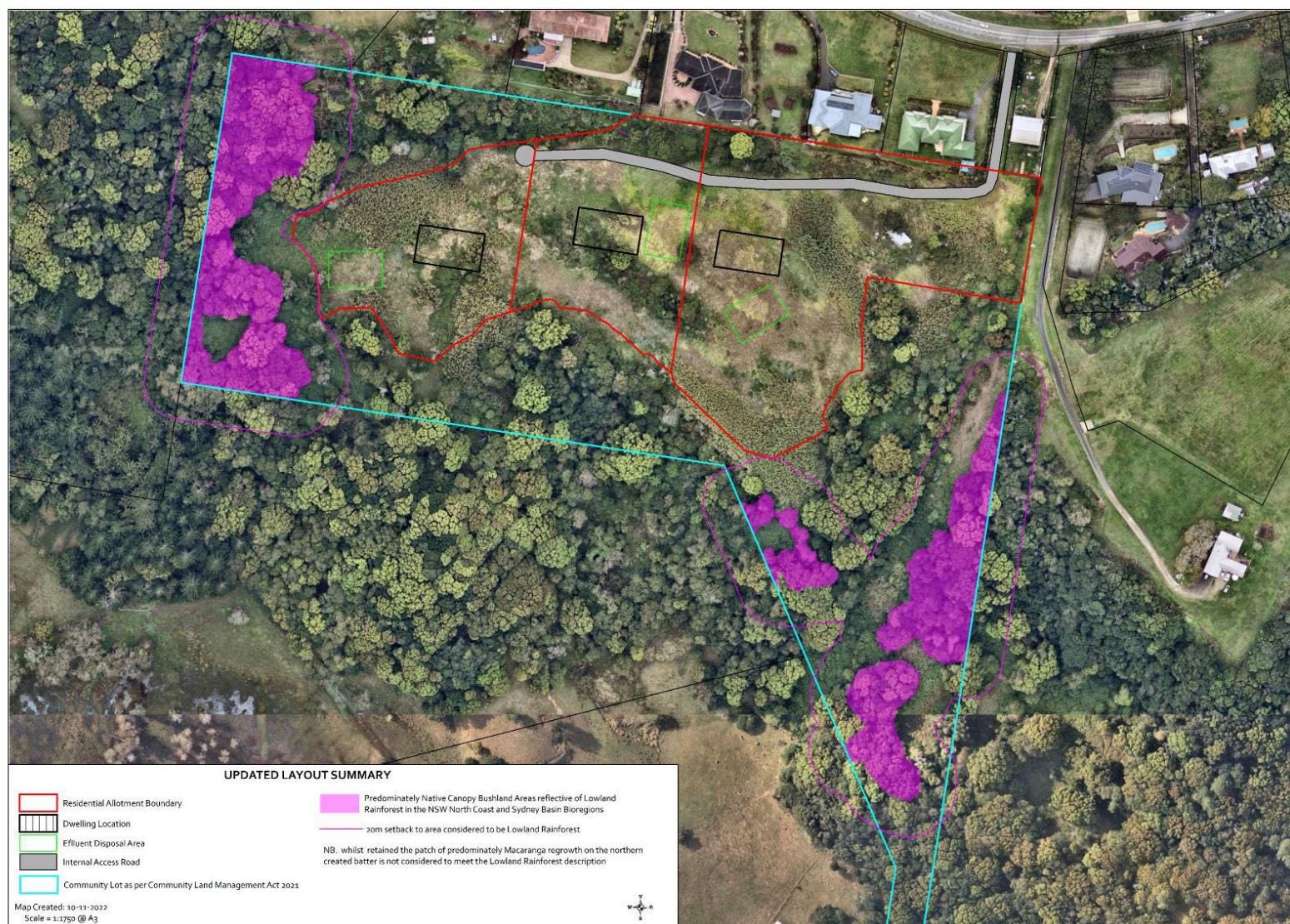


Figure 4: Layout Summary Plan

2.2 Soil Landscapes

The site has been mapped by Tweed VMP Map 5: Soils and eSPADE as containing the following soil types:

Disturbed Soil Landscapes

Disturbed soil landscapes are dominated by ground surfaces arising from human activity. Soil parent materials have been moved, accumulated, removed or replaced (with soil or other items). Landform elements include fill-tops, embankments, cut faces, cut-over surfaces, dams, mounds and pits. Denoted as Disturbed Terrain (xx).

Erosional Soil Landscapes

Erosional landscapes have been primarily sculpted by erosive action of running water. Streams are well defined and competent to transport their sediment load. Soil depth is usually shallow (with occasional deep patches) and mode of origin is variable and complex. Soils may be either absent, derived from water washed parent materials or derived from in situ weathered bedrock. Erosional soil landscapes usually include tors, benches, and areas of rock outcrop. Evidence of mass movement is rare. This group consists of the following soil landscape units; Billinudgel (bi), Burringbar (bu), Byrrill (by), Frogs Hollow (fh), Green Pigeon (gp), Kunghur (ku), Limpinwood (li), Mount Terragon (mt) and wollumbin (wl). The Mebbin (me) unit is considered as an Erosional/Colluvial landscape (TSC, 2004:4.3-4.4).

Such areas are described in more detail within 'Soil Landscapes of the Murwillumbah Tweed Heads' (Morland, 1996) and mapped as two landscape units:

Disturbed (xx): mapped in central northern ex-quarrying areas

Location: Numerous areas throughout the Murrwillumbah-Tweed Heads region associated with areas undergoing rapid urban development, old sand mining sites, quarries, golf courses and canal estates.

Geology: Quaternary beach and dune sands. Artificial fill. Bedrock exposed in quarries, commonly basalt, metamorphics, and rhyolite.

Topography: Quarries. There are many quarries of varying sizes throughout the Murwillumbah Tweed Heads area, generally providing road base. Made land varying from level plains to undulating terrain which has been disturbed by human activity to a depth of at least 100cm. The original soil has been removed, greatly disturbed or buried. The original vegetation has been completely cleared (Morland, 1996; 162 + map).

Burringbar (bu): mapped over the balance of the site

Location: Rolling hills on the metasediments of the Neranleigh-Fernvale Group. Occurs throughout the major portion of the eastern side of the mapped area, within the Burringbar Hills.

Geology: Jurassic Neranleigh-Fernvale Group. Predominately phyllitic siltstones and shales, slaty in part, of what was previously known as the Brisbane Metamorphics.

Topography: Level, High rolling to steep hills. Slopes are steep and slope angles range from 15->33%, lesser slope angles occurring in lower slopes and very limited footslope areas. This soil landscape is occasionally overlain by basalt.

Soils: Soil types within the Burringbar soil landscape are primarily governed by lithology with topographic position having an influence on soil depths (Morand 1996; 58-59 + map).

Inspection of the site and provided contour plans notes that flat areas are generally restricted to the central north areas terraced through previous quarrying works. The balance areas are generally sloping north to south (80m to 30m AHD).

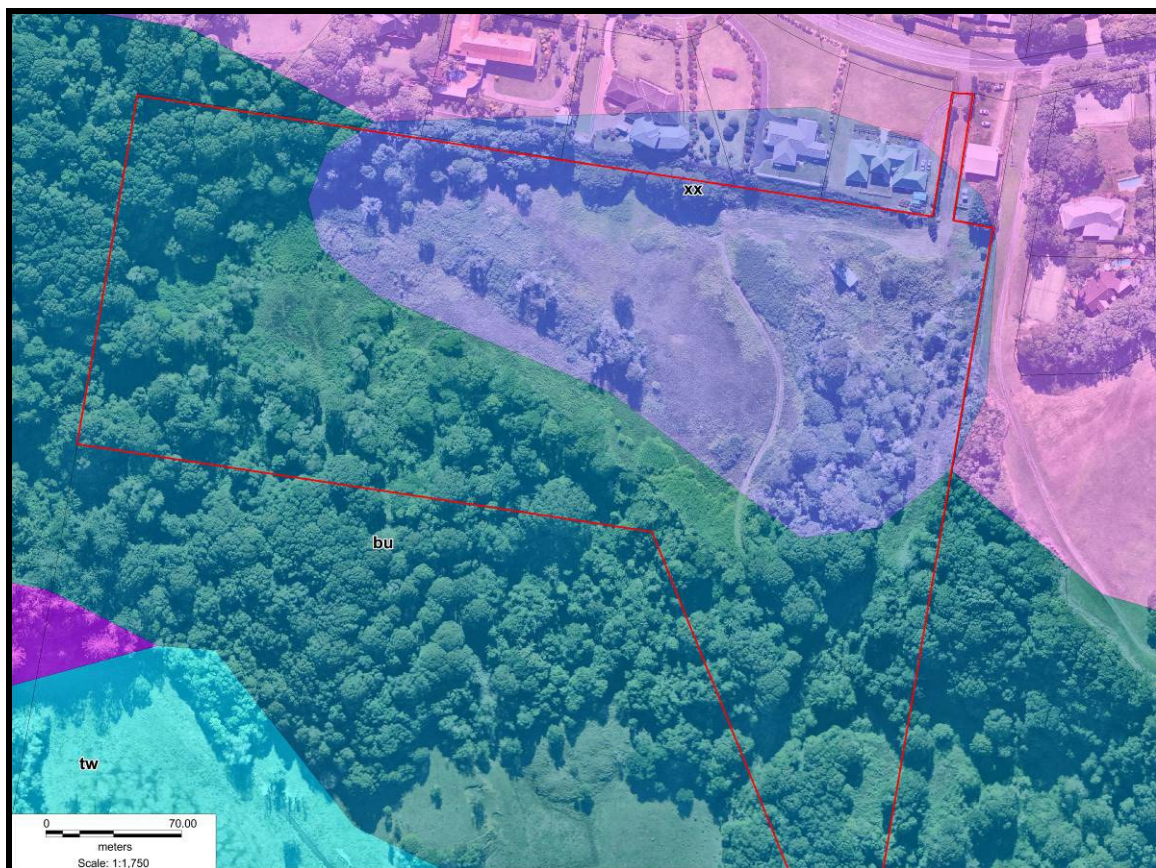
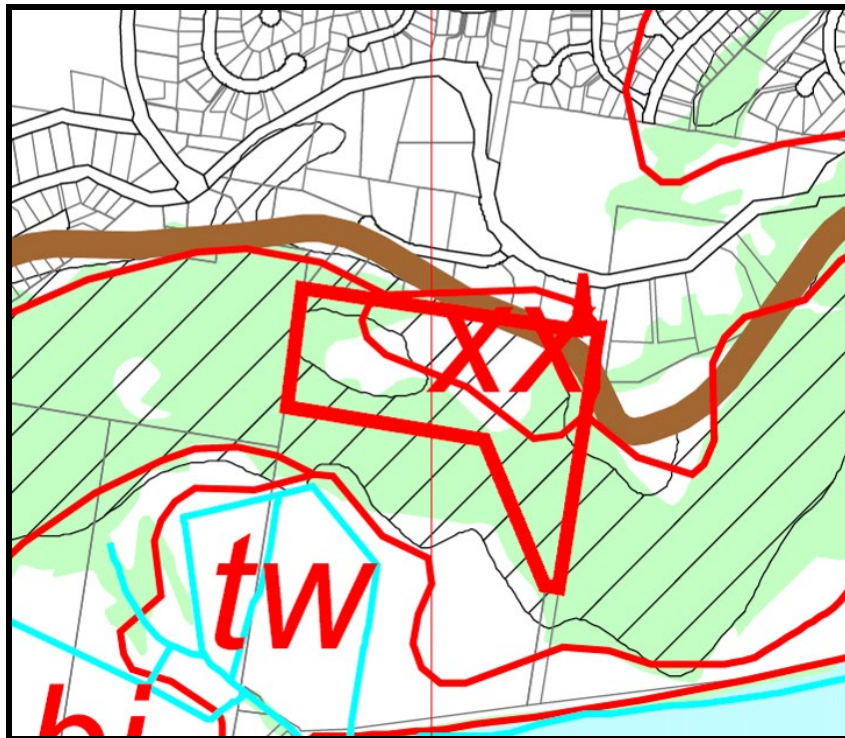


Figure 5: Extract From Soil Landscapes Of The Murwillumbah-Tweed Heads (Morland 1996)

2.3 Biodiversity Offset 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.

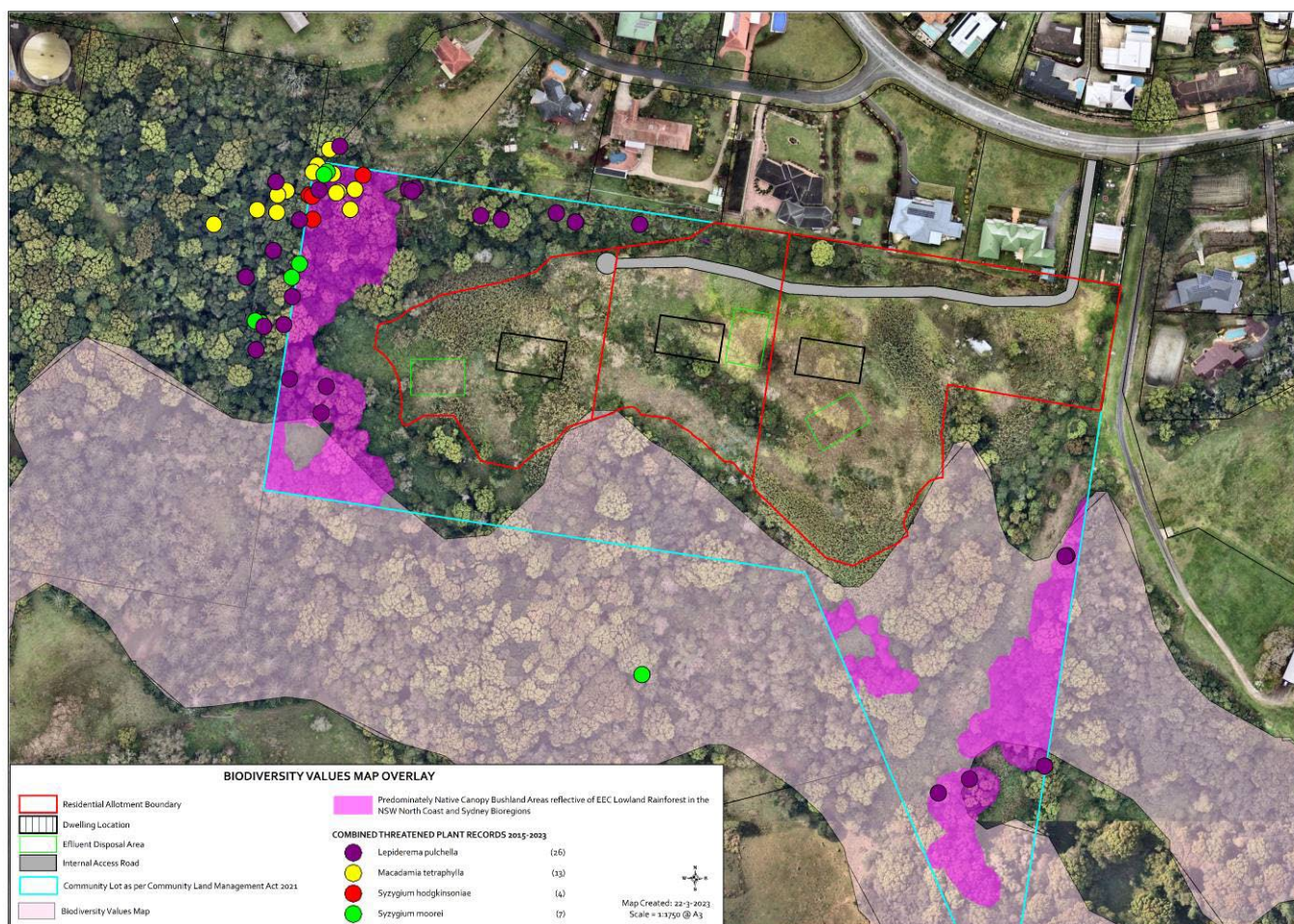


Figure 6: Biodiversity Values Map With The Subject Site

Southern areas of the allotment are mapped as Biodiversity Value areas aligned with a mixture of Camphor Laurel Dominated Bushland and small areas of disturbed Subtropical Rainforest/Camphor Laurel Forest. The 3-lot subdivision proposal will not result in any native vegetation clearance within the mapped areas although rehabilitation and revegetation works are proposed (refer Attachment 1).

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 7: 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.

Reviewing the Tweed Local Environmental Plan, the minimum LEP Lot size mapped over the subject site is 1ha. Reviewing the BOS area clearing threshold, it is noted that the threshold for native vegetation clearing is 0.5ha or more.

A survey of the site and review of the vegetation communities within the impact zones associated with the three lot subdivision notes that the area is almost entirely comprised of non-native species. Section 60B of the LLS Act states that for native vegetation to be considered 'native' under the Act, the native vegetation must be native to NSW and established before European settlement.

Well below 5000m² of vegetation native to NSW will be required to be removed as a result of the proposal with areas containing the majority of native vegetation protected within the community title lot. Therefore, the BOS area clearing threshold has not been exceeded.

Although the threshold is not exceeded section 7.2.1a of the BCA 2016 still requires local development proposals to perform a 'test of significance' (refer Section 6 of this report)

Example images of the impact zones are provided below:





2.4 Contributors

The roles of all Planit staff responsible for the preparation of this report are listed within Table 1 below:

Table 1: Report Contributors

Name	Organisation	Role
Graham Dart	Planit Consulting	Report preparation, flora/fauna survey, GIS analysis and assessment

All work was performed under the appropriate licences (in 2015, 2016 & 2023) which are summarised within Section 4.4 below.

3 Vegetation Assessment

To identify and classify vegetation species and communities which occur on site, the following methodology was applied between the 15th and 22nd January 2015 with additional surveys in association with preparation of a weed and rehabilitation management plan (refer Attachment 1) undertaken on 19th January 2023. These works were additional to the previous survey works described in the below report which is also appended for ease of reference:

- Aspect North (2004) *Flora and Fauna Assessment Terranora Road (Proposed Rezoning at 225 Terranora Road, Banora Point) on behalf of Darryl Anderson Consulting*. Aspect North, Lismore.

DESKTOP ANALYSIS

- Review of Council's Planning Scheme Mapping & Associated Reporting (i.e., Tweed Environmental Mapping, Tweed LEP 2014 Maps, Tweed Shire Council Online Mapping Tools)
- Search of the Atlas of NSW Wildlife/Bionet database within a search area 10km surrounding the site to review threatened plant records.
- Review of Vegetation Information System (VIS) Classification Data and associated mapping
- Review of Google Earth, Nearmap and Six maps (Aerial Photos)
- Review of Sharing and Enabling Environmental Data (SEED)
- Review available ecological surveys within the locality including:
 - Biolink (2008) Ecological & Bushfire Planning Assessment of Lot 1 DP 167380, Lot 2 DP 961928 & Lot 4 DP 1054848 Walmsley's Road, Bilambil Heights. Biolink, Uki.
 - Boyds Bay Environmental Services (2011) Preliminary Ecological Site Assessment Lot 517 DP729286 Tweed Coast Road, Cabarita. BBES, Tweed Heads.
 - Glen Holmes & Associates (1993) Biological Investigation for Proposed Residential Subdivision and Artificial Lake Adjacent to Tweed River, Tweed Heads (Lot 4 DP228424, Soorley Street). GH&A, Canungra.
 - Idyll Spaces (2008) Cudgen Lakes Sand Extraction Project: Flora Assessment (Gales-Kingscliff Pty Ltd)
 - James Warren & Associates (2003) Analysis of Environmental Constraints Lot 156 Creek Street Hastings Point. JWA, Ballina
 - James Warren & Associates (2010) Ecological Assessment Lot 2 DP873399 & Lot 22 DP105759 Clothiers Road-Bogangar. JWA, Ballina.
 - James Warren & Associates Pty Ltd (2005) Flora and Fauna Assessment Lots 165 & 167 DP755701 Ozone Street, Chinderah. JWA, Alstonville
 - James Warren and Associates (2009) Amended Flora and Fauna Assessment for Lots 2 & 3 DP244652 Uriup Road Bilambil A Report Prepared to Plateau Nominees Pty Limited. JWA, Ballina
 - James Warren and Associates (2009) Ecological Assessment Rise Estate Bilambil Heights West Tweed MP-080234 Report Prepared for Terranora Group Management Pty Ltd. JWA, Ballina.
 - Parsons Brinckerhoff (2004) Tugun Bypass Environmental Impact Statement. Technical Paper Number 12: Flora and Fauna Assessment. PB, Brisbane
 - Parsons Brinckerhoff (2008) Upgrading the Pacific Highway. Banora Point Pacific Highway Upgrade Technical Paper 2-Ecological Assessment. Report for NSW Roads and Traffic Authority.
 - Peter Parker (2002) Clothiers Creek Road Realignment Species Impact Statement prepared for Jim Glazebrook and Associates and Tweed Shire Council. PPEC, Broken Head.
 - Planit (2002) Detailed Ecological Assessment for Gales Holdings Kingscliff, NSW. Planit Consulting, Southport.
 - Planit (2007) Flora and Fauna Assessment for Clothiers Creek Road, Tanglewood [Lot 200 DP100310] for Peachey Constructions. Planit, Nobby Beach.
 - Planit (2008) Flora and Fauna Assessment for Ozone Street Road Upgrade prepared for CMF Properties, May 2009. Planit, Kingscliff.
 - Planit (2008) Flora and Fauna Assessment for Ozone Street, Chinderah prepared for CMF Properties, October 2008. Planit, Kingscliff.

- Planit (2008) Terrestrial Flora and Fauna Assessment. Reyson's Land, Banora Point for Nutek Laboratories P/L. Planit, Kingscliff.
- Planit (2009 February) Flora and Fauna Assessment Curtawilla Street, Banora Point Lot 12 DP1003644 prepared for Halcore (QLD) P/L. Planit, Nobby Beach.
- Planit (2009) Preliminary Terrestrial Flora and Fauna Assessment 67 Scenic Drive Lot 7 on DP853859 Prepared for NH Dickinson Pty Ltd. Planit, Kingscliff
- Planit (2010) Flora and Fauna Assessment for Ozone Street Road Upgrade prepared for CMF Properties, June 2010. Planit, Kingscliff.
- Planit (2010) Preliminary Review of Terrestrial Flora and Fauna Values Sandalwood Drive, Bogangar Lot 2 DP821987 Prepared for Land and Property Management Authority. Planit, Nobby Beach.
- Planit (2010) Terrestrial Flora and Fauna Assessment Lot 706 DP1056641 prepared for Land and Property Management Authority. Planit, Nobby Beach.
- Planit (2011 June) Terrestrial Flora and Fauna Assessment Marana Avenue, Bilambil Heights Lot 30 DP850230 prepared for PS Developments. Planit, Nobby Beach
- Planit (2011) Ecological Assessment Tanglewood Drive, Tanglewood Lot 1 DP1084992 & Lot 1 DP601049 Prepared for Peter Tagget. Planit, Nobby Beach.
- Planit (2012 June) Terrestrial Flora and Fauna Assessment Temporary Construction Access @ Parkes Drive, Tweed Heads for Feitelson Holdings P/L. Planit, Nobby Beach.
- Planit (2012) Preliminary Review of Terrestrial Flora & Fauna Values 742-744 Cudgen Road, Cudgen prepared for Usher Powell Cudgen. Planit, Kingscliff.
- Planit (2013 July) Preliminary Terrestrial Flora and Fauna Assessment Sierra Vista Boulevard, Bilambil for Two Dams P/L. Planit, Nobby Beach.
- Planit (2013 March) Preliminary Flora and Fauna Assessment 136-150 Dry Dock Road, Tweed Heads South for Asset Revolutions P/L. Planit, Nobby Beach.
- Planit Consulting (2013) Updated Terrestrial Flora and Fauna Assessment. Residential Development @ 156 Creek Street, Hastings Point prepared for Walter Elliott Holdings P/L. Planit, Nobby Beach.

FIELD SURVEY

Random Meander/Diversity Searches: Random searches within each vegetation community were undertaken recording all species observed was undertaken in accordance with Cropper (1993), DEC (2004) and DES (2020). Knowledge of known habitat of threatened floral species was utilized to target such species. Observation also included review of crown cover, tree heights estimation, dominant species present and identification of ecologically dominant layer. The focus was upon the proposed development envelope and adjacent areas as a ground truthing exercise in relation to the existing detailed site vegetation assessment previously performed by Aspect North (2004)

The survey techniques were applied to determine the following:

- Validate or modify existing site vegetation mapping.
- Meet minimum Council vegetation/survey requirements.
- Review species dominance within ecologically dominant layer in association with Aspect North (2004) reporting.
- Determine incidence of weed invasion and disturbance over the site and within vegetation strata in association with Aspect North (2004) reporting.
- 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*.

3.1 Vegetation Survey Results

Detailed flora analysis has been previously performed by Aspect North (2004) which was reviewed and ground-truthed to be generally accurate and suitable for the purposes of impact assessment in 2015 when the previous 9-lot subdivision application was prepared.

In 2023 minor refinements have occurred to reflect the central northern terrace of the site with relation to the extent of cleared and weeded areas which have been subjected to varying slashing regimes over the past eight years. Additionally more refined site based linework was performed with the assistance of higher resolution, recent (2022) aerial photographs and Global Mapper App with 2015/16 boundaries pre-loaded.

As a result of previous flora surveying four (4) vegetation associations/assemblages were identified on site and are described briefly below with full descriptions contained within Attachment 2. An updated vegetation community maps is presented in Figure 12 which adopts Aspect North (2004) community descriptions with refined boundaries based upon 2015 inspections and higher resolution georeferenced 2014 aerial photographs to enable minor boundary amendments.

Vegetation community descriptions summarised from Aspect North (2004) are reproduced below. More recent (2015/2016 and 2023) images of typical condition have also been added.

VEGETATION COMMUNITY 1 - Open grassland dominated by *Paspalum* (*Paspalum dilatatum*), and Rhodes Grass (*Chloris* sp.) and isolated clumps dominated by *Lantana* (*Lantana camara*) and Black Wattle (*Acacia melanoxylon*). Very poor native species diversity is present (Refer to Attachment 2 Appendix B). A range of environmental weeds dominate the Area (Refer to Attachment 2 Appendix B). The vegetation in this area is considered highly degraded - i.e., ecosystem is in very poor condition (Wilson, 2003) [Aspect North, 2004: 12-13]

2015, 2016 and 2023 survey noted this community to be heavily infested with weeds in all areas with few scattered native trees or native tree groupings remaining. Across the preceding eight years the exotic grassland areas have been observed in both overgrown and slashed states.

DOMINANT TREES SPECIES WITHIN UPPER STOREY	HEIGHT (M)	FPC (%)	SLOPE	ASPECT	DESCRIPTION
Acacia melanoxylon, Macaranga tanarius, Guioa semiglauc	10	<5	0-15	S	Highly disturbed open grassland with clumps of weed regrowth.





Exotic Grassland/Pasture with isolated small trees



Exotic Grassland/Pasture with isolated small trees



Exotic Grassland/Pasture with isolated small trees



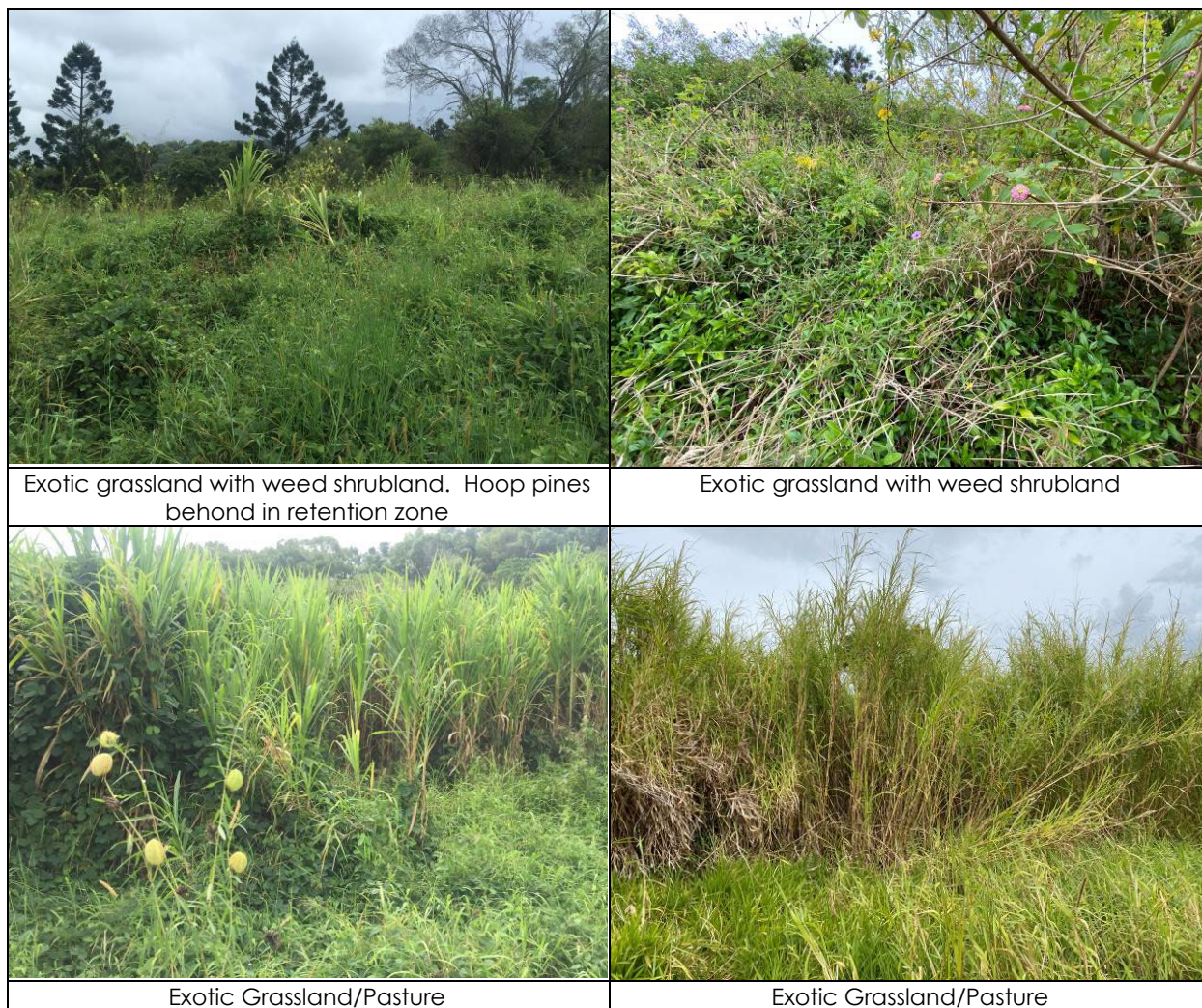
Exotic Grassland/Pasture with isolated small trees



Exotic grassland with weed shrubland



Exotic grassland with weed shrubland



VEGETATION COMMUNITY 2 -Regrowth closed forest dominated by Camphor Laurel (*Cinnamomum camphora*) and Guioa (*Guioa semiglauc*) and patches of grassland. Medium native species diversity is present (Refer to Attachment 2 Appendix B). A range of environmental weeds dominate the Area (Refer to Attachment 2 Appendix B). The vegetation in this Area is considered degraded (i.e., ecosystem is in poor condition (Wilson, 2003) [Aspect North, 2004: 13]

DOMINANT TREES SPECIES WITHIN UPPER STOREY	HEIGHT (M)	FPC (%)	SLOPE	ASPECT	DESCRIPTION
Cinnamomum camphora, Guioa semiglauc,	15-20	70	40-45	S-SW	Secondary regrowth with areas of closed forest, powerline clearing, highly disturbed grassland. Cupaniopsis newmanii noted in this area

2015 and 2023 inspections noted this community to be heavily infested with weeds and dominated by non-native species.





Highly disturbed camphor laurel

Highly disturbed camphor laurel

VEGETATION COMMUNITY 3 - Open to closed forest regrowth with large areas of Lantana (*Lantana camara*) thicket and grasses in disturbed areas. Medium native species diversity is present (Refer to Attachment 2 Appendix B). Fewer environmental weeds are present (Refer to Attachment 2 Appendix B). The vegetation in this Area is considered degraded to modified - i.e., ecosystem is in poor or moderate condition (Wilson, 2003) [Aspect North, 2004: 13]

DOMINANT TREES SPECIES WITHIN UPPER STOREY	HEIGHT (M)	FPC (%)	SLOPE	ASPECT	DESCRIPTION
Macaranga tanarius, Acacia melanoxylon, Guioa semiglauc	15	40-70	30-60	S	Highly disturbed secondary regrowth with large areas of Lantana (<i>Lantana camara</i>) thicket and grasses in disturbed areas

2015 and 2023 inspection noted this community also to be heavily weed infested. The weed infested row of Macaranga along the northern batter of central paddock has also been added.



Highly disturbed early regrowth rainforest/camphor laurel forest

Highly disturbed early regrowth rainforest/camphor laurel forest



VEGETATION COMMUNITY 4 - Closed forest dominated by Peperberry (*Cryptocarya obovata*), Scrub Bloodwood (*Baloghia lucida**), Guioa, Foambark *Jagera pseudorhus*), and Camphor Laurel. Good native species diversity for all strata. High diversity of lowland subtropical species is present (Attachment 2 Appendix B). Fewer environmental weeds are present (Attachment 2 Appendix B). The vegetation in this Area is considered modified to little disturbed - i.e. ecosystem is in moderate to good condition (Wilson, 2003) [Aspect North, 2004: 12-13]

DOMINANT TREES SPECIES WITHIN UPPER STOREY	HEIGHT (M)	FPC (%)	SLOPE	ASPECT	DESCRIPTION
Cryptocarya obovata, Baloghia lucida, Guioa semiglaucula, Jagera pseudorhus, Cinnamomum camphora	25	70+	20-35	S	Closed forest, high diversity of lowland subtropical rainforest species. Significant species include Macadamia tetraphylla, Archidendron muellerianum, Cupaniopsis newmanii, Syzygium moorei, Syzygium hodgkinsoniae.

* now *B. inophylla*

2015 inspection noted this community also to be heavily infested with weeds on the eastern and southern fringes. A distinct area of edge forest dominated by Camphor Laurel has been excluded from this community and incorporated into the mapped area for Community 2. Camphor laurel dominance and co-dominance remains for the majority of this community mapped as occurring on the site with true native rainforest predominately occurring offsite and along the very western boundary. As no boundary fencing occurs within this area without the aid of GPS devices locating where the site ends would have been difficult. A series of typical community images are included below demonstrating the east-west gradation from camphor laurel dominated forest (including rainforest species in suppression) to native species dominant rainforest (camphor laurel suppressed) below.

All threatened plant species previously listed were encountered with the exception of *Floydia praelata*. Additional common rainforest species such as red cedar, native tamarind, maidens blush, scentless rosewood and orange boxwood were encountered as were several large mango trees on the very western boundary. The northwestern portions contained several thickets of woody vine dominance.

In 2023 additional areas were added to this VC east of the powerlines to more accurately reflect areas regenerating with pioneer rainforest trees and vines. Previously unrecorded stems of Fine-leaved Tuckeroo were discovered in this area.





Camphor laurel dominant components



Camphor laurel dominant components



Camphor laurel dominant components



Camphor laurel dominant components



Camphor laurel dominant components



Camphor laurel dominant components



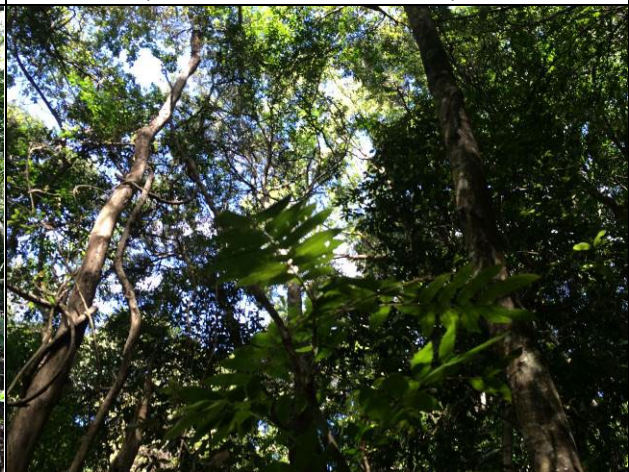
Camphor laurel dominant components



Camphor laurel dominant components



Native species dominant component. Lowland Rainforest



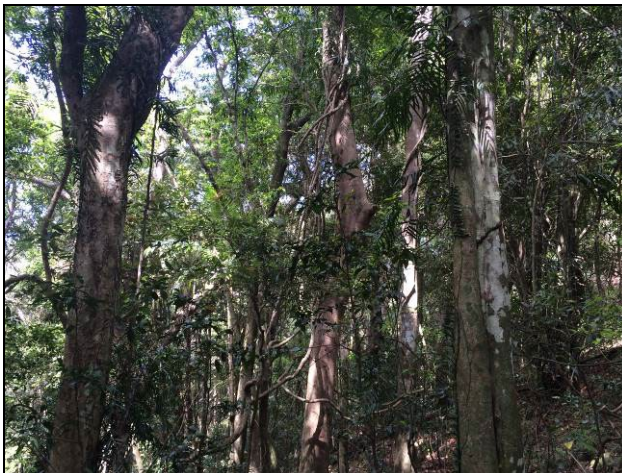
Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Native species dominant component. Lowland Rainforest



Syzygium hodgkinsoniae



Lepiderema pulchella



3.2 Endangered Ecological Communities

Endangered ecological communities are listed under Schedule 2, of the *Biodiversity Conservation Act 2016*, while threatened ecological communities are listed under the *Environment Protection and Biodiversity Conservation Act 1999* as critically endangered, endangered and vulnerable.

The extent of *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* was refined in 2016 to include areas downslope of the previous development envelope south of the 50m contour as requested by Tweed Shire Council. Such mapping was subject to minor changes again in 2023 including:

- More accurate linework with the assistance of higher resolution, recent (2022) aerial photographs and Global Mapper App with 2016 EEC boundaries pre-loaded
- Areas of camphor laurel felling in the north
- Inclusion of 0.55ha southeast of the electricity easement which has a distinct regrowth rainforest component within the broader dominance of camphor laurel.

These mapping amendments do not affect the previously established areas considered suitable for the three residential allotments.



Previously mapped EEC area dominated by primarily exotic vegetation with camphor laurel felling evident



Previously mapped EEC area dominated by primarily exotic vegetation with camphor laurel felling evident



Previously mapped camphor laurel forest southeast of powerlines now mapped as Lowland Rainforest EEC to reflect native



Previously mapped camphor laurel forest southeast of powerlines now mapped as Lowland Rainforest EEC to reflect native



Example of linework rectification to exclude obvious area of camphor laurel dominance from mapped Lowland Rainforest EEC.



Example of linework rectification to include a co-dominant rainforest/camphor laurel area which was previously excluded from the mapped Lowland Rainforest EEC on the southwestern

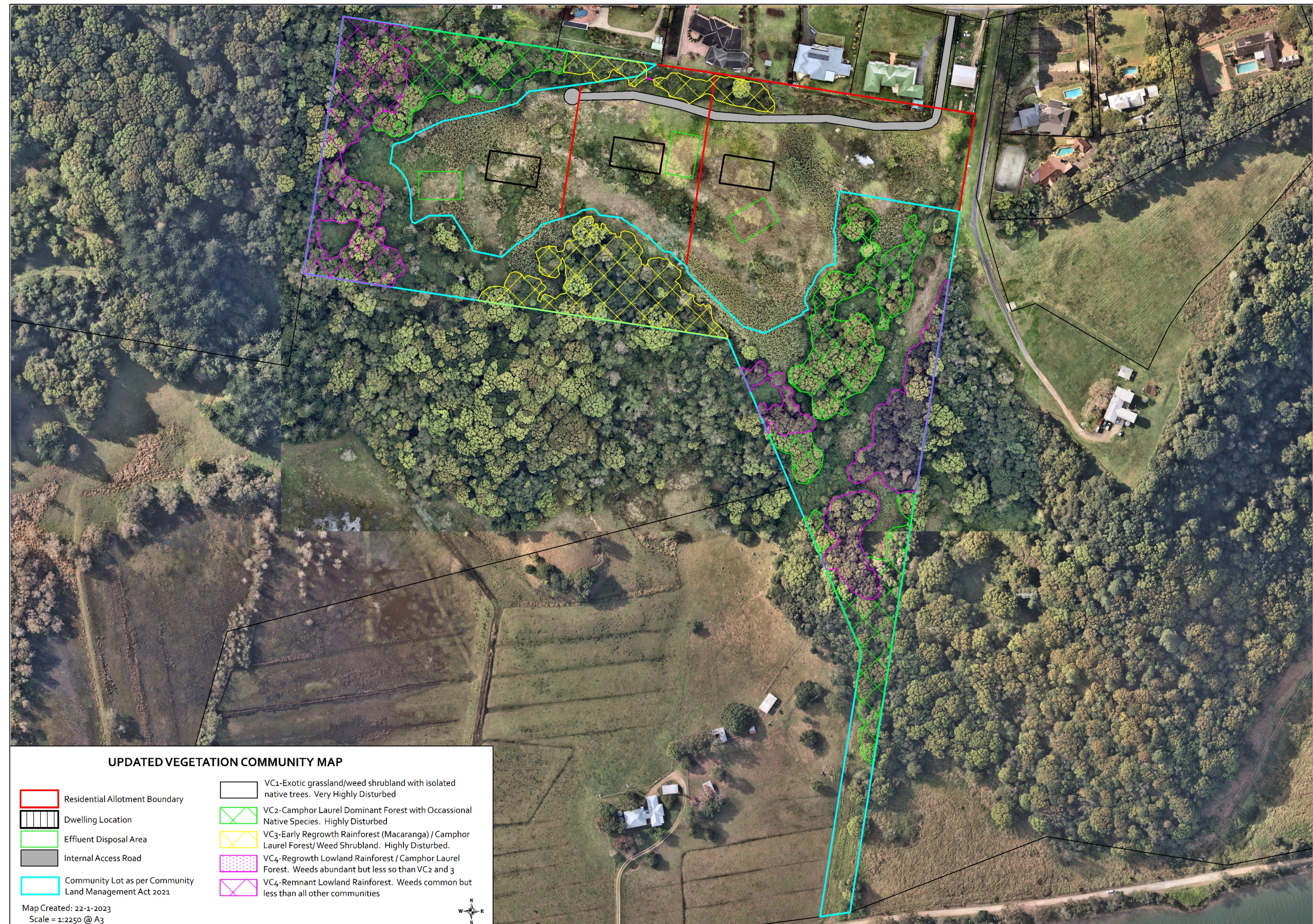


Figure 8: Vegetation Community Mapping

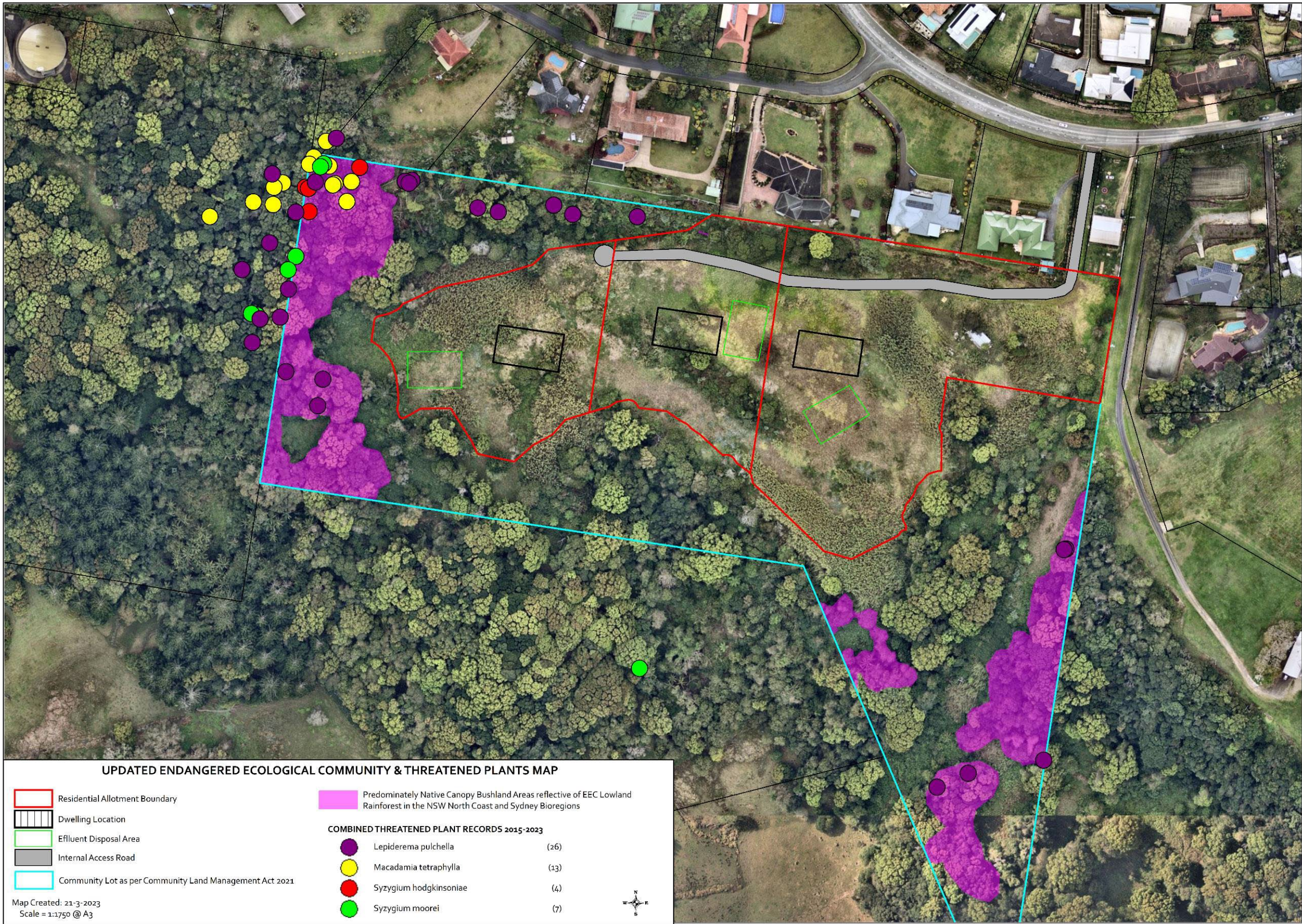


Figure 9: Endangered Ecological Community and Threatened Plants Map



LOWLAND RAINFOREST WEST-NOMINATED AS EEC



LOWLAND RAINFOREST WEST-NOMINATED AS EEC



LOWLAND RAINFOREST WEST-NOMINATED AS EEC



LOWLAND RAINFOREST WEST-NOMINATED AS EEC



REGENERATING LOWLAND RAINFOREST EAST-NOMINATED AS EEC



REGENERATING LOWLAND RAINFOREST EAST-NOMINATED AS EEC



REGENERATING LOWLAND RAINFOREST EAST-NOMINATED AS EEC



REGENERATING LOWLAND RAINFOREST EAST-NOMINATED AS EEC



DISTURBED MACARANGA REGROWTH ON NORTHERN BATTER
Not considered to be Lowland Rainforest EEC



DISTURBED MACARANGA REGROWTH ON NORTHERN BATTER
Not considered to be Lowland Rainforest EEC



DISTURBED MACARANGA REGROWTH
Not considered to be Lowland Rainforest EEC



DISTURBED MACARANGA REGROWTH
Not considered to be Lowland Rainforest EEC

			
CAMPBOR LAUREL HIGHLY WEED INFESTED AREAS Not considered to be Lowland Rainforest EEC	CAMPBOR LAUREL HIGHLY WEED INFESTED AREAS Not considered to be Lowland Rainforest EEC	CAMPBOR LAUREL HIGHLY WEED INFESTED AREAS Not considered to be Lowland Rainforest EEC	CAMPBOR LAUREL HIGHLY WEED INFESTED AREAS Not considered to be Lowland Rainforest EEC
			
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4 Fauna Assessment

This section describes the site's fauna and associated habitat as identified through surveying which includes:

- Aspect North (2004) Flora and Fauna Assessment Terranora Road (Proposed Rezoning at 225 Terranora Road, Banora Point on behalf of Darryl Anderson Consulting. Aspect North, Lismore.
- Planit (2015) Addendum Terrestrial Flora and Fauna Assessment [9-Lot subdivision Proposal] 225 Terranora Road, Terranora for Wrenn P/L

DESKTOP ANALYSIS

- Review of Council's Planning Scheme Mapping & Associated Reporting (i.e., Tweed Environmental Mapping, Tweed LEP 2014 Maps, Tweed Shire Council Online Mapping Tools, Comprehensive Koala Plan of Management etc)
- Search of the Atlas of NSW Wildlife/Bionet database within a search area 10km surrounding the site to review threatened plant records.
- Review of Vegetation Information System (VIS) Classification Data and associated mapping
- Review of Google Earth, Nearmap and Six maps (Aerial Photos)
- Review of Sharing and Enabling Environmental Data (SEED)
- Review available ecological surveys within the locality.
 - Bali et al (2003) The Status and Distribution of the Cobaki Long-nosed Potoroo Population
 - Boyds Bay Environmental Services (2011) Preliminary Ecological Site Assessment Lot 517 DP729286 Tweed Coast Road, Cabarita. BBES, Tweed Heads.
 - Fitzgerald, M. (2007) Glossy Black-cockatoo *Calyptorhynchus lathamii* Koala Beach Monitoring Report November 2007 Prepared for Tweed Shire Council. Mark Fitzgerald, Mullumbimby.
 - Glen Holmes & Associates (1993) Biological Investigation for Proposed Residential Subdivision and Artificial Lake Adjacent to Tweed River, Tweed Heads (Lot 4 DP228424, Soorley Street). GH&A, Canungra.
 - Hannah, D. and Lewis, B.D. (2007). Blossom Bat Monitoring Report, Koala Beach Estate, Winter 2007. Report to the Koala Beach Wildlife and Habitat Management Committee on behalf of Tweed Shire Council.
 - Hannah, D.S. (2008). *Planigale maculata* monitoring report, Koala Beach Estate, Spring 2007. Report prepared for the Koala Beach Wildlife and Habitat Management Committee
 - Hero et al (2000) Survey of Reptiles, Amphibians and Mammals Inhabiting Coastal Lowland Areas Associated with the Proposed Tugun Bypass
 - Hero et al. (2001a) Survey for Reptiles, Amphibians and Mammals Inhabiting the Northern Section of the Proposed Tugun Bypass
 - Hero et al. (2001b) Supplementary Surveys of Common Planigales, Eastern Long-eared Bat and Wallum Sedge Frogs within the Proposed Tugun Bypass
 - James Warren & Associates (2003) Analysis of Environmental Constraints Lot 156 Creek Street Hastings Point. JWA, Ballina
 - James Warren & Associates (2010) Ecological Assessment Lot 2 DP873399 & Lot 22 DP105759 Clothiers Road-Bogangar. JWA, Ballina.
 - James Warren & Associates Pty Ltd (2005) Flora and Fauna Assessment Lots 165 & 167 DP755701 Ozone Street, Chinderah. JWA, Alstonville
 - James Warren and Associates (2009) Amended Flora and Fauna Assessment for Lots 2 & 3 DP244652 Uriup Road Bilambil A Report Prepared to Plateau Nominees Pty Limited. JWA, Ballina
 - James Warren and Associates (2009) Ecological Assessment Rise Estate Bilambil Heights West Tweed MP-080234 Report Prepared for Terranora Group Management Pty Ltd. JWA, Ballina.
 - Kendall & Kendall (2008) Cudgen Lakes Sand Extraction Project: Fauna Assessment. Report for Gales-Kingscliff Pty Ltd.

- Lewis (2004) Systematic Surveys for the Coastal Planigale (*Planigale maculata*) on Crown Lands and a Detailed Habitat Appraisal of the Tugun/Cobaki Locality
- Parsons Brinckerhoff (2004) Tugun Bypass Environmental Impact Statement. Technical Paper Number 12: Flora and Fauna Assessment. PB, Brisbane
- Parsons Brinckerhoff (2008) Upgrading the Pacific Highway. Banora Point Pacific Highway Upgrade Technical Paper 2-Ecological Assessment. Report for NSW Roads and Traffic Authority.
- Peter Parker (2002) Clothiers Creek Road Realignment Species Impact Statement prepared for Jim Glazebrook and Associates and Tweed Shire Council. PPEC, Broken Head.
- Planit (2002) Detailed Ecological Assessment for Gales Holdings Kingscliff, NSW. Planit Consulting, Southport.
- Planit Consulting (2002). *Survey for Land Snail Thersites mitchellae*. Section 95(2) report to NSW NPWS.
- Planit (2007) Flora and Fauna Assessment for Clothiers Creek Road, Tanglewood [Lot 200 DP100310] for Peachey Constructions. Planit, Nobby Beach.
- Planit (2008) Flora and Fauna Assessment for Ozone Street Road Upgrade prepared for CMF Properties, May 2009. Planit, Kingscliff.
- Planit (2008) Flora and Fauna Assessment for Ozone Street, Chinderah prepared for CMF Properties, October 2008. Planit, Kingscliff.
- Planit (2008) Terrestrial Flora and Fauna Assessment. Reyson's Land, Banora Point for Nutek Laboratories P/L. Planit, Kingscliff.
- Planit (2009 February) Flora and Fauna Assessment Curtawilla Street, Banora Point Lot 12 DP1003644 prepared for Halcore (QLD) P/L. Planit, Nobby Beach.
- Planit (2009) Koala Plan of Management for Clothiers Creek Road, Tanglewood [Lot 200 DP100310] for Northhill P/L. Planit, Nobby Beach.
- Planit (2009) Preliminary Terrestrial Flora and Fauna Assessment 67 Scenic Drive Lot 7 on DP853859 Prepared for NH Dickinson Pty Ltd. Planit, Kingscliff
- Planit (2010) Flora and Fauna Assessment for Ozone Street Road Upgrade prepared for CMF Properties, June 2010. Planit, Kingscliff.
- Planit (2010) Preliminary Review of Terrestrial Flora and Fauna Values Sandalwood Drive, Bogangar Lot 2 DP821987 Prepared for Land and Property Management Authority. Planit, Nobby Beach.
- Planit (2010) Terrestrial Flora and Fauna Assessment Lot 706 DP1056641 prepared for Land and Property Management Authority. Planit, Nobby Beach.
- Planit (2011 June) Terrestrial Flora and Fauna Assessment Marana Avenue, Bilambil Heights Lot 30 DP850230 prepared for PS Developments. Planit, Nobby Beach
- Planit (2011) Ecological Assessment Tanglewood Drive, Tanglewood Lot 1 DP1084992 & Lot 1 DP601049 Prepared for Peter Tagget. Planit, Nobby Beach.
- Planit (2012 June) Terrestrial Flora and Fauna Assessment Temporary Construction Access @ Parkes Drive, Tweed Heads for Feitelson Holdings P/L. Planit, Nobby Beach.
- Planit (2012) Preliminary Review of Terrestrial Flora & Fauna Values 742-744 Cudgen Road, Cudgen prepared for Usher Powell Cudgen. Planit, Kingscliff.
- Planit (2012) Threatened Species Management Plan for Tanglewood Lot 1 DP1084992 & Lot 1 DP601049 Prepared for Peter Tagget. Planit, Nobby Beach.
- Planit (2013 July) Preliminary Terrestrial Flora and Fauna Assessment Sierra Vista Boulevard, Bilambil for Two Dams P/L. Planit, Nobby Beach.
- Planit (2013 March) Preliminary Flora and Fauna Assessment 136-150 Dry Dock Road, Tweed Heads South for Asset Revolutions P/L. Planit, Nobby Beach.
- Planit Consulting (2013) Updated Terrestrial Flora and Fauna Assessment. Residential Development @ 156 Creek Street, Hastings Point prepared for Walter Elliott Holdings P/L. Planit, Nobby Beach.
- Sandpiper Ecological Surveys (2001a) Assessment of the Impact of the Proposed Tugun Bypass: Terrestrial and Estuarine Birds

- Sandpiper Ecological Surveys (2001b) Tugun Bypass Assessment of Impacts on Birds: Boyd Street Interchange to Stewart Road
- SMEC (2009) Tugun Bypass Compensatory Habitat Package-Outstanding Offsets: Final Report.
- Stanisic (2001) Survey for the Land Snail *Thersites mitchellae*: Proposed Tugun Bypass Route

4.1 Previous Fauna Survey Techniques-Diurnal

- Binocular search and identification of all fauna heard or sighted.
Duration: Opportunistic during other survey works (January 2015)
- Bird identification surveys were conducted in association with dawn and dusk activity and comprised walked transects and area searches through the site.
Duration: 6 person hours (January 2004)
1 x dawn/mid-morning (60 minutes) and 1 x dusk (30 minutes) [January 2015]
- 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 tree hollows, hanging bark, termite mounds, flowering and nesting trees.Duration: 1 hour x 3 days (January 2004)
Opportunistic during other survey works (January 2015)
- Ground strata searches and rock/timber/leaf litter rolls and examination for reptiles and frogs.
Duration: 45 minutes x 3 days (January 2004)
2 x 30 minutes during the middle of the day & opportunistic during all other survey works [January 2015]
- Elliott & Trapping: Seventy-five A-sized Elliott traps were placed in the field in three lines each containing 25 traps. Trap lines were situated in areas that were considered to best represent potential habitat for ground-dwelling mammal species. Traps were spaced at approximately 10 metre intervals and were baited with a mixture of oats, peanut butter, vanilla essence, oil and honey. Traps were left in the field for three nights and were checked each morning within 2 hours of sunrise. Three cage traps, targeting larger ground-dwelling mammals and baited with raw meat, were also placed in the field for a period of 3 nights.
Duration: 234 trap nights (January 2004)

4.2 Previous Fauna Survey Techniques-Nocturnal

Nocturnal survey included the following survey techniques:

- Audible survey for calls, scratching and landings.
 - Spotlighting utilising:
 - o Short duration-long distance white light, and
 - o Long duration-short distance red light
- Duration: 6 person hours January 2004
4 person hours January 2015
- Anabat detection system was utilized to record echolocation of microchiropteran bats along spotlighting transects and from fixed points.
Duration: Two nights' recording along spotlighting transect and one night of stationary recording (January 2004)
 - Amplified call playback of the following threatened species:
 - Woompoo Fruit Dove (*Ptilinopus magnificus*)
 - Rose-crowned Fruit Dove (*Ptilinopus regina*)
 - Bush-stone Curlew (*Burhinus grallarius*)
 - Barking Owl (*Ninox connivens*)
 - Powerful Owl (*Ninox strenua*)
 - Masked Owl (*Tyto novaehollandiae*)
 - Grass Owl (*Tyto capensis/longimembris*)
 - Barred Cuckoo-shrike (*Coracina lineata*)
 - White-eared Monarch (*Carterornis leucotis*)

- Varied Sitella (*Daphoenositta chrysoptera*)

Each call playback session comprised of the following:

- A 2min listening period for unelicited fauna calls.
- A 3min call playback for relevant species on a 25W Toa Megaphone
- A 2min search/spotlight for fauna at the playback site

Depending on the targeted species playback was undertaken at dawn, dusk and/or after dark. All call files were obtained from BOCA or NATURESOUND.

Duration: One session each for species listed above (January 2015)
One session each for Powerful Owl, Masked Owl, Barking Owl, Sooty Owl and Grass Owl (January 2004)

2015 January weather conditions were warm to hot during the day and remaining warm at night (maximum of 32°C and minimum of 21°C as measured at the Coolangatta station ([40717])). Rain fell three times during the survey period which occurred within a period of hot weather which occasionally resulted in evening showers or storms. There was a thunderstorm on the evening of 12th January with another on the 20th January (62mm and 76mm as measured at the Tweed Heads Golf Club ([58056])).

4.3 Survey Limitations

Whilst the duration of flora surveys and inspections of the site are considered appropriate, it was not practical to intensively search all areas of vegetation present (~9.9ha), much of which is overgrowth with pasture grasses and woody weed shrubland. Additional undetected threatened or other native flora species may be present on the property (particularly weed species within the pasture/grassland). 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, 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. It should be acknowledged that site conditions, including the presence of threatened species, can change over time.

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 (refer Section 5).

Notwithstanding the above, it is considered reasonably unlikely that significant habitats for threatened flora, fauna, endangered populations or endangered ecological communities have been overlooked in the areas proposed for development due to the historically modified nature of the impact areas residual habitats and the dominance of non-native vegetation.

4.4 Licencing

The following issued licences are held by the surveyor:

Table 2: Licences Held by the Surveyor

Authority	Licence/Permit	Title	Permit No.
NSW DPI Animal Care & Ethics Committee	Animal Research Approval	Fauna Surveying, Trapping & Release	TRIM 14/1971
NSW DPI Animal Care & Ethics Committee	Animal Research Authority	Fauna Surveying, Trapping & Release	CSB 14/1971
NSW National Parks & Wildlife Service	Scientific Licence Biodiversity Conservation Act	Ecological Survey	S100142
NSW DPIE	Biodiversity Assessment Method Assessor under the BCA 2016	BAM Accredited Assessor	BAAS19041
QLD DES QLD DEEDI Animal Ethics	Scientific Purposes Permit NCAR2006 Animal Care and Protection Act 2001	Wildlife Research Scientific User Registration	WISP14894214 Reg No. SUR000241
QLD DAAF Animal Ethics QLD DES	Community Access AEC Rehabilitation Permit NC(Administration)R 2017	Fauna Surveying Spotter Catcher Activity	CA 2018/03/1168 WA0016358

4.5 Fauna Survey Results

The following section(s) list the fauna species recorded on and adjacent the site during the previous detailed fauna surveys (Aspect North, 2004; Planit, 2015). 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.

Survey Method Codes:

A	Stranding/beached	P	Scat
AR	Acoustic recording	Q	Camera
B	Burnt	R	Road kill
C	Cat kill	S	Shot
D	Dog kill	T	Trapped or netted
E	Nest/roost	U	Ultrasonic recording
F	Tracks, scratchings	V	Fox kill
FB	Burrow	W	Heard call
G	Crushed Cones	X	In scat
H	Hair, feathers or skin	Y	Bone, teeth or shell
I	Subfossil/Fossil Remains	Z	In raptor/owl pellet
K	Dead	*	All birds were either directly observed through diurnal survey, spotlighting, trail camera or call identification
O	Observed	**	Introduced/feral/non-native species
O			
W	Observed and Heard call	***	Recorded in adjacent offsite areas or flying overhead

BIRDS*

FAMILY	SPECIES NAME	COMMON NAME
Acanthizidae	<i>Sericornis frontalis</i>	White-browed Scrubwren
Accipitridae	<i>Aviceda subcristata</i>	Pacific Baza
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle***
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite***
Alcedinidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
Ardeidae	<i>Ardea ibis</i>	Cattle Egret
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night Heron
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird

FAMILY	SPECIES NAME	COMMON NAME
Artamidae	<i>Cracticus tibicen</i>	Australian Magpie
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird
Artamidae	<i>Strepera graculina</i>	Pied Currawong
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Centropodidae	<i>Centropus phasianinus</i>	Pheasant Coucal
Charadriidae	<i>Vanellus miles</i>	Masked Lapwing
Cisticolidae	<i>Cisticola exilis</i>	Golden-headed Cisticola
Columbidae	<i>Chalcophaps indica</i>	Emerald Dove
Columbidae	<i>Columba leucomela</i>	White-headed Pigeon
Columbidae	<i>Streptopelia chinensis</i>	Spotted Turtle-dove
Columbidae	<i>Geopelia striata</i>	Peaceful Dove
Columbidae	<i>Leucosarcia picata</i>	Wonga Pigeon
Columbidae	<i>Macropygia amboinensis</i>	Brown Cuckoo-Dove
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon
Columbidae	<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove
Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird
Corvidae	<i>Corvus orru</i>	Torresian Crow
Cuculidae	<i>Chalcites basal</i>	Horsfield's Bronze-Cuckoo
Dicruridae	<i>Dicrurus bracteatus</i>	Spangled Drongo
Estrildidae	<i>Neochmia temporalis</i>	Red-browed Finch
Estrildidae	<i>Taeniopygia bichenovii</i>	Double-barred Finch
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow
Maluridae	<i>Malurus lamberti</i>	Variegated Fairy-wren
Maluridae	<i>Malurus melanocephalus</i>	Red-backed Fairy-wren
Megaluridae	<i>Megalurus timoriensis</i>	Tawny Grassbird
Megapodiidae	<i>Alectura lathami</i>	Australian Brush-turkey
Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner
Meliphagidae	<i>Meliphaga lewinii</i>	Lewin's Honeyeater
Meliphagidae	<i>Philemon corniculatus</i>	Noisy Friarbird
Monarchidae	<i>Carterornis leucotis</i>	White-eared Monarch
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark
Monarchidae	<i>Myiagra rubecula</i>	Leaden Flycatcher
Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed Oriole
Oriolidae	<i>Sphecotheres vieilloti</i>	Australasian Figbird
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican***
Petroicidae	<i>Eopsaltria australis</i>	Eastern Yellow Robin
Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
Psophodidae	<i>Psophodes olivaceus</i>	Eastern Whipbird
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail
Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook
Threskiornithidae	<i>Threskiornis molucca</i>	Australian White Ibis

MAMMALS

FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Canidae	** <i>Vulpes vulpes</i>	Fox	O
Leporidae	** <i>Lepus capensis</i>	Brown Hare	O

FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Macropodidae	<i>Wallabia bicolor</i>	Swamp Wallaby	O
Muridae	<i>Melomys burtoni</i>	Grassland Melomys	T
Muridae	<i>**Mus musculus</i>	House Mouse	T
Muridae	<i>Rattus fuscipes</i>	Bush Rat	T
Muridae	<i>Rattus lutreolus</i>	Swamp Rat	T
Phalangeridae	<i>Trichosurus vulpecula</i>	Brushtail Possum	O
Pteripodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	O

REPTILES

FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Agamidae	<i>Pogona barbata</i>	Bearded Dragon	O
Colubridae	<i>Morelia spilota</i>	Carpet Snake	O
Elapidae	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	O
Elapidae	<i>Pseudonaja textilis</i>	Eastern Brown Snake	O
Scincidae	<i>Carlia vivax</i>	Lively Lizard	O,T
Scincidae	<i>Cryptoblepharus virgatus</i>	Wall Skink	O,T
Scincidae	<i>Lampropholis delicata</i>	Grass Skink	O,T
Scinidae	<i>Cyclodomorphus gerrardii</i>	Pink tongued Skink	O
Scinidae	<i>Tiliqua scincoides</i>	Blue-tongued Lizard	O
Varanidae	<i>Varanus varius</i>	Lace Monitor	O

AMPHIBIANS

FAMILY	SCIENTIFIC NAME	COMMON NAME	METHOD
Bufonidae	<i>**Bufo marinus</i>	Cane toad	OW
Hylidae	<i>Litoria fallax</i>	Eastern Sedgefrog	W
Hylidae	<i>Litoria dentata</i>	Bleating Treefrog	W
Hylidae	<i>Litoria gracilentia</i>	Graceful Treefrog	PW
Myobatrachidae	<i>Limnodynastes terraereginae</i>	Northern Pobblebonk	W
Myobatrachidae	<i>Pseudophryne spp.</i>	Toadlet spp.	W

4.6 Discussion of Survey Results

4.6.1 Birds

Seventy-four (74) species of bird were recorded during previous surveys of the subject site. Two species scheduled as vulnerable under the *Biodiversity Conservation Act 2016* were recorded on the site during fauna survey works.

A reasonably large number of bird species were detected during the survey over the two survey periods. The subject site would provide preferred foraging habitat for a diversity of avifauna species due to the fact that there are a variety of flora species at the site including a number of fruiting and nectar bearing plants that provide a food resource for avifauna. Additionally, the Camphor Laurel dominated Closed to Open Forest occurring on the site affords a good degree of cover for avifauna species as they forage and roost (Aspect North, 2004: 20-21).

4.6.2 Mammals

A total of nine (9) mammal species were recorded on the subject site. One species (Grey Headed Flying Fox) listed as vulnerable under the *Biodiversity Species Conservation Act 2016* was recorded on the site during fauna survey works.

Ground-dwelling Mammals

All terrestrial mammals require vegetated cover for shelter and to facilitate movement. Small terrestrial mammals prefer areas within a complex vegetation structure which is dense within the lower strata and subsequently provides shelter/nesting sites and refuge from predators. Larger terrestrial mammals (larger wallabies, kangaroos) also generally require dense cover for refuge but tend to favour more open areas for grazing/feeding.

The rainforest understorey habitat of the subject site provides potential habitat for ground-dwelling mammal species particularly when it is considered that the site is relatively densely vegetated and provides a high degree of cover. Additionally, the denser grassland occurring at the site is preferred habitat for ground mammals such as native rats and melomys as evidenced by the results of Elliott trapping (Aspect North, 2004: 21).

Arboreal Mammals

Arboreal mammals previously noted to occur within the vicinity of the site are all noted to be hollow dependent with the exception of the Koala and the Ringtail Possum (which does utilize hollows but will also construct leaf drays) (Strahan eds, 2002; Gibbons and Lindenmayer, 2002). It is widely accepted that a reduction in senescent trees is a limiting factor in hollow dependent arboreal mammal populations (Smith and Lindenmayer, 1998; Gibbons and Lindenmayer, 2002; Lindenmayer, 2002; Lunney, 1987).

Within the site there exists a paucity of hollow bearing trees (HBT) with associated Eucalypt Woodland/Open Forest absent. The habitat value for hollow-dependent arboreal mammals is accordingly considered to be low although the Brushtail Possum was encountered during spotlighting. No favoured koala habitat or koala habitat foraging trees were encountered.

Flying Mammals

The survey results indicate that the site is utilised opportunistically by flying-foxes for the purposes of foraging. This is likely due to the fact that there are a variety of both rainforest and wet-sclerophyll tree species that would provide fruit as a food source for such species as would the extensive areas of camphor laurel. Microbat species are less likely to utilise the area as flyways are largely absent from the closed forest at the site as are tree hollows such as those required by microbat species (Aspect North, 2004: 21).

No flying fox roosts were encountered onsite with a colony noted to roost on Big Island within the Terranora Broadwater to the north.

Anabat Detection survey did not result in the detection of any microbat species (Aspect North, 2004). More recent surveys within the locality (JWA, 2009; Biolink, 2008; Planit, 2009 & 2013) note the recording of eleven bat species within 5km of the site.

It is considered that the site contains a variety of suitable foraging spaces for microchiropteran bats (i.e. the open grassland/disturbed areas of the site and the areas above the canopy line of forested areas provide 'uncluttered open space' for 'open space aerial foragers'; adjacent roadways and powerline easements provide 'edge' space for 'edge space aerial foragers', the native and exotic bushland areas provide 'cluttered' space for 'gleaning' and 'flutter-detection' foragers [per Schnitzerler and Kalko, 2001]). Numerous streetlights and floodlights within the adjacent residential areas also provide additional micro-bat activity areas associated with increased insect activity per Adams et al (2005).

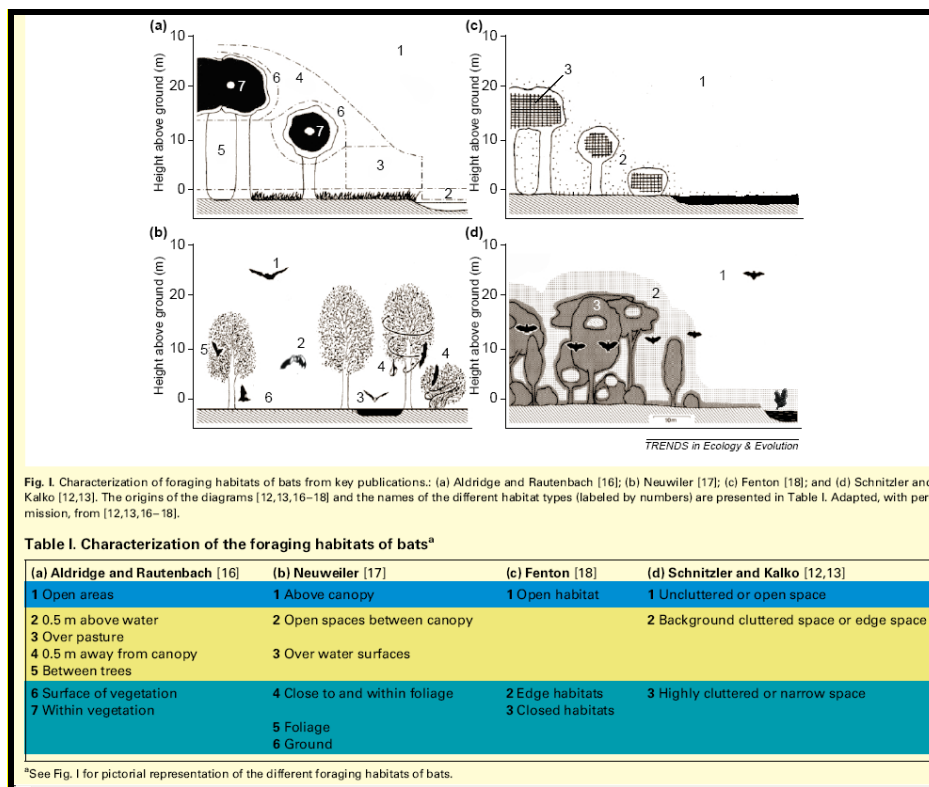


Figure 10: Review of Micro-Bat Foraging Habitats (Sourced From Schnitzler Et Al, 2003)

A review of the bats recorded within the site indicates that tree cavities and caves/crevices are necessary for roosting/breeding. In addition to providing shelter, maternity places and retreats for hibernation, roosts are also important places for social interactions among bats. The availability of suitable roosts is therefore critical for the survival of forest bats (Herr, 1998). Within the site it is considered that cave/mine potential breeding sites are absent with tree hollows and cavities are very scarce.

Palm fronds which are suitable for species such as the Eastern Long-eared Bat are present in association with *Archontophoenix* species are present in moderate abundance in the south west (mostly offsite) and disused structures such as buildings which are potentially suitable for various species (i.e. Gould's Wattled Bat, Yellow-bellied Sheathtail Bat, Eastern Broad-nosed Bat) are restricted to the small shed in the northern paddock (this shed was inspected in January 2023 with no evidence of roosting by microbats observed).

Bridge structures which may provide potential roosting sites for several species such as the Large-eared Pied Bat, Eastern Bentwing, Little Bentwing and Southern Myotis (Hoye, 2009; Bat Advisory Recovery Team, 2001; TSC, 2010) were not located onsite but are common within the broader locality.

Table 3: Microbats Roosting Types (recorded elsewhere during previous surveys in the locality)

Species Name	Common Name	Roost Type
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	<p>Mostly within tree cavities although occasionally within other areas [tree stump, disused birds' nests, building roofs, canvas roll, tractor exhaust] (Chruszcz and Barclay, 2002).</p> <p>Victoria studies conducted by Lumsden and Bennett (1995) and later by Lumsden (2004) found roost switching was common in individuals faithful to a roost area. Roosts used on successive days were usually within 300m of each other. Lumsden (2004) showed a strong bias for roost trees within floodplain forests and preference toward large Blue Gum/River Red Gums.</p> <p>Colonies are generally small (up to 30) within individuals (primarily males) also roosting individually (Dixon and Lumsden in Van Dyck and Strahan, 2008).</p>

Species Name	Common Name	Roost Type
<i>Vespadelus pumilus</i>	Eastern Forest Bat	Roosts within large trees where available although small trees may be utilised in regrowth forests in colonies of up to 50 females (Law et al in Van Dyck and Strahan, 2008). Males are excluded from the maternity roosts in late spring and typically roost solitarily (Law and Anderson, 2000).
<i>Austronomus australis</i>	White-striped Freetail	Roosts in tree hollows either singly or in groups. Research in Brisbane shows <i>T. australis</i> to roost in hollows in old eucalypt trees, especially in Forest Red Gums (<i>E. tereticornis</i>) and in Grey Gums (<i>E. propinqua</i>) with colony sizes up to 300 individuals. Such studies in Brisbane have also identified occasional roost cohabitation with the Brushtail Possum where neither species appeared to show any aggression toward the other (Rhodes, 2001; Rhodes, 2006).
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	Roosting has been recorded in tree hollows and rock crevices (Kutt et al in Van Dyck and Strahn, 2008).
<i>Miniopterus oceanensis</i>	Eastern bentwing Bat	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).
<i>Miniopterus australis</i>	Little Bentwing Bat	<p>Caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day (DECC 2005). DECC (2005) note the following additional particulars with regard to roosting of little bentwing bat:</p> <ul style="list-style-type: none"> • Maternity colonies form in spring. Males and juveniles disperse in summer. • Only five nursery sites /maternity colonies are known in Australia. • They often share roosting sites with the Common Bentwing-bat, and, in winter, the two species may form mixed clusters. <p>In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young.</p>
<i>Myotis macropus</i>	Large-footed Myotis	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. 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.
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	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).
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	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) also notes that burrows of terrestrial mammals in treeless areas or bird nests or sugar glider nests may be utilized.
<i>Scoteanax rueppellii</i>	Greater Broadnosed Bat	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 Bunjalung National Park noted the species to roost exclusively within Melaleuca quinquenervia (Campbell, 2001).

4.6.3 Reptiles

A total of ten (10) reptile species were recorded on the subject site. No species listed as endangered or vulnerable under the *Biodiversity Conservation Act 2016* were recorded during fauna survey works.

Typically reptile species require a diversity of microhabitats (including vegetation structure, ground substrates, basking sites etc) and suitable shelter sites to regulate body heat. Such components are crucial as reptiles require differing levels of microhabitat to regulate body heat which controls essential functions such as movement, digestion, respiration and breeding activity (Kaplan, 1996). In this regard, it is considered that habitat for reptile species is present across the site including rank grassland/weedland areas over the majority of the site and a combination of forested areas and weed thickets on the western, southern and eastern fringes on exposed rocky surfaces.

A small variety of snakes and skinks were recorded during fauna survey with those encountered considered to be common occurrences within the locality and will be minimally affected by the proposal via modification of the grassland ground refuge within the area occupied by the three allotments.

4.6.4 Amphibians

Five (5) species of native frog and one (1) introduced toad were recorded on the subject site. No amphibians scheduled under the *Biodiversity Conservation Act 2016* or the *Environment Protection and Biodiversity Conservation Act 1999* were recorded.

Although the site does not contain any permanent waterways, there are some soakage areas that provide minor habitat for amphibians. Additionally, some individual *Pseudophryne* sp. were heard calling from the damp leaf litter occurring in the closed forest areas of the site (Aspect North, 2004: 21). The eastern sedgefrog, graceful treefrog and bleating treefrog were also recorded in January 2015 within the western and southern (offsite) forests which contained flowing rocky gullies following rainfall.



It is considered that the development envelope (principally cleared and modified exotic grassland) does not contain significant amphibian habitat.

The recorded frog species recorded can be attributed to adult and breeding habitat guilds (per Ecotone, 2007) based upon habitat information (Cogger, 1992; Robinson, 1998; Barker et al, 1995) and breeding information (Anstis, 2002, Tyler, 1999).

Table 4: Frog Habitat Guilds

FROG HABITAT GUILDS			
Species	Common Name	Adult Habitat	Breeding Habitat
<i>Limnodynastes terraereginae</i>	Northern Pobblebonk	Ground	Lentic Dams and ponds, flooded roadside ditches, swamps.
<i>Litoria fallax</i>	Eastern Sedgefrog	Tree & ground frog	Permanent-temporary pools/lentic. Dams, ponds and swamps especially those with emergent reeds.
<i>Litoria dentata</i>	Bleating Treefrog	Tree & ground frog	Permanent-temporary pools/lentic. Permanent or temporary ponds, ditches and swamps. Calling from trees, the

			ground, low vegetation or afloat in shallow water.
<i>Litoria gracilentia</i>	Graceful Treefrog	Tree & ground frog	Permanent-temporary pools/lentic. Swamps, roadside ditches, ponds and flooded grassland.
<i>Pseudophryne coriacea</i>	Red-backed Broodfrog	Ground	Permanent-temporary pools/lentic. Hidden nests under leaf litter, grasses and rocks on moist slopes just above or at the water level of small temporary water courses, ditches or creeks.

5 Discussion of Recorded & Potentially Occurring Endangered Communities, Endangered Populations and Threatened Species

5.1 Endangered Ecological Communities

As discussed within Section 3.2.1, one EEC is considered present which will be retained and protected.

5.2 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
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve
- Gould's Petrel

None of the above AOBVs occurs within the vicinity of the site.

5.3 Threatened Flora

No flora species listed as endangered or vulnerable under the *Biodiversity Conservation Act 2016* were observed within the development envelope.

The following threatened species were encountered (as documented within Aspect North 2004 or during 2015/2023 investigations) within vegetated areas external to the development envelope in habitat protection areas (refer Figure 9):

Table 5: Recorded Threatened Flora Species

SPECIES NAME	TSCA STATUS	VEGETATION COMMUNITY	LOCATED 2014	LOCATED 2015-2023
<i>Lepiderema pulchella</i>	Vulnerable	2 & 4	√	√
<i>Macadamia tetraphylla</i>	Vulnerable	4	√	√
<i>Syzygium hodgkinsoniae</i>	Vulnerable	4	√	√
<i>Syzygium moorei</i>	Vulnerable	4	√	√
<i>Floydia praealta</i>	Vulnerable	4	√	

The following species are also known from the locality based upon survey works performed by JWA (2009), Biolink (2008), Planit (2009) and Planit (2013) in nearby areas:

SPECIES	TSC ACT	SOURCE
<i>Acacia bakeri</i>	V	JWA (2009) , Biolink (2008)
<i>Amorphaespermum whitei</i>	V	Biolink (2008)
<i>Archidendron hendersonii</i>	V	Planit (2009), JWA (2009), Planit (2013)
<i>Bosistoa transversa</i>	V	JWA (2009)
<i>Cryptocarya foetida</i>	V	JWA (2009), Biolink (2008)
<i>Cupaniopsis newmanii</i>	V	Planit (2009) , Biolink (2008)
<i>Diploglottis campbellii</i>	E	JWA (2009)
<i>Diospyros mabacea</i>	E	Planit (2009)
<i>Diospyros major var ebenus</i>	E	Planit (2009)
<i>Drynaria ruigidula</i>	E	JWA (2009), Planit (2009)
<i>Endiandra hayesii</i>	V	JWA (2009)
<i>Floydia praealta</i>	V	JWA (2009)
<i>Geijera paniculata</i>	E	JWA (2009)
<i>Gossia fragrantissima</i>	E	JWA (2009)
<i>Grevillea hilliania</i>	E	JWA (2009)
<i>Hicksbeachia pinnatifolia</i>	V	JWA (2009)
<i>Lepiderema pulchella</i>	V	JWA (2009), Planit (2009) , Biolink (2008), Planit (2013)
<i>Macadamia tetraphylla</i>	V	JWA (2009), Planit (2009) , Biolink (2008), Planit (2013)

SPECIES	TSC ACT	SOURCE
<i>Ochrosia moorei</i>	E	JWA (2009)
<i>Randia moorei</i>	E	JWA (2009), Planit (2009), Biolink (2008), Planit (2013)
<i>Syzygium hodgkinsoniae</i>	V	Planit (2013)
<i>Syzygium moorei</i>	V	JWA (2009), Planit (2009), Planit (2013)

A search of the BioNet Atlas (2023) indicates that thirty-three species of threatened flora have been previously recorded within the locality (search area -28.17, 153.4, 153.57, -28.27). Based on habitat assessment and the known distribution of these species within the NENSW bioregion, 13 of these species are considered unlikely to be present within the site. It is considered that preferred or potential habitat occurs for 20 of the listed species with four detected during field survey all within the proposed habitat retention areas.

It is considered that preferred habitat for the discussed species is absent from the development envelope, and none were encountered within the area proposed for the roadway and allotments.

Table 6: Potentially Occurring Threatened Flora

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
<i>Acalypha eremorum</i>	This shrub occurs within subtropical rainforest, dry rainforest and vine thickets. Although widespread and moderately common in south-east Queensland, in NSW it occurs in only a few localities, including the Chaelundi, Lismore and Burringbar areas (NPWS, 2002).	E		Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Acacia bakeri</i>	<i>Acacia bakeri</i> has a restricted distribution in north-east New South Wales and south-east Queensland and is found in or near lowland subtropical rainforest, in adjacent eucalypt forest and in regrowth of both (DEH, 2012 online: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10004).	V	-	Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Acronychia littoralis</i>	<p>Scented <i>Acronychia</i> occurs from Fraser Island in Queensland to Port Macquarie in NSW. In 1996, the species occurred at 42 sites (Benwell, 1996). Most populations occur in NSW, between Ballina and Tweed Heads. The two Queensland populations include two trees at the Gold Coast and a few individuals in Great Sandy National Park (NP) (EPA, 2007). In NSW, populations are conserved in Bongil Bingil NP, Bundjalung NP, Broken Head Nature Reserve (NR), Cape Byron NR, Brunswick Heads NR, Cudgen Lake NR and Cooloola NP. Scented <i>Acronychia</i> is found on sand in humid, high rainfall zones (greater than 1600 mm), within 2 km of the ocean.</p> <p>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). Associated species include <i>Lophostemon confertus</i>, <i>Banksia integrifolia</i>, <i>Callitris columellaris</i>, <i>Araucaria cunninghamii</i>, <i>Eucalyptus intermedia</i> and <i>Melaleuca quinquenervia</i> (Benwell, 1996). Former habitat has been reduced as a result of coastal development, sand mining, waterlogging and land clearing for agriculture (Hunter et al., 1992; Benwell, 1996) [in DSEWPC, 2008:1-2]</p>	E1	E	Not recorded during site surveys. Preferred habitat for this species is absent from the subject site.
<i>Archidendron hendersonii</i>	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	V	-	Not recorded during site surveys.

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
	soils including coastal sands and those derived from basalt and metasediments (DECC, 2005).			Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Bosistoa transversa</i>	<p>Three-leaved <i>Bosistoa</i> is known from the Richmond River, NSW, to Mt Larcom near Gladstone, Queensland. This species is conserved within Mt Warning National Park, Numbinbah Nature Reserve, Limpinwood Nature Reserve and Whian Whelan State Forest (Floyd, 1989). Population information is unavailable; however, it has been asserted that this species is common in its range (Hartley, 2004, pers. comm.). This species occurs within the Northern Rivers (NSW), Fitzroy, Burnett Mary and Southeast Queensland Natural Resource Management Regions.</p> <p>Three-leaved <i>Bosistoa</i> grows in lowland subtropical rainforest up to 300 m above sea level (Floyd 1989; Richards cited in Harden 2002; Hartley 1977; Stanley & Ross 1983).</p>	V	V	<p>Not recorded during site surveys.</p> <p>Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.</p>
<i>Cassia marksiana</i>	This species is known from Brunswick Heads, around Murwillumbah, and north into south-east Queensland as far as Beenleigh where it occurs within Littoral and riverine rainforest, and in regrowth vegetation on farmland and along roadsides (DECC., 2005).	E1	-	<p>Not recorded during site surveys.</p> <p>Preferred habitat for this species is absent from the subject site.</p>
<i>Centranthera cochinchinensis</i>	In NSW, it is known from only 6 locations from near Woolli to north of Grafton in swampy areas and other moist sites. Two locations occur within conservation reserves, Yuraygir National Park and Fortis Creek National Park (DEC, 2008 online: http://www.environment.nsw.gov.au/determinations/CentrantheraCochinchinensis_EndSpListing.htm).	E1		<p>Not recorded during site surveys.</p> <p>Preferred habitat for this species is absent from the subject site.</p>
<i>Cryptocarya foetida</i>	Stinking <i>Cryptocarya</i> 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	<p>Not recorded during site surveys.</p> <p>Preferred habitat for this species is absent from the subject site.</p>
<i>Cupaniopsis serrata</i>	The species occurs in Queensland and reaches its southern distributional limit in New South Wales. Within New South Wales, an historical collection of <i>Cupaniopsis serrata</i> has been made from the Tweed River valley. There are no other specimen-backed records in NSW, although there have been a few unconfirmed reports of the species. The preferred habitat in New South	E1		<p>Not recorded during site surveys.</p> <p>Preferred habitat considered absent from the development footprint. Potential</p>

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
	Wales for <i>Cupaniopsis serrata</i> appears to be sub-tropical and dry rainforest (NSW SC, 2003 online: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2000-2003/cupaniopsis-serrata-a-small-tree-endangered-species-listing)			habitat present within the retained lowland rainforest vegetation.
<i>Diploglottis campbellii</i>	"The forest types in which the species occurs varies from lowland subtropical rainforest to drier subtropical rainforest with a <i>Lophostemon confertus</i> (Brush Box) open overstorey. Hunter <i>et al.</i> (1992) showed that the species occurs on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite" (NPWS, 2004: 6).	E1	E	Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Diospyros mabacea</i>	This species 'occurs only in north-east NSW. It is found in a few stands on the Tweed and Oxley Rivers, upstream from Murwillumbah, on Stotts Island in the lower Tweed River and one other small population west of Mullumbimby on the Brunswick River. The largest population is in Limpinwood Nature Reserve. Usually grows as an understorey tree in lowland subtropical rainforest, often close to rivers. Soils are generally basalt-derived or alluvial (OEH, 2018).			Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Diospyros yandina</i>	In NSW this species is found only in Hogans Scrub at North Tumbulgum and on Mount Cougal, in the Tweed Valley (OEH, 2016). It grows in the understorey of riverine or lowland subtropical rainforest (OEH, 2016).	E1	-	Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Drynaria rigidula</i>	<i>Drynaria rigidula</i> was presumed extinct in New South Wales and has been recently rediscovered. The species is currently known from only 3 locations in N.S.W, although it is common in Queensland. It is a fern that grows on rocks or as an epiphyte from rainforests north from the Clarence River in northern coastal N.S.W (NSW Science Committee, 2015).	E1		Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Endiandra</i>	The Rusty Rose Walnut has a restricted distribution in northern NSW and southern Queensland	V	V	Not recorded during site surveys.

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
<i>hayesii</i>	(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).			Preferred habitat for this species is absent from the subject site.
<i>Endiandra muelleri</i> subsp. <i>bracteata</i>	<p>'According to the literature the Green-leaved Rose Walnut is known from north-eastern NSW, north from the Clarence River (where a specimen from Maclean was employed in Hyland's 1989 description) to southern and central Queensland (Hyland 1989). The taxon is not considered threatened in Queensland and is apparently moderately common. In NSW, records nominally of this taxon are concentrated on the Tweed and Byron coasts, but also extend inland to the hinterland ranges, and south to Tuckean, Bungawalbin and Maclean.</p> <p>Records for the combined taxa (<i>E. hayesii</i> and <i>E. muelleri</i> subsp. <i>bracteata</i>) are usually from the poorer soils derived from sedimentary, metamorphic or acid volcanic rocks. Vegetation includes subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats' (NPWS, 2004: 5).</p>	E1	-	<p>Not recorded during site surveys.</p> <p>Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.</p>
<i>Floydia praealta</i>	'The Ball Nut occurs in small, scattered populations from Gympie, Queensland, southwards to the Clarence River in north-east NSW, where it inhabits riverine and subtropical rainforest, usually on soils derived from basalt (DECC, 2005) or in coastal scrub (Foreman, 1995). This species occurs within the Northern Rivers (NSW), Burnett Mary and Southeast (Queensland) Natural Resource Management Regions' (Environment Australia, 2008:1).			<p>Previously recorded by Aspect North (2004) within the western retained Lowland Rainforest habitat although unable to be found in 2015, 2016 and 2023</p> <p>Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.</p>
<i>Geodorum densiflorum</i>	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	-	<p>Not recorded during site surveys.</p> <p>Preferred habitat considered absent from the subject site.</p>
<i>Gossia fragrantissima</i>	Occurs in south-east Queensland and in north-east NSW south to the Richmond River. Mostly found on basalt-derived soils. The species is typically found in dry subtropical and riverine rainforest. As it can coppice from roots left in the ground when rainforest is cleared, it is found at several sites as isolated plants in paddocks or regrowth (OEH, 2019)	E1	E	<p>Not recorded during site surveys.</p> <p>Preferred habitat considered absent from the subject site.</p>

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
<i>Grevillea hilliana</i>	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 surveys. Preferred habitat considered absent from the subject site.
<i>Lepiderema pulchella</i>	This species occurs within Lowland subtropical rainforest and is largely confined to infertile metasediments in the Tweed Valley (NPWS, 2002).	V	-	26 stems recorded in the west and southeast all of which will be unaffected by the three-lot subdivision. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Lindsaea brachypoda</i>	This fern occurs in very moist habitats in subtropical or warm-temperate rainforest or palm forest (NPWS, 2002: 11).	E		Not recorded during site surveys. Preferred habitat considered absent from the subject site.
<i>Macadamia tetraphylla</i>	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	13 stems recorded in the northwest all of which will be unaffected by the three-lot subdivision. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Niemeyera whitei</i>	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).	V	-	Not recorded during site surveys. Preferred habitat types are absent from the subject site.
<i>Peristeranthus</i>	<i>Peristeranthus hillii</i> is found in northeastern NSW, north from the Hastings River (Port Macquarie),	V		Not recorded during site surveys.

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
<i>hillii</i>	and extends to northeastern Queensland, as far as the Bloomfield River. In subtropical regions, including NSW, the species is restricted to coastal and near-coastal environments, particularly remnants of littoral rainforest growing on aeolian sands and lowland subtropical rainforest on floodplains (DEC, 2005)			Preferred habitat considered absent from the subject site.
<i>Phaius australis</i>	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 surveys. Preferred habitat considered absent from the subject site.
<i>Randia moorei</i>	The known range of the Spiny Gardenia extends from Lismore on the north coast of NSW, northwards to the Logan River, southern Queensland (Quinn et al. 1995). The Spiny Gardenia occurs in subtropical, riverine, littoral and dry rainforest and sometimes along moist scrubby watercourses. In NSW the species is often found in Hoop Pine (<i>Araucaria cunninghamii</i>) - Brush Box (<i>Lophostemon confertus</i>) forest with other rainforest elements present in the understorey. Although plants are typically found within rainforest or in Hoop Pine - Brush Box forest, at Terranora in Tweed Shire and on the southern slopes of Mount Chincogan in Byron Shire, the Spiny Gardenia occurs as a scattered remnant shrub in open grazing land that was formerly rainforest (NPWS, 2004: 3-4).	E1	E	Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Rhodamnia rubescens</i>	In New South Wales (NSW), <i>Rhodamnia rubescens</i> 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 <i>R. rubescens</i> 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 <i>R. rubescens</i> are often found in wet sclerophyll associations in rainforest transition zones and creekside riparian vegetation (Benson and McDougall 1998). <i>Rhodamnia rubescens</i> 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 surveys. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Rhodomyrtus psidioides</i>	In New South Wales (NSW), <i>Rhodomyrtus psidioides</i> 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.	E4	-	Not recorded during site surveys. Preferred habitat considered absent from the development footprint. Potential

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
	The species occurs in rainforest and its margins with sclerophyll vegetation, often near creeks and drainage lines. <i>Rhodomertus psidiodes</i> is a pioneer species in disturbed environments (Williams and Adam 2010) and is locally common in disturbed areas, such as regrowth and rainforest margins.			habitat present within the retained lowland rainforest vegetation.
<i>Sophora tomentosa</i>	The silverbush occurs on "recent sands on frontal coastal dunes. Historic records suggest it was a fairly common plant from Port Stephens northwards. Populations previously recorded from Tweed Heads, Coffs Harbour and Iluka are now thought to be extinct. The currently known southern limit of distribution is at Old Bar, near Taree. The largest known population at Port Macquarie is estimated at up to 500 plants, other populations are of less than 20 plants" NSWSC, 2001 online: http://www.environment.nsw.gov.au/determinations/SophoraTomentosaEndSpListing.htm).	E1		Not recorded during site surveys. Preferred habitat considered absent from the subject site.
<i>Syzygium hodgkinsoniae</i>	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	4 stems recorded in the northwest all of which will be unaffected by the three-lot subdivision. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Syzygium moorei</i>	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 Mudgeeraba Creek and Upper Tallebudgera Creek in south-east Queensland (Floyd, 1989). Rose Apple is most commonly found in Subtropical Rainforest.	V	V	7 stems recorded in the northwest all of which will be unaffected by the three-lot subdivision. Preferred habitat considered absent from the development footprint. Potential habitat present within the retained lowland rainforest vegetation.
<i>Xylosma terrae-reginae</i>	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, at 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 online:	E1		Not recorded during site surveys. Preferred habitat considered absent from the subject site.

Species	Preferred Habitat	BCA Status	EPBC Status	Comment
	http://www.environment.nsw.gov.au/determinations/XylosmaTerraeReginaeEndSpListing.htm .			

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 Threatened Fauna Species

A search of the BioNet Atlas (2023) indicates that 56 species of threatened fauna have been previously recorded within the locality (search area -28.17, 153.4, 153.57, -28.27). Based on habitat assessment and the known distribution of these species within the NENSW bioregion, 41 of these species are considered unlikely to be present within the site. It is considered that preferred or potential habitat occurs for 15 of the listed species with three detected during field survey all within the proposed habitat retention areas.

It is considered that preferred habitat for the discussed species is absent from the development envelope, and none were encountered within the area proposed for the roadway and allotments.

Table 7: Recorded Threatened Fauna Species

Species	Location Recorded
White-eared Monarch	Recorded within lowland rainforest
Wompoo Fruit-dove	Recorded within lowland rainforest
Grey Headed Flying Fox	Opportunistic foraging per Aspect North (2004)
White-bellied Sea-Eagle	Flying offsite along the Tweed River to the south



The following threatened species are known from the locality based upon previous survey works performed by JWA (2009), Biolink (2008) and Planit (2009, 2013):

Species	Location Recorded	Recorded by
Eastern Bentwing Bat	Terranora Lakes Country Club	JWA, 2009
Eastern Freetail Bat		
Grey-headed Flying-fox		
Little Bentwing Bat		
Rose-crowned Fruit-dove		
White-eared Monarch	Walmsleys Road, Bilambil	Biolink, 2008
Grey-headed Flying-fox		
Yellow-bellied Sheath-tail-bat		
Eastern Bentwing Bat		
Little Bentwing Bat		
Eastern Long-eared Bat	Scenic Drive, Bilambil	Planit, 2009
Little Bentwing Bat		
Southern Myotis		
Eastern Bentwing Bat		
Rose-crowned Fruit-dove		
Superb Fruit-dove	Sierra Vista Boulevard, Terranora	Planit, 2013
Grey-headed Flying Fox		
Little Bentwing Bat		
Southern Myotis		

Species	Location Recorded	Recorded by
Eastern Bentwing		
Rose-crowned Fruit-dove		
Wompoo Fruit-dove		
White-eared Monarch		
Osprey		
Collared Kingfisher		
Bush Stone-curlew		
Koala		

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 subject site. 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 subject site.
- 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 8). 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 for which it is considered that the species may be affected by the proposal (i.e. impact on feeding, roosting, nesting, behaviour and associated habitat), the five-part test of significance has been performed within Section 6.

It is considered, however, unlikely that threatened fauna will be significantly impacted upon by the proposal as the impact zone has been located within a largely modified pastoral/grassland habitat type.

Table 8: Potentially Occurring Threatened Fauna Species

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
<i>Amaurornis moluccana</i>	Unlikely	<p>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.</p> <p>Preferred habitat for the Bush Hen is considered absent from the site and it was not recorded during the site survey efforts. It is considered highly unlikely that the proposed development will have a significant impact upon this stork.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Anseranas semipalmata</i>	Unlikely	<p>This species favours coastal wetlands and swamps with prolific reed/sedge growth mostly within northern Australia (NPWS, 2002; Tulloch et al, 1981). Breeding is confined to the northern areas in association with large floodplains of creeks/rivers generally within 80km of the coast (Frith and Davies, 1961). Dense sedge/rush growth within shallow waters in these locations is favoured for nest formation (Tulloch et al, 1981; Bayliss and Yeoman, 1990). Foraging within grazed paddocks and breeding within constructed stormwater wetlands has also been observed at Carrara on the Gold Coast (pers. obs.).</p> <p>Preferred habitat for the Magpie Goose is considered absent from the site and it was not recorded during the site survey efforts. It is considered highly unlikely that the proposed development will have a significant impact upon this stork.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Burhinus glallarius</i>	Possible	<p>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:</p> <ul style="list-style-type: none"> 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) <p>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).</p> <p>As the species utilizes a wide range of habitats (including modified residential areas) it is considered most of the site represents potential habitat. Favoured grassy woodland areas are, however, absent and the Stone-curlew has not been recorded on the site during fauna survey.</p>	E1	-	<p>An insignificant area of marginal potential habitat (i.e. modified exotic grassland) will be removed in association with establishing the 3-lot subdivision.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p> <p>Test of Significance Performed</p>
<i>Calyptorhynchus lathamii</i>	Unlikely	<p>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 <i>Eucalyptus</i> woodlands and forest with moderate-high densities of <i>Allocasuarina</i> 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.</p> <p>Substantial areas of potential eucalypt forest/woodland habitat containing foraging material (<i>Allocasuarina</i> spp.) are absent from the site. Within the subject site numerous large trees bearing suitably sized hollows are also absent. The species was not recorded during the survey efforts.</p> <p>It is considered highly unlikely that the proposed development will have a significant impact upon this species.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
<i>Carterornis leucotis</i>	Recorded	<p>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.</p> <ul style="list-style-type: none"> 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. <p>The lowland rainforest and camphor laurel dominated areas provide potential habitat for the White-eared Monarch which was recorded within the western rainforest habitats in 2015. The monarch has been recorded from nearby areas (Sierra Vista Boulevard) within a variety of lowland rainforest, camphor laurel forest and early regrowth forests at the edges of grazed paddocks (Planit, 2013).</p>	V	-	<p>Recorded within western lowland rainforest.</p> <p>All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p> <p>Test of Significance Performed</p>
<i>Chalinolobus nigrogriseus</i>	Unlikely	<p>In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat (DEH, 2012 online: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10158). This species is a continuous flight forager that primarily searches for a variety of insects close above the canopy and within openings in forested habitat (Fenton 1982, Allison 1995, Churchill 1998). It also forages over open ground adjacent to forested habitat (McKenzie and Rolfe 1986). The presence of insects, such as wingless ants, in scats suggests that some gleaning off foliage and other surfaces occurs (Vestjens and Hall 1977, Allison 1995) in Lumsden et al, 2005: 131). Roosting has been recorded in tree hollows and rock crevices (Kutt et al in Van Dyck and Strahn, 2008).</p> <p>Preferred habitat (eucalypt forests) for the hoary wattled bat is considered to be absent from the site and the species was not recorded during previous anabat survey efforts of the site.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Climacteris picumnus victoriae</i>	Unlikely	<p>"The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of <i>Climacteris picumnus victoriae</i> runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper <i>Climacteris picumnus picumnus</i> which then occupies the remaining parts of the state. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, that have been isolated or fragmented for more than 50 years.</p> <p><u>HABITAT AND ECOLOGY</u></p> <ul style="list-style-type: none"> Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. Gregarious and usually observed in pairs or small groups of 8 to 12 birds; terrestrial and arboreal in about equal proportions; active, noisy and conspicuous while foraging on trunks and branches of trees and amongst fallen timber; spend much more time foraging on the ground and fallen logs than other treecreepers. When foraging in trees and on the ground, they peck and probe for insects, mostly ants, amongst the 	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
		<p>litter, tussocks and fallen timber, and along trunks and lateral branches; up to 80% of the diet is comprised of ants; other invertebrates (including spiders, insects larvae, moths, beetles, flies, hemipteran bugs, cockroaches, termites and lacewings) make up the remaining percentage; nectar from Mugga Ironbark (<i>Eucalyptus sideroxylon</i>) and paperbarks, and sap from an unidentified eucalypt are also eaten, along with lizards and food scraps; young birds are fed ants, insect larvae, moths, crane flies, spiders and butterfly and moth larvae.</p> <ul style="list-style-type: none"> Hollows in standing dead or live trees and tree stumps are essential for nesting. The species breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha). Each group is composed of a breeding pair with retained male offspring and, rarely, retained female offspring. Often in pairs or cooperatively breeding groups of two to five birds" (OEH, online: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10171) <p>The site does not contain preferred habitat for this species of tree creeper, and it was not recorded during avifauna survey efforts of the site. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>			
<i>Coracina lineata</i>	Possible	<p>This species has been recorded from a variety of habitats including rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses within Coastal NSW (NPWS, 2002). Foraging requirements include fruiting tree species within in rainforest, wet sclerophyll forest, vegetation remnants or isolated trees (DEC, 2005) and insects captured among foliage (NPWS, 2002).</p> <p>Potential habitat is considered to be present in association with the lowland rainforest habitat although the cuckoo shrike was not recorded during fauna survey.</p>	V	-	<p>Not recorded. Reduction in insignificant areas of marginal foraging habitat (occasional small tree within pastoral/grassland area).</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p> <p>A 'Test of Significance' has been conducted for this species.</p>
<i>Crinia tinnula</i>	Unlikely	<p>This species of wallum frog is found along drainage lines in sub-coastal wet heath, in acid paperbark (<i>Melaleuca</i>) 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.</p> <p>Preferred habitat for the wallum froglet is considered to be absent from the site and it has not been recorded during fauna survey.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Daphoenositta chrysoptera</i>	Unlikely	<p>The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.</p> <p>Substantial areas of potential eucalypt forest/woodland habitat are absent from the site and the species was not recorded during site survey efforts. It is considered unlikely that the proposed development will have a significant impact upon the varied sittella.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Dasyurus maculatus</i>	Unlikely	<p>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;</p>	V	E	<p>Not recorded. All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
		<p>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). Population density is therefore naturally quite low and has been estimated at 1 individual per 3 km² even within optimal 'core' habitat (Jones & Rose, 1996).</p> <p>Whilst potential habitat is present in the form of rainforests containing rocky debris plus fallen debris including logs it is considered that the residual patches of potential habitat are too small to support a population of the species and isolated from similar habitats (numerous dispersal barriers including development, farmland, swamps/creeks etc). The quoll has not been previously recorded and certainly the habitats available on the site would be insufficient to support a single individual of the species based upon reviewed scientific literature and the quoll was not recorded during survey.</p>			significantly affected by the proposal.
<i>Ephippiorhynchus asiaticus</i>	Unlikely	<p>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.).</p> <p>Preferred habitat for the Black-necked Stork is considered absent from the site and it was not recorded during the site survey efforts.</p>	E1	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Glossopsitta pusilla</i>	Unlikely	<p>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 <i>et al.</i> 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 <i>et al.</i> 2002), Little Lorikeets were more likely to occupy forest sites with relatively short to intermediate logging rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires" (DECC, 2009).</p> <p>Extensive sclerophyll/eucalypt forests are absent from the site and 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 during site surveys. It is considered unlikely that the development will have a significant impact upon this species.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Haliaeetus leucogaster</i>	Recorded offsite	<p>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 <i>et al.</i> 1994; Ferguson-Lees & Christie 2001; Marchant & Higgins 1993; Rose 2001a).</p> <p>Expansive favoured habitat for the Sea-eagle occurs in the locality (in association with the foreshore and river estuaries such as Tweed River, Terranora Creek, Cobaki Broadwater etc.). The species has been recorded on several occasions within the Tweed area (pers obs.) and has previously been recorded throughout the locality in association with the Tugun Bypass SIS (PB, 2004).</p> <p>Preferred waterbased habitats are not present and although the species was not recorded during survey efforts of the site it was recorded in 2015 flying over the Tweed River to the south (>400m south of the development footprint). Large stick nests were not observed, and it is considered unlikely that the three-lot subdivision would have a significant impact upon the sea-eagle.</p>	V	-	<p>Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Hieraaetus</i>	Unlikely	The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak	V	-	Not recorded. Preferred habitat absent.

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
<i>morphnoides</i>		<p>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 <i>Hieraaetus weiskei</i> (Lerner and Mindell 2005).</p> <p>The site may fall within the species hunting range although the species has not been recorded within the subject site. No stick nests suitable for this species were observed and it is considered unlikely that the three lot subdivision would have a significant impact upon the little eagle.</p>			Unlikely to be significantly impacted upon by the proposal.
<i>Irediparra gallinacea</i>	Unlikely	<p>This species inhabits deep, permanent freshwater lagoons, swamps and dams with abundant aquatic vegetation, especially water-lilies throughout coastal Australia and well inland in the north from the Kimberley to Sydney (DEC, 2005). The jacana is also known from constructed stormwater wetlands and sewerage treatment ponds containing abundant floating vegetation including areas adjacent to urban development (pers. obs.).</p> <p>Preferred waterbased habitats are not present on the site and the species was not recorded during survey efforts. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Ixobrychus flavicollis</i>	Unlikely	<p>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).</p> <p>Preferred waterbased habitats are not present on the site and the species was not recorded during survey efforts. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Lichenostomus fasciolaris</i>	Unlikely	<p>Although regarded as a mangrove specialist, mangrove honeyeaters have been recorded from eucalypt woodlands adjacent to mangroves, and trees in coastal towns (Schodde & Tideman 1990; Pizzey and Knight 1997).</p> <p>Surveys undertaken by Sandpiper Ecological (2001) associated with the Tugun Bypass SIS mangrove honeyeaters were recorded only in mangrove habitats fringing the Cobaki Broadwater, or on small mangrove islands within the Broadwater. Densities of almost five birds/hectare were recorded along the mangrove fringe in the vicinity of the Pony Club, with densities of over two birds/hectare recorded on the western side of Cobaki Broadwater (Sandpiper Ecological, 2001: 69).</p> <p>Preferred waterbased habitats are not present on the site and the species was not recorded during survey efforts. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Litoria alongburensis</i>	Unlikely	<p>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 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).</p> <p>Preferred habitat for the wallum sedgefrog is considered absent from site and it was not recorded during survey works.</p>	V	V	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Miniopterus australis</i>	Possible	<p>This species utilises well-timbered habitats including rainforest, <i>Melaleuca</i> swamps and dry sclerophyll forests where 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 (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young.</p>	V	-	<p>Not recorded. All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
		Preferred habitat is considered to be present in association with Lowland Rainforest habitats although potential roosting habitat is unlikely to be present. The species was not recorded during previous Anabat surveys. Although it is considered that the proposed 3-lot subdivision will not have a significant impact upon this mobile species, a 'Test of Significance' has been conducted.			A 'Test of Significance' has been conducted for this species.
<i>Miniopterus orianae oceanensis</i>	Possible	<p>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).</p> <p>All habitats of the site represent potential habitat for the Large Bentwing which is also known to forage over modified habitats such as grasslands although possible roosting/breeding areas are considered to be absent. Anabat survey efforts of the site failed to record this species.</p> <p>Although it is considered that the proposed development will not have a significant impact upon this mobile species, a 'Test of Significance' has been conducted.</p>	V	-	<p>Not recorded. Reduction in insignificant areas of marginal foraging habitat (paddock, grassland with isolated trees).</p> <p>Unlikely to be significantly impacted upon by the proposal.</p> <p>A 'Test of Significance' has been conducted for this species.</p>
<i>Mormopterus norfolkensis</i>	Possible	<p>"Habitat for <i>M. norfolkensis</i> is generally stated as dry sclerophyll forest and woodland east of the Great Dividing Range (Duncan et al. 1999, Churchill 2008, Hoye et al. 2008), where it has been found to use flyways and upper slopes (Lloyd et al. 2006). However, it has also been recorded from a range of other habitat types, such as cleared agricultural land containing paddock trees (Law et al. 2000), wet sclerophyll forest (Hoye et al. 2008), saltmarsh (Laegdsgaard et al. 2004, Belbase 2005) and mangrove forests (G. Hoye, pers. comm. 2008). There are also records of the species using suburban areas (The Office of Environment and Heritage 2011)" (McConville, 2013: 11). The species forages upon insects above the forest canopy or at forest edges (Allison, 1983). It is known to roost in tree hollows and mangrove forests but is occasionally found in buildings (Gilmore and Parnaby, 1994; Allison and Hoye, 1995; DEC, 2005, McConville, 2013).</p> <p>Although preferred eucalypt habitats utilized by the long-eared bat are absent other habitats such as rainforest and cleared agricultural/pastoral land are present. Potential hollow bearing tree roosts are scarce although none will be impacted by the proposal. This species was not recorded via previous Anabat survey.</p>	V	-	<p>Not recorded. Reduction in insignificant areas of marginal foraging habitat (paddock, grassland with isolated trees).</p> <p>Unlikely to be significantly impacted upon by the proposal.</p> <p>A 'Test of Significance' has been conducted for this species.</p>
<i>Myotis macropus</i>	Possible	<p>The <i>Myotis</i> roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water. Breeding colonies may consist of 10-15 individuals or occasionally up to several hundred. 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. (NPWS, 2002; Richards, 2002).</p> <p>Whilst the <i>myotis</i> is commonly recorded within the locality the paucity of suitable roosting sites and water surfaces for foraging limits its potential occurrence on this particular site. It was not recorded during previous Anabat surveys.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p> <p>A 'Test of Significance' has been conducted for this species.</p>
<i>Ninox connivens</i>	Unlikely	<p>The habitat requirements of the barking owl are summarized in NPWS (2003: 4) from Kavanagh <i>et al.</i> (1995a), Debus (1997) and Higgins (1999):</p> <p>The Barking Owl lives in forests and woodlands of tropical, temperate and semi-arid zones. Its habitat is typically dominated by eucalypts, often red gum species and, in the tropics, paperbarks <i>Melaleuca</i> species. It usually roosts in or under dense foliage in large trees including rainforest species of streamside gallery forests, River She-oak <i>Casuarina cunninghamiana</i>, other <i>Casuarina</i> and <i>Allocasuarina</i> species, eucalypts, <i>Angophora</i> or <i>Acacia</i> species. Roost sites are often near watercourses or wetlands. It typically breeds in hollows of large eucalypts or paperbarks, usually near watercourses or wetlands. Barking Owls have been recorded in remnants of forest and woodland and in clumps of trees at farms, towns and golf courses. DECC (2005) notes that large home ranges of 30-200 hectares are occupied by the owl.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
		Although the site may fall within the species potential foraging range, preferred habitat is absent from the site. The species was not recorded during nocturnal survey efforts and no suitable sized hollows were recorded within the site. It is considered unlikely that the proposed 3 lot subdivision will have a significant impact upon the barking owl.			
<i>Ninox strenua</i>	Unlikely	<p>The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.</p> <p>The site may fall within the species' large hunting range although large trees bearing suitable hollows were not encountered during site surveys. Spotlighting and call playback failed to record the Powerful Owl within the subject site. It is considered unlikely that the proposed 3-lot subdivision will have a significant impact upon the powerful owl.</p>	V	-	<p>Not recorded. All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p>
<i>Nyctimene robinsoni</i>	Unlikely	<p>Known from coastal areas of north-eastern Australia from Cape York south to the far north-east corner of NSW. Few records from NSW, including the Nightcap, Tweed and Burringbar Ranges and in the vicinity of Mt Warning (OEH, 2019). Favour streamside habitats within coastal subtropical rainforest and moist eucalypt forests with a well-developed rainforest understorey (OEH, 2019).</p> <p>Preferred habitat is absent from the site and the species was not recorded during survey. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>	V	-	<p>Not recorded. All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p>
<i>Nyctophilus bifax</i>	Possible	<p>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).</p> <p>Preferred lowland rainforest habitat is present although potential hollow bearing roost trees are scarce. The Long-eared Bat was not recorded during previous Anabat surveys.</p>	V	-	<p>Not recorded. All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p> <p>A 'Test of Significance' has been conducted for this species.</p>
<i>Pandion cristatus</i>	Possible	<p>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.</p> <p>Expansive favoured habitat for the osprey occurs in the locality (in association with the foreshore and river estuaries such as Tweed River, Terranora Creek, Cobaki Broadwater etc) although such habitat is absent from the site and the species has not been recorded on the site during fauna survey.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal</p>
<i>Petaurus norfolcensis</i>	Unlikely	<p>This species of Glider is associated with dry sclerophyll forest and woodlands although in northern NSW and Qld it has been recorded from wet sclerophyll environments (Suckling in Strahan eds, 2002; Lindenmayer 2002). It is considered to be most abundant in associations containing winter flowering Eucalypts and/or environments with a high abundance of Acacia, Banksia species in the lower layers (Smith & Murray, 2003; Menkhorst et al, 1998; Quinn, 1995).</p> <p>Within the canopy of the preferred habitat numerous trees bearing hollows are critical habitat values required to support populations of the species (Quinn, 1995; Smith & Murray, 2003; Lindenmayer, 2002). Gliders are known to regularly swap den trees and utilise a number of such dens (between 6 and 19 den trees per Glider) within their</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment										
		<p>home range (van der Ree, 2000). These results are supported by survey work undertaken by Southern Cross University (June/July 2002) which indicated that 12 radio tracked gliders utilised 37 den trees incorporating live hollow bearing trees and stags (Cited in Warren, 2004).</p> <p>The absence of eucalypt forest and hollow bearing trees from the site and surrounding areas is likely to be a limiting factor for this species which was not recorded during survey. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>													
<i>Phascolarctos cinereus</i>	Unlikely	<p>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 favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000).</p> <p>Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (<i>Eucalyptus microcorys</i>), Forest Red Gum (<i>E. tereticornis</i>), Scribbly Gum (<i>E. racemosa</i>), Grey Gum (<i>E. propinqua</i>), Red Mahogany (<i>E. resinifera</i>) and White Stringybark (<i>E. tindaliae</i>). Further research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (<i>E. robusta</i>) and Blue Gum (<i>E. tereticornis</i>) [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 (<i>E. tereticornis</i>), Tallowwood (<i>E. microcorys</i>) and/or Grey Gum (<i>E. propinqua</i>) 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 (<i>E. propinqua</i>, <i>E. biturbinata</i>) to be secondary browse species in Currumbin.</p> <p>Recent studies (Biolink, 2007) indicate that <i>Eucalyptus tereticornis</i>, <i>E. microcorys</i> and <i>E. propinqua</i>/<i>E. biturbinata</i> are the most preferred koala food trees throughout the Gold Coast LGA.</p> <p>Within the Tweed Coast Swamp Mahogany <i>Eucalyptus robusta</i> and Forest Red Gum <i>E. tereticornis</i> are the most preferred tree species with Tallowwood <i>E. microcorys</i> and Grey Gum <i>E. propinqua</i> being the next most preferred (Biolink, 2011).</p> <p>Recent studies (Biolink, 2012) notes Swamp Mahogany (<i>E. robusta</i>), Forest Red Gum (<i>E. tereticornis</i>) and Tallowwood (<i>Eucalyptus microcorys</i>) being primary food tree species with Grey Gum (<i>E. propinqua</i>) being a secondary food tree species within Byron Shire.</p> <p>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]).</p> <p>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).</p> <table><tr><th>Source</th><th>Study Location</th><th>Habitat Type</th><th>Additional Comments</th><th>Koala/ha</th></tr><tr><td>Dique et al, 2003</td><td>Southeast QLD Pine Rivers Shire</td><td>Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics</td><td>Stratified by two habitat descriptions. 'urban' and 'bushland'</td><td>0-0.76</td></tr></table>	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	V	V	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
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											

Species	Potential occurrence based upon habitat	Notes					BCA Status	EPBC Status	Comment
		<div>Dique et al, 2004</div> <div>Southeast QLD Koala Coast ~375sqm of Redland, Logan and Brisbane City shires</div> <div>Eucalypt Forests. Predominately RE 12.9-10.4 & 12.11.5</div> <div>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)</div> <div>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</div>							
		<div>White and Kunst 1990</div> <div>Southeast QLD Sheldon</div> <div>Eucalypt Forest</div> <div></div> <div>0.4 (0.3-0.46)</div>							
		<div>Sullivan et a 2004</div> <div>Southwest QLD</div> <div>Eucalypt Forest/woodland within the mulglands</div> <div>Habitat stratified by floristics and landzone.</div> <div>0.0007-2.513</div>							
		<div>Biolink 2007</div> <div>Coombabah Koala Habitat Area</div> <div>Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts</div> <div>Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per Dique, 2003. EPA, 2005.</div> <div>0.22+/-0.04</div>							
		<div>Biolink 2007</div> <div>Coomera-Pimpama Koala Habitat Area</div> <div>Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts</div> <div>Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per Dique, 2003. EPA, 2005.</div> <div>0.23+/-0.03</div>							
		Suitable habitat (Eucalypt Forest) and individual preferred foot trees are absent from the site and the koala was not recorded during survey.							
<i>Phyllodes imperialis southern subspecies</i>	Unlikely	<p><i>Phyllodes imperialis</i> southern spp 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 <i>P. imperialis</i> 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 Southeast (Queensland) and Northern Rivers (NSW) Natural Resource Management Regions. The subspecies typically occurs below altitudes of 600 m in undisturbed subtropical rainforest in association with the vine <i>Carronia multiselepalea</i> although it has been observed at Springbrook in rainforest >800m (pers. obs).</p> <p>Although some rainforest habitat is present <i>Carronia multiselepalea</i> vines do not occur on the site and the Pink Underwing Moth was not encountered. It is considered unlikely that the proposed development will have a significant impact upon this moth</p>					E1	-	Not recorded. Preferred habitat absent. Unlikely to be significantly impacted upon by the proposal.
<i>Planigale maculata</i>	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					V	-	Not recorded. Preferred habitat absent. Unlikely to be significantly impacted upon by the proposal.

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
		<p>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:</p> <ul style="list-style-type: none"> 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). <p>As favoured vegetation types and dense understory elements are not present preferred habitat for the common planigale is considered to be absent from the site. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>			
<i>Pteropus poliocephalus</i>	Recorded	<p>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).</p> <p>All forested areas of the site including camphor laurel dominated areas represent potential foraging habitat for the flying fox which has been previously encountered during nocturnal survey. No roosting has been observed on the land.</p> <p>Given the abundance of available foraging habitat within the locality and that this species can fly up to 50km a night in search for food, it is considered that the minor reduction of potential exotic species foraging material will not have a significant impact upon this species.</p>	V	V	<p>Reduction in insignificant areas of marginal foraging habitat (occasional small tree within pastoral/grassland area).</p> <p>Unlikely to be significantly affected by proposal.</p> <p>A 'Test of Significance' has been conducted for this species.</p>
<i>Ptilinopus magnificus</i>	Recorded	<p>'In NSW, the Wompoo Fruit-dove occurs in patches of subtropical rainforest and adjoining wet sclerophyll habitats (Recher <i>et al.</i> 1995; Higgins & Davies 1996) but has also been recorded using single trees in farmland (Hawkins <i>in litt.</i> 2009). They appear to be most abundant in warmer, mature rainforests dominated by <i>Ficus</i> spp. (Recher <i>et al.</i> 1995; Hawkins <i>in litt.</i> 2009) and less common in fragments. Moran <i>et al.</i> (2004) classified the Wompoo Fruit-dove as a 'decreaser' on the basis that it was significantly more common in extensive rainforest (2.65 birds per count) than in remnants (1.00 bird per count) or regrowth (0 birds per count).</p> <p>Breeding of the Wompoo Fruit-dove takes place from late winter to mid-summer, varying in response to suitable weather conditions. Both sexes share in the construction of the nest, which is a small, sturdy, flat platform made from twigs and is usually positioned low in the tree, between 2-10 m from the ground (Recher <i>et al.</i> 1995). s an obligate frugivore it requires a high availability of fruiting materials which it generally feeds on in the high canopy (Recher <i>et al.</i> 1995) but the species will also secure food in the lower storeys of the forest (Higgins & Davies 1996). The Wompoo Fruit-dove selectively forages on species that are more common in well-developed rainforest than in regrowth. Fruit is taken from palms (Arecaceae), vines (Vitaceae) and trees in the families Araliaceae, Cunoniaceae, Ebenaceae, Elaeocarpaceae, Lauraceae, Meliaceae, Moraceae, Myrtaceae, Oleaceae, Pennantiaceae, Rutaceae and Sapindaceae (Innis 1989; Milledge & Bower <i>in litt.</i> 2009). Individual mature paddock trees such as figs (<i>Ficus</i> spp.) may also be visited during fruiting (Milledge & Bower <i>in litt.</i> 2009)</p> <p>The Wompoo Fruit-dove does not travel large distances, but rather moves around in small, localised areas in response to food availability and nesting requirements (Higgins & Davies 1996). Nevertheless, the species has a seasonal altitudinal migration, spending time in upland forests during summer and moving to lower elevations during winter (Milledge & Bower <i>in litt.</i> 2009). Occasionally, particularly during autumn and winter when rainforest fruit is scarce, individuals will move up to 15 km to temporarily occupy more open country (Higgins & Davies 1996). The species has an estimated home range requirement of approximately 20 ha when breeding (Milledge & Bower</p>	V	-	<p>Recorded within western lowland rainforest.</p> <p>All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p> <p>Test of Significance Performed</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
		<i>in litt.</i> 2009).’ [in NSW Scientific Committee, 2010:3-4]. Potential habitat for the fruit-dove is considered to be present within the lowland rainforest and it was recorded in this habitat (western boundary) during January 2015 survey works.			
<i>Ptilinopus regina</i>	Possible	<p>‘The Rose-crowned Fruit-dove inhabits rainforests, especially with vines, and also nearby sclerophyll forests and coastal scrub with abundant fruiting trees or shrubs. The species occurs in small remnants and regrowth patches, and in Camphor Laurel-privet regrowth in farmland. It has a wider habitat and dietary tolerance than the larger, more specialised Wompoo Fruit-dove, which is more restricted to fig-rich rainforest (Higgins & Davies 1996). The Rose-crowned Fruit-dove is not restricted to lowland, larger and denser rainforest, or to northern lowland and basswood forests in winter (Recher et al. 1995), but also occurs in the same types as recorded by Recher et al. (1995) for the Wompoo, in other moist forest and woodland with abundant fruiting trees, and occasionally in parks and gardens with fruiting trees (Higgins & Davies 1996).</p> <p>The Rose-crowned Fruit-dove feeds on fleshy fruits of rainforest trees, palms and vines, especially native figs, and of introduced weeds such as Cinnamomum camphora (Camphor Laurel), privets, Phytolacca octandra (Inkweed), Solanum mauritianum (Tobacco Bush) and Lantana camara (Lantana)’ [in NSW Scientific Committee, 2008: 2]. The species is considered a partial migrant and moves north in autumn/winter and returning in spring/summer to breed (Recher et al, 1995).</p> <p>All forested areas of the site including camphor laurel dominated areas represent potential foraging habitat for the fruit dove although it has not been recorded on the site. The rose-crowned fruit dove has been recorded from nearby areas (Sierra Vista Boulevard) within a variety of lowland rainforest, camphor laurel forest and early regrowth forests (Planit, 2013).</p>	V	-	<p>Not recorded. All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p> <p>A ‘Test of Significance’ has been conducted for this species.</p>
<i>Saccolaimus flaviventris</i>	Possible	<p>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 sheath-tail bat is known to utilise mammal burrows.</p> <p>This species of bat is known to utilise a wide variety of habitats (including treeless areas) and whilst not recorded onsite it has been recorded further to the southeast (Kingscliff) by Kendall & Kendall (2008). Forested habitat of the site may provide foraging habitat although potential hollow bearing roost trees are scarce. The 3-lot subdivision proposal will result in the modification of a pastoral/grassland area which represents additional potential foraging habitat for this species.</p>	V	-	<p>Reduction in insignificant areas of marginal foraging habitat (occasional small tree within pastoral/grassland area).</p> <p>Unlikely to be significantly affected by proposal.</p> <p>A ‘Test of Significance’ has been conducted for this species.</p>
<i>Syconycteris australis</i>	Unlikely	<p>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)</p> <p>It is noted that the Blossom Bat has been encountered within the region including at Koala Beach to the south (Hannah & Lewis, 2007) with significant habitat plantings also occurring at Casuarina Beach.</p> <p>Potential habitat for the Blossom Bat is considered to be absent from the site and it has not been recorded during fauna survey.</p>	V		<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Thersites mitchellae</i>	Possible	<p>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).</p> <p>It is considered that site falls within the known range of the snail and marginal habitats occur in association with</p>	E1	CE	<p>Not recorded. All areas of preferred habitat will be retained in association with the proposal.</p> <p>This species is considered unlikely to be significantly affected by the proposal.</p>

Species	Potential occurrence based upon habitat	Notes	BCA Status	EPBC Status	Comment
		the lowland rainforest although alluvial soils are absent. No snails (or shells) were encountered in these areas during fauna survey.			
<i>Todiramphus chloris</i>	Unlikely	<p>This species is recorded in coastal Australia from Shark Bay to the Clarence River where it is almost exclusively associated with mangrove and estuarine areas (NPWS, 2005; Readers Digest, 2002). Favoured habitat for the Collared Kingfisher is considered to be abundant in the locality in association with the estuarine and riparian zones of the Cobaki Broadwater estuarine zone. Up to 3.5 birds/ha have been encountered within such areas (Sandpiper Ecological, 2001).</p> <p>Preferred estuarine habitats are not present on the site and the species was not recorded during survey efforts. It is considered unlikely that the proposed development will have a significant impact upon this species.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Tyto capensis</i>	Unlikely	<p>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 (Garrett 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 (Olsen 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).</p> <p>Preferred habitat for the Grass Owl is considered to be absent from the site and traversal of rank pasture/exotic grassland and amplified call playback session did not record the species.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>
<i>Tyto novaehollandiae</i>	Unlikely	<p>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 5-10km² 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).</p> <p>The site may fall within the species' large hunting range although eucalypt forest and large trees bearing suitable hollows was not encountered during site surveys. Spotlighting and call playback failed to record the Masked Owl within the subject site.</p>	V	-	<p>Not recorded. Preferred habitat absent.</p> <p>Unlikely to be significantly impacted upon by the proposal.</p>

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)

5.5 Endangered Populations

Endangered populations are listed under Schedule 1, Part 2 of the *Biodiversity Conservation Act 2016*.

The 'Cobaki Lakes and Tweed Heads West population of the Long-nosed Potoroo *Potorous tridactylus* (Kerr 1792) in the Tweed local government area' endangered population within the Tweed Shire. This population is assessed in detail within Bali et al (2003) and is remote from the location of this particular site.

Preferred habitat for the Potoroo is absent from the site and it was not recorded during survey.

The 'Koala *Phascolarctos cinereus* (Goldfuss, 1817) between the Tweed and Brunswick Rivers east of the Pacific Highway' endangered population begins approximately 6km southeast of the site, south of the Tweed River.

Preferred habitat for the Koala is absent from the site and it was not recorded during survey.

5.6 Fauna Corridors/Linkages

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.

It is noted that the southern portions of the site are mapped as being within a sub-regional corridor. It is considered that, following a review of the residual habitats of the site, that significant terrestrial habitats are absent from the areas proposed for the three allotments which are comprised of exotic grassland and associated pasture/environmental weeds.

Higher value is associated with the perimeter forested (native and exotic) areas, although rehabilitation works (refer Attachment 1) are necessary to progressively reduce the impact of weed infestation.



Figure 11: Tweed Shire Council Fauna Corridor Mapping (Source: <https://experience.arcgis.com/experience/fd1f987923044b9b937cd8602f4537d7/>)

5.7 Wetlands and Waterways

No wetlands or waterways are mapped over the site and no such features were recorded during survey with constructed drainage present offsite to the south and a farm dam present offsite to the southeast. Previously (10th September 2015) Tweed Shire Council indicated there may be two drainage lines containing freshwater wetland vegetation traversing the eastern/central exotic grasslands of the site. Such areas have been previously inspected and the following information prepared (Planit, 2016):



Images of mapped Drainage Line / Depression 1

Drainage Line / Depression 1:

The majority of the depressed area is regularly slashed / maintained. Residual vegetation which is not subject to the slashing contains Barner Grass (*Pennisetum purpureum*), Guinea Grass (*Megathyrus maximus*) and occasionally Common Reed (*Phragmites australis*).

It is noted that no areas contained flowing water during the site inspection even though 16.4ml of rainfall fell within the locality the preceding day (recorded at Coolangatta Airport). Only a minor area of the drainage line / depression contained soakage. It is also noted that no amphibians were recorded vocalising throughout the area.

Considering that the area is regularly slashed / maintained, and only minor areas contain soakage it is considered that the drainage line / depressed area is of low value and does not provide significant ecological values.

Drainage Line / Depression 2: The subject area occurs within the southwestern sections of the site and generally runs in a north to south direction.



Images of mapped Drainage Line / Depression 2

Similarly to the previous drainage line / depressed area, the majority of the area is regularly slashed / maintained. Residual vegetation which is not subject to the slashing is primarily dominated by weed species. Grass species recorded includes Bana Grass (*Pennisetum purpureum*), Guinea Grass (*Megathyrsus maximus*) and Common Reed (*Phragmites australis*). Other vegetation recorded throughout the area includes Macaranga (*Macaranga tanarius*), Black Wattle (*Acacia melanoxylon*) and Bracken (*Pteridium esculentum*).

As previous stated, exotic species dominated this area and includes Lantana (*Lantana camara*), Blue Billygoat Weed (*Ageratum houstonianum*), Cobbers Pegs (*Bidens pilosa*), Easter Cassia (*Senna pendula* var. *glabrata*), Devil's Fig (*Solanum chrysotrichum*), Wild Tobacco (*Solanum mauritianum*) etc.

No areas contains flowing water even though 16.4ml of rainfall fell in the locality the preceding day (recorded at Coolangatta Airport).

Considering that the area is regularly slashed / maintained and is heavily infested with exotic species it is considered that the drainage line / depressed area is of low value and does not provide significant ecological values.

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.

The Assessment of Significance is not a 'pass/fail' test or technique based on a scoring system. Instead, the outcome of each factor needs to be considered as to whether effects are likely and whether they are significant (NPWS 1996a). It is further noted that a positive finding in respect of one or more factors of the test of significance does not necessarily lead to the conclusion that an SIS is then required (Talbot in Gales Holdings Pty Ltd v Tweed Shire Council [2006] NSWLEC 212). Rather it allows consideration as to whether a particular effect may be present or occur as a result of the development and whether that effect is likely to be significant.

The test is applied to scheduled flora, fauna, populations and communities (where applicable) to assess potentially adverse impacts of the proposal on threatened species, populations or communities identified on or likely to utilise the site based on available habitat components, geography and local environmental conditions. 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 such it is considered that, of the scheduled species, populations and/or communities described previously within this report, the following 5 species of threatened flora, 12 species of threatened flying fauna and 1 endangered ecological community has been recorded onsite, or are considered potential occurrences within the area based upon available habitat components and may have the potential to be significantly affected through any development of the site (i.e. as a result of minor losses of marginal foraging habitat).

Table 9: Threatened Species, Populations and/or Communities Subject to the 'Test of Significance'

Ecological Communities	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	
Populations	N/A	
Flora	<i>Floydia praealta</i> <i>Lepiderema pulchella</i> <i>Macadamia tetraphylla</i> <i>Syzygium hodgkinsoniae</i> <i>Syzygium moorei</i>	Floyds Ball Nut Fine-leaved Tuckeroo Rough-shelled Bushnut Red Lillipilli Durrobbay
Fauna	<i>Burhinus glallarius</i> <i>Carterornis leucotis</i> <i>Coracina lineata</i> <i>Miniopterus australis</i> <i>Miniopterus orianae oceanensis</i> <i>Mormopterus norfolkensis</i> <i>Myotis macropus</i> <i>Nyctophilus bifax</i> <i>Pteropus poliocephalus</i> <i>Ptilinopus magnificus</i> <i>Ptilinopus regina</i> <i>Saccolaimus flaviventris</i>	Bush-stone Curlew White-eared Monarch Barred Cuckoo-shrike Little Bentwing Bat Large Bent-wing Bat Eastern Freetail Bat Southern Myotis Eastern Long-eared Bat Grey-headed Flying Fox Wompoo Fruit Dove Rose-crowned Fruit Dove Yellow-bellied Sheath-tail Bat

6.1 Significant Impact Criteria in Accordance with the BC Act 2016

As stated within Section 2.5, local development proposals that do not exceed the Biodiversity Offset Threshold are still required to carry out a 'test of significance' in accordance with Section 7.3 of the Act:

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:

- 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.

THREATENED FAUNA SPECIES

Megachiropterans Grey-headed Flying Fox (*Pteropus poliocephalus*)

Local Population

As the noted mega-bat species is wide ranging in the region, it is considered that it is not genetically isolated on the subject site and form part of populations within the wider region. The Bionet database contains fifty-seven (57) records of this species within 10 kilometres from the centre of the site.

Stages of lifecycle potentially affected by development

The habitat and roosting preferences of the nominated bat species are summarised below:

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-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).	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 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

Species	Habitat Preference	Roosting/Breeding
	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).	<p>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).</p> <p>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 Grey-headed Flying foxes. Roosting habitat that:</p> <ol style="list-style-type: none"> 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 site contains a variety of forested habitat containing flowering and fruiting flora species, including camphor laurels, capable of attracting the flying fox to the area. Extensive fruiting and flowering resources are also present within the locality in association with similar rainforest and camphor laurel habitats which cover ~460ha within a 5km radius of the site.

The 3-lot subdivision proposal will result in the removal of a small number of native and exotic flowering or fruiting trees located within a cleared/weed invaded grassland formally utilized as a quarry. It is considered that this reduction in potential habitat is considered unlikely to represent a significant reduction of potential flying fox habitats on the site or within the locality. This removal is not considered to be a significant reduction in the regional foraging base for the Grey-headed Flying Fox. Furthermore, as no roost sites were recorded within the site, it is considered that breeding requirements will not be disturbed as part of the proposal.

As the grey-headed flying fox is considered to be wide ranging species, the proposal will result modification of a marginal area of potential foraging habitat (almost entirely comprised of non-native/exotic species) and no potential roosting sites will be disturbed it is considered unlikely that a significant impact to the species will be occasioned.

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.

Microchiropteran Bats

Local Population

As the noted micro-bat species are 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*)

This species was not recorded on the subject site but is known from the locality (JWA, 2009; Biolink, 2008; Planit, 2009; Planit, 2013). The Bionet database contains 54 records of this species within 10km of the site.

Large Bent-wing Bat (*Miniopterus orianae oceanensis*)

This species was not recorded on the subject site but is known from the locality (JWA, 2009; Biolink, 2008; Planit, 2009; Planit, 2013). The Bionet database contains 13 records of this species within 10km of the site.

Eastern Freetail Bat (*Mormopterus norfolkensis*)

This species was not recorded on the subject site but is known from the locality including adjacent lands to the west (JWA, 2009). The Bionet database contains 1 records of this species within 10km of the site.

Southern Myotis (*Myotis macropus*)

This species was not recorded on the subject site but is known from the locality (Planit, 2009). The Bionet database contains 16 records of this species within 10km of the site.

Eastern Long-eared Bat (*Nyctophilus bifax*)

This species was not recorded on the subject site but is known from the locality (Biolink, 2008). The Bionet database contains 8 records of this species within 10km of the site.

Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)

This species was not recorded on the subject site but is known from the locality (Planit, 2008; Kendall and Kendall, 2008; Parsons Brinkerhoff, 2008). The Bionet database contains 4 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The habitat and roosting preferences of the nominated bat species are summarised below:

Species	Habitat Preference	Roosting/Breeding
Little Bentwing Bat	This species utilises well-timbered habitats including rainforest, <i>Melaleuca</i> swamps and dry sclerophyll forests where it feeds on insects within the canopy.	<p>DECC (2005) note the following particulars with regard to the little bentwing bat:</p> <ul style="list-style-type: none"> - 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, <i>Melaleuca</i> 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 (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young.
Large Bentwing Bat	Utilises a broad range of habits including wet and dry sclerophyll forest, open woodland, paperbark forests, rainforests and open grasslands (North & Pasic, 2005) where they forage upon insects.	Has been found to roost within caves, tunnels, stormwater culverts or disused mining areas (Strahan eds, 2002; DEH, 2005). 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

Species	Habitat Preference	Roosting/Breeding
		bentwing often selects cool areas within caves, mines, tunnels, drains and bridges (Hoye & Hall in Van Dyck & Strahan, 2008).
Eastern Freetail Bat	Recorded in dry eucalypt forest and coastal woodlands but individuals have been captured in riparian zones in rainforest and wet sclerophyll forest and mangrove forests east of the Great Dividing Range (Allison and Hoye, 1995; DEC, 2005). The species forages upon insects above the forest canopy or at forest edges (Allison, 1983).	Known to roost in tree hollows but occasionally found in buildings (Gilmore and Parnaby, 1994; Allison and Hoye, 1995; DEC, 2005).
Southern Myotis	This bat forages over waterbodies where it scoops insects and small fish from the water surface or catches insects aerially (DEH, 2005; Menkhorst, 1996; Richards, 2002). It has been recorded foraging over small creeks, coastal rivers, estuaries, lakes and inland rivers (Law & Anderson, 1999) and other smaller waterbodies including farm dams (Law et al, 1998).	Has been found to roost within caves, tunnels, stormwater culverts or disused mining areas (Strahan et al, 2002; DEH, 2005). 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).
Eastern Long-eared Bat	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).
Yellow-bellied Sheath-tail	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) also notes that burrows of terrestrial mammals in treeless areas or bird nests or sugar glider nests may be utilized.

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 the above indicates that potential habitat for the discussed microbats is present in association with rainforest vegetation located in the west and southeast of the site. The proposed 3 lot subdivision layout provides for the retention of this vegetation community.

The exotic grassland areas also represent a potential foraging area for the Eastern Bentwing and Yellow-bellied Sheath-tail Bats which may forage over such areas although the species has not been recorded from this site. Cleared/grassland areas are considered to be abundant within the locality.

It is noted that the 3-lot subdivision proposal involves the modification of cleared/weed invaded grassland formally utilized as a quarry. It is considered that this reduction in potential habitat is considered unlikely to represent a significant reduction of the discussed microbat habitats on the site or within the locality. This habitat is considered to be marginal (i.e. marginal potential foraging area for the eastern bentwing and yellow-bellied sheath-tail).

A review of the above species indicates that tree cavities, caves/crevices and/or mangrove forests are necessary for roosting/breeding. In addition to providing shelter, maternity places and retreats for hibernation, roosts are also important places for social interactions among bats. The availability of suitable roosts is therefore critical for forest bat survival (Herr, 1998). Within the site it is considered that cave/mine potential breeding sites are absent and hollow

bearing trees are scarce with none to be removed in association with the proposal. Several Archontophoenix palms with hanging fronds potentially suitable for the Eastern Long-eared Bat were also encountered within the western lowland rainforest which will be similarly unaffected by the proposal.

As the recorded threatened micro-bats are considered to be wide ranging species, the proposal will result in modification of an area of marginal foraging habitat potential (almost entirely comprised of non-native/exotic species) and no roosting sites will be disturbed it is considered unlikely that a significant impact to any of the discussed microbat species will be occasioned.

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.

Bush-stone Curlew

The bush-stone curlew has not been recorded onsite.

The following bush stone curlew recordings are noted from the locality:

- Within the Northstar Holiday Resort (TSC, 2011).
- Within North Pottsville (SKM, 2003).
- Within the Creek Street road reserve [western end] at Hastings Point (Planit, 2011).
- From locality database records (Birds Australia/Royal Australasian Ornithologists Union, 2011)
- From locality database records (NPWS Wildlife Atlas, 2011)
- From within the Kings Forest 'Cudgen Paddock' in scattered Scribbly gum on the margin of regrowth heathland (Landpartners, 2008; Aspect North, 2005).
- From a small population within the Koala Beach residential estate (Koala Beach Wildlife and Habitat Management Committee, 2009; DEC, 2006)

No specific population estimates are known from the Terranora/Banora Point locality although the Koala Beach Wildlife and Habitat Management Committee (2009) note that over the last ten years more than twenty juvenile Bush Stone-curlews have been killed by car strike at Koala Beach Estate (further to the south) indicating a breeding population occurs throughout the locality.

DEC (2006) notes that breeding pairs of bush stone curlew are generally sedentary within home ranges estimated to be 250-600ha for foraging year-round, with a core of 10-25ha during breeding. Home ranges are likely to be highly variable in size, depending on the type of habitat, resource availability and level of disturbance within the area' (DEC, 2006; App4 pg 1).

As the bush-stone curlew is likely to be wide ranging in the region, it is considered unlikely that the species would be genetically isolated on the subject site and would form part of the population within the wider region.

The Bionet database contains 14 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The habitat and breeding preferences of the curlew are summarised below:

Habitat Preference	Roosting/Breeding
<p>This species is widespread throughout predominately coastal Australia where its preferred habitat consists of open forest-woodlands containing a grassy understorey with fallen timber and leaf litter (Readers Digest, 2002; NPWS, 2006). 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).</p> <p>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</p>	<p>The Bush Stone-curlew nests on the ground, near dead timber, usually under trees within open woodlands that have an understorey of short grass or among brushwood (Wilson 1989 in NPWS, 1999). The nest site is typically in or near the edge of open grassy woodland or within a cleared paddock where there is good visibility across the surrounding lands</p>

Habitat Preference	Roosting/Breeding
<p>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:</p> <ul style="list-style-type: none"> ○ a low sparse ground cover ○ some fallen timber and leaf litter ○ a general lack of a shrubby understorey ○ open woodlands (DECC, 2006: 8) 	<p>(Johnson and Baker-Gabb 1994 in DECC, 2006).</p>

With regard to the above it is considered that all areas of the site represent potential habitat for the bush stone curlew as it will utilize modified residential habitats, however, preferred grassy eucalypt forest/woodland and associated important structural elements per DECC (2006) are absent.

However, similar to the site, it must also be considered that the majority of the locality also provides potential habitat for the curlew (obviously excluding impervious areas and open water surfaces). This is supported by TSC statements that the curlew exists in proximate areas (Northstar Resort/caravan park further south) which have been developed at a high density with no known domestic animal bans.

It is noted that the 3-lot subdivision proposal involves the modification of cleared/weed invaded grassland formally utilized as a quarry. It is considered that this reduction in potential habitat is considered unlikely to represent a significant reduction of potential curlew habitats on the site or within the locality. This habitat is considered to be marginal (i.e. not reflective of favoured woodland/open forest containing recognised structural elements).

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed action will disrupt the lifecycle of local bush stone-curlew populations to the point that they are at risk of extinction.

Rose-crowned Fruit-dove

As the Fruit-dove is considered to be wide ranging in the region, it is considered that it is not genetically isolated on the subject site and forms part of a population within the wider region.

The rose-crowned fruit-dove was not recorded during fauna survey works of the site although it is known from the locality including lands further to the northwest (Planit, 2009; JWA, 2009; Planit, 2013). The Bionet database contains 16 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The habitat and roosting preferences of the fruit-dove is summarised below:

Species	Habitat Preference	Roosting/Breeding
Rose-crowned Fruit-dove	<p>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 (Recher et al, 1995; Innis, 1989).</p>	<p>The species is considered a partial migrant and moves north in autumn/winter and returning in spring/summer to breed. The nest consists of a platform of sticks and vines within dense vegetation usually with 6m of the ground (Recher et al, 1995).</p>

Although potential rainforest and camphor laurel habitats are present the species has not been encountered on the site. The absence of extensive remnant rainforest habitats limits the significance of the site for Rose-crowned Fruit-dove populations although potential foraging during peak fruiting periods of rainforest trees (particularly the western lowland rainforest areas) and camphor laurels cannot be discounted given the presence of an interconnected, albeit fragmented, corridor of native and exotic vegetation occurring westwards towards Stotts Island.

The 3-lot subdivision proposal will result in the removal of a small number of native and exotic flowering or fruiting trees located within a cleared/weed invaded grassland formally utilized as a quarry. The removal of this vegetation is considered unlikely to represent a significant reduction of potential rose-crowned fruit-dove habitats on the site or within the locality. This modified grassland habitat is considered to be marginal (i.e. not reflective of favoured remnant rainforest).

It is considered that this reduction in potential habitat is considered unlikely to represent a significant reduction of potential Fruit-dove habitats on the site or within the locality. Furthermore, as no roost sites were recorded within the site, it is considered that breeding requirements will not be disturbed as part of the proposal.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed action will disrupt the lifecycle of local rose-crowned fruit dove populations to the point that they are at risk of extinction.

Wompoo Fruit-dove

As the Wompoo Fruit-dove is considered to be wide ranging in the region, it is considered that it is not genetically isolated on the subject site and forms part of a population within the wider region.

One wompoo fruit-dove was sighted during fauna survey works within the western lowland rainforest (but offsite to the west) and the species was also noted vocalising in this area. It is also known from the locality including lands further to the northwest (JWA, 2009; Planit, 2013). The Bionet database contains 4 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The habitat and roosting preferences of the fruit-dove are summarised below:

Habitat Preference	Roosting/Breeding
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).	Breeding in NENSW extends from winter to midsummer with a simple stick platform nest constructed generally below 10m from the ground (Recher et al, 1995).

A review of the available habitats of the site indicates that potential lowland rainforest habitats are available in the west and southeast. All such habitats will be retained in association with the proposal.

As such whilst areas of modified grassland formally utilised as a quarry will be modified in association with the 3-lot subdivision its removal is considered unlikely to represent a significant reduction of potential Wompoo Fruit-dove habitats in the locality and no known roosting/breeding sites will be impacted.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed development will disrupt the lifecycle of local wompoo fruit-dove populations to the point that they are at risk of extinction.

White-eared Monarch

As the Monarch is considered to be wide ranging in the region, it is considered that it is not genetically isolated on the subject site and forms part of a population within the wider region.

The monarch was recorded in the west of the site within Lowland Rainforest habitats, and it is known from the locality including lands further to the northwest (JWA, 2009; Planit, 2013). The Bionet database contains 6 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The habitat and breeding preferences of the Monarch are summarised below:

Habitat Preference	Roosting/Breeding
<p>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). They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads (DEC, 2005).</p> <p>They are highly active when foraging, characteristically sallying, hovering and fluttering around the outer foliage of rainforest trees where they are usually observed high in the canopy or subcanopy (DEC, 2005; Young, 2005).</p>	They breed from about September to March usually nesting high in the canopy, and often at the edge of patches of rainforest (DEC, 2005; Young, 2005).

A review of the available habitats of the site indicates that potential subtropical/lowland rainforest habitats are available in the west and an individual of the species was encountered in this area during January 2015 surveys. As no known foraging or roosting habitat will be removed in association with the proposal it is considered unlikely that a significant impact to the white-eared monarch will be occasioned.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed development will disrupt the lifecycle of White-eared Monarch populations to the point that they are at risk of extinction.

Barred Cuckoo Shrike

As the Barred Cuckoo Shrike is wide ranging in the region, it is considered that it is not genetically isolated on the subject site and would form part of a population within the wider region. The shrike was not recorded during previous fauna survey works of the site.

The Bionet database contains 2 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The habitat and breeding preferences of the barred cuckoo shrike are tabulated below:

Habitat Preference	Roosting/Breeding
<p>This species has been recorded from a variety of habitats including rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses within Coastal NSW (NPWS, 2002). Foraging requirements include fruiting tree species within in rainforest, wet sclerophyll forest, vegetation remnants or isolated trees (DEC, 2005) and insects captured among foliage (NPWS, 2002). Although they do eat insects up to 90% of their diet is freshly plucked fruit and because they swallow fruit whole they only take those of the right size (Readers Digest, 2002). The species is nomadic in search of its food wandering in flocks of often 10-20 but up to more than 50 birds (Readers Digest, 2002; Moorcombe, 2004)</p>	<p>Breeding occurs from September-March within a flat saucer shaped nest of fine twigs, bark and sometimes casuarina needles bound with spider webs in a broad fork of a thick tree branch between 15m and 30m above ground (Moorcombe, 2004; Readers Digest, 2002)</p>

A review of the available habitats of the site indicates that potential lowland rainforest habitats are available in the west and southeast although the species has not been recorded during fauna survey works. These habitats will be retained in association with the proposal.

As such whilst areas of modified grassland formally utilised as a quarry will be modified in association with the 3-lot subdivision its removal is considered unlikely to represent a significant reduction of potential Cuckoo-shrike habitats in the locality and no known roosting/breeding sites will be impacted.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed development will disrupt the lifecycle of barred cuckoo shrike populations to the point that they are at risk of extinction.

THREATENED FLORA SPECIES

Five threatened species of flora were recorded during previous surveys of the site (Aspect North, 2004). The local population of these species is unlikely to be restricted to the habitats of this site and are likely to be found within additional and interconnected remnants of lowland rainforest and mixed highly disturbed camphor laurel/early regrowth rainforest within the locality

Species	Abundance 2004 (Aspect North)	Abundance 2015/2023 Refer Figure 9	Locality Records
<i>Floydia praelta</i>	Noted as infrequent within Lowland Rainforest	Not encountered	The Bionet database contains 0 records of this species within 10km of the site.
<i>Lepiderema pulchella</i>	Noted as infrequent within Camphor Laurel Forest. Noted as occasional within Lowland Rainforest	26 stems	The Bionet database contains 63 records of this species within 10km of the site.
<i>Macadamia</i>	Noted as occasional within	13 stems	The Bionet database contains 62

Species	Abundance 2004 (Aspect North)	Abundance 2015/2023 Refer Figure 9	Locality Records
<i>tetraphylla</i>	Lowland Rainforest		records of this species within 10km of the site.
<i>Syzygium hodgkinsoniae</i>	Noted as infrequent within Lowland Rainforest	4 stems	The Bionet database contains 6 records of this species within 10km of the site.
<i>Syzygium moorei</i>	Noted as occasional within Lowland Rainforest	7 stems	The Bionet database contains 30 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The habitat preferences of the recorded threatened plant species are tabulated below:

Species	Habitat Preference
<i>Floydia praealta</i>	<p>The Ball Nut occurs in small, scattered populations from Gympie, Queensland, southwards to the Clarence River in north-east NSW, where it inhabits riverine and subtropical rainforest, usually on soils derived from basalt (DECC, 2005) or in coastal scrub (Foreman, 1995) from Gympie, Queensland, south to the Clarence River, near Dorrigo in north-east NSW (Floyd 1989; Foreman 1995a; Harden 2000; Quinn et al. 1995).</p> <p>Individuals may live for more than 100 years, with a juvenile period of 10 years (Queensland CRA/RFA Steering Committee 1997). Flowering of the Ball Nut has been recorded from January to February (Floyd 1989; Foreman 1995a; Harden 1991; Quinn et al. 1995) and January to July (Forster et al. 1991). Fruits have been recorded as present between January and June (Floyd 1989), though Harden (1991), Foreman (1995a) and Quinn and colleagues (1995) suggest fruit is present closer to June only (Department of the Environment (2015). <i>Floydia praealta</i> in Species Profile and Threats Database online: http://www.environment.gov.au/sprat).</p>
<i>Lepiderema pulchella</i>	<p>"<i>Lepiderema pulchella</i> occurs in lowland subtropical rainforest and in New South Wales is largely confined to infertile metasediments in the Tweed Valley. There are few populations of mature trees in conservation reserves, and the number of adult trees in individual sites is small, mostly less than 20" (NSWSC, 2011 online: http://www.environment.nsw.gov.au/determinations/LepideremaPulchellaVulSpListing.htm).</p> <p>Two recent surveys (Planit, 2008) including small patches of lowland/subtropical rainforest and mixed camphor laurel/early regrowth rainforest within Terranora and Bilambil have recorded >400 stems of this species within the locality, predominately within lowland/subtropical rainforest.</p>
<i>Macadamia tetraphylla</i>	<p>"Rough-shelled Bush Nut occurs from north-east New South Wales (chiefly in the Richmond & Tweed River areas) to south-east Queensland (Mt Glorious, near Brisbane) (Stanley & Ross, 1986; Floyd, 1989; Gross, 1995; Sheringham & Westaway, 1995). Populations at any given location tend to be small, with fewer than 20 individuals (Fanning et al., 1998). Populations in the south-east Queensland Regional Forest Agreement area are estimated at 350 mature individuals in 12 populations (Queensland CRA/RFA Steering Committee, 1997). There are no population estimates available for New South Wales. The geographic range of the Rough-shelled Bush Nut is estimated to be less than 100 km (Briggs & Leigh, 1996). Rough-shelled Bush Nut occurs in subtropical rainforest and notophyll vine forest in near coastal areas. It is often found on steep slopes, especially at ecotones" (TSSC, 2008adi: 1).</p> <p>'Rough-shelled Bush Nut is estimated to have a lifespan of over 100 years, with a juvenile period greater than six years (Queensland CRA/RFA Steering Committee 1997). Rough-shelled Bush Nut flowers from August to October and is recorded fruiting between January and April. The species reproduces from seed and seed dispersal is via streams. Clean nuts germinate within a period of two weeks and the seed remains viable for a period of a few weeks to six months. Seeds of this species are subject to Black Rat (<i>Rattus rattus</i>) predation" (DoE, 2015 online: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=6581).</p>
<i>Syzygium hodgkinsoniae</i>	<p>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; NSW NPWS, 2002). The species occurs mostly as scattered individuals along watercourses, where the habitat is frequently limited and degraded (Landmark Ecological Services, Ecograph & TerraFocus, 1999). Recorded occurrences in NSW include Toonumbar and Unumgar State Forests, Big Scrub and Minyon Falls Forest Reserves, Davis Scrub and Brunswick</p>

Species	Habitat Preference
	<p>Heads Nature Reserves, as well as sites at Lismore, Alstonville, Wardell, Hayters Hill, Mullumbimby, Billinudgel, Crabbes Creek, Burringbar, Eungella, Upper Oxley and Couch Creek (Floyd, 1989; Sheringham & Westaway, 1995; NSW NPWS, 2002). There are 37 recorded occurrences of this species in the Byron Bay Local Government Area (LGA), of which 12 are within Nature Reserves. There are four recorded individuals in Tweed LGA (Tweed Shire Council, 2002)" (TSSC, 2008agi: 1)</p> <p>"Smooth-bark Rose Apple flowers have been recorded in January to May (Floyd 1989), June, November and December (Hyland 1983). Ripe fruits have been found in August to November (Floyd 1989) and May (Hyland 1983)" (DoE, 2015 online: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=3539)</p>
<i>Syzygium moorei</i>	<p>"Rose Apple 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 Mudgeeraba Creek and Upper Tallebudgera Creek in south-east Queensland (Floyd, 1989). This species occurs within the Northern Rivers (NSW) and Border Rivers Maranoa-Balonne (Queensland) Natural Resource Management Regions. Recorded occurrences include Emigrant Creek, Hayters Hill, Mullumbimby, Crabbes Creek, Burringbar, Big Scrub, Dum Dum, Eungella, Couchy Creek, Durobby Creek and Hogans Scrub. Individual plants are conserved within several conservation reserves, including Inner Pocket, Brunswick Heads, Tyagarah and Broken Head Nature Reserves (Floyd, 1989; NSW NPWS, 2002).</p> <p>Rose Apple is most commonly found in Subtropical Rainforest <i>Argyrodendron trifoliatum</i> Alliance, including sub-alliance</p> <p>1 (<i>Argyrodendron trifoliatum</i>) on lowland krasnozom; suballiance</p> <p>2 (<i>Toona-Flindersia</i> spp.) on lowland alluvium; and sub-alliance</p> <p>ii (<i>Archontophoenix-Livistona</i>) on alluvium with excess moisture (Floyd, 1990).</p> <p>Stands of the <i>A. trifoliatum</i> Alliance originally occurred on the best potential agricultural land, so consequently was mostly cleared, with the exception of small patches occurring in floodprone, stony or poorly drained soils.</p> <p>There are 75 recorded occurrences of this species in the Byron Bay Local Government Area (LGA), although in many cases the record relates to one isolated individual. Two of the records are located within nature reserves (Landmark Ecological Services, Ecograph & Terrafocus, 1999). There are 40 recorded individuals in Tweed LGA (Tweed Shire Council, 2002) and three in Queensland (Biodiversity Assessment & Management, 2006)." (TSSC, 2008vp: 1)</p>

Recorded habitat for all of the threatened species is associated with Lowland Rainforrest and Camphor Laurel Forest also providing habitat for the *Lepiderema* (previously noted in this area by Aspect North, 2004). In association with the 3-lot subdivision all individuals of the threatened flora species encountered to be retained in their existing habitats.

It is noted that the 3-lot subdivision proposal involves the modification of cleared/weed invaded grassland formally utilized as a quarry. It is considered that removal of this vegetation is unlikely to represent a significant reduction of potential habitats for the discussed threatened flora on the site or within the locality and no specimens were observed within the grassland/weeded community in 2004, 2015/16 or 2023.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed development will disrupt the lifecycle of the recorded threatened flora populations to the point that they are 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,

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:

(ii) 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.

LOWLAND RAINFOREST IN THE NSW NORTH COAST AND SYDNEY BASIN BIOREGIONS

Those areas considered to be reflective of the above listed EEC as described by the Scientific Committee are displayed in Figure 9 and discussed in Section 3.2.1.

The local occurrence of this EEC is considered to be that occurring on the site (~1.37ha), that contained within bushland contiguous with the EEC of the site connected to other mapped lowland rainforest EECs in nearby areas [but excluding non-connected incidences of early regrowth rainforest and all floodplain rainforests] and other mapped areas of lowland/subtropical rainforest within the locality (~169ha per Kingston et al mapping, 2004; OEH UNE CRAFTI Vis 1108, 2012). Kingston et al (2004) notes the presence of 8919ha of this vegetation type (described type TVMP102) within the Tweed LGA.

As displayed on Figure 9 all mapped Lowland Rainforest areas will be retained in association with the 3-lot subdivision proposal. Furthermore a draft Environmental Management Plan (refer Attachment 1) has been prepared which is recommended to be implemented to progressively decrease the existing risk of native flora species diversity reduction through exotic species dominance.

Conclusion

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

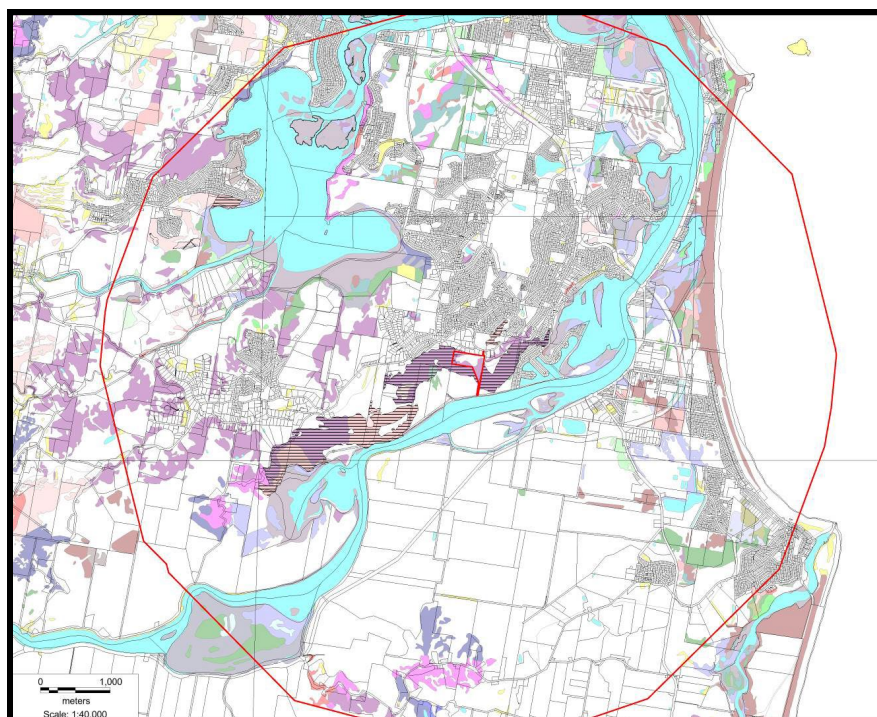


Figure 12: Potential Local Occurrence Of Eec Lowland Rainforest [Includes Similar But Uninspected Mapped Tvmp Vt1002 Contiguous With Tvmp Vt102 & 103]

- c. *in relation to the habitat of a threatened species or ecological community:*
- the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,*
 - 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*
 - 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 the Lowland Rainforest and to a lesser extent Camphor Laurel Forests represent potential or recorded habitat for listed the discussed threatened flora and fauna species and the Lowland Rainforest represent habitat for the discussed EEC. These communities cover ~3.73ha of the site and will be retained although most areas are considered highly disturbed due to weed invasion and fragmentation.

~460ha of mapped similar habitat (VT102, 103, 1002, 1004) occurs within 5km of the site. The regional (Shirewide) occurrence of these habitat types are noted to cover >15700ha per the TVMP (2004).

It is noted that the 3-lot subdivision involves the modification of cleared/weed invaded grassland (Vegetation Community 1) formally utilized as a quarry. As analyzed within this 5-part test these heavily disturbed areas represent marginal habitat for the rose-crowned fruit dove, grey-headed flying fox, bushstone curlew, yellow-bellied sheath-tail bat and eastern bentwing bat. ~2000ha of mapped similar habitat (VT1099) occurs within 5km of the site. The regional (Shirewide) occurrence of this habitat type is noted to cover >59000ha per the TVMP (2004).

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).

In association with the development proposal it is considered that the potential impacts associated with habitat fragmentation, barrier and edge effects on the ecological processes and biodiversity of the native bushland of the site will be minor given the development envelope is recommended to be restricted to an area which was formally utilized as a quarry and is now occupied principally by grasses and weeds. Restriction of the development to this area will ensure that the Lowland Rainforest habitats will not be fragmented, no physical barriers are introduced into the retained vegetation area as a result of the proposal and the existing canopy/treed edges not altered.

Additionally, the potentially occurring threatened species are considered to be highly mobile occupying large home ranges or dispersal ability and are unlikely to be precluded from using the habitats surrounding local area as a result of the 3-lot residential subdivision.

To ensure terrestrial fauna dispersal can continue through the retained vegetation of the site the following is proposed:

- No clearing of vegetation (other than weed species) is permitted within the retention areas
- No free roaming of domestic animals is permitted within the retention areas

The following management initiatives are recommended in association with the development to reduce the impact of existing 'edge effects' on the retained, vegetation:

- Implementatoin of the weed management and rehabilitation plan (within the Draft EMP) contained in Attachment 1 with the aim of reducing existing weed abundance on the site which is likely to be suppressing native regeneration in numerous areas

Reviewing the above, it is considered that the proposal will not result in a significant area of habitat for a threatened species, population or ecological community to become isolated from currently interconnecting or proximate areas of habitat for threatened species, populations or ecological communities. Further the proposal is unlikely to adversely impact upon or alienate movement corridors or limit dispersal options for any threatened 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 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 10: BCA Key Threatening Processes

THREATENING PROCESS	COMMENT
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, <i>Manorina melanocephala</i>	Not applicable

THREATENING PROCESS	COMMENT
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	<p>The proposed development envelope 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:</p> <p>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)</p> <p>However, a review of this report notes that clearance will be restricted to a small area previously cleared and quarried and the level of <u>native vegetation</u> clearing proposed is very minor and unlikely to significantly impact upon the viability of threatened fauna species and habitat values available within the site and surrounding locality.</p>
Competition and grazing by the feral European rabbit (<i>Oryctolagus cuniculus</i>)	Not applicable
Competition and habitat degradation by feral goats (<i>Capra hircus</i>)	Not applicable
Competition from feral honey bees (<i>Apis mellifera</i>)	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 (<i>Solenopsis invicta</i>)	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	Not applicable

THREATENING PROCESS	COMMENT
disease chytridiomycosis	
Infection of native plants by <i>Phytophthora cinnamomi</i>	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 (<i>Bombus terrestris</i>)	Not applicable
Invasion and establishment of exotic vines and scramblers	Several exotic vines species were recorded onsite. Control methods to manage such species are included within the draft EMP
Invasion and establishment of Scotch broom (<i>Cytisus scoparius</i>)	Not applicable
Invasion and establishment of the cane toad (<i>Bufo marinus</i>)	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 <i>Olea europaea</i> L. subsp. <i>cuspidata</i>	Not applicable
Invasion, establishment and spread of <i>Lantana camara</i>	Lantana was recorded onsite. Control methods to manage such species are included within the draft EMP
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)	Not applicable
Invasion of native plant communities by exotic perennial grasses	Several exotic grass species were recorded on site. Control methods to manage such species are included within the draft EMP
Invasion of the yellow crazy ant (<i>Anoplolepis gracilipes</i> (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 (<i>Canis lupus familiaris</i>)	Dogs are well known from the locality. The proposal is unlikely to increase the impacts of this listed threatening process. Domestic dogs associated with the 3-lot residential subdivision will be restricted from free roaming within the vegetation retention zones.
Predation by the European red fox (<i>Vulpes vulpes</i>)	Foxes are well known from the locality. The proposal is unlikely to increase the impacts of this listed threatening process.
Predation by the feral cat (<i>Felis catus</i>)	Cats are well known from the locality. The proposal is unlikely to increase the impacts of this listed threatening process. Domestic cats associated with the 3-lot residential subdivision will be restricted from free roaming within the vegetation retention zones.
Predation by <i>Gambusia holbrooki</i> Girard, 1859 (plague minnow or mosquito fish)	Not applicable
Predation by the ship rat (<i>Rattus rattus</i>) on Lord Howe Island	Not applicable
Predation, habitat degradation, competition and disease	Not applicable

THREATENING PROCESS	COMMENT
transmission by feral pigs (<i>Sus scrofa</i>)	
Removal of dead wood and dead trees	Not applicable

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

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

6.2 State Environmental Planning Policy (Koala Habitat Protection) 2021

Koala SEPP 2021 applies to land zoned Residential in Tweed Shire. Part 2 of the SEPP provides that the development assessment process for koala habitats for land to which an approved koala management plan applies is as follows:

- The council's determination of the development application must be consistent with the approved koala plan of management that applies to the land

As such the development must be assessed and deemed consistent with the Tweed Coast Comprehensive Koala Plan of Management which is taken to be an approved KPoM and was approved by the Department of Planning, Industry and Environment under SEPP (Koala Habitat Protection) 2021 on 17 March 2021.

The proposal has been assessed against the TCCKPoM as required in the below section.

6.3 Tweed Coast Koala Comprehensive Plan of Management

The site is mapped as being within the TCKCPoM area, however, the site is not mapped as containing preferred koala habitat or being within a koala management precinct. The site falls within the Tweed Heads Koala Management Area for which the following is noted per TSC 2015:

"For the purposes of this Plan; the Tweed Heads KMA representing the broader Tweed Heads area north of the Tweed River; and the Southern Tweed Coast KMA representing the rest of the Tweed Coast.

The future management of these two areas differ in their recovery potential. North of the Tweed River, the Habitat Study showed evidence of a highly depleted population on the brink of local extinction, the recovery of which does not appear possible due to lack of suitable habitat to support a long-term population and ongoing urban intensification."

As stated, the site is not mapped as containing Preferred Koala Habitat (refer to Figure 13), no koala food trees occur, and the koala has not been recorded during either 2004 or 2015 or 2023 surveys and as such is not considered to be an important area of koala activity.



Figure 13: Tweed Preferred Koala Habitat Mapping (Online:
<http://tweedsc.maps.arcgis.com/apps/webappviewer/index.html>)

Regardless, the koala development assessment pathway as highlighted below has been completed overpage:

KOALA DAP RESPONSE

YES

YES

NO

NO

NO

NO

NO

NO

NO

NO

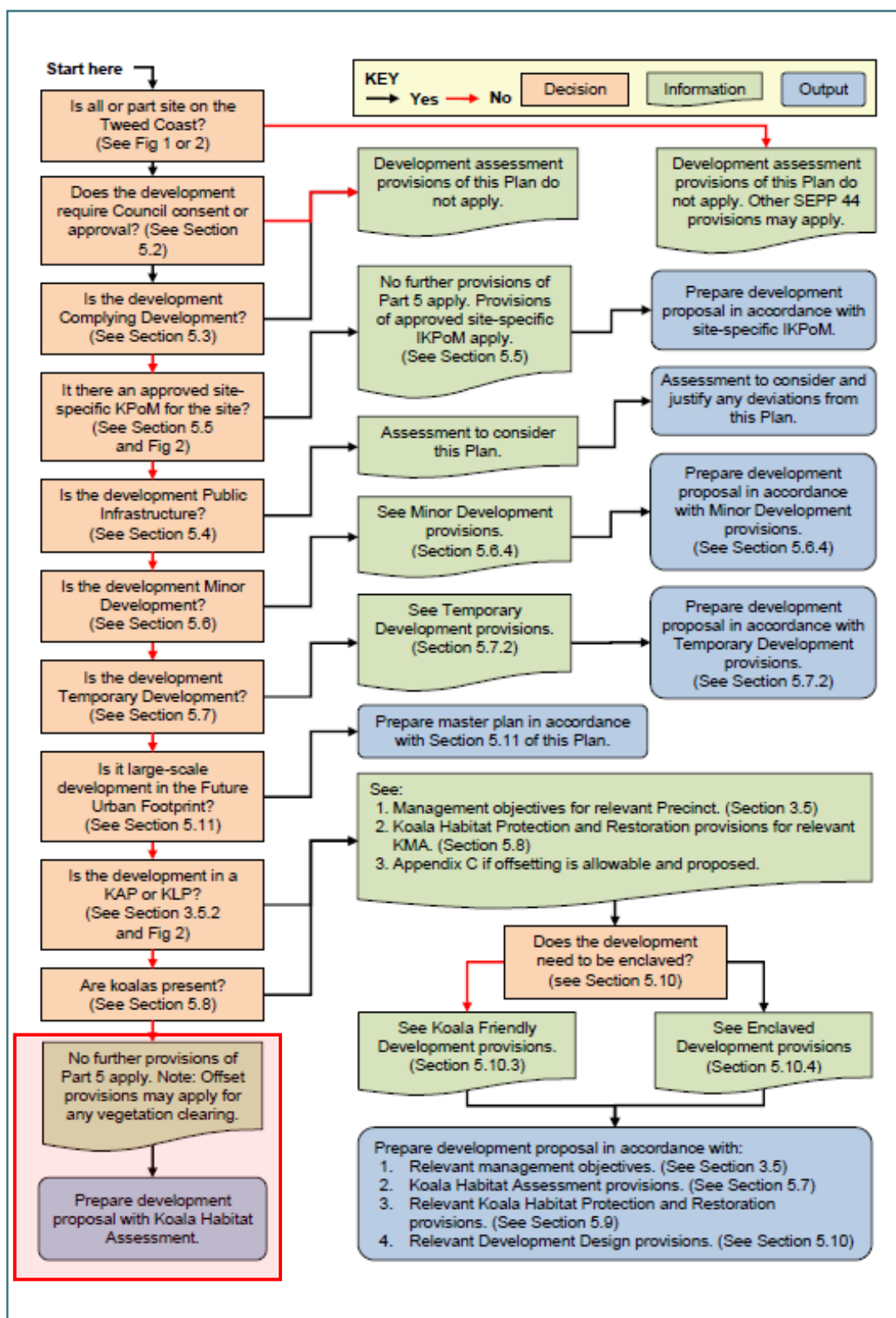


Figure 3 Development Assessment Pathway

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:

- o Areas of high conservation value are affected.
- o 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.
- o 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.
- o The impacts are likely to be long-term in duration.
- o The impacts are likely to be permanent and irreversible.

In this instance it is noted that the proposal has been carefully designed to be restricted to a largely maintained and pastoral/grassland area almost entirely comprised of exotic/weed flora species which was previously occupied by a quarry.

Consequently, no threatened flora or fauna, or EECs are expected to be significantly impacted upon as a result of the 3-lot residential subdivision. Additionally, no endangered populations or AOBVs occur on site or within proximate areas.

Although the potential impacts of the proposed action on threatened biodiversity are not considered significant (as discussed in detail within Section 6.1), mitigation measures are proposed to manage potential secondary impacts (refer Section 8).

7.2 Impacts to Native Vegetation

Clearing of vegetation (almost entirely exotic/weed vegetation) will be the major direct impact associated with the intended development although this clearing will be restricted to highly modified paddock (exotic species) areas. As discussed in this report it is considered that these works are unlikely to have a significant ecological impact.

The removal of native trees to facilitate the three allotments will be limited to isolated small macaranga, swamp oak and blackwoods in the central paddock.

7.3 Impacts to Fauna Habitat

The proposal will involve the modification of primarily exotic vegetation within the northern paddock/grassland to deliver the 3 new residential allotments. These proposed vegetation removal/modification works are not considered to represent a significant impact upon the endemic fauna assemblage of the site or locality. The area to be modified has been selected to minimize native tree removal and avoids the forested (native and exotic) communities of the site focusing upon consolidation of impacts within a previously quarried area.

It is acknowledged that any clearing of vegetation may impact upon fauna habitat elements including loss of feeding resources, removal of dead timber (fallen and standing), removal of low levels of ground strata, debris and leaf-litter. Such elements are necessary (depending upon species) for shelter, refuge from predators, feeding, temperature regulation and breeding. Typical additional impacts associated with vegetation clearing 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 the above potential resources will be occasioned due to the restriction of the development footprint to a modified habitat area which was formally used as a quarry. None of the trees to be removed were noted to bear hollows and as such loss of potential breeding/roosting sites for hollow dependent arboreal mammals, microchiropteran bats and avifauna will not be occasioned.

It is also considered that an 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 location of the development within an existing open/modified habitat which is currently fragmented and exposed to edge impacts.

Furthermore, the retained forested areas of the site are proposed to be rehabilitated/restored in accordance with Attachment 1.

7.4 Fauna Mortality/Injury

Any level of construction/building work 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/building 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 hybridization, 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 occupies 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 harbor other pest species that can, in turn, have a detrimental effect.

As discussed in this report, weeds are abundant across the site with the potential for ongoing suppression of natural regeneration within forested areas. To minimise the potential future impact of unmitigated continued spread of weed species it is considered appropriate that a weed management and regeneration/restoration works be progressively undertaken.

A weed management and rehabilitation plan has been prepared in this regard (refer Figure 1) which is summarised in Figure 14 below.

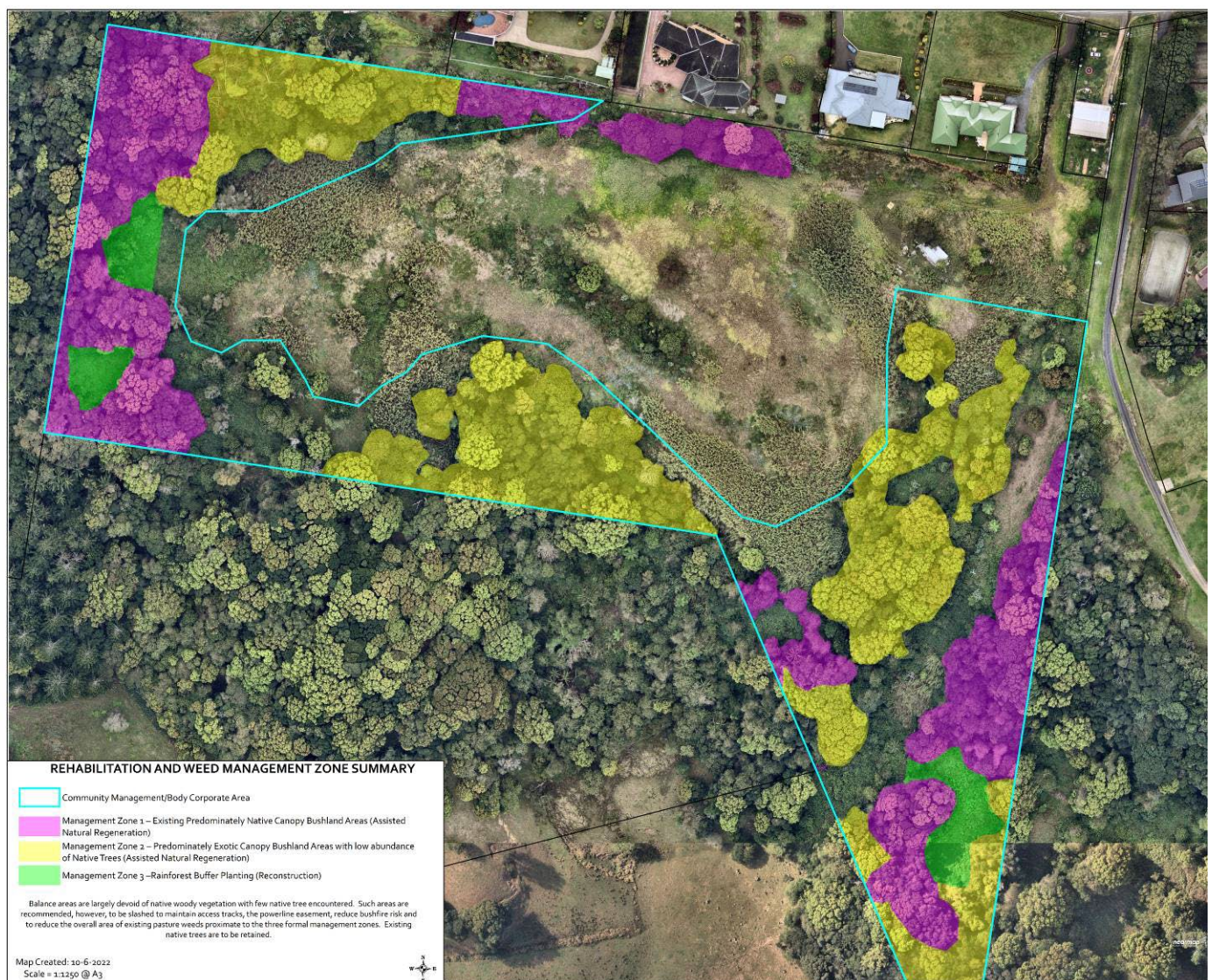


Figure 14: Rehabilitation And Weed Management Zone Summary

7.6 Mortality Associated with Roadways/Vehicle Strikes

Roads and traffic are widely accepted as having impacts upon terrestrial wildlife. "Roads cut across landscape features and divide wildlife habitats. Consequently, they are one of the main obstacles to the movement of land vertebrates

(Yanes *et al.* 1995). The implications of movement barriers to wildlife populations are considerable. Barriers tend to create metapopulations (subpopulations) where a road divides a large continuous population into smaller, partially isolated local populations (Forman and Alexander 1998). Small populations fluctuate in size more widely and have a higher probability of extinction than do large populations (van der Zande *et al.* 1980). In addition, disruption of population dispersal (Mansergh and Scotts 1989) and recolonisation (Mader 1984; Andrews 1990) may result from the barrier-effect of roads.

Roads also result in vehicle collisions with wildlife (roadkill) and can represent a significant source of mortality for declining populations of some wildlife species (Harris and Gallagher 1989; Saunders 1990; Sheridan 1991; Scott *et al.* 1999).

Larger species or species with restricted distributions, or those regularly in contact with roads (e.g. migration paths or home ranges), are those most affected by roadkill (Bennett 1991; Forman and Alexander 1998) [in Taylor and Goldingay, 2003]". Mortality rates can also be particularly high for species which are slow moving (i.e. arboreal mammals), those which become distracted by vehicle lights (i.e. kangaroos) and those which require many individual movements to cross the roadway (i.e. small reptiles and amphibians).

It is widely accepted that terrestrial fauna (in particular koala) mortality associated with vehicle strike on roadways intersecting or proximate to habitat represents a serious through to the ongoing viability of populations (Dique *et al.* 2003; NPWS, 2003; McAlpine *et al.* 2007; EPA, 2006). Vehicle strikes are heightened where arterial and other roads bisect bushland, remnant bushland or urban habitat areas, resulting in high mortality of resident koalas, or limited success of dispersing animals that must crossroads to reach suitable habitat and mates (Dique *et al.* 2003 in EPA, 2007). NPWS (2003) note that habitat bisecting roadways are particularly likely to lead to increased vehicle strike where traffic volume is high, speeds exceed 60km/hr, where visibility of road edges is reduced and/or where lighting is absent.

In this instance whilst a new internal cul-de-sac is intended to be created this will be installed in the previously cleared area of the site which was utilized as a quarry and is now occupied principally by weeds and represents poor fauna habitat and a reduced area of native animal dispersal. Certainly the road will not fragment existing significant areas of fauna habitat or threaten the viability of any local or regional fauna corridors. Protection of the forested (native and exotic) habitats will ensure that the majority of potential fauna habitat is retained and terrestrial fauna dispersal options around the development envelope east-west are maintained.

As such it is considered unlikely that the proposed internal roadway will cause substantial and ongoing vehicle mortality or represent a significant barrier to fauna dispersal across the site.

7.7 Predation / Disruption by Cats and Dogs

Pest/domestic animals (i.e. foxes, dogs and cats) are noted to be established within the locality. Mortality of fauna (especially koalas) as a result of dog attacks is considered to be a key conservation concern for koala management with some studies reporting that dog attacks account for between 5% and 40% of total recorded mortalities (McAlpine *et al.* 2007). Within the 'koala coast' of SEQLD an average of 300 koalas each year die as a result of dog attacks (EPA, 2006). Studies into dispersal patterns of koalas undertaken by Dique *et al.* (2003) indicates that in addition to mortality the presence of dogs within or proximate to habitats is likely to disrupt behaviour and associated dispersal options which can lead to those impacts discussed in 7.5 above. The risk of predation can strongly alter the behaviour and activity of potential prey (Lima and Dill 1990). In assessing predation hazards, many species use remote cues of risk because of the dangers of direct encounters with predators, including avoidance of open areas (e.g. Banks *et al.* 1999) or changing the time that they forage (in Banks *et al.* 2003; 406). Wild dogs may also potentially carry diseases such as distemper and an array of parasites e.g. hydatids).

Cats also have direct impacts on native fauna through predation. 'They can kill vertebrates weighing as much as 3kg (Dickman 1996), but preferentially kill mammals weighing less than 220g and birds less than 200g. They also kill and eat reptiles, amphibians and invertebrates (Dickman 1996). Cats can also have indirect effects on native fauna by carrying and transmitting infectious diseases (DEH 2004). They are thought to have contributed to the extinction of many small to medium-sized mammals and ground-nesting birds in the arid zone, and to have seriously affected populations of bilby, mala and numbat (DEH 2004)' (DEWHA, 2008).

To reduce the potential impact of unrestrained domestic animal impact (predation/harassment) on native fauna the following is proposed in association with the 3-large lot residential development:

- Production animals and/or livestock or similar, including but not limited to horses, cattle, sheep and goats, are prohibited from being kept within the community title Environmental Management Areas (i.e. the retained bushland areas)
- No domestic animals may roam free within the Environmental Management Areas
- Domestic animals are prohibited from entering the Environmental Management Area unless restrained at all times (i.e. on leash).
- Domestic animals unrestrained (i.e. free roaming) must be confined to the designated private allotments within:
 - o A native fauna exclusion enclosure (i.e. cat or dog run, a fenced in paddock etc), OR
 - o Anywhere on the private allotment if the boundaries of the allotment are fenced with native fauna exclusion fencing

The above is considered a potentially significant benefit to the existing 'as of right' uses of the site.

8 Measures to Avoid and Minimise Ecological Impacts

8.1 Protection and Avoidance

It is noted that a range of planning constraints were considered during the design process for the three new residential allotments within the R5 zone footprint established by the previous Gateway Determination (Reference No. PP_2017_TWEEED_003_01).

Following the flora and fauna surveys (outlined in the preceding sections) and analysing the potential impacts of the refined subdivision proposal, it is considered that ecologically significant areas are absent from the 3-lot residential subdivision development footprint. This is largely due to the absence of tracts of native bushland and typically associated important fauna habitat and dominance of exotic vegetation within the former quarrying area.

The consolidation of development impacts to the highly disturbed grassland/weedland habitat which were previously quarried has been included in the development design to ensure the retention of the forested areas of the site, including patches of Lowland Rainforest.

8.2 Mitigation Measures

The following measures are proposed to mitigate potential impacts associated with the proposed 3-lot residential subdivision:

8.2.1 Impact of Vegetation and Habitat Clearing

Disturbance to primarily exotic/weed 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 it will be necessary to clearly identify and mark the boundaries of the clearance zone prior to construction/building works. Such boundaries are to be protected via high visibility fencing, sediment fencing and signage identifying that no construction activities (including temporary storage, stockpiling, vehicle movement etc) are permitted beyond.

A wildlife spotter catcher is to be utilized during all phases of clearing of the site to ensure safe dispersal and relocation/dispersal of native fauna. As areas of rank grassland which may be utilised by native rodents during regular foraging forays will be removed a load reduction trapping exercise prior to clearing of the development envelope has been recommended previously. This exercise can be implemented quite simply by installing a silt fence at the outer edge of future approved works/clearing zones and undertaking cage and Elliot trapping over four nights prior to clearing. Captured individuals are to be placed within the habitat on the retained side of the silt fence to minimise potential re-entry to the clearance/construction zone.

Salvageable habitat components such as dead stems or ground logs shall also be stockpiled and randomly dispersed throughout the retained bushland external to the development envelope.

8.2.2 Weed Management

A weed management plan has been prepared (Attachment 1) and is to be implemented to progressively reduce the weed infestations noted within the vegetation retention areas and to allow for natural regeneration of native species which is currently being suppressed in numerous areas by uncontrolled exotic growth.

8.2.3 Domestic Animal Management

To mitigate the potential impact of domestic animals on resident fauna the following measures are proposed:

- Imposition of a 'dog and cat restriction' covenant as follows:
 - Dogs and cats on the allotment shall not be permitted unrestrained in areas external to the designated dwelling envelope

The above is considered a potentially significant benefit to the existing 'as of right' uses of the site.

8.2.4 Compensatory Restoration/Revegetation Works

To compensate for the minor loss of small native trees from the development envelope it is recommended that ~2345² of rainforest trees be planted within existing canopy gaps in the southwestern corner of the vegetation areas to be retained as documented within Attachment 1.

8.3 RESIDUAL IMPACTS

Many of the potential impacts of the development on flora and fauna values have been either avoided or minimized through the design process or are considered to be adequately mitigated or managed in the context of the existing ecological values of the site. Impacts that cannot, or are not, proposed to be mitigated (in the context of the residential development as proposed) are considered to be residual impacts

- Loss/modification of Vegetation Community 1 (cleared/modified grassland area) in the northern paddock.
- Loss of minor residual fauna habitat associated with the above.
- Loss of a small number of native trees (swamp oak, macaranga, blackwood) within the previously quarried northern paddock providing potential foraging habitat for flying mammals and avifauna
- Intensifying an existing dispersal barrier to terrestrial fauna dispersal within the previously quarried area of the site.

It is considered that weed management works to promote natural regeneration and revegetation/restoration plantings as outlined in Sections 8.3.1 and 8.3.2 are suitable ecological compensation for these residual impacts.

Attachments

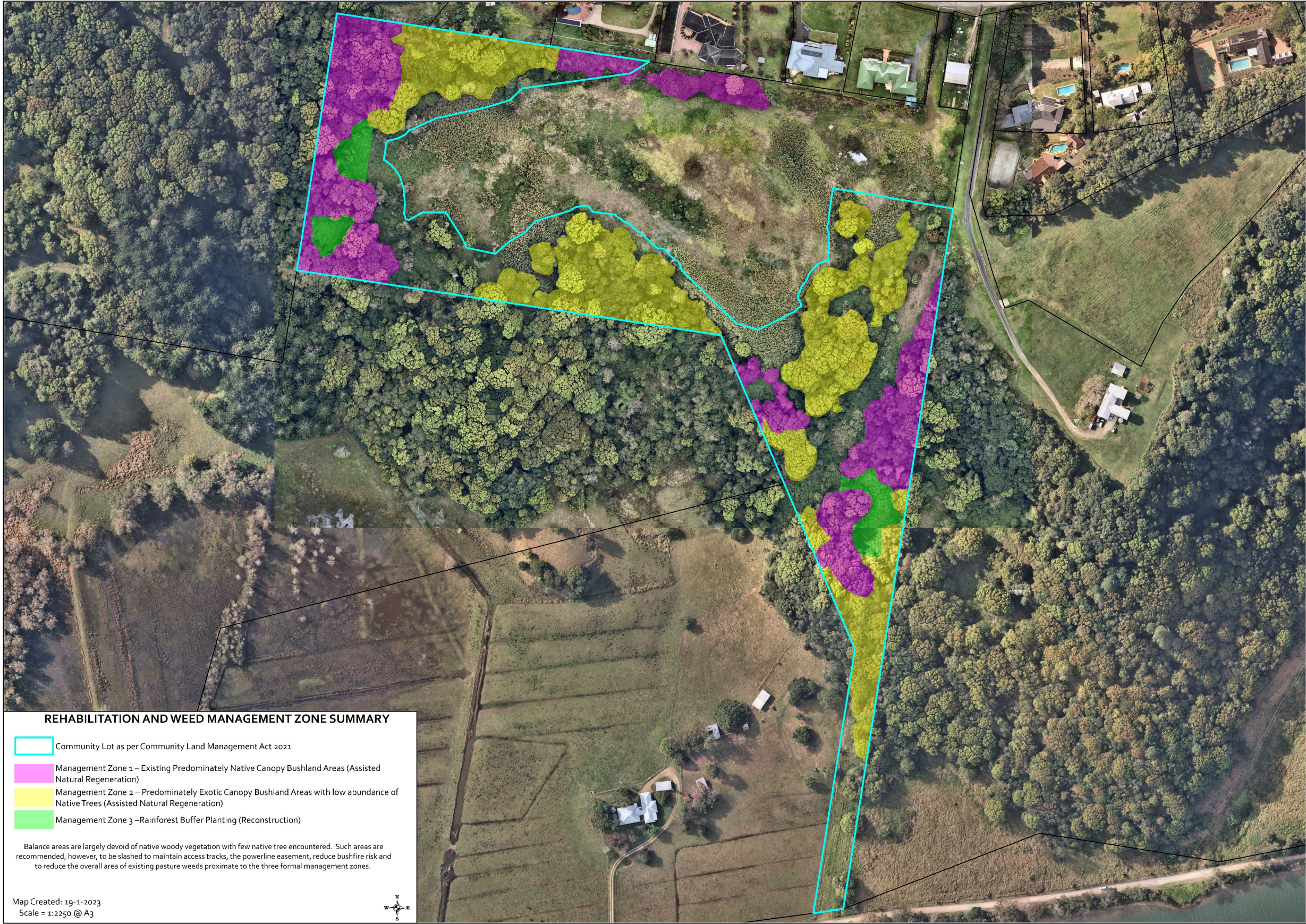
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- Attachment 1 – Draft Environmental Management Plan**
 - Attachment 2 – Previous Flora and Fauna Assessment**
 - Attachment 3 – NSW Bionet Database Records (2023)**

ATTACHMENT 1

DRAFT ENVIRONMENTAL MANAGEMENT PLAN



225 TERRANORA ROAD, BANORA POINT DRAFT ENVIRONMENTAL MANAGEMENT PLAN



PROJECT:
225 TERRANORA ROAD, BANORA POINT

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DRAFT ENVIRONMENTAL MANAGEMENT PLAN

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MZ1-LOWLAND RAINFOREST WEST



MZ1-LOWLAND RAINFOREST WEST



MZ1-LOWLAND RAINFOREST WEST



MZ1-LOWLAND RAINFOREST WEST



MZ1-REGENERATNG LOWLAND RAINFOREST EAST



MZ1-REGENERATNG LOWLAND RAINFOREST EAST



MZ1-REGENERATNG LOWLAND RAINFOREST EAST



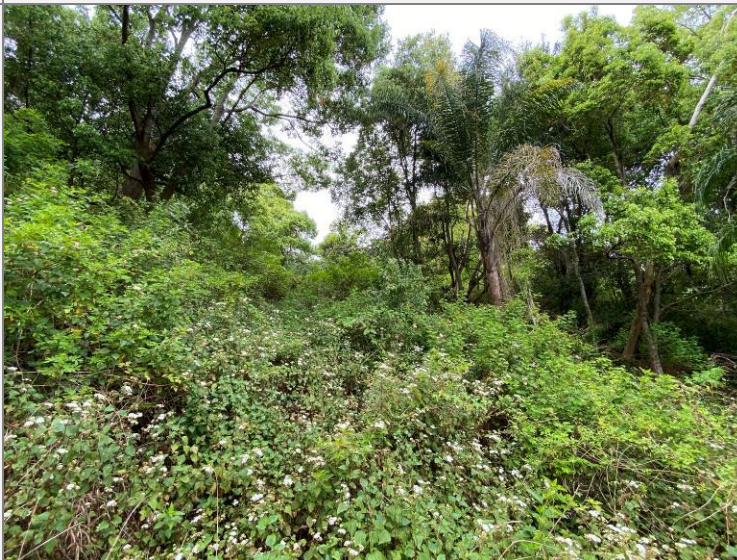
MZ1-REGENERATNG LOWLAND RAINFOREST EAST



MZ1-DISTURBED MACARANGA REGROWTH ON NORTHERN BATTER



MZ1-DISTURBED MACARANGA REGROWTH ON NORTHERN BATTER



MZ2-CAMPHOR LAUREL HIGHLY WEED INFESTED AREAS



MZ2-CAMPHOR LAUREL HIGHLY WEED INFESTED AREAS

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WEED MANAGEMENT AND REHABILITATION INTRODUCTION

A substantial amount of rehabilitation research has been conducted and compiled in association with the below reference documents and have been subsequently endorsed by the majority of South East Queensland and/or Northern NSW councils:

- *Subtropical Rainforest Restoration: A Practical Manual and Data Source for Landcare Groups, Land Managers and Rainforest Regenerators*. BSRLG, Bangalow.
- South East Queensland Ecological Restoration Framework (SEQERF)

Given this, information provided within this Rehabilitation document will largely utilise information derived from these frameworks. The primary objectives associated with bushland rehabilitation include:

- Retain and protect retained native bushland;
- Retain and enhance existing native fauna habitat;
- Increase the extent of native vegetation cover over time (i.e. across weeded and/or sparsely covered areas).
- Restore native vegetation and fauna habitat to areas which have been degraded/simplified by historic farming/grazing uses

There are four commonly recognised ecological restoration approaches as identified within the SEQERF and following a review of the habitat and condition of habitat contained within bushland retention zones it is considered that the overarching rehabilitation approach should be a combination of ‘assisted natural regeneration’ and ‘reconstruction’ (GCCC, 2007; TSC, 2009; Greening Australia, 1999, SEQERF, 2012). The applicable circumstances of these types of rehabilitation are provided below:

ASSISTED NATURAL REGENERATION

Applies:	<ul style="list-style-type: none">• To natural areas where the native plant community is largely healthy and functioning.• When native plant seed is still stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water.• Where the natural regeneration processes (seedling germination, root suckering, etc.) are being inhibited by external factors, such as weed invasion, soil compaction, cattle grazing, mechanical slashing, etc.• When limited human intervention, such as weed control, minor amelioration of soil conditions, erection of fencing, cessation of slashing, etc. will be enough to trigger the recovery processes through natural regeneration.• When the main management issue is weed infestation and/or current land use practices.
Role of planting:	<ul style="list-style-type: none">• Planting in such areas can work against the aims of restoration by interfering with natural regeneration except where species cannot return to site without direct intervention.
Goal vegetation community:	<ul style="list-style-type: none">• The re-establishing plant community will be substantially similar in structure, composition and diversity to the original vegetation.

RECONSTRUCTION

Applies:	<ul style="list-style-type: none">• Where the site is highly degraded or altered.• When the degree of disturbance has been so great and long-standing that the pre- existing native plant community cannot recover by natural means.• To sites such as areas of fill, sites affected by stormwater flow, areas that have been drastically cleared, even though there may be a few remaining native trees or shrubs.• When a greater degree of human intervention is required, such as weed control, cessation of grazing and/or slashing, amelioration of soil conditions such as importation of soils, drainage works or re-shaping of the landscape
Role of planting:	<ul style="list-style-type: none">• Importation of native species to the area is required, either through planting or direct seeding (in some situations). natural regeneration and recruitment is insufficient to initially re-establish the original vegetation. Depending on the prevailing circumstances, the planting of a broad diversity of species from the target ecosystem may be unnecessary and the use of pioneers may be sufficient to re-establish ecological processes.
Goal vegetation community:	<ul style="list-style-type: none">• The re-establishing planted community should be similar to the original vegetation in structure, composition and diversity.

REHABILITATION ZONES

Three rehabilitation zones have been proposed according to the existing bushland conditions, as verified by site inspection, and the rehabilitation approaches required:

Management Zone 1 – Existing Predominately Native Canopy Bushland Areas (Assisted Natural Regeneration) [~1.58ha]

These areas of predominately native vegetation are to be protected and weed management should be performed to the entire zone to encourage natural regeneration by reducing competition. Due to the existing seed bank likely being intact (as evidenced by existing natural regeneration) it is recommended that no revegetation works are undertaken allowing for natural regeneration to occur throughout the area. These areas are to be reviewed and monitored over time for regeneration success. Supplementary planting maybe required where there is a lack of natural regeneration over the medium term. This MZ includes patches of remnant and regenerating Lowland Rainforest and a linear patch of mostly regrowth Macaranga on the northern batter.

Management Zone 2 – Predominately Exotic Canopy Bushland Areas with low abundance of Native Trees (Assisted Natural Regeneration) [~2.1ha]

These are areas of Camphor Laurel Bushland which are dominated by non-native flora on southern sloping land. To minimise potential erosion woody weeds are to be progressively stem injected and left standing to provide habitat for fauna. Weed management of the lower strata also to be progressively performed to the entire zone to encourage natural regeneration by reducing competition. Progressive management will allow the seasonal visitation by frugivorous birds which may introduce additional native flora species into the management zone.

These areas are to be reviewed and monitored over time for regeneration success. Supplementary planting maybe required where there is a lack of natural regeneration over the medium term.

Management Zone 3 –Rainforest Buffer Planting (Reconstruction) [~2400m²]

Weed management to entire zone to encourage natural regeneration by reducing competition of the disused paddocks which are currently fragmenting a patch of rainforest along the western boundary and a patch of regrowth rainforest along the eastern boundary. Initially this shall occur by slashing and brush-cutting the existing weed thickets and over-spraying/spot-spraying regrowth of weeds to provide a manageable revegetation zone. Any existing/ occurring regrowth of native trees, shrubs and groundcovers to be protected and retained. Reconstruction of natural environment to be undertaken via tubestock installation including a diversity of tree, shrub and groundcover species to match the adjoining Lowland Rainforest.

Balance areas external to the community lot/rehabilitation footprint are largely devoid of native woody vegetation with few native trees encountered. Such areas are recommended, however, to be slashed to maintain access tracks, the powerline easement, reduce bushfire risk and to reduce the overall area of existing pasture weeds proximate to the three formal management zones.

REHABILITATION SITE WORKS

Prior to rehabilitation works commencing, the rehabilitation zones should be secured from degrading impacts such as grazing by stock, unauthorised access and rubbish dumping. Some factors may require immediate attention due to the potential for adverse effects. These situations may include:

- Uncontrolled stock access
- The presence of highly invasive weed species which may disperse further prior to substantial rehabilitation works commencing.
- Flammable vegetative materials accumulating in areas which could spread into retained bushland (including weed thickets, overgrown grasses).
- Damaging and easy access by 4WD, motorbikes and pedestrians into rehabilitation zones. This may require installation of temporary fencing if deemed appropriate.

The carrying out of effective and comprehensive restoration works in a natural area requires that the site be revisited regularly, preferably over a period of at least two to five years, to achieve the best possible ecological outcomes. Ongoing works may be broken down into the following categories:

Primary Works

Primary works or initial works within the site or a section of the site involves a sequence of activities such as the control of all groundcover weeds, woody weeds in the understorey and exotic vines prior to the control of weed trees. Primary work has the effect of creating a large degree of disturbance which will stimulate the germination of native and exotic species. Therefore, continuing works should be scheduled shortly after the initial visit to allow for timely control of the newly regenerating weeds. Highly invasive weeds should be treated as a priority during primary work in order to avoid invasion of newly disturbed areas. Some weeds will need to be treated in steps e.g. where areas of weed is being used by nesting birds or where the staged removal of canopy weed trees is required. Techniques used during primary work commonly involve spot spray, cut-scrape-paint, cut-paint, scrape-paint, roll-hang and over spraying (SEQERF, 2012: 84). Weed control methods and herbicide control techniques are discussed further below.

Follow-up Works

At intervals, which will vary according to the type of weed impacting the site and growing conditions, follow-up work will be necessary. This generally involves the spot-spraying of newly germinating weeds and resprouting sections of woody weeds and vines. It is at this stage that observational visits should be made to the site to determine what progress the vegetation is making, and decide when to implement further follow-up work. A site that receives badly-timed, too frequent or too little follow-up will rapidly experience setbacks, as weed propagules will quickly become established in the newly disturbed areas. Germinating native seedlings may be swamped by weeds or damaged by inexperienced operators thereby exhausting the seedbank. Unless adequate follow-up can be ensured when planning restoration works, there is little point in commencing primary work, as time and resources are consumed with no substantial gain achieved (SEQERF, 2012: 84).

Maintenance Works


By the maintenance stage, the vegetation community is at a point where native plant species are germinating and establishing, and canopy formation is occurring. Weed density is starting to decrease as the native plants which have been encouraged during the previous restoration works are able to out-compete the weeds. One of the fundamental principles of ecological restoration is that it attempts to create or re-establish an ecosystem that is self-sustaining. Therefore, it is the underlying goal that maintenance will eventually be decreased to a minimum. While this is not always possible, due to factors such as the continual reintroduction of weed propagules to the site from nearby residential areas; unfavourable seasons or weather event; persistent weed species; or global influences such as the enhanced greenhouse effect, it should always be strived for (source: SEQERF). Maintenance works over time are intended to be limited to minor ongoing weed management and infill planting in areas of failure.

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GENERAL METHODS FOR WEED CONTROL

The methods and herbicide use rates provided below are current best practice methods. It is the responsibility of the operator to ensure methods used are current best practice and are suitable for the site and any environmental constraints experienced at the site. The rates outlined below are general rates with specifications for site identified individual species contained in the following table.

Cut-scrape-paint

This weed control method applies to all woody shrubs, trees and some vines.

- Cut plant low to the ground at an angle.
- Apply Glyphosate immediately at the rate of 1-part Glyphosate to 1.5 parts water, with a paintbrush approximately 1.5 centimetres wide.
- Scrape sides lightly to reveal green tissue and apply the herbicide to the scraped area.
- Take care that the brush is not contaminated with soil.

Note - all seed that has high viability and longevity, e.g. *Senna spp.* and other members of the Fabaceae family, or plants with a high invasive potential, such as Umbrella Tree *Schefflera actinophylla*, must be removed from the parent and either composted on site or removed from the site.

Control of Woody Weeds

Examples of woody weeds include:

- lantana, bitou bush, cotoneaster, privet (cut and paint)
- camphor laurel, Mickey Mouse bush (oxchna) and cassia/senna (stem scrape)

METHODS OF REMOVAL

1 CUT AND PAINT

Useful for small to medium sized woody weeds up to 10cm basal diameter

Make a horizontal cut as close to the ground as possible with secateurs, loppers or a bush saw.

Immediately apply herbicide to the exposed flat stump surface.

2 SAFETY CONSIDERATIONS

The following general precautions should be made when using herbicides:

- Read the label before opening the container and follow the instructions.
- Wear protective clothing as directed on the label.
- Wash hands after use and before eating or smoking.

3 considerations

- Cuts should be horizontal to prevent herbicide from running off the stump. Sharp angle cuts are hazardous.
- Herbicide must be applied immediately before the plant cells close and translocation of herbicide ceases.
- If plants resprout, cut and paint the shoots after sufficient regrowth has occurred.
- Stem scraping can be more effective on some woody weeds.

Illustration of cutting and painting a tree stump.

Illustration of applying herbicide to a stump.

Stem Injection

This weed control method applies to all woody trees and shrubs with a diameter of about six to ten centimetres or greater.

- Drill a hole at an angle into the sap wood using an 8-10mm drill bit angle, Holes to be no >than 10cm apart.
- Apply herbicide (approx 4ml) immediately into the hole using a tree-injecting device (if using Glyphosate, apply undiluted or at the rate of 1 part Glyphosate to 1.5 parts water). Repeat this procedure at intervals around the circumference of the tree, as close to the ground as possible. Where the presence of a crotch angle makes this difficult, drill a hole above it. Note – one row of drill holes will be sufficient for trees with trunks of six to ten centimetres; larger trunk diameters will need correspondingly more.
- Treat all visible lateral roots as per dot point 1.

Control of Woody Weeds cont..

Examples of woody weeds include:

- lantana, bitou bush, cotoneaster, privet (cut and paint)
- camphor laurel, Mickey Mouse bush (oxchna) and cassia/senna (stem scrape)

METHODS OF REMOVAL

1 STEM INJECTION

For use on larger shrubs or trees above 10cm basal diameter and in inaccessible sites where removal is a problem.

INJECTION:

At the base of the tree drill holes at a 45 degree angle into the sapwood at 5 cm intervals.

OR

FRILL/CHIP

Make a cut into the sapwood with a chisel or axe.

Fill each hole/cut with herbicide immediately.

Repeat the process at 5 cm intervals around the tree.

2 SAFETY CONSIDERATIONS

The following general precautions should be made when using herbicides:

- Read the label before opening the container and follow the instructions.
- Wear protective clothing as directed on the label.
- Wash hands after use and before eating or smoking.

3 considerations

- Plants should be healthy and actively growing. Deciduous plants should be treated in spring and autumn when leaves are fully formed.
- For multi-stemmed plants, inject or chip below the lowest branch or treat each stem individually.
- Herbicide must be injected immediately before the plant cells close (within 30 seconds) and translocation of herbicide ceases.

Illustration of injecting herbicide into a tree trunk.

Illustration of frilling or chipping a tree trunk.

Scrape-paint

This weed control method is applicable to many species of vines where it is desirable to treat the vines intact, particularly those with aerial tubers such as Madeira Vine *Anredera cordifolia* or those which will propagate from segments, e.g. Cape Ivy *Delairia odorata*.

- Scrape the stem tissue on one side of the stem only for at least 20-30 centimetres if possible. Note on Madeira vine it is necessary to scrape heavily. Scrape as many sections of the stem as possible.
- Apply undiluted Glyphosate with a paintbrush.
- On stems that are thicker or horizontal, make a ditch into the stem with a knife and apply herbicide. Tubers and side roots should be treated the same way. Note - care must be taken not to sever the stem.

Control of Vines and Scramblers

Examples of vines include:

- balloon vine, morning glory, honeysuckle, cape ivy, jasmine, madeira vine, blackberry

METHODS OF REMOVAL

1 HAND REMOVAL

Take hold of one runner and gently pull it along the ground towards you.

Check points of resistance where fibrous roots grow from the nodes. Cut roots with a knife or dig out with a trowel and continue to follow the runner.

The major root systems need to be removed manually or scraped/cut and painted with herbicide.

Bag any reproductive parts.

2 STEM SCRAPING

With a knife, scrape 15 to 30 cm of the stem to reach the layer below the bark/outer layer.

Immediately apply herbicide along the length of the scrape.

Illustration of hand removal of a vine.

Illustration of stem scraping a vine.

2 considerations

- A maximum of half the stem diameter should be scraped. Do not ring bark.
- Larger stems (>1cm) should have two scrapes opposite each other.
- Aerial tubers on madeira vine should die with the plant where stem scraping is used. Those that fall from the plant in the scraping process need to be bagged.
- Vines can be left hanging in trees after treatment.

(SOURCE: NPWS, UNDATED)

Spot Spraying

This weed control method is carried out using a 10-15 litre backpack spray unit with a modified spray nozzle that gives a solid spray pattern. Glyphosate is the main herbicide used with the addition of a marker dye. For plants that show some resistance (e.g. Madeira Vine) or where growing conditions are not optimal, an acidifying agent, L1700®, is added. Metsulfuron methyl can also be used for resistant species and grasses. It should be used with a surfactant, such as Agral® or Pulse®.

- Where both Glyphosate and Metsulfuron methyl it is important to mix the chemicals as recommended e.g. MM must be well mixed with water prior to adding to backpack.
- Dilution rates for Glyphosate and Metsulfuron methyl are in accordance with the manufacturer's recommendations and any variation requires a permit from the National Registration Authority.
- Dilution rates for Glyphosate to water for treatment of some weed species are provided below:
- Plants with more or less succulent leaves, e.g. Wandering Jew Tradescantia fluminensis, Madeira Vine Anredera cordifolia (autumn to winter is the suggested time for spraying these plants), Spider/Ribbon Plants Chlorophytum spp. etc - 1 part Glyphosate to 50 parts water plus 1.5g Metsulfuron methyl to 10 litres water + 2 ml Agral® or 20ml Pulse® to 10 litres water
- Lantana Lantana camara - 1 part Glyphosate to 100 parts water
- Other soft-leaved plants, annuals and grasses - 1 part Glyphosate to 100 parts water
- Bitou Bush Chrysanthemoides monilifera subsp. rotundata - 1 part Glyphosate to 150 parts water to 1 part Glyphosate to 400 parts water
- Typical dilution rates for Metsulfuron methyl to water are - 1.5g Metsulfuron methyl to 10 litres water + 2 ml Agral® or 20ml Pulse® to 10 litres water.

SPOT-SPRAYING IMAGE

SOURCE: CHENOWETH EPLA AND BUSHLAND RESTORATION SERVICES, 2012

Overspray

This weed control method is applicable to large, dense infestations of such plants as *Lantana camara*, where it is desirable to leave the dead plants intact to prevent erosion and runoff impacts and over-exposure of large areas, protect native seedlings from predators such as wallabies, and avoid trampling by humans.

- Spray over the top of the infestation, using a weak solution of Glyphosate.
- Any native plants that may be under the weed will be protected by the foliage cover of the weed.
- Leave the sprayed plants intact so that native seedlings can establish under the shelter provided.
- The rate for overspraying of Lantana is 1 part Glyphosate to 100 parts water.
- Alternatively, weeds can be cut and flattened with bush-hooks or loppers and the subsequent regrowth sprayed with Glyphosate. In many cases it is preferable to overspray wherever practicable as this will cause less erosion (via increased runoff across exposed soils) and trampling of suppressed native plants, such as ferns and seedlings. However, handwork will be necessary to cut-scrape-paint any unsprayed Bitou Bush or Lantana that surrounds native plants.

OVERSPRAYING IMAGE SOURCE: CHENOWETH EPLA AND BUSHLAND RESTORATION SERVICES, 2012

Gouge-paint

This weed control method applies to those plant species that have a fleshy root system, such as rhizomes or large bulbs. It is particularly appropriate for the treatment of *Asparagus spp.*

- Gouge out sections of the fleshy base with a knife (if using on Asparagus, first cut the stems at shoulder height and also at the base).
- Apply 1 part Glyphosate to 1.5 parts water immediately, with a paint brush approximately 1-5 centimetres wide.

Crowning

This weed control method is applicable to weeds which have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems, etc. e.g. *Asparagus spp.*, and introduced grasses).

- Grasp the leaves or stems and hold them tightly so that the base of the plant is visible. Plants with sharp leaves or stems should be cut back first.
- Insert the knife close to the base of the plant at a slight angle, with the tip well under the root system.
- Cut through the roots close to the base. Depending on the size of the plant, two or more cuts may be needed to sever all the roots.
- Remove the plant. Make sure that the base of the plant where the roots begin is completely removed.

Control of Weeds with Underground Reproductive Structures

Examples of weeds with:

- Top roots - catnip, dandelion
- Rhizomes - asparagus fern, ginger plant
- Bulbs and corms - scalloped, onion weed, woadwort, freesia, mouthwillie
- Tubers - madroena vine, arrowhead vine

METHODS OF REMOVAL

1 HAND REMOVAL OF PLANTS WITH A TAPROOT

Example: Paddy's lucerne, dandelion

Gently remove and bag seeds or fruit.

Push a narrow trowel or knife into the ground next to the taproot. Carefully loosen soil. Repeat the step around the taproot.

Grasp stem at ground level, rock plant back wards and forwards and pull gently.

Gently tap the roots to dislodge soil. Replace disturbed soil and lightly pat down.

2 CROWNING (Many grasses can be crowned)

Example: asparagus fern

Gently remove and bag stems with seed or fruit.

Grasp the leaves or stems together so that the base of the plant is visible.

Insert, at an angle, a knife or lever, close to the "crown".

Cut through all the roots around the crown.

Remove and bag the crown.

Illustration of hand removal of a plant with a taproot.

Illustration of crowning a plant.

(SOURCE: NPWS, UNDATED)

PROJECT:
225 TERRANORA ROAD, BANORA POINT

DRAWING TITLE:
DRAFT ENVIRONMENTAL MANAGEMENT PLAN

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
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JOB NO:
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REVISION:
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SCALE:
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DRAWING NO:
J5950_01

225 TERRANORA ROAD, BANORA POINT DRAFT ENVIRONMENTAL MANAGEMENT PLAN

Scientific Name	Common Name	Recommended Treatment
<i>Ageratina adenophora</i>	crofton weed	Plants: spot spray (G 100 mL/10 L + S or O). NOTE: No slashing or whipper snipping of seeding crofton weed is to occur.
<i>Ageratina riparia</i>	Mistflower	Plants: hand-pull and hang to dry or spot spray (G 100 mL/10L +S or O, or MM 1-2 g/10L + W or O). NOTE: No slashing or whipper snipping of seeding mistweed is to occur.
<i>Ageratum houstonianum</i>	Blue Billygoat Weed	Isolated individuals spot spray or hand removal Plants: spot spray (G 100 mL/10 L + S or O).
<i>Ambrosia artemisiifolia</i>	Annual Ragweed	Plants: hand-pull or spray (G 100 mL/10 L + S or O).
<i>Asparagus aethiopicus</i> cv. <i>Sprengeri</i>	Asparagus Ferns	Initial treatment via hand removal using crowning technique and hanging off ground to dry. For successful weed control it is vital to cut out the entire central growing point. Plants: spot spray (G 100 mL/10 L + MM1.5g/10L + W or O).
<i>Asparagus africanus</i> <i>Andropogon virginicus</i> <i>Chloris gayana</i> <i>Megathyrsus maximus</i> <i>Melinis repens</i> <i>Paspalum dilatatum</i> <i>Pennisetum clandestinum</i> <i>Pennisetum purpureum</i> <i>Setaria sphacelata</i> <i>Sporobolus africans</i>	Exotic/ pasture grasses	In areas which are comprised solely of pasture grasses whipper-snipping/brush cutting is permitted followed up by spot spraying of grass tussock bases. No whipper snipping of native species is permitted. Spot spraying or overspray of clumps and scattered individuals. Plants: spot spray (G 100 mL/10 L).
<i>Bidens pilosa</i>	Cobblers Pegs	Plants: spot spray (G 100 mL/10 L + S or O).
<i>Cestrum parqui</i>	Green Cestrum	Plants: spot spray (G 100 mL/10 L + S or O).
<i>Cinnamomum camphora</i>	Camphor Laurel	Hand pull seedlings or spot spray (G 200 mL/10 L + S or O). Saplings CS&P G:1.5 Trees: F/I G 1: 1.5.
<i>Commelina/ Tradescantia</i>	Wandering jew	Plants: spot spray (G 100 mL/10 L + S or O).
<i>Conyza spp</i>	Fleabane	Plants: spot spray (G 100 mL/10 L + S or O).
<i>Crassocephalum crepidioides</i>	Thickhead	Plants: spot spray (G 100mL/10 L + S or O).
<i>Desmodium intortum</i>	Greenleaf desmodium	Plants: spot spray (G 100 mL/10 L + S or O).
<i>Desmodium uncinatum</i>	Silverleaf Desmodium	Plants: hand-pull or crown, CS&P tuberous roots (G 1:1.5). Spray (G 200 mL/10L +S or O, or G 200 mL/10L + MM 1.5 g/10L + W or O, or MM 1-2 g/10L + W or o). Collect and bag seeds.
<i>Gomphocarpus physocarpus</i>	Cotton Bushes	Shrubs: CS&P (G1:1.5) Plants: hand-pull or spray (G 100 mL/10 L + S or O).
<i>Lantana camara</i>	Lantana	Lopper, then CS&P base 1:1.5 G or Overspray large infestations and spot spray regrowth (G200mL/10L G + S or O) Brushcutting followed by followup spot spraying is only permitted in areas where thickets are comprised of Lantana (and other weeds) only.

Scientific Name	Common Name	Recommended Treatment
<i>Macroptilium atropurpureum</i>	Siratro	Vines: hand-pull or CS&P (1:1.5). Materials above head height to be left insitu where it will die and fall to the ground as natural mulch. Spot spray: (G 100 mL/10 L + S or O, or G 200 mL/10 L + MM 1.5 g/10 L + W or O).
<i>Murraya paniculata</i>	Mock orange	Shrubs: CS&P (G1:1.5) Plants: hand-pull or spray (G 200 mL/10 L + S or O).
<i>Ochna serrulata</i>	micky mouse bush	Shrubs: CS&P (G1:1.5) Plants: hand-pull or spray (G 200 mL/10 L + S or O).
<i>Passiflora suberosa, P. edulis, P. subpeltata</i>	Passionflowers	Vines: hand-pull or CS&P (G1:1.5). Materials above head height to be left insitu where it will die and fall to the ground as natural mulch. Spot spray: (G 200 mL/10 L + S or O, or G 100 mL/10 L + MM 1.5 g/10 L + W or O).
<i>Pennisetum purpureum</i>	Barner grass	Brush-cut, lopper or machete clumps and then spot-spray or overspray. Plants: spot spray (G 100 mL/10 L + S or O).
<i>Pinus elliottii</i>	Slash Pine	Hand pull seedlings or spot spray (G 200 mL/10 L + S or O). Saplings CS&P G:1.5 Trees: F/I G 1: 1.5.
<i>Schefflera actinophylla</i>	Umbrella Tree	Hand pull seedlings or spot spray (G 100 mL/10 L + S or O). Saplings CS&P G:1.5 Trees: F/I G 1: 1.5.
<i>Senna pendula</i>	Easter Cassia	Lopper, then CS&P base 1:1.5 G or Overspray large infestations and spot spray regrowth (G200mL/10L G + S or O)
<i>Sida cordifolia</i>	Flannel Weed	Lopper, then CS&P base 1:1.5 G or Overspray large infestations and spot spray regrowth (G100mL/10L G + S or O) Plants: spot spray (G 100 mL/10 L + S or O, or MM 1-2 g/10L + W or O).
<i>Sida rhombifolia</i>	Paddy's Lucerne	Plants: spot spray (G 100 mL/10 L + S or O, or MM 1-2 g/10L + W or O).
<i>Solanum nigrum</i>	Blackberry nightshade	Plants: hand-pull or spray (G 100 mL/10L + A).
<i>Solanum chrysotrichum</i>	Devil's Fig	Isolated small individuals spot spray or hand removal [gloves needed] Shrubs: C&P (G 1:1.5). Regrowth/small plants: spot spray (G 150 mL/10 L + A). Large Shrubs: F/I (G 1:1.5).
<i>Solanum mauritianum</i>	Wild Tobacco	Stems: C&P (G 1:1.5). Regrowth: spot spray (G 200 mL/10 L + S or O). Seedlings: Handpull or spot spray (G 200 mL/10 L + S or O); Saplings: CS&P (G 1:1.5). Trees: F/I (G 1:1.5)
<i>Solanum seaforthium</i>	Climbing Nightshade	Vines: hand-pull or CS&P (1:1.5). Materials above head height to be left insitu where it will die and fall to the ground as natural mulch. Spot spray: (G 200 mL/10 L + S or O, or G 100 mL/10 L + MM 1.5 g/10 L + W or O)
<i>Sphagneticola trilobata</i>	Singapore Daisy	Plants: spot spray (G 200 mL/10 L + MM 1.5 mL/10 L + W or O).
<i>Urena lobata</i>	Hibiscus burr	Lopper, then CS&P base 1:1.5 G or Overspray large infestations and spot spray regrowth (G200mL/10L G + S or O). Ensure burrs are not transported into other areas.

Scientific Name	Common Name	Recommended Treatment
<i>Verbena bonariensis</i>	Purple top	Plants: hand-pull or spray (G 100 mL/10 L + S or O). Careful application required due to low leaf surface area
<i>Ipomoea cairica</i>	Mile a minute Morning Glory	Vines: hand-pull or CS&P (G 1:1.5). Materials above head height to be left insitu where it will die and fall to the ground as natural mulch. Spot spray: (G 100 mL/10 L + S or O, or G 200 mL/10 L + MM 1.5 g/10 L + W or O).

Control Method Abbreviations:

CS&P = cut, scrape and paint
C&P = cut and paint
F/I = frill/stem-inject/spear or drill
S&P = scrape and paint
G = glyphosate (Roundup Biactive) dilution ratio (i.e. Glyphosate to water)
MM = metsulfuron-methyl (i.e.Brush-off) dilution ratio
S = surfactant (e.g. LI 700)
A = spray adjuvant, (e.g. Agral, Codacide, Protec Plus)
2, 4-D = 2,4-D 625 glamine (Amicide 625) dilution ratio

* where herbicide treatment is required the use of Roundup Biactive is primarily recommended. The active ingredient of this herbicide is Glyphosate isopropylamine which has been found to be non-toxic to frog tadpoles and generally does not require the use of additional surfactants.

Recommended Application Technique For Spraying (Knapsack/Handgun Equipment)

The dilution rate is given as a ratio of herbicide volume to water volume. Adjust equipment to achieve an even spray pattern. Apply to ensure complete and uniform wetting of all foliage. For handgun equipment, a D6 spray tip (Spraying Systems Australia P/L) or equivalent, and an operating pressure of 400-700 kPa are recommended.

Additional General Recommendations

- Where areas are spot-sprayed and/or hand weeded, weed material must be left insitu to act as natural site mulch
- Following initial control, spot-spraying should occur from areas that are dominated by native vegetation and extend into more weedy areas.
- Weed control (especially groundcover weed control) must be undertaken in a manner which does not promote erosion, expose soils to excessive runoff or instability of soil, especially in waterways or high velocity flow zones.
- Herbicide dye must be used to reduce the potential for over spraying or re-spraying of previously treated areas. If evidence of excessive spraying exists or if off target damage is evident, rehabilitation will be required to the satisfaction of Council to ensure all areas of the RZ are stable and not at increased risk of erosion or expose runoff related ipmacts due to off target damage.
- Undesirable vine species must be treated by cutting the plant twice. Once at head height and then at ground level. Immediately after cutting at ground level herbicide must be applied using the cut, scrape and paint method.

Referenced Material:

Australian Government Australia Pesticides and VMA Permit to Allow Minor Use of an AGVET Chemical Product for the Control of Environmental Weeds in Non-Crop Areas Permit Number – PER11463 1-7-2009 to 30-6-2023 Biosecurity QLD.
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Nufarm Australia Limited (undated) Roundup Biactive Herbicide by Monsanto NRA Approval No. 48518/1102
Big Scrub Rainforest Landcare Group (2005) *Subtropical Rainforest Restoration: A Practical Manual and Data Source for Landcare Groups, Land Managers and Rainforest Regenerators*. BSRLG, Bangalow.
Chenoweth EPLA and Bushland Restoration Services (2012) *South East Queensland Ecological Restoration Framework: Manual*. Prepared on behalf of SEQ Catchments and South East Queensland Local Governments, Brisbane

PROJECT:
225 TERRANORA ROAD, BANORA POINT

DRAWING TITLE:
DRAFT ENVIRONMENTAL MANAGEMENT PLAN

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
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225 TERRANORA ROAD, BANORA POINT DRAFT ENVIRONMENTAL MANAGEMENT PLAN

REVEGETATION METHODS

Following primary weed management works nominated areas requiring infill planting (reconstruction areas) is to be performed. The revegetation work comprises:

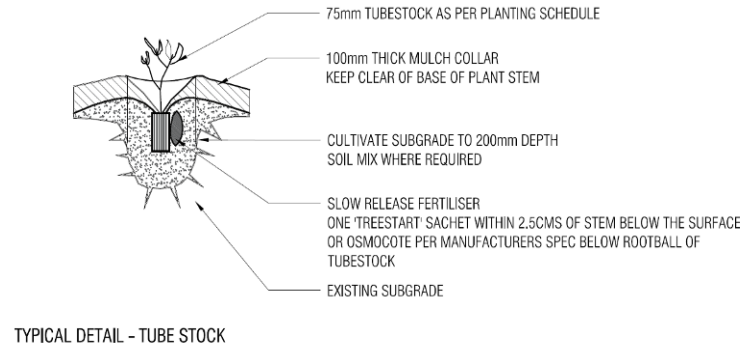
1. Purchase and supply all plants in accordance with approvals
2. Installation and mulching of all plants within revegetation area
3. Ongoing maintenance of revegetation area to ensure survival

PLANT SUPPLY

- Plants shall be vigorous, well established, of good form, not soft or forced, hardened off, free from disease and pests with large healthy root systems and not pot bound.
- The root system shall be well balanced in relation to the size of the plant.
- Trees shall have a single leading shoot.
- Plant containers shall be of an appropriate size and free from weeds.
- Plants shall not exhibit signs of being stressed at any stage during their development due to inadequate watering, excessive sunlight, physical damage or have restricted growth due to nursery rows.
- Plants species shall be selected from the adjacent revegetation module and substitutions are only permitted where reflective of the preclearing vegetation type (lowland rainforest)

PLANT INSTALLATION/REVEGETATION

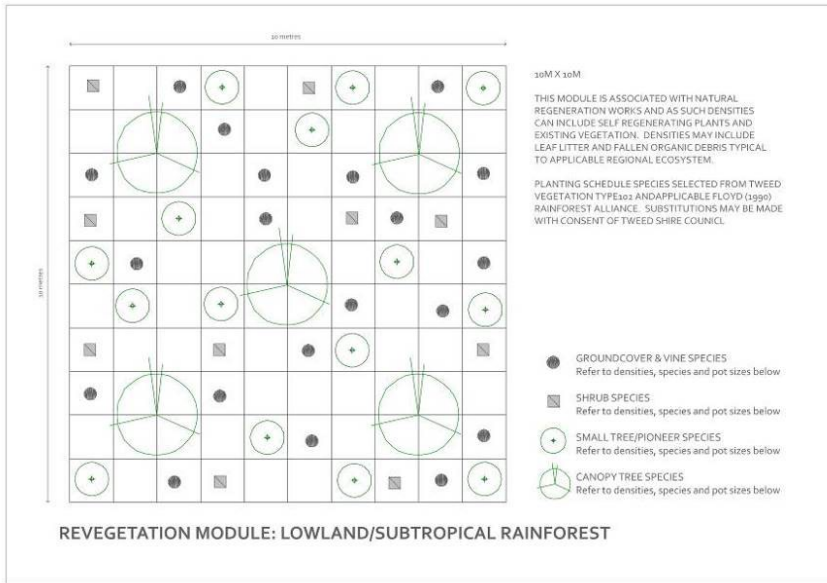
- Planting is to occur as soon as possible after delivery occurs. If this is not possible (i.e. due to weather conditions) plants are to be stored in a shady area and watering maintained.
- If planting is to be executed during council water restriction periods ensure plants can be watered in at time of planting. Do not allow plants to be installed on a day they can't be watered.
- Planting to be executed in accordance with the planting detail below



- Do not plant into dry or muddy soil or in extreme weather conditions.
- Ensure plant root systems are moist when removed from container and not allowed to dry out and planting area has been thoroughly watered.
- Excavate soil at planting site at twice the width of the rootball and over excavate planting depth to allow placement of slow release fertiliser (Osmocote' sustained release fertiliser or equivalent) and water crystals
- Plant out with minimum disturbance to root ball ensuring finished compacted soil levels coincide with the natural soil level of the plant and plant stem is erect
- Thoroughly water entire planting area before applying forest mulch
- Apply and spread mulch evenly to a depth of 100mm to all plants and a minimum distance of 500mm around each plant but ensuring that the mulch is not in contact with the plant stem. Mulch to be 'forest mulch' as detailed, free of weeds, termites and other foreign matter.

PLANT MAINTENANCE

- Revegetation areas are to be regularly watered for a period of twelve weeks.
- Weeds within the revegetation area are to be controlled quarterly during winter and autumn and monthly during spring and summer.
- Replacement of planted stock lost to death shall occur as required to achieve a 90% survival rate at 2 years after planting.



SPECIES NAME	COMMON NAME	POT SIZE	QUANTITY PER MODULE	MINIMUM DIVERSITY PER MODULE
LARGE AND EMERGENT CANOPY TREES				
ACMENA INGENS	RED APPLE	75MM TUBE	5	3
ARAUCARIA CUNNINGHAMII	HOOP PINE			
ARGYRODENDRON TRIFOLIOLATUM	BOOYUNG			
CASTANOSPERMUM AUSTRALE	BLACKBEAN			
CRYPTOCARYA OBOVATA	PEPPERBERRY			
ELAEOCARPUS GRANDIS	BLUE QUANDONG			
EUROSCINUS FALCATUS	RIBBONWOOD			
FICUS WATKINSIANA	STRANGLING FIG			
LOPHOSTEMON CONFERTUS	BRUSHBOX			
PSEUDOWEINMANNIA	ROSE MARARA			
LACHNOCARPA				
SLOANEA WOOLLSII	YELLOW CARBEEN			
TOONA CILIATA	RED CEDAR			
CANOPY TREES AND PIONEERS				
ACACIA MELANOXYLON	BLACKWOOD	75MM TUBE	15	7
ACRONYCHIA OCTANDRA	DOUGHWOOD			
ACRONYCHIA WILCOXIANA	SILVER ASPEN			
ARCHONTOPHOENIX CUNNINGHAMIANA	PICCABEEN PALM			
BALOGHIA INOPHYLLA	SCRUB BLOODWOOD			
COMMERSONIA BARTRAMIA	BROWN KURRAJONG			
CRYPTOCARYA MICRONEURA	MURROU			
CUPANIOPSIS ANACARDIOIDES	TUCKEROO			
DYSOXYLUM MOLLISSIMUM	REDBEAN			
ENDIANDRA DISCOLOR	ROSE WALNUT			
FLINDERSIA SCHOTTIANA	BUMPY ASH			
GLOCHIDION SUMATRANUM	CHEESE TREE			
GUIOA SEMIGLAUCA	WILD QUINCE			
HOMALANTHUS POPULIFOLIUS	BLEEDING HEART			
JAGERA PSEUDORHUS	FOAMBARK			
MACARANGA TANARIUS	MACARANGA			
MALLOTUS PHILIPPENSIS	RED KAMALA			
MELICOPE ELLERYANA	PINK DOUGHWOOD			
PLANCHONELLA AUSTRALIS	BLACK APPLE			
POLYSCIAS MURRAYI	PENCIL CEDAR			
RHODOSPERMA RHODANTHEMA	DEEP YELLOWWOOD			
SLOANEA AUSTRALIS	MAINDENS BLUSH			
SYNOUM GLANDULOSUM	SCENTLESS ROSEWOOD			
SYZYGIUM LUEHMANNII	RIBERRY			
SYZYGIUM OLEOSUM	BLUE CHERRY			
WATERHOUSEA FLORIBUNDA	WEeping LILLIPILLI			
SMALLER TREES AND SHRUBS				
ARCHIRHODOMYRTUS BECKLERI	ROSE MYRTLE	75MM TUBE	10	3
ARYTERA DIVARICATA	ROSE TAMARIND			
CINNAMOMUM VIRENS	RED-BARKED SASSAFRAS			
CORDYLINE PETIOLARIS	LARGE-LEAVED PALM LILY			
CORDYLINE RUBRA	RED-FRUITED PALM LILY			
CRYPTOCARYA LAEVIGATA	GLOSSY LAUREL			
ELATTOSTACHYIS NERVOSA	GREEN TAMARIND			
LITSEA AUSTRALIS	BROWN BOLLYGUM			
NEOLITSEA DEALBATA	WHITE BOLLYGUM			
OLEA PANICULATA	NATIVE OLIVE			
PILIDIOSTIGMA GLABRUM	PLUM MYRTLE			
PSYCHOTRIA LONICEROIDES	HAIRY PSYCHOTRIA			
RHODAMNIA MAIDENIANA	SCRUB TURPENTINE			
SARCOPTERYX STIPATA	STEELWOOD			
TOECHIMA DASYRRACHE	BLUNT STEELWOOD			
WILKIEA HUEGELIANA	VEINY WILKEA			
GROUND COVERS AND CREEP VINES				
AUSTROSTEENISIA GLABRISTYLA	GIANT BLOOD VINE	75MM TUBE	20	7
CALLERYA MEGASPERMA	NATIVE WISTERIA			
CISSUS ANTARCTICA	KANGAROO VINE			
CISSUS HYPOGLAUCA	FIVE-LEAVED WATER VINE			
DIANELLA REVOLUTA	FLAX LILLY			
HIBBERTIA DENTATA	GUINEA FLOWER			
LOMANDRA HYSTRIX	CREEK MATRUSH			
LOMANDRA MULTIFLORA	MATRUSH			
PALMERIA FOREMANII	BIG SCRUB ANCHOR VINE			
PANDOREA PANDORANA	WONGA VINE			
TROPHIS SCANDENS	BURNY VINE			

REHABILITATION ZONE ONGOING MAINTENANCE

The following maintenance actions are necessary to achieve the restoration aim and objectives:

- Maintenance of rehabilitation zones will be undertaken for a period of five (5) years;
- Plantings are to be regularly watered as necessary for a period of twelve (12) weeks following installation.
- Follow up weed control is to occur within the management zones monthly during winter and autumn and fortnightly during spring and summer;
- All fallen natural debris and hollow logs are to be retained in-situ within the management zones to provide habitat for reptiles, amphibians, and ground dwelling mammals.
- Replanting shall occur where installed plants decline during the maintenance period in order to achieve the key performance indicators outlined below
- Mulch is to be replenished as necessary to maintain a depth of 100mm around tubestock during the 5 year maintenance period
- Plantings exhibiting signs of grazing (i.e. rabbits or wallabies) are to be protected with tree guards or exclusion fencing.
- Where construction works are approved within 10 metres of the boundary of a management zone it must be fenced with orange safety mesh (CEP-FENCING-100 Safety Fence Orange, or similar) during the construction phase of the development to reduce the risk of encroachment into the rehabilitation area or damage by machinery etc.



TYPICAL REHABILITATION MANAGEMENT AREA FENCING.

REHABILITATION ZONE MONITORING

The success of a regeneration project can be assessed by systematic visual monitoring of the zone area. This need not be an overly time consuming process and the information generated can then be used to evaluate the success of various treatments.

A permanent photo point can be set up using a star picket marked with fluorescent yellow safety cap, so that a photograph may be taken of the site at regular intervals as it is being restored. A time series of photographs, from a degraded state prior to the commencement of restoration, through the transition stages, to the minimum maintenance stage, can be a powerful reminder of the changes that have been achieved by restoration.

- Collected site photos should be compiled in a 'master' monitoring report for proper record-keeping.
- Monitoring of the weed management and revegetation works allows for:
- Review of the baseline condition for measuring the success of the weed removal and control.
- Ensure level of protection for existing identified native vegetation inclusive of that which has naturally regenerated
- Review the rate of spread or contraction of weed infestation within the management zones
- Monitor the rate of assisted regeneration and revegetation of desirable native species promoted in areas where weeds have been removed.
- Identification of new weed threats or other factors which may be affecting the rehabilitation zones

It is recommended that at least two photo points be established in each management zone and photographed on a quarterly basis for the five year maintenance period. GPS coordinates of the permanent monitoring points shall also be documented to enable others to find the monitoring points in the field.

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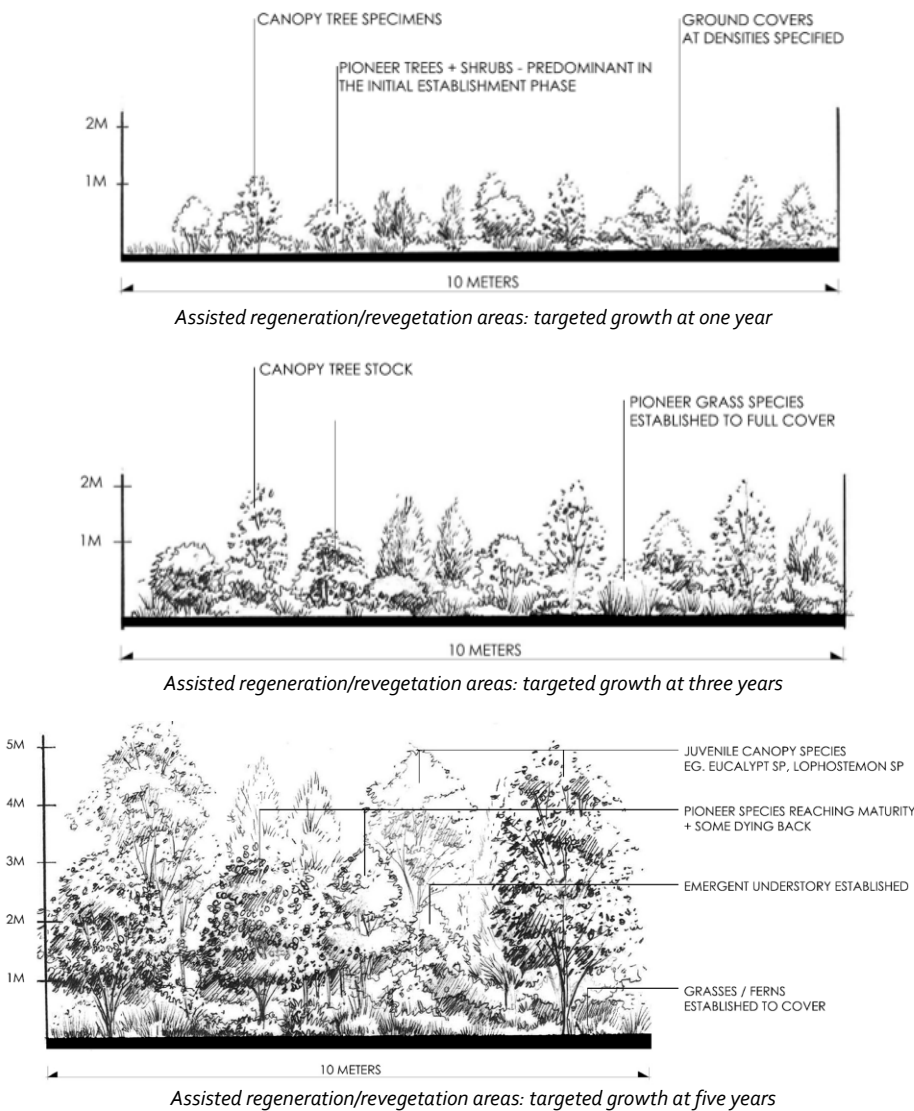
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REHABILITATION ZONE KEY PERFORMANCE INDICATORS

- The following key performance indicators are to be achieved within the rehabilitation zones:
- Existing native vegetation to be retained where applicable
 - All rubbish and anthropogenic debris is removed
 - Primary treatment of all weeds within the rehabilitation zones is to occur by the end of year 3.
 - All woody weeds, all exotic vines and all invasive plants within each management area are to have initial/primary treatment within three years of commencement of the rehabilitation plan
 - The standard of weed control and management works within each management zone is to be maintained or improved at year 4.
 - Less than 10% of existing environmental weeds are to be present within each management area at the end of year 5.
 - All weed treatment must be performed in a manner which does not promote erosion, uncontrolled runoff or instability of soil. For example, on steep slopes spot spraying of planting locations rather than blanket spraying of the entire management zone.
 - All weeds within the drip zones of native vegetation are to be treated to reduce competition and to increase opportunities for native plant regeneration;
 - >90% survival rate of planted stock is to be achieved over the five (5) year establishment and maintenance period;
 - Planted vegetation and assisted regeneration areas are to achieve average growth of >1m by year three and 1.5m by year five and cumulative cover of 60% by year 3



REHABILITATION ZONE KEY PERFORMANCE INDICATORS (cont.)

- Planted stock to exhibit fair or healthy conditions as follows:

Condition	Descriptor
Healthy	Leaves green, no abnormal leaf loss
Fair	Leaves green, some yellowing of leaves, but <20% of canopy affected
Poor	Many leaves yellow or brown, substantial reduction in canopy extent since last measurement
Dead	Leaves brown or absent, little of the canopy remaining

Additional key performance indicators assisted regeneration management areas:

Nominated Rehabilitation Zones 1 and 2 shall be managed as 'assisted regeneration' areas whereby weed re-establishment will be routinely monitored (and control applied as necessary) and regeneration of native vegetation cover also monitored for a period of four years.

At this stage a review should be performed determine the success of the natural regeneration areas. This shall be determined via the cover of the assisted regeneration zones with native species. In order for assisted natural regeneration to be considered successful the following is to be present over the majority of the areas within the relevant rehabilitation zones:

- generally 1 plant per 2 square metres to the rehabilitation zone (or establishment of leaf litter/natural debris and/or foliage projection cover typical to surrounding areas of the native vegetation community)
- Assisted regeneration areas must exhibit species occurring within surrounding areas of the native vegetation community or typical to similar communities within the locality

During the review to determine the success of the assisted regeneration efforts, substantial areas which are bare or denuded shall be addressed via reconstructive management (i.e. landscaping/revegetation). This landscaping will be implemented and monitored accordingly for an additional 12 months (5 years total in accordance with Tweed Shire Council Site Action Plan Guidelines). The landscaping modules to be planted within 'failed' areas (if deemed necessary after four years) shall be the Lowland Rainforest Module contained in this document.

REHABILITATION ZONE CORRECTIVE ACTIONS/ADAPTIVE MANAGEMENT

The following corrective actions are to be implemented in instances of non-compliance with the above key performance indicators:

- Rubbish or litter remaining within the rehabilitation zones is to be immediately removed.
- Where weed re-establishment occurs, appropriate control measures are to be implemented.
- Where planted specimens fail to strike or plantings do not achieve the required survivorship then supplementary plantings are to be installed to achieve the key performance indicators in this regard. Where it is considered that a particular species has failed due to non-suitability or repeated failure within the planting environment a suitable native plant replacement species is to be discussed with and approved by Council's ecologist.
- If regular increases in height and crown cover extent are not recorded within the monitoring period a horticulturalist/arborist is to be employed to identify likely causes and to recommend measures (i.e. fertiliser application, increased watering etc.) to encourage increased growth. It is to be noted that plant growth rates may be limited by climatic, environmental, natural disaster or genetic reasons during the management period and exhibited growth rates are to be considered in the context of these external factors prior to implementing management measures in this regard.
- In locations where 'assisted regeneration' is failing (at 4 years months post commencement of each rehabilitation zone) then 'reconstruction/revegetation' works are to proceed
- If retained or planted vegetation show signs of ill health (i.e. poor or dead), a horticulturalist/arborist is to be employed to identify likely causes and to recommend mitigation measures to improve regeneration conditions.
- Where damage to vegetation protection fencing or signage is observed the structures are to be repaired to pre-existing condition.
- Any incidences of native tree, shrub or ground cover clearing beyond the approved extent is to be reported to Tweed Shire Council
- If native vegetation has been damaged (either as a result of obvious illegal clearing or dieback) then Tweed Shire Council is to be notified.

N.B. In the event that adaptive management procedures are considered necessary throughout the course of the rehabilitation program, any amendment to the management regime described within this document must be undertaken in consultation with Council's ecologist. Such procedures may include (but are not limited to) watering during drought, amendment of weed removal technique where unsuccessful for a given species, scarification of topsoil to reduce compaction, addition of fertiliser to poorly establishing areas etc. These measures will be considered in the context of plant species suitability on the site, with preference to those adapted and tolerant of the local environmental conditions.

PROTECTION OF THREATENED ECOLOGICAL COMMUNITY (TEC)

Minor areas containing Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions have been previously identified on the boundaries of the site which are retained within the Community Lot. This ecological community will be protected and managed for conservation in association with the following which have been incorporated into the design of the 3 large lot subdivision:

- The TEC will be retained within the delineated environmental/community lot area
- Additional setbacks are provided via the location of the building envelopes of the three large allotments away from allotment boundaries
- A rehabilitation strategy has been prepared which aims to reduce the extent of weeds and promote native flora species within the environmental/community lot area
- By-laws are to be incorporated regarding the control of domestical animals to protect native fauna associated with the TEC

It is therefore considered that mechanisms which demonstrate that the TEC can be protected concurrent with the implementation of the 3 large residential concept have been identified.

RUNOFF MANAGEMENT

All stormwater management required to facilitate development adjoining the Community Management Area is to be contained within their respective lot/s as well as being designed, installed and maintained in accordance with Council and any other applicable standards including but not limited to Development Design Specification D5 Stormwater drainage design and D7 Stormwater Quality. Further detail is to be provided within this EMP as part of its finalisation, alongside any development consent issued.

SEEPAGE MANAGEMENT

No evidence of seepage was observed within the Community Management Area during site inspections undertaken to prepare this draft Environmental Management Plan. Notwithstanding, all primary, follow-up and maintenance works are to include visual monitoring for evidence of seepage. Should evidence of seepage within the Community Management Area be identified, specific advices are to be sought from engineering specialists as soon as practical and rectification actions pursued as suitable to preserve ecological values.

BUSHFIRE MANAGEMENT

The provisions of this draft Environmental Management Plan reflect the findings of the Strategic Bushfire Study, prepared by Bushfire Planning Australia, which locates all asset protections zones within the boundaries of the adjoining large lot residential land. No asset protection zones are to be provided within the Community Management Area for the benefit of development on adjoining land.

POTENTIAL DOMESTIC PET IMPACTS ON NATIVE FAUNA

Mortality of fauna as a result of dog attacks is considered to be a key conservation concern for fauna management with some studies reporting that dog attacks account for between 5% and 40% of total recorded mortalities (McAlpine et al, 2007). Within the 'koala coast' of SEQLD an average of 300 koalas each year die as a result of dog attacks (EPA, 2006). Studies into dispersal patterns of koalas undertaken by Dique et al (2003) indicates that in addition to mortality the presence of dogs within or proximate to habitats is likely to disrupt behaviour and associated dispersal options. The risk of predation can strongly alter the behaviour and activity of potential prey (Lima and Dill 1990). In assessing predation hazards, many species use remote cues of risk because of the dangers of direct encounters with predators, including avoidance of open areas (e.g. Banks et al. 1999) or changing the time that they forage (in Banks et al, 2003; 406).

Cats also have direct impacts on native fauna through predation. 'They can kill vertebrates weighing as much as 3kg (Dickman 1996), but preferentially kill mammals weighing less than 220g and birds less than 200g. They also kill and eat reptiles, amphibians and invertebrates (Dickman 1996). Cats can also have indirect effects on native fauna by carrying and transmitting infectious diseases (DEH 2004). They are thought to have contributed to the extinction of many small to medium-sized mammals and ground-nesting birds in the arid zone, and to have seriously affected populations of bilby, mala and numbat (DEH 2004)' (DEWHA, 2008).

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ESTATE DOMESTIC PET/ANIMAL MANAGEMENT

To reduce the potential impact of unrestrained domestic animal impact (predation/harassment) on native fauna the following is proposed in association with the 3-large lot residential development:

- Production animals and/or livestock or similar, including but not limited to horses, cattle, sheep and goats, are prohibited from being kept within the community title Environmental Management Areas (i.e. the retained bushland areas)
- No domestic animals may roam free within the Environmental Management Areas
- Domestic animals are prohibited from entering the Environmental Management Area unless restrained at all times (i.e. on leash);
- Domestic animals unrestrained (i.e. free roaming) must be confined to the designated private allotments within:
 - o A native fauna exclusion enclosure (i.e. cat or dog run, a fenced in paddock etc), OR
 - o Anywhere on the private allotment if the boundaries of the allotment are fenced with native fauna exclusion fencing

In association with Tweed Shire Council Comprehensive Koala Plan of Management a Fauna Exclusion Fence should include the following design parameters:

- Fencing is to be 1.8m high
- Fencing placement must consider and integrate with any adjacent infrastructure such that no gaps or access points into the exclusion area (i.e. the private allotment) are created
- If the fence material is chain mesh or other climbable material an opaque sheeting to minimum 600mm height is to be attached to the lower portion of the fence on the habitat side to create a visual barrier to fauna encountering the fence
- Fencing should be positioned such that existing or retained vegetation does not contact the fence
- The fence must be positioned to allow for suitable access to either side of the fence to allow for fence and vegetation maintenance
- Any access gates must be able to be kept closed and designed to prevent fauna access



DOMESTIC PET RESTRICTION AREA SUMMARY

- Community Management/Body Corporate Environmental Management Area- DOMESTIC PET RESTRICTED AREA (ON-LEASH ONLY)
- Allotment Areas- DOMESTIC PET UNRESTRICTED AREA (FREE ROAMING) ONLY IF PROPERTY BOUNDARIES OR PET ENCLOSURE IS FENCED WITH NATIVE FAUNA EXCLUSION FENCING
- Internal Private Roadway
- Dwelling Locations
- Effluent Disposal Area

Map Created: 10-7-2022
Scale = 1:1250 @ A3



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REFERENCES AND FURTHER INFORMATION

REHABILITATION RESOURCES DOCUMENTS

Big Scrub Rainforest Landcare Group (2005) *Subtropical Rainforest Restoration: A Practical Manual and Data Source for Landcare Groups, Land Managers and Rainforest Regenerators*. BSRLG, Bangalow.

Bradley, J. (1988) *Bringing back the bush: The Bradley method of bush regeneration*. Lansdowne Publishing Pty. Ltd. The Rocks, NSW;

Buchanan, R. A. (1989) *Bush Regeneration: Recovering Australian Landscapes*. TAFE Student Learning Publications, NSW;

Chenoweth EPLA and Bushland Restoration Services (2012) *South East Queensland Ecological Restoration Framework: Manual*. Prepared on behalf of SEQ Catchments and South East Queensland Local Governments, Brisbane

Robertson, M. (1994) *Stop Bushland Weeds: A guide to successful weeding in South Australia’s bushland*. The Nature Conservation Society of South Australia Inc.

TSC (2009) *Site Action Plan Guidelines To Guide Ecological Restoration Planning and Ongoing Management of Native Vegetation and Fauna Habitat* (Tweed-Byron Futures Protect, 2009).

BUSHLAND REGENERATION & WEED MANAGEMENT AND IDENTIFICATION WEBSITES

SEQ Ecological Restoration Framework

<https://hlw.org.au/resources/seqecologicalrestorationframework/>

Society for Ecological Restoration Australasia

<https://www.seraustralasia.org/>

Australian Association of Bushland Regenerators

<https://www.aabr.org.au/>

NSW WeedWise

<https://weeds.dpi.nsw.gov.au/>

Tweed Shire Council Weeds

<https://www.tweed.nsw.gov.au/environment/pest-animals-weeds/weeds>

Big Scrub Landcare Rainforest Regeneration

<https://www.bigscrubrainforest.org/>

Weed Id Department of Agriculture and Fisheries Weeds

<https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/plants-weeds>

Weeds of National Significance

<https://weeds.org.au/weeds-profiles/>

Gold Coast City Council Weeds

<https://www.goldcoast.qld.gov.au/Council-region/About-our-city/Environment-sustainability/Protecting-our-environment/Managing-pest-plants-animals/Pest-plants-weeds>

MOBILE PHONE APPS

Weeds of SE Qld and Northern NSW

<https://apps.apple.com/au/app/weeds-of-south-east-qld/id935518023>

Rainforest Plants of Australia

<https://apps.apple.com/au/app/rainforest-plants-of-australia/id1187065616>

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ATTACHMENT 2

ASPECT NORTH (2004) FLORA AND FAUNA ASSESSMENT





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Flora and Fauna Assessment Terranora Road (Proposed Rezoning at 225 Terranora Road, Banora Point on behalf of Darryl Anderson Consulting)

Guy Holloway

Environmental Manager, ASPECT north

Date: 28-9-04

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1. Introduction and Background

1.1 Introduction

ASPECT *north* Ltd has been commissioned by Darryl Anderson Consulting to prepare a Flora and Fauna Assessment for Lot 16 DP 856265, 225 Terranora Road, Banora Point as part of a submission to Tweed Shire Council to rezone the northern part of the land from 7(d) to either 2(a) or 1(c). This assessment identifies any possible ecological constraints to the proposed development and considers appropriate environmental legislation.

A comprehensive flora assessment and a fauna inspection of the site have been undertaken and the results of these have been considered the preparation of this report.

1.2 The Subject Site

The study site is located off Terranora Road, in the township of Tweed Heads, northern New South Wales (NSW) (Refer to Figure 1). The site encompasses an irregularly shaped Lot, 10.19 hectares in area (Refer to Figure 2). A large part of the site is cleared. The remnant vegetation present on the site consists of predominantly regrowth rainforest vegetation stands dominated by Camphor Laurel (*Cinnamomum camphora*) and patches of highly disturbed to relatively undisturbed Subtropical Rainforest. The 'Tweed Vegetation Management Plan 1999' classifies the vegetation on this site as 'Highly Modified/Disturbed - Camphor Laurel Dominant Closed to Open Forest' (Map 5 - Tweed remnant vegetation classified by vegetation type).

1.3 Proposed Development

The proposed rezoning submission from a 7(d) zoning to either 2(a) or 1(c) applies to the northern portion of the site, and is submitted in order to develop the site into 30 lots having shared access from Terranora Road. Only the cleared portion of the site is proposed for development, while the forested areas are to be retained and rehabilitated as part of Section 88B Instrument or the like. Site works will eventually include clearing, earthworks, and provision of access from Terranora Dr (Refer to Figure 2).

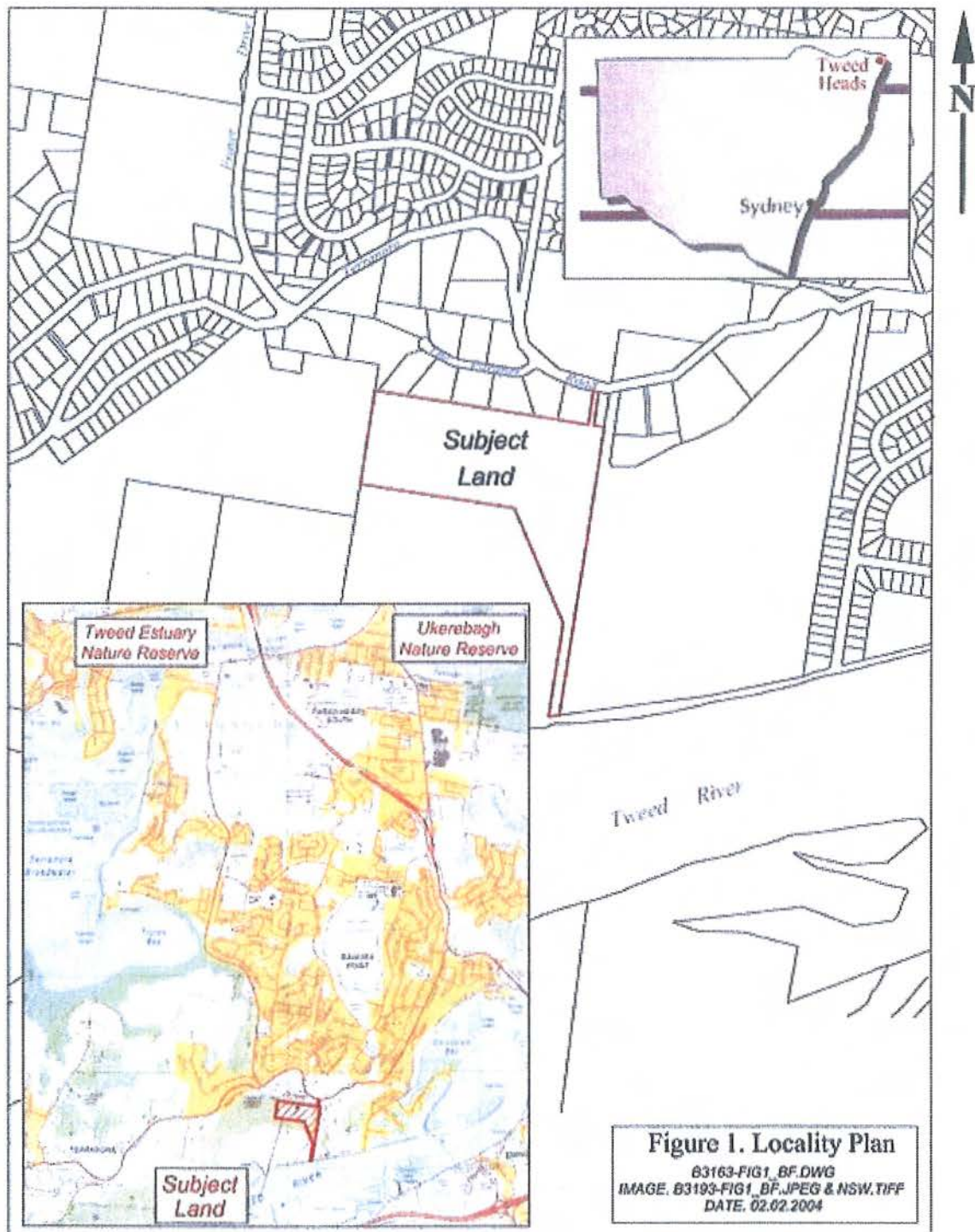
1.4 Site History and Land Use

The subject site is privately owned land. The site has tree large flat terraces as a result of past quarrying activities (Refer to Plate 1). The subject site is contained partly in 1(c) Rural Residential Development and predominantly in 7(d) Environmental Protection (Scenic/Escarpment) Zone (Tweed Local Environmental Plan, 2000). The site is bounded by 1(c) Rural Residential Development to the north and to the south-east and 7(d) Environmental Protection (Scenic/Escarpment) to the west, south and east (Refer to Figure 2). Rural residential blocks adjoining the site to the north are predominantly cleared (i.e. they do not support a structured vegetation community) but are otherwise landscaped. While the land to the west, south and south-east of the site is predominantly vegetated.



Plate 1. Cleared terraced areas as a result of past quarrying activities.

The site is not in proximity (5 km radius) of a wetland protected under State Environmental Planning Policy No. 14 (SEPP 14) or a wetland listed as a Wetland of International Significance (Ramsar Sites) which is a considered a Matter of National Significance under the *Environmental Protection and Biodiversity Conservation Act, 1999*. Tweed Estuary Nature Reserve is located approximately 5 km north west of the site, Ukerebagh Nature Reserve is located approximately 5 km north east of the site (Refer to Figure 1), while Stotts Island Nature Reserve is located approximately 4 km to the south –west of the site.



ASPECT north - Advanced Surveying Planning Engineering Consultancy Team

Figure 1. Locality map



Figure 2. Subject site in context with locality and relevant zoning

1.5 Methodology

The methodology used to conduct this Assessment included:

- A review of existing studies within the vicinity of the proposed development site;
- A search of the schedules 1, 2 And 3 of the New South Wales *Threatened Species Conservation Act 1995* (TSC Act) and of the National Parks and Wildlife Service (NPWS) Atlas of NSW Wildlife (Atlas) to identify threatened species, populations and ecological communities, or their habitats recorded on and within a five kilometre radius of the site;
- Comprehensive flora survey (1.5 days) of the subject site with particular attention to the threatened flora identified in the NPWS Atlas search;
- Comprehensive fauna survey (3 day) of the subject site with particular attention given to targeting the threatened fauna identified in the NPWS Atlas search;
- An evaluation of the habitat and wildlife corridor value of the site; and
- Identification of possible effects of the proposed development on existing fauna and flora and the development of ameliorative measures.

The particular methodologies for the flora and fauna surveys conducted at the site are outlined in the Field Survey Methods section of this report.

2. Field Survey Methods

2.2 Flora

The proposed development site was divided into 4 Areas as outlined on Figure 3. Each Area was surveyed by walking the area and recording all species encountered over a day and half (22 & 23 January 2003). All flora species encountered were identified and their relative abundance noted. The native species recorded are listed in Appendix A and the non-native species recorded are listed in Appendix B. Vegetation communities on the site were classified according to their floristic and structural characteristics (Specht & Specht, 1999) and dominant species identified. Conservation significance of the vegetation present at the site was assessed according to the Relative Ecological Value assigned to vegetation in the Draft Tweed Vegetation Management Strategy 2003.

2.3 Fauna

General Survey Approach and Survey Effort

A survey of the subject site was conducted over a 3 day period between the 13th and 16th of January 2004. The aim of the survey was to determine the presence of any fauna species and/or their habitat with particular attention given to targeting threatened fauna species identified in the search of the NPWS Atlas of NSW Wildlife (see Table 1). Weather during the field study was generally showery with rain falling intermittently throughout the survey period.

As a large range of terrestrial vertebrate groups were targeted, a variety of survey methods were utilised. The particulars of the methods used are outlined below and the locations at which particular sampling activities were conducted are shown on Figure 3.

Site Selection

The locations at which sampling was undertaken were chosen based on factors such as the presence of suitable habitat for target species, accessibility and whether they were representative of the general study area.

Avifauna

Area Search

Avifauna was sampled using an area search method. Two observers, using binoculars, walked throughout the site for a period of at least one hour per day over 3 days and recorded any bird species sighted.

Call-playback Sampling

Call-playback sampling was conducted at the site to test for the presence of nocturnal bird species. An initial listening period of 15 minutes, followed by a spotlighting period of 10 minutes was undertaken prior to the calls of target species being broadcast. The call of each of the target species was broadcast intermittently for 5 minutes using an amplifier. Broadcasts were followed by a 10 minute listening and spotlighting period. The species targeted were as follows:

- Powerful Owl (*Ninox strenua*);
- Masked Owl (*Tyto novaehollandiae*);
- Barking Owl (*Ninox connivens*);
- Sooty Owl (*Tyto tenebricosa*); and
- Grass Owl (*Tyto capensis*).

The specific locations at which call-playback sampling was undertaken are shown on Figure 3.

Mammals (excluding bats)

Elliott Trapping

Seventy five A-sized Elliott traps were placed in the field in three lines each containing 25 traps. Trap lines were situated in areas that were considered to best represent potential habitat for ground-dwelling mammal species. Traps were spaced at approximately 10 metre intervals and were baited with a mixture of oats, peanut butter, vanilla essence, oil and honey. Traps were left in the field for three nights and were checked each morning within 2 hours of sunrise. The locations of the specific trap lines are shown on Figure 3.

Cage Trapping

Three cage traps, targeting larger ground-dwelling mammals and baited with raw meat, were placed in the field for a period of 3 nights. The locations at which specific traps were placed are shown on Figure 3.

Scat and Track Surveys

Searches for footprints, scats, nests and scratches on trees were undertaken throughout the subject site using a random meander transect method. Field survey staff walked the site for a period of approximately 1 hour per day for 3

days and searched for any of the aforementioned signs of animal activity. The specific locations of the scat and track transects are shown on Figure 3.

Spotlighting

Spotlighting, targeting ground and arboreal mammals, was conducted throughout the site using a random meander transect method. Two people walked the site for approximately an hour per night over three nights using 100 watt spotlights. The specific locations of the spotlighting transects are shown on Figure 3.

Bats

Electronic Detection

A hand-held electronic bat detector was used for approximately 45 minutes on two of the survey nights to sample for the presence of microchiropteran bat species. An automatic device, that runs overnight, was used to supplement the results of hand-held sampling for one night of the survey.

Reptiles

Habitat Searches

Searches of areas representing potential reptile habitat were conducted for a period of 45 minutes on each of three separate days to determine the presence of reptile species at the site. Searches involved turning over rocks and logs with care taken to replace them as they were found.

Spotlighting

Spotlighting as outlined above was utilised to target nocturnal reptile species potentially utilising the site.

Amphibians

The presence of frog species in the vicinity of the proposed zone of disturbance was determined by listening for their call and by spotlighting.



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Figure 3. Vegetation survey sites (Areas 1 to 4) and location of fauna sampling activities.

3. Results – Flora

3.3 Threatened Species, populations and ecological communities potentially occurring at the subject site.

A search of the NPWS Atlas in January 2004¹ for threatened flora species listed under the *Threatened Species Conservation Act 1995* (TSC Act) identified 10 (ten) recorded species within a five kilometre radius of the subject site. Seven out of the ten species are also listed as threatened in the *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act). These are listed on Table 1 below.

Table 1. Threatened flora species recorded within 5 km radius of the site

Common Name	Scientific Name	NSW TSC Act Conservation Status*	EPBC Act# Conservation status*
Scented Acronychia	<i>Acronychia littoralis</i>	E	E
Brush Cassia	<i>Cassia brewsteri</i> var. <i>marksiana</i>	E	Not listed
Small-leaved Tamarind	<i>Diploglottis campbellii</i>	E	E
Southern Swamp Orchid	<i>Phaius australis</i>	E	E
Spiny Gardenia	<i>Randia moorei</i>	E	E
Marblewood	<i>Acacia bakeri</i>	V	Not listed
Three-leaved Bosistoa	<i>Bosistoa transversa</i>	V	V
Stinking Cryptocaria	<i>Cryptocarya foetida</i>	V	V
Fine-leaved Tuckeroo	<i>Lepiderema pulchella</i>	V	Not listed
Coolamon	<i>Syzygium moorei</i>	V	V

*E = Endangered, V = Vulnerable

#indicates species listed as threatened in the *Environmental Protection and Biodiversity Conservation Act, 1999*.

Furthermore a search of the schedules 1, 2 and 3 of the *TSC Act* NSW indicates that an endangered ecological community, namely the “Lowland Rainforest on Floodplain in the NSW North Coast Bioregion” occurs within the floodplain in the Tweed LGA. ‘Lowland Rainforest on the Floodplain’ includes 10 types of subtropical, dry and warm temperate rainforest. The following major rainforest

¹ The on-line search of the National Parks & Wildlife Atlas indicated that the data displayed was current up to the 15/12/2003.

Suballiance (according to Floyd, 1990) within the nominated community are the recognised categories within the lowland floodplain rainforest. These are:

- Suballiance 3: *Cryptocarya obovata* - *Dendrocnide excelsa* - *Ficus* spp - *Araucaria*.

Elements of

- Suballiance 1: *Heritiera trifoliata*,
- Suballiance 2: *Toona* - *Flindersia*,
- Suballiance 4: *Elaeocarpus grandis*,
- Suballiance 5: *Castanospermum* - *Dysoxylum mollissimum*,
- Suballiance 6: *Archontophoenix* - *Livistona*,
- Suballiance 23: *Ficus-Streblus-Dendrocnide-Cassine*,
- Suballiance 24: *Castanospermum* - *Grevillea robusta*,
- Suballiance 25: *Streblus* - *Austromyrtus*, Suballiance
- 26: *Waterhousea floribunda* - *Tristaniopsis laurina* and
- Suballiance 33: *Ceratopetalum/Schizomeria* - *Heritiera/Sloanea* also occur.

The floodplain according to NPWS is defined as the area of land affected by the 1 in 100 year flood event.

3.4 Site Assessment

The site is facing south off the Terranora Ridge and has extensive views of the Tweed River. The central portion of the proposed development site is predominantly cleared as a result of past quarrying activities. The remainder is forested.

The central and northern portion of the site lies on flat terraced ground, the remainder of the site slopes downward to the south. According to Morand (1996) the soil type is moderately deep, moderately well-drained Yellow Earths and Yellow Podzolic Soils occurring on rolling hills on metamorphics of the Nerai Leigh-Fernvale Group which support partly to extensively cleared open-forest (wet-sclerophyll).

A large diversity of native flora species have been identified on the forested area of the site. The site has been divided into 4 Areas (depicted on Figure 3) according to the relative Foliage Projective Cover (FPC). Native species identified in the study for each Area and their relative abundance are listed in Appendix A. Exotic and/or non-endemic species (environmental weeds) were also noted for each Area, these are listed in Appendix B. The dominant species, height, Foliage Projective Cover, slope, aspect and general description for each Area are outlined on Table 2.

Table 2. Dominant species, height, Foliage Projective Cover, slope, aspect and general description for the 4 Areas (refer to Figure 3) identified on Lot 16 DP 856265.

Area	Dominant Species	Height (m)	Foliage Projected Cover (%)	Slope	Aspect	Description
1	<i>Acacia melanoxylon</i> , <i>Macaranga tanarius</i> , <i>Guioa semiglauc</i>	10	<5	0-15°	S	Highly disturbed open grassland with clumps of weedy regrowth.
2	<i>Guioa semiglauc</i> , <i>Cinnamomum camphora</i>	15-20	70	40-45°	S-SW	Secondary regrowth with areas of closed forest, powerline clearing, highly disturbed grassland. <i>Cupaniopsis newmanii</i> noted in this Area.
3	<i>Macaranga tanarius</i> , <i>Acacia melanoxylon</i> , <i>Guioa semiglauc</i>	15	40-70	30-60°	S	Highly disturbed secondary regrowth with large areas of Lantana (<i>Lantana camara</i>) thicket and grasses in disturbed areas.
4	<i>Cryptocarya obovata</i> , <i>Baloghia lucida</i> , <i>Guioa semiglauc</i> , <i>Jagera pseudorhus</i> , <i>Cinnamomum camphora</i>	25	70+	20-35°	S	Closed forest, high diversity of lowland subtropical species. Significant species include: <i>Macadamia tetraphylla</i> , <i>Archidendron muellerianum</i> , <i>Cupaniopsis newmanii</i> , <i>Syzygium moorei</i> , <i>Syzygium hodgkinsoniae</i> .

As indicated previously the 'Tweed Vegetation Management Plan 1999' classifies the vegetation on this site as 'Highly Modified/Disturbed - Camphor Laurel Dominant Closed to Open Forest' (Map 5 - Tweed remnant vegetation classified by vegetation type). This study confirms such vegetation classification for the forested areas present on the site. More specifically as indicated on Table 2, the vegetation for each of the four zoning is classified as follows:

- Area 1 – Open grassland dominated by *Paspalum* (*Paspalum dilatatum*), and Rhodes Grass (*Chloris sp.*) and isolated clumps dominated by Lantana (*Lantana camara*) and Black Wattle (*Acacia melanoxylon*). Very poor native species diversity is present (Refer to Appendix A). A range of environmental weeds

dominate the Area (Refer to Appendix B). The vegetation in this Area is considered highly degraded - i.e. ecosystem is in very poor condition (Wilson, 2003).

- Area 2 – Regrowth closed forest dominated by Guioa (*Guioa semiglauc*), and Camphor Laurel (*Cinnamomum camphora*) and patches of grassland. Medium native species diversity is present (Refer to Appendix A). A range of environmental weeds dominate the Area (Refer to Appendix B). The vegetation in this Area is considered degraded (i.e. ecosystem is in poor condition (Wilson, 2003).
- Area 3 - Open to closed forest regrowth with large areas of Lantana (*Lantana camara*) thicket and grasses in disturbed areas. Medium native species diversity is present (Refer to Appendix A). Fewer environmental weeds are present (Refer to Appendix B). The vegetation in this Area is considered degraded to modified - i.e. ecosystem is in poor or moderate condition (Wilson, 2003).
- Area 4 – Closed forest dominated by Peperberry (*Cryptocarya obovata*), Scrub Bloodwood (*Baloghia lucida*), Guioa, Foambark (*Jagera pseudorhus*), and Camphor Laurel. Good native species diversity for all strata. High diversity of lowland subtropical species is present (Refer to Appendix A). Fewer environmental weeds are present (Refer to Appendix B). The vegetation in this Area is considered modified to little disturbed - i.e. ecosystem is in moderate to good condition (Wilson, 2003).

The forest community at the site ranges from highly disturbed to relatively undisturbed and display a diversity of flora species and structure. Nevertheless the vegetation at the site is affected by environmental weeds. In particular (as shown in Appendix B) Camphor Laurel, Climbing Asparagus *Protoasparagus plumosus*), Lantana, and other weed species are posing various degrees of threat to the resilience of the native vegetation community present at this site.

3.5 Threatened species found at the site

One of the ten potential threatened species listed in Table 1 was found at the site, namely Coolamon (*Syzygium moorei*). Two other threatened species were found on the site which have not been previously recorded within the 5 km radius from the study site. These are the Rough-shelled Bush Nut (*Macadamia tetraphylla*) and Red Lilly Pilly (*Syzygium hodgkinsoniae*). The Coolamon, Rough-shelled Bush Nut and the Red Lilly Pilly are listed as vulnerable under the *TSC ACT 1995* and the *EPBC ACT 1999*. These threatened species were found in Area 4 (Refer to Figure 3, Table 2 and Appendix A).

Two *Rare or Threatened Australian Plants* (ROTAP listed (Briggs & Leigh, 1995) were also found on site, namely Veiny Lace Flower (*Archidendron muellerianum*) and Long-leaved Tuckeroo (*Cupaniopsis newmanii*). The Veiny Lace Flower was found in Areas 2 and 4, while the Long-leaved Tuckeroo was found in Area 4 (Refer to Figure 3, Table 2 and Appendix A).

Endangered Ecological Community

The *TSC Act* NSW indicates that an endangered ecological community, namely the "Lowland Rainforest on Floodplain in the NSW North Coast Bioregion" occurs within the floodplain in the Tweed LGA. The floodplain according to NPWS is defined as the area of land affected by the 1 in 100 year flood event. The remnant vegetation in the subject site has been classified as 'Highly Modified/Disturbed - Camphor Laurel Dominant Closed to Open Forest' by the 'Tweed Vegetation Management Plan 1999' (Map 5-Tweed remnant vegetation classified by vegetation type). The site assessment found that portions of vegetation on the site fit the closed forest classification according to Specht & Specht (1999), and the native species present on the site are recognised as rainforest species. In particular the vegetation community in Area 4 (Figure 3) displays characteristic associated with lowland subtropical rainforest.

Tweed Shire Council has not undertaken a flood study for this site hence no information was available as whether the site lays within the 1 in 100 year flood event. However, perusal of the relevant topographical map indicates that site elevation ranges from 90m to 10m AHD. Area 4 elevation ranges from 80 to 40m AHD, which should be well above the floodplain.

Furthermore, according to Dr John Stanisic (2003) there is unambiguous distinction 'between what is lowland subtropical rainforest on alluvium and relatively adjacent rainforest on higher ground. The latter can be classified as 'foothill' rainforest, usually growing on rocky substrate', which is the case for the vegetation present in Area 4.

This would indicate that the remnant Rainforest community present at the site could not be classified as “Lowland Rainforest on Floodplain in the NSW North Coast Bioregion” as it does not occur within the floodplain and it does not display the bio-physical characteristics which are typical of Lowland Rainforest.

3.6 Vegetation Conservation Significance of Subject Site

The conservation significance ranking for the vegetation present in the Tweed is identified in the Draft Tweed Vegetation Management Strategy 2003, however Tweed Shire Council has currently postponed the release of the Draft Strategy 2003 and the document is not available for perusal (Judge G., 2003, pers. comm.). Hence the conservation significance for the vegetation type mapped for the site (i.e. ‘Highly Modified/Disturbed - Camphor Laurel Dominant Closed to Open Forest’) could not be determined.

Following site assessment, the vegetation at the site can be best described as predominantly regrowth rainforest vegetation stands dominated by Camphor Laurel (*Cinnamomum camphora*) and patches of highly disturbed to relatively undisturbed Subtropical Rainforest. Again no measure of conservation significance could be assigned for the Tweed area. However in the nearby Brunswick and Richmond catchments, Rainforest community is recognised as vegetation of Very High Conservation Value (Byron Shire Council, 2003; RRVC, 2002).

It must be noted that classification of vegetation community or forest ecosystem significance is relatively independent of the actual condition in regard to disturbance, threats and resilience of the community. The habitat value of the remnant vegetation present at the site is further discussed Section 4.3.

4. Results – Fauna

4.1 Threatened Species Potentially Occurring at the Subject Site

A search of the NPWS Atlas in January 2004 identified thirty one (31) threatened fauna species (listed under the TSC Act) recorded within a five-kilometre radius of the subject site (see Table 3).

Table 3. Threatened fauna listed on the NPWS atlas database that were detected within a five kilometre radius of the site

Common Name	Scientific Name	Legal Status*
Avifauna		
Barking Owl	<i>Ninox connivens</i>	V
Barred Cuckoo-shrike	<i>Coracina lineata</i>	V
Beach Stone-curlew	<i>Esacus neglectus</i>	E
Black Bittern	<i>Ixobrychus flavicollis</i>	V
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E
Black-tailed Godwit	<i>Limosa limosa</i>	V
Bush-hen	<i>Amaurornis olivaceus</i>	V
Collared Kingfisher	<i>Todiramphus chloris</i>	V
Comb-crested Jacana	<i>Irediparra gallinacea</i>	V
Flesh-footed Shearwater	<i>Puffinus carneipes</i>	V
Grass Owl	<i>Tyto capensis</i>	V
Great Knot	<i>Calidris tenuirostris</i>	V
Greater Sand Plover	<i>Charadrius leschenaultii</i>	V
Lesser Sand Plover	<i>Charadrius mongolus</i>	V
Little Tern	<i>Sterna albifrons</i>	E
Magpie Goose	<i>Anseranas semipalmata</i>	V
Mangrove Honeyeater	<i>Lichenostomus fasciocularis</i>	V
Osprey	<i>Pandion haliaetus</i>	V
Pied Oystercatcher	<i>Haematopus longirostris</i>	V
Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	V
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	V
Terek Sandpiper	<i>Xenus cinereus</i>	V
White-eared Monarch	<i>Monarcha leucotis</i>	V
Mammals		
Bats		
Beccari's Freetail Bat	<i>Mormopterus beccarii</i>	V
Black Flying-fox	<i>Peteropus alecto</i>	V
Common Blossom-bat	<i>Syconycteris australis</i>	V
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	V

Common Name	Scientific Name	Legal Status*
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V
Other		
Koala	<i>Phascolarctos cinereus</i>	V
Reptiles		
Green Turtle	<i>Chelonia mydas</i>	V
Invertebrates		
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	E

*Legal Status key:

E: Schedule 1 (Endangered) under the TSC Act

V: Schedule 2 (Vulnerable) under the TSC Act

4.2 Site Assessment

Fauna Species Detected at the Site

Avifauna

Sampling resulted in the detection of the avifauna listed in Table 4. No bird species listed as threatened in current conservation legislation were detected during the survey period. Brush turkeys were seen to be present on the site and three of their mounds were seen in the forested sections of the site. A Whistling Kite was heard calling as it roosted in or near to the southern section of the site where the forested land gives way to land cleared for pasture. A nest could not be sited.

Table 4. Avifauna species recorded during the site survey.

Common Name	Scientific Name/ Family	Method of Observation
Avifauna		
Australian Brush Turkey	<i>Alectura lathamii</i>	O
Australian Magpie	<i>Gymnorhina tibicen</i>	O
Australian Pelican	<i>Pelecanus conspicillatus</i>	O
Australian White Ibis	<i>Threskiornis molucca</i>	O
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	O
Brown Quail	<i>Coturnix ypsilophora</i>	O
Cattle Egret	<i>Ardea ibis</i>	O
Crested Pigeon	<i>Ocyphaps lophotes</i>	O
Torresian Crow	<i>Corvus orru</i>	O
Dollarbird	<i>Eurystomus orientalis</i>	O
Figbird	<i>Specothes viridis</i>	O
Golden-headed Cisticola	<i>Cisticola exilis</i>	O
Grey Butcherbird	<i>Cracticus torquatus</i>	O
Grey Fantail	<i>Rhipidura fuliginosa</i>	O
Grey Shrike Thrush	<i>Colluricincla harmonica</i>	O
Kookaburra	<i>Dacelo novaeguineae</i>	O
Lewin's Honeyeater	<i>Meliphaga lewinii</i>	O

Common Name	Scientific Name/ Family	Method of Observation
Noisy Miner	<i>Manorina melanocephala</i>	O
Pheasant Coucal	<i>Centropus phasianinus</i>	O
Pied Butcherbird	<i>Racticus nigrogularis</i>	O
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	O
Red-backed Fairy-wren	<i>Malurus melanocephalus</i>	O
Red-browed Finch	<i>Neochmia temporalis</i>	O
Rufus Whistler	<i>Pachycephala rufiventris</i>	O
Spangled Drongo	<i>Dicrurus bracteatus</i>	O
Spotted Turtle-Dove	<i>Streptopelia chinensis</i>	O
Variegated Fairy-wren	<i>Malurus lamberti</i>	O
Whipbird	<i>Psophodes olivaceus</i>	O
Whistling Kite	<i>Haliastur sphenurus</i>	W
Willie Wagtail	<i>Rhipidura leucophrys</i>	O

Key:

- O – Observed
- T – Trapped
- W – Heard Calling

Mammals

The mammals species detected during sampling are listed in Table 5. A number of ground dwelling mammals species and one species of bat were detected during sampling. The use of electronic bat detectors at the site did not result in the detection of any microbat species. It is likely that the results of electronic detection were hindered by the relatively poor weather conditions and intermittent rainfall occurring at the time of sampling.

Table 5. Mammal species recorded during the site survey.

Common Name	Scientific Name/ Family	Method of Observation
Mammals		
Bush Rat	<i>Rattus fuscipes</i>	T
Grassland Melomys	<i>Melomys bertonii</i>	T
House Mouse	<i>Mus musculus</i>	T
Swamp Rat	<i>Rattus lutreolus</i>	T
Swamp Wallaby	<i>Wallabia bicolor</i>	O
Unidentified Flying-fox	<i>Pteropus sp.</i>	W

Key:

- O – Observed
- T – Trapped
- W – Heard Calling

Reptiles

The reptile species detected during sampling are listed in Table 5. Both of the identified specimens were trapped in Elliott traps of an evening. No reptiles, aside from the occasional skink were detected during active searches.

Table 6. Reptile species recorded during the site survey.

Common Name	Scientific Name/ Family	Method of Observation
Reptiles		
Pink-tongued Skink	<i>Cyclodomorphus gerrardii</i>	T
Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>	T
Skink species	<i>Scincidae sp.</i>	O

Key:

O – Observed

T – Trapped

Amphibians

The amphibian species detected during sampling are listed in Table 7. All of these specimens were heard calling during the survey period. *L. terraereginae* was heard to start calling late in the survey period after substantial rain had fallen and parts of the survey site began to become inundated with water.

Table 7. Amphibian species recorded during the site survey.

Common Name	Scientific Name/ Family	Method of Observation
Amphibians		
Northern Pobblebonk	<i>Lymnodynastes terraereginae</i>	W
Toadlet sp.	<i>Pseudophryne sp.</i>	W

Key:

W – Heard calling

4.3 Fauna Habitat and Corridor Value of Subject Site

Fauna Habitat

The habitat value of the site was assessed in terms of criteria developed by Gilmore *et al* (1985) (see Appendix C). The site contained features indicative of both an area of high conservation value and medium conservation value according to the above criteria. Features of an area of high conservation value were, however, most common and consequently the site was determined to be of overall high conservation value. Specifically, the characteristics of the site with regard to conservation values are summarised in Table 4.

Table 4. Fauna habitat conservation values.

Characteristic of Site	Conservation Value According to Gilmore <i>et al.</i>
Some vegetation stands have good structure (high);	High
There is some degradation of the site due to exotic species occurrence;	Medium
There is good potential habitat for a diversity of fauna including endangered fauna;	High
There is a low diversity of habitat types;	Medium
The site is above 4 hectares in size;	High
The site is linked or provides links to other areas of habitat;	High
The site likely functions as a corridor for fauna;	High
The site has good potential for rehabilitation;	High
The site contains vegetation communities or associations of local significance;	High

The habitat value of the site for the general fauna groups is described in the following paragraphs:

Avifauna

A reasonably large number of bird species were detected during the survey conducted for the purposes of this report. None of these species are listed as vulnerable or endangered according to the relevant legislation. The subject site would provide preferred foraging habitat for a diversity of avifauna species due to the fact that there are a variety of flora species at the site including a number of fruiting and nectar bearing plants that provide a food resource for avifauna. Additionally, the Camphor Laurel dominated Closed to Open Forest occurring on

the site affords a good degree of cover for avifauna species as they forage and roost.

Mammals

Bats

The survey results indicate that the site is utilised opportunistically by flying-foxes for the purposes of foraging. This is likely due to the fact that there are a variety of both rainforest and wet-sclerophyll tree species that would provide fruit as a food source for such species. Microbat species are less likely to utilise the area as flyways are largely absent from the closed forest at the site as are tree hollows such as those required by microbat species.

Arboreal Mammals

Most arboreal mammals rely on tree hollows for habitat and as there are few hollow-bearing trees at the site it is unlikely that significant numbers of such species utilise the area. However, the presence of fruiting and flowering trees and the occasionally dense foliage of the rainforest understorey may provide foraging habitat for some arboreal mammal species. The relatively comprehensive survey undertaken for the purposes of this report failed to detect any evidence of arboreal mammals utilising the site.

No Koala food trees were detected at the site.

Terrestrial Mammals

The rainforest understorey habitat of the subject site provides potential habitat for ground-dwelling mammal species particularly when it is considered that the site is relatively densely vegetated and provides a high degree of cover. Additionally, the more dense grassland occurring at the site is preferred habitat for ground mammals such as native rats and melomys as evidenced by the results of Elliott trapping.

Reptiles

Two lizards were captured in Elliott traps during the fauna survey indicating that the grassland area of the site is favourable habitat for some reptile species. In addition to the captured reptile species, the dense rainforest understorey may provide favourable habitat for such species as the Green Tree Snake (*Dendrelaphis punctulata*) and Carpet Python (*Morelia spilota*).

Amphibians

Although the site does not contain any permanent waterways, there are some soakage areas that provide breeding habitat for amphibians (some Northern Pobblebonks were heard calling from such a soak). Additionally, some individual *Pseudophryne* sp. were heard calling from the damp leaf litter occurring in the closed forest areas of the site.

Fauna Corridor

Fauna corridors are described as vegetation communities that allow the movement of fauna between connected landscape elements (Soule & Gilpin, 1991). Corridors provide dispersion routes for migrating animals with large foraging or breeding ranges. Corridors are also particularly important for small remnants that do not support large viable populations.

The subject site is part of a segment of land that provides a connection between proximate stands of vegetation. Specifically, the subject site is part of a band of forested land that extends from Chinderah Bay in the Tweed River to the east to the Tweed Broadwater (in the vicinity of Stott's Island Nature Reserve) to the west.

The potential of the subject area as a fauna corridor will be maintained in the long term when it is considered that the forested sections of the site will be largely retained.

4.4 Likelihood of Occurrence of Threatened Fauna Species

There are a number of listed species that have been detected previously in the general area of the site that, based on their habitat requirements (see Table 5), could potentially utilise the habitat available in the area of the proposed development. Species considered as either likely to occur, or possibly occurring, at the subject site are assessed in Section 5 with regard to the relevant legislative considerations.

Table 5. Likelihood of Threatened Fauna Species Occurring at the Site

Common Name	Scientific Name	Habitat	Likely	Possible	Unlikely
Avifauna					
Barking Owl	<i>Ninox connivens</i>	The Barking Owl occupies eucalypt woodland, open forest, swamp woodlands and timber along watercourses. Occasionally it roosts in denser habitats but hunts over more open country. Nests are in hollows of large, old eucalypt trees. Roosts are typically in tall, densely-foliaged understorey trees, such as wattles and casuarinas, or the dense clumps canopy leaves in large eucalypts. The Owl feeds on a variety of prey including birds, invertebrates and mammals. Territories range from 30 to over 1000 hectares and pairs of birds remain in the same area all year (NPWS, 2002b).			✓
Barred Cuckoo-shrike	<i>Coracina lineata</i>	Flocks travel between food trees, common in northern Australia, less common in this region. Found in coastal rainforest and vine scrubs, nearby eucalypts, paperbarks, plantations and tropical gardens. The Shrike nests from September to March in a shallow saucers of twigs, Casuarina needles and rootlets bound with web in the fork of a tree 15-30 m above the ground (Morecombe, 2000).		✓	
Beach Stone-curlew	<i>Esacus neglectus</i>	Marine tidal zone, northern half of Australia (Morecombe, 2000).			✓
Black Bittern	<i>Ixobrychus flavicollis</i>	The Black Bittern inhabits both terrestrial and estuarine wetlands preferring areas with permanent water and dense vegetation. If permanent water is found, the Bittern will occupy flooded grassland, forests, woodland, rainforest and mangroves. The Bitten forages on reptiles, fish and invertebrates. During the day, the bird generally roosts in trees or on the ground amongst dense reeds (NPWS, 1999a).			✓
Black-necked Stork	<i>Epippiorhynchus asiaticus</i>	Inhabits terrestrial wetlands including swamps, large permanent pools, lagoons and mangrove swamps. The Stork is also found in flooded meadows, spring seepages, on dry plains and occasionally on open grassy woodlands (Ayers, 1995).			✓
Black-tailed Godwit	<i>Limosa limosa</i>	Found in estuaries, sheltered bays, and lagoons and sometimes around large			✓

Common Name	Scientific Name	Habitat	Likely	Possible	Unlikely
		ephemeral inland lakes. Less frequently found on rocky coasts, islets and sewage farms. Black-tailed Godwits nest on the Cairns shoreline and in the Gulf of Carpentaria (Morecombe, 2000).			
Bush-hen	<i>Amaurornis olivaceus</i>	The Bush-hen is found in densely overgrown margins of permanent terrestrial freshwater wetlands such as creeks, rivers, billabongs, ponds, swamps, waterholes, dams, lakes and roadside ditches. Habitat requirements are permanent waterbodies, streams and thick undergrowth 2-4m tall, especially tall dense grasses or dense thickets of lantana or other shrubs (Marchant and Higgins, 1993; Holmes, 1987). Breeding occurs in dense grasses close to streams. The hen prefers to breed in grass clumps growing among or beneath shrubs, bushes, thickets or trees next to creeks. The Bush-hen is considered to be predominantly nocturnal, feeding on seeds, soft vegetation and small animals (frogs) (Murantyi, 1994).			✓
Collared Kingfisher	<i>Todiramphus chloris</i>	The Collared Kingfisher is sedentary in northern Australia but migratory here. It is found around mangroves and hunts on nearby mudflats and beaches. It nests in termite mounds, tree hollows and earthen banks (Morecombe, 2000).			✓
Comb-crested Jacana	<i>Irediparra gallinacea</i>	Lakes, swamps and dams where there are waterlilies or other extensive cover of floating vegetation provide habitat for this species. It forages across such waters searching for small aquatic species or insects (Morecombe, 2000).			✓
Flesh-footed Shearwater	<i>Puffinus carneipes</i>	The Flesh-footed Shearwater breeds on a number of offshore islands in the Indian ocean and around the Australian and New Zealand coastline. The species is oceanic and coastal in temperate and subtropical seas (Lindsey, 1986 and Simpson and Day, 1996).			✓
Grass Owl	<i>Tyto capensis</i>	As the name indicates, Grass Owls inhabit tall coarse grasses in open swampy country (Morcombe, 2000).			✓
Great Knot	<i>Calidris</i>	The Great Knot is found on sheltered coastal mudflats, inlets, harbours,			✓

Common Name	Scientific Name	Habitat	Likely	Possible	Unlikely
	<i>tenuirostris</i>	lagoons, mangrove swamps, sandy bars and beaches. Occasionally found on salt lakes, lagoons and saltworks ponds (Morcombe, 2000).			
Greater Sand Plover	<i>Charadrius leschenaultii</i>	Found on mudflats and sandbanks of sheltered bays and estuaries, sandy cays of coral reefs, reef platforms, saltmarsh and wetlands around Australia (Morcombe, 2000).			✓
Lesser Sand Plover	<i>Charadrius mongolus</i>	Lesser Sand Plovers occur on mudflats, wide sandy beaches, estuaries and tidal areas in mangroves (NPWS, 2002).			✓
Little Tern	<i>Sterna albifrons</i>	Found in sheltered coastal locations including estuaries, bays, islets, coastal swamps and lakes around most of the Australian coast, rare in southern Australia (Morcombe, 2000).			✓
Magpie Goose	<i>Anseranas semipalmata</i>	Magpie geese are found mainly in shallow wetlands (less than one metre deep) such as large swamps and dams, especially with dense growth of rushes or sedges, and with permanent lagoons and grasslands nearby. The commencement of breeding is strongly influenced by water level (NPWS, 2002).			✓
Mangrove Honeyeater	<i>Lichenostomus fasciogularis</i>	Primary habitat is mangrove forest but the species also occurs in other near-coastal forests and woodlands, including casuarina and paperbark swamp forests. It sometimes frequents adjacent shrublands and woodlands dominated by banksias and eucalypts; and sometimes visits gardens in coastal towns (NPWS, 2002).			✓
Osprey	<i>Pandion haliaetus</i>	Found around the coast of Australia, over coastal waters and estuaries, beaches, islets and reefs. Follows major rivers and wetlands inland to large pools (Morcombe, 2000).			✓
Pied Oystercatcher	<i>Haematopus longirostris</i>	Found on beaches and mudflats of inlets, bays, ocean beaches and offshore islets around the coast of Australia (Morcombe, 2000).			✓
Rose-crowned Fruit-dove	<i>Ptilinopus regina</i>	Within northeastern NSW this species may be found in eucalypt woodland with scattered small patches of rainforest and also in mangrove forests (Recher, et al., 1995). It is known to inhabit rainforests, monsoon forests, wet		✓	

Common Name	Scientific Name	Habitat	Likely	Possible	Unlikely
		eucalypt forests, melaleuca woodlands, lantana thickets and regrowth scrub along creeks (Morcombe, 2000).			
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	Sooty Oystercatchers favour rocky headlands, rocky shelves and beaches and offshore islands. They also occur more rarely on sandy beaches and estuarine tidal flats (NPWS, 2002).			✓
Terek Sandpiper	<i>Xenus cinereus</i>	The Terek Sandpiper inhabits tidal mudflats, estuaries, shores and reefs of offshore island and coastal swamps (NPWS, 2002).			✓
White-eared Monarch	<i>Monarcha leucotis</i>	Found in coastal rainforest, mangroves, swamps and riverine vegetation from northern NSW to north Queensland. Builds nests high in the canopy of rainforest and breeds from September to February (Morecombe, 2000).		✓	
Mammals					
Bats					
Beccari's Freetail Bat	<i>Mormopterus beccarii</i>	Beccari's Freetail Bat occurs though New Guinea and northern Australia in desert, semi arid and mesic regions where it forages over rainforests, floodplains, and eucalypt communities. The freetail bat hunts above the tree canopy and over rivers. They roost in tree hollows but have been found under roofs (McKenzie, 1995).		✓	
Black Flying-fox	<i>Pteropus alecto</i>	These are nocturnal animals that in many areas spend the day time roosting in "camps" in mangroves, paperbark swamps or patches of rainforest including tropical and subtropical rainforests and wet sclerophyll forests of the coastal areas of northern Australia. These camps can contain hundreds of thousands of Flying-foxes (Hall, 1995). Pollen and nectar of blossoms of eucalypts, paperbarks and turpentine trees are the preferred food of the bat and it will travel up to 50 km to feed (Hall, 1995). They also feed on other flowers and fruit, including introduced and commercial fruits like mangoes. Fruit bats are responsible for pollinating a wide variety of native flowering plants (Hall, 1995). It has also been noted that on rare occasions they may utilise swamp sclerophyll forests as foraging habitat and utilise remnant		✓	

Common Name	Scientific Name	Habitat	Likely	Possible	Unlikely
		vegetation as "stepping stones" between feeding grounds.			
Common Blossom-bat	<i>Syconycteris australis</i>	Common Blossom-bats forage in heathlands but roost in rainforest. They roost most commonly in the sub-canopy but occasionally in the canopy. Roosts are amongst large leaves (sometimes dead), often on the growing tips of saplings or amongst dense vines. The combination of heathland and coastal rainforest is essential habitat for this species in northern NSW. Common Blossom-bats have a foraging area of about 13ha of heathland and use the same area each night. Farther north they occur in rainforest, monsoon and paperbark forests (Churchill, 1998).		✓	
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	Inhabits a variety of habitats from rainforests to dry sclerophyll woodlands and is often found among the vegetation along watercourses. Lunney <i>et.al.</i> (1995) notes that rainforest appears to be the most critical habitat for this species in northern NSW. The Long-eared Bat has been recorded roosting in tree hollows and the roofs of buildings. In northern NSW, it has been recorded roosting in dead foliage of rainforests as well as the dead fronds of Bangalow Palms. The species has also been recorded roosting under the bark of paperbarks (State Forests of NSW, 1995).		✓	
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands. They forage on nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and fruits of rainforest trees and vines. They also forage in cultivated gardens and fruit crops. The Grey-headed Flying-fox roosts in large camps up to the tens of thousands, often in stands of riparian rainforest, Paperbark or Casuarina forest (NPWS, 1999b; Australasian Bat Society Inc., 2000).		✓	
Other					
Koala	<i>Phascolarctos cinereus</i>	Associated with eucalypt forest, the Koala feeds almost entirely on the foliage of species of this genus. Feeds on Forest Red Gums, Tallowwoods			✓

Common Name	Scientific Name	Habitat	Likely	Possible	Unlikely
		and Grey Gums in northern NSW (Hall, 1995).			
Reptiles					
Green Turtle	<i>Chelonia mydas</i>	The Green Turtle is abundant along the tropical coast of Australia and breeds throughout its range (Cogger, 2000).			✓
Invertebrates					
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	Remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground with palms and fig trees around the edges of wetlands are particularly favoured habitat (NPWS, 2002 & NPWS, 2001).			✓

5. Statutory Requirements

5.1 NSW Environmental Planning and Assessment Act 1979

State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 (SEPP 44) was gazetted in January 1995. It encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure permanent free-living populations will be maintained over their present range. The policy applies to 107 local government areas. Local councils cannot approve development in an area affected by the policy without an investigation of core Koala habitat. The policy provides the statewide approach needed to enable appropriate development to continue, while ensuring there is ongoing protection of Koalas and their habitat.

Does the subject land occur in a Local Government Area identified in Schedule 1?

The site is located in the Tweed Local Government Area, which is listed in Schedule 1.

Is the land to which the development application applies smaller than 1 hectare in area?

The subject land is 10.19 hectares in area.

Does the site contain areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component?

The site does not contain areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component.

Is the land potential Koala habitat?

The land is not considered potential Koala habitat in that there are no Koala food trees occurring on the site. Additionally, the land is not identified as Koala habitat, but rather classified as mainly cleared/other vegetation community, on the Tweed Coast Koala Habitat Atlas - Habitat Classification Map (Australian Koala Foundation, 1996).

Is there core habitat on the subject land?

There is no core habitat on the land.

Is there a requirement for the preparation of a Plan of Management for identified core Koala habitat?

There is no core habitat on the land therefore a Plan of Management is not required.

Section 5A of the Environmental Planning and Assessment Act

Section 5A of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) lists the factors (8 point test of significance) to be considered when determining whether a proposed development is likely to have a significant effect upon listed threatened species, populations or ecological communities, and their habitats, therefore determining if a Species Impact Statement is required.

Three (3) threatened listed flora species were found on the site, namely the

- Coolamon (*Syzygium moorei*);
- Rough-shelled Bush Nut (*Macadamia tetraphylla*); and
- Red Lilly Pilly (*Syzygium hodgekinsoniae*).

The Coolamon, Rough-shelled Bush Nut and the Red Lilly Pilly are listed as vulnerable under the *TSC ACT 1995* and the *EPBC ACT 1999*.

No threatened fauna species were detected utilising the subject site during the fauna inspection. A number of listed species are, however, considered to have potential to utilise the site.

The fauna species considered are as follows:

- Barred Cuckoo-shrike (*Coracina lineata*);
- Rose-crowned Fruit-dove; (*Ptilinopus regina*)
- White-eared Monarch; (*Monarcha leucotis*)
- Beccari's Freetail Bat (*Mormopterus beccarii*);
- Black Flying-fox (*Pteropus alecto*);
- Common Blossom Bat (*Syconycteris australis*);
- Eastern Long-eared Bat (*Nyctophilus bifax*); and
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

An assessment of these threatened flora and fauna species with regard to the provisions of Section 5A of the EP&A Act is undertaken below.

Eight Point Test of Significance

In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.

FLORA

Common name	Scientific name	Legal Status (TSC Act)
<u>Coolamon</u>	<i>Syzygium moorei</i>	Vulnerable
Habitat description/ life cycle components	Coolamon is a tree to 40m tall, with dense dark foliage and flaky bark. Its paired leaves are thick and usually rounded at the tips. Flowers are pink to red and are clustered directly on the older leafless branches and the trunk of the tree (NPWS, 2002). Flowering time is November to March (Harden, 1991). It is found in Subtropical and Riverine Rainforest at low altitude. It is also occur as isolated paddock trees (NPWS, 2002).	
Sensitivities	Threats to the Coolamon include the following: <ul style="list-style-type: none"> • Clearing and fragmentation of habitat for development, agriculture and road-works; • Weed infestation and general degradation of rainforest habitats; • Grazing and trampling by domestic stock; and • Illegal collection for horticulture (NPWS, 2002). 	
Likelihood of local extinction	The proposed activity will not result in the local extinction of this species as all examples of this species detected on the site are to be retained.	

Common name	Scientific name	Legal Status (TSC Act)
<u>Rough-shelled Bush Nut</u>	<i>Macadamia tetraphylla</i>	Vulnerable
Habitat description/ life cycle components	<i>M. tetraphylla</i> is a densely bushy tree growing up to 15m tall. The leathery, glabrous leaves are usually in whorls of four, 18-25cm long and have stiff, prickly toothed margins (Harden, 1991). Creamy pink to purplish flowers hang in long strings among the leaves (NPWS, 2002) from August-October (Harden, 1991).	

In the Richmond and Tweed valleys of northern NSW, *M. tetraphylla* is generally found in small wild populations (2-50 plants) within disjunct rainforest remnants with different habitat attributes in terms of forest fragment area and disturbance history (agricultural, urban and logging impacts).

It is found in subtropical rainforest, usually near the coast (NPWS, 2002). It is uncommon in the wild.

The Rough-shelled Bush Nut is at threat from the following:

- | | |
|---------------|--|
| Sensitivities | <ul style="list-style-type: none"> • Clearing and fragmentation of habitat for coastal development, agriculture and road-works; • Risk of local extinction due to low numbers; • Grazing and trampling by domestic stock; • Fire; • Invasion of habitat by introduced weeds; and • Loss of local genetic strains through hybridisation with commercial variety (NPWS, 2002). |
|---------------|--|

Likelihood of local extinction	The proposed activity will not result in the local extinction of this species as all examples of this species detected on the site are to be retained.
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Common name	Scientific name	Legal Status (TSC Act)
<u>Red Lilly Pilly</u>	<i>Syzygium hodgkinsoniae</i>	Vulnerable

Habitat description/ life cycle components	<p>Red Lilly Pilly is a small tree with smooth-fibrous to flaky bark to 11m tall. The glabrous leaves are dark green above and paler below (Harden, 1991). The flowers are off-white, fluffy and held in clusters at the ends of stems from February to March. Round, bright red fruit follows (NPWS, 2002).</p>
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	<p>Red Lilly Pilly is usually found in Riverine and Subtropical rainforest on rich alluvial or basaltic soils (NPWS, 2002).</p>
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| Sensitivities | <p>The Red Lilly Pilly is at threat from the following:</p> <ul style="list-style-type: none"> • Clearing and fragmentation of habitat for development, agriculture, road-works and powerlines; • Weed infestation and general degradation of rainforest habitat; • Grazing and trampling by domestic stock; • Roadside slashing and mowing; and • Illegal collection for horticulture (NPWS, 2002). |
|---------------|---|

Likelihood of local extinction The proposed activity will not result in the local extinction of this species as all examples of this species detected on the site are to be retained.

FAUNA

Common name <u>Barred Cuckoo-shrike</u>	Scientific name <i>Coracina lineata</i>	Legal Status (TSC Act) Vulnerable
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Habitat description/ life cycle components	Flocks travel between food trees, common in northern Australia, less common in this region. Found in coastal rainforest and vine scrubs, nearby eucalypts, paperbarks, plantations and tropical gardens. The Shrike nests from September to March in a shallow saucers of twigs, Casuarina needles and rootlets bound with web in the fork of a tree 15-30 m above the ground (Morecombe, 2000).
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Sensitivities	<p>The Barred Cuckoo-shrike is at threat from the following:</p> <ul style="list-style-type: none"> • Reduction of habitat, particularly rainforest, as a result of clearing for agriculture, development and timber harvesting. (NPWS, 2002).
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Likelihood of local extinction	<p>Given the fact that the proposed development does not call for alteration to land on the site that represents potential habitat for the Cuckoo-shrike, namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.</p>
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Common name <u>Rose-Crowned Fruit Dove</u>	Scientific name <i>Ptilinopus regina</i>	Legal Status (TSC Act) Vulnerable
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Habitat description/ life cycle components	The Rose-crowned fruit-dove occurs mainly in sub-tropical and dry rainforests and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. They are shy pigeons, not easy to see amongst the foliage, and are more often heard than seen. They feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits. Some populations are migratory in response to food availability – numbers in NE NSW increase during spring and summer then decline in April or May. The
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Rose-crowned Fruit-dove occurs throughout coastal Queensland and Northern Territory south to Port Stephens.

Within northeastern NSW this species may be found in eucalypt woodland with scattered small patches of rainforest and also in mangrove forests (Recher *et al.*, 1995). The Rose-crowned Fruit-dove is a frugivore (fruit eater) that forages mainly in the canopy of mature trees. The species has been identified as utilising a number of exotic species such as Camphor Laurel, Lantana and Wild Tobacco (Recher, *et al.*, 1995), as well as native species such as the Moreton Bay Fig (Holmes, 1987).

The Rose-crowned Fruit-dove is at threat from the following:

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|---------------|---|
| Sensitivities | <ul style="list-style-type: none"> • Clearing and fragmentation of low to mid-elevation rainforest; • Logging and roading in moist eucalypt forest with well-developed rainforest understorey; • Burning of remnant rainforest habitat; and • Invasion of habitat by introduced weed species. |
|---------------|---|

Likelihood of local extinction	<p>Given that the proposed development does not call for alteration to land on the site that represents potential habitat for the Rose-crowned Fruit Dove, namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.</p>
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Common name	Scientific name	Legal Status (TSC Act)
<u>White-eared Monarch</u>	<i>Monarcha leucotis</i>	Vulnerable

Habitat description/ life cycle components	<p>Found in coastal rainforest, mangroves, swamps and riverine vegetation from northern NSW to north Queensland. Builds nests high in the canopy of rainforest and breeds from September to February (Morecombe, 2000).</p>
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The White-eared Monarch is at threat from the following:

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|---------------|--|
| Sensitivities | <ul style="list-style-type: none"> • Clearing and isolation of low-elevation subtropical rainforest, coastal rainforest, and wet and swamp forest resulting from agricultural, tourist and residential development; • Conversion of multi-aged wet forests to young, even- |
|---------------|--|

- aged stands through forestry operations; and
- Weed invasions completely dominating habitats. (NPWS, 2002).

Likelihood of local extinction Given that the proposed development does not call for alteration to land on the site that represents potential habitat for the White-eared Monarch, namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.

Common name	Scientific name	Legal Status (TSC Act)
<u>Beccari's Freetail Bat</u>	<i>Mormopterus beccarii</i>	Vulnerable

Habitat description/ life cycle components Beccari's Freetail-bat occurs throughout New Guinea and northern Australia in desert, semi arid and mesic regions where it forages over rainforests, floodplains, and eucalypt communities. The Freetail Bat hunts above the tree canopy and over rivers. They roost in tree hollows but have been found under roofs (McKenzie, 1995).

Sensitivities Beccari's Freetail-bat is at threat from the following:

- Clearing of forest and woodland habitat for agricultural, residential and infrastructure development;
- Loss of hollow-bearing trees used for roosting and maternity sites as the result of dieback, too-frequent burning and forest management favouring younger stands; and
- Use of pesticides. (NPWS, 2002).

Likelihood of local extinction Given that the proposed development does not call for alteration to land on the site that best represents potential habitat for Beccari's Freetail Bat , namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.

Common name	Scientific name	Legal Status (TSC Act)
<u>Black Flying-Fox</u>	<i>Pteropus alecto</i>	Vulnerable

Habitat description/ life cycle components	<p>Black Flying-foxes are nocturnal animals that spend the day roosting in "camps" in mangrove areas, paperbark swamps or patches of rainforest including tropical, subtropical rainforests and wet sclerophyll forest of the coastal areas of northern Australia. These camps can contain hundreds of thousands of Flying-foxes (Hall, 1995).</p> <p>The preferred food of the Black Flying-fox is pollen and the nectar from the blossoms of eucalypt, paperbark and turpentine trees, with individuals travelling up to 50 kilometres to feed (Hall, 1995). They also feed on other flowers and fruit, including introduced and commercial fruits like mangoes.</p> <p>Fruit bats are responsible for pollinating a wide variety of native flowering plants (Hall, 1995). It has also been noted that on rare occasions they may utilise swamp sclerophyll forests as foraging habitat and utilise remnant vegetation as "stepping stones" between feeding grounds.</p> <p>Mating season occurs from March to April and activity occurs in the camps at this time. The mother carries a single young usually born in October for about one month (Hall, 1995). During the winter months, camps are disbanded and most bats live alone or in small groups preferring to roost amongst dense leaf cover, high in the branches of mangrove and paperbark swamps.</p>
Sensitivities	<p>The Black Flying-fox is at threat from the following:</p> <ul style="list-style-type: none">• Clearing and fragmentation of rainforest and swamp forest remnants used for roost sites, mostly as the result of urban development;• Loss of forest areas used for feeding, particularly winter feeding areas, through agriculture, intensive forestry and urban development;• Deliberate destruction and disturbance of flying-foxes including shooting of individuals and harassment and attempted re-location of camps near urban areas;• Conversion of old-growth forests, woodlands and shrublands to young, even-aged stands as a result of intensive forestry and too frequent burning;• Invasion of habitat by introduced weeds• (NPWS, 2002);• Unregulated shooting by local orchard owners as a

- means of controlling crop loss; and
- Electrocution on powerlines due to their large size (Hall, 1995).

Likelihood of local extinction Given that the proposed development does not call for alteration to land on the site that best represents potential habitat for the Black Flying-fox, namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.

Common name	Scientific name	Legal Status (TSC Act)
<u>Common Blossom-bat</u>	<i>Syconectes australis</i>	Vulnerable

Habitat description/ life cycle components Common Blossom-bats forage in heathlands but roost in rainforest. They roost most commonly in the sub-canopy but occasionally in the canopy. Roosts are amongst large leaves (sometimes dead), often on the growing tips of saplings or amongst dense vines. The combination of heathland and coastal rainforest is essential habitat for this species in northern NSW. Common Blossom-bats have a foraging area of about 13ha of heathland and use the same area each night. Farther north they occur in rainforest, monsoon and paperbark forests (Churchill, 1998).

Sensitivities The Common Blossom-bat is at threat from the following:

- Clearing of coastal habitat for urban development or sandmining; and
- Weeds, such as Bitou Bush, that suppress the regeneration of key food trees, such as Coastal Banksia (NPWS, 2002).

Likelihood of local extinction Given that the proposed development does not call for alteration to land on the site that best represents potential habitat for the Common Blossom-bat, namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.

Common name	Scientific name	Legal Status (TSC Act)
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Casuarina forest (NPWS, 1999b & Australasian Bat Society Inc., 2000).

The Grey-headed Flying -fox is at threat from the following:

- Sensitivities
- Clearing and fragmentation of rainforest and other vegetation remnants used for roosting sites, mainly through agriculture and urban development;
 - Loss or modification of forest areas used for feeding, particularly winter feeding areas, through agricultural development, intensive forestry and urban development;
 - Deliberate destruction and disturbance of flying-foxes, including shooting of individuals and attempted re-location of camps near urban areas;
 - Invasion of habitat by introduced weeds; and
 - Conversion of old-growth forests, woodlands and shrublands to young, even-aged stands as a result of intensive forestry and too-frequent burning. (NPWS, 2002).

Likelihood of local extinction

As with the Black Flying-fox, given that the proposed development does not call for alteration to land on the site that best represents potential habitat for the Grey-headed Flying-fox, namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.

In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

There are no endangered fauna populations, as defined In Part 2 of Schedule 1 of the Threatened Species Conservation Act 1995, at the site and it is unlikely that the life cycle of a species that constitutes such a population will be disrupted.

In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.

It cannot be said that, in relation to the regional distribution of the habitat of threatened species, that a significant area of known habitat is to be removed or

Eastern Long-Eared Bat

Nyctophilus bifax

Vulnerable

Habitat description/ life cycle components Inhabits a variety of habitats from rainforests to dry sclerophyll woodlands and is often found among the vegetation along watercourses. Lunney et.al. (1995) notes that rainforest appears to be the most critical habitat for this species in northern NSW. The Long-eared Bat has been recorded roosting in tree hollows and the roofs of buildings. In northern NSW, it has been recorded roosting in dead foliage of rainforests as well as the dead fronds of Bangalow Palms. The species has also been recorded roosting under the bark of paperbarks (State Forests of NSW, 1995).

Sensitivities The Eastern Long-eared Bat is at risk from the following:

- Clearing, fragmentation and isolation of lowland subtropical rainforest, wet and swamp eucalypt forest and coastal scrub, particularly forest and scrub close to the coast, for agricultural, residential and other development;
- Loss of hollow-bearing trees and stands of palms and rainforest trees used for roosting and maternity sites;
- Invasion of habitat by weeds, particularly by Bitou Bush on the coast; and
- Use of pesticides.

Likelihood of local extinction Given that the proposed development does not call for alteration to land on the site that best represents potential habitat for the Eastern Long-eared Bat, namely the forested areas, it is unlikely that the life cycle of this species would be disrupted such that a viable local population could be placed at risk of extinction. Rather, proposed rehabilitation works for the forested areas of the site would likely enhance the overall habitat potential of the location.

Common name	Scientific name	Legal Status (TSC Act)
<u>Grey-Headed Flying-Fox</u>	<i>Pteropus poliocephalus</i>	Vulnerable

Habitat description/ life cycle components The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands. They forage on nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and fruits of rainforest trees and vines. They also forage in cultivated gardens and fruit crops. The Grey-headed Flying-fox roosts in large camps up to the tens of thousands, often in stands of riparian rainforest, paperbark or

modified. Rather, the forested area that, for the purposes of this report, is habitat or considered to be potential habitat for some threatened species is to be retained with management strategies incorporated into the development process that will see these areas rehabilitated and enhanced in terms of their potential as habitat.

Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

An area of known habitat is not likely to become isolated from currently interconnecting or proximate areas of habitat as the significant areas of vegetation (i.e. the forested areas) occurring at the site are to be retained and rehabilitated. Development is only proposed for a section of the subject site that was previously cleared for quarrying purposes and is currently overwhelmingly weed infested.

Whether critical habitat will be affected.

Stott's Island (habitat for the endangered Mitchell's Rainforest Snail) and Sydney's North Harbour (habitat for the endangered Little Penguin) are the only critical habitats listed under the TSC Act, therefore the proposed development will not affect critical habitat.

Whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region.

It could be argued that none of the threatened species in northern NSW are considered adequately represented in conservation reserves. Nevertheless, all of the species considered in this assessment are found in one or more nature reserves in the region of the proposed development. The following is a summary of where the subject flora and fauna species have been detected previously:

Coolamon

The species has been detected in Nicholls Scrub National Park, Brunswick Heads Nature Reserve, and Stotts Island Nature Reserve (Briggs and Leigh, 1995).

Rough-shelled Bush Nut

The Rough-shelled Bush Nut is relatively well represented in conservation reserves of the Caldera rim and local rainforest remnant reserves. The species has been detected in Lamington National Park, Natural Arch National Park, Mount Warning National Park, Nightcap National Park, Nicholls Scrub National Park, Davis Scrub Nature Reserve, Limpinwood Nature Reserve, Numinbah Nature Reserve, Victoria Park Nature Reserve, and Minyon Falls Flora Reserve (Briggs and Leigh, 1995).

Red Lilly Pilly

The Red Lilly Pilly is relatively well represented in conservation reserves of the Caldera rim and local rainforest remnant reserves. The species has been detected in Gwongorella National Park, Mount Cougal National Park, Natural Arch National Park, Warrie National Park, Mount Warning national Park, Nightcap National Park, Numinbah Nature Reserve, Brunswick Heads Nature Reserve, Inner Pocket Nature Reserve, Limpinwood Nature Reserve, Big Scrub Flora Reserve, Boomerang Falls Flora Reserve, and Minyon Falls Flora Reserve (Briggs and Leigh, 1995).

Barred Cuckoo-shrike

The Barred Cuckoo-shrike has been detected previously in Richmond Range National Park and Bundjalung National Park.

Rose-crowned Fruit Dove

The Rose-crowned Fruit-dove is relatively well represented in conservation reserves of the Caldera rim and local rainforest remnant reserves. The species has been detected in Brunswick Nature Reserve, Cudgen Nature Reserve and Broken Head Nature Reserve.

White-eared Monarch

The White-eared Monarch has been detected previously in Nightcap National Park, Border Ranges National Park, Bundjalung National Park and Mount Warning National Park (NPWS, 2000). Additionally, the species has been detected in the Big Scrub Flora Reserve, Richmond Range State Forest, Brunswick Heads Nature Reserve, Cudgen Nature Reserve and Victoria Park Nature Reserve.

Beccari's Freetail Bat

Beccari's Freetail Bat has been detected previously in Ukerebagh Nature Reserve, Tweed Estuary Nature Reserve, Cudgen Nature Reserve and Stotts Island Nature Reserve.

Black Flying-fox

The Black Flying Fox has been recorded at the Border Ranges National Park, Broadwater National Park and Bundjalung National Park. It has also been detected in Boatharbour Nature Reserve, Wilson Nature Reserve, Ballina Nature Reserve and the Tweed Estuary Nature Reserve.

Common Blossom-bat

The Common Blossom-bat has been recorded at Broadwater National Park, Bundjalung National Park, Mt Warning National Park, Yuraygir National Park, Iluka Nature Reserve, Cudgen Nature Reserve, Tyagarah Nature Reserve, Brunswick Heads Nature Reserve, Broken Head Nature Reserve, Limeburners Creek Nature Reserve and Cape Byron State Conservation Area.

Eastern Long-eared Bat

The Eastern Long-eared Bat has been detected previously in Nightcap National Park, Bundjalung National Park, Border Ranges National Park, Booyong Recreation Reserve, Whian Whian State Forest, Victoria Park Nature Reserve, Tyagarah Nature Reserve, Wilson Nature Reserve, Brunswick Heads Nature Reserve and Cape Byron State Conservation Area.

Grey-headed Flying-fox

Grey-headed Flying Foxes are currently found along the east coast of Australia from Bundaberg to Melbourne. In northern NSW, the western boundary reaches the western slopes, however in the south it is confined to a narrow band east of the escarpment. In NSW, Grey-headed Flying Foxes have been recorded in numerous conservation reserves along the east coast, and the tablelands and eastern slopes of the Great Dividing Range (NPWS, 2001). The Grey-headed Flying-fox has been detected in Ballina Nature Reserve and the Tweed Estuary Nature Reserve.

Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,

The TSC Act lists the following threatening processes:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands (as described in the final determination of the Scientific Committee to list the threatening process)
- Human Caused Climate Change
- Bush rock removal (as described in the final determination of the Scientific Committee to list the threatening process)
- Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process)
- Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
- Invasion of native plant communities by *Chrysanthemoides monilifera*
- Loss or degradation (or both) of sites used for hill-topping by butterflies
- Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish) (as described in the final determination of the Scientific Committee to list the threatening process)
- Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)
- Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)
- Predation by the Ship Rat *Rattus rattus* on Lord Howe Island

The proposed development is not considered a threatening process as defined above. Some clearing of the subject site will occur but the project plans are for clearing to occur in an area of previously cleared land (i.e. the area of the old quarry) that is currently infested with introduced weep species rather than

containing native vegetation. It should be noted that the development proposal calls for areas of existing native vegetation occurring on the site to be rehabilitated as part of a community title agreement or the like.

Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Coolamon occurs in the Richmond, Tweed and Brunswick Valleys in north – eastern NSW. It has a limited occurrence in south-east QLD with a northern limit to the Mudgeeraba area (NPWS, 2002; Harden, 1991). Hence it is not at the limit of its known habitat

The Rough-shelled Bush Nut native to south-eastern QLD and north-eastern NSW (north from Rous near Lismore to Mt Tambourine), growing in subtropical rainforests usually near the coast. Hence it is not at the limit of its known habitat

The red Lilly Pilly occupies a restricted range from the Richmond River in north-eastern NSW to Gympie in QLD. It can be locally common in parts of its range, but it is otherwise sparsely distributed (NPWS, 2002). However, it is not at the limit of its known habitat.

A number of the listed fauna species that are considered to have potential to occur at the subject site are nearing the southern most limit of their distribution. The pattern of distribution for these species is as follows:

- Barred Cuckoo-shrike occurs as far south as northern NSW (Simpson and Day, 1996);
- The Rose-crowned Fruit Dove occurs as far south as northern NSW (Simpson and Day, 1996);
- The White-eared Monarch occurs as far south as northern NSW (Simpson and Day, 1996);
- Beccari's Freetail-bat occurs as far south as the north east corner of NSW (NPWS, 2002).
- The Black Flying-fox occurs as far south as near Coffs Harbour in NSW (Strahan, 1995);
- The Common Blossom-bat occurs as far south as near Port Macquarie in NSW (Strahan, 1995); and
- The Eastern Long-eared Bat is distributed along the east coast of Australia from Cape York to northern NSW (Churchill, 1998).

Other listed species listed in Table 5 as potentially occurring at the subject site are not at their known limit of distribution in the vicinity of the subject site.

5.2 NSW Threatened Species Conservation Act 1995

The objectives of the TSC Act are:

- To conserve biological diversity and promote ecologically sustainable development;
- To prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- To protect the critical habitat of those threatened species, populations and ecological communities that are endangered;
- To eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

Section 94 lists the eight-part test of significance to determine whether an action is likely to significantly affect threatened species, populations or ecological communities, or their habitats. The appropriate provisions prescribed in Section 94 are identical to those found in the EP&A Act, 1979 and have been addressed in Section 5 above.

5.3 NSW Fisheries Management Act 1994

The *Fisheries Management Act 1994* aims to protect fish and fish stocks and protect threatened species, populations and ecological communities of fish and marine vegetation. The Act lists (Section 220C - Schedules 4 & 5) the following endangered and vulnerable species, populations and communities:

Endangered species (Part 1 of Schedule 4)

Fish

* <i>Carcharias taurus</i>	Grey Nurse Shark
<i>Craterocephalus fluviatilis</i>	Murray Hardyhead
* <i>Maccullochella ikei</i>	Eastern Freshwater Cod
* <i>Maccullochella macquariensis</i>	Trout Cod
* <i>Nannoperca oxleyana</i>	Oxleyan Pygmy Perch
<i>Notopala sublineata</i>	River Snail
<i>Pristis zijsron</i>	Green Sawfish
*indicates species listed as threatened in the <i>Environmental Protection and Biodiversity Conservation Act, 1999</i>	

Endangered populations (Part 2 of Schedule 4)

Ambassis agassizii (Steindachner, 1866) Olive Perchlet, western NSW population.
Mogurnda adspersa (Castelnau, 1878) Purple Spotted Gudgeon, western NSW population.

Endangered ecological communities (Part 3 of Schedule 4)

Aquatic ecological community in the natural drainage system of the lower Murray River catchment (as described in the recommendation of the Fisheries Scientific Committee to list the ecological community).

Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River (as described in the recommendation of the Fisheries Scientific Committee to list that aquatic ecological community, as the area covered by that recommendation).

Vulnerable species (Schedule 5)

Fish

<i>Archaeophya adamsi</i>	Adams Emerald Dragonfly
<i>Bidyanus bidyanus</i>	Silver Perch
<i>Branchinella buehneri</i>	Buchanans Fairy Shrimp
* <i>Carcharodon carcharias</i>	Great White Shark
<i>Epinephelus daemeli</i>	Black Cod
<i>Macquaria australasica</i>	Macquarie Perch
<i>Nannoperca australis</i>	Southern Pygmy Perch
*indicates species listed as threatened in the <i>Environmental Protection and Biodiversity Conservation Act, 1999</i> .	

None of these species are likely to occur at the subject site therefore the proposed activity will not result in a significant effect on their lifestyle or habitat. There is also no likelihood of impacts on marine vegetation from the proposed development.

The proposed development does not represent a threatening process under the Act. Threatening processes listed include:

- Degradation of native riparian vegetation along NSW watercourses.
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.
- Introduction of fish to waters within a river catchment outside their natural range.
- Removal of large woody debris
- Cold water pollution.
- River regulation and environmental flow.

5.4 Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth mechanism for national environment protection and biodiversity conservation is the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act provides for:

- Identification and listing of Threatened Species and Threatened Ecological Communities;
- Development of Recovery Plans for listed species and ecological communities;
- Recognition of Key Threatening Processes; and where appropriate; and
- Reducing these processes through Threat Abatement Plans.

The EPBC Act identifies that a person must not, without approval under the act, take an action that has or will have, or is likely to have a significant impact on a matter of National Environmental Significance (NES). NES matters include:

- The world heritage value of a declared World Heritage property;
- The ecological character of a declared Ramsar wetland;
- A threatened species or endangered community listed under the Act;
- A migratory species listed under the Act;
- A nuclear action; and
- An action in a Commonwealth marine area or on Commonwealth land that has or will have, or is likely to have a significant impact on the environment.

Table 6 summarises the assessment of the proposed development with regard to the EPBC Act.

Table 6. Assessment of Impacts of the Proposed Activity on NES Matters as Described in the EPBC Act

NES Matter	Impact	Comment
World Heritage	No	The site is not a World Heritage property and the proposed activity will not impact on any World Heritage property.
Ramsar wetlands	No	The site is not a Ramsar wetland or located near a Ramsar wetland.
Threatened species or endangered communities	No	All nationally listed species and communities are also listed on the TSC Act. Impacts on these species are discussed in detail previously in Section 5.
Migratory species	No	The subject site does not provide high conservation value habitat for migratory species.
Nuclear action	No	The proposal does not include any nuclear action.
Impact on Commonwealth land	No	The proposal is not on Commonwealth land.

6. Impacts and Amelioration

Due to the sensitivity of the site, this detailed flora and fauna assessment under Section 5A of the *NSW Environmental Planning and Assessment Act 1979* was conducted and is to be lodged with the Development Application.

As the proposed development will almost exclusively be undertaken on the previously cleared area of land (Area 1), that was formerly used as a quarry and is now largely weed infested, it is considered that potential adverse impacts on flora and fauna, particularly listed threatened flora occurring at the site and fauna potentially occurring on the site, are minimal.

The retention and proposed ongoing management of the forested areas surrounding the previously cleared quarry site (Areas 2, 3 and 4) will ensure that a majority of the preferred habitat for threatened flora and fauna species potentially occurring on the site is maintained.

Those fauna species detected (using Elliott traps during the site survey) in the grassland proposed for development typically occur in a range of vegetation communities that have a dense understorey and it is likely that the proposed works will simply result in these animals being displaced to the neighbouring forested areas. As a precautionary measure, and considering the fact that a reasonably large number of individual animals were captured during sampling, a programme of trapping and relocating animals to nearby suitable habitat is recommended for the period immediately prior to site works. Additionally, it is recommended that an ecologist be on hand during initial site clearing works in the case that any of the ground dwelling animals are disturbed and/or injured.

The following section outlines management strategies recommended in order to minimise adverse impacts and maintain the habitat values of the site.

6.1 Recommendations

It is recommended that the following actions be undertaken prior to, and during, potential development of the site:

- Native vegetation in Areas 2, 3 and 4 to be retained and an ecological restoration program for the management of these areas be developed and implemented ;
- Areas 2, 3 and 4 are to be developed under a Section 88B instrument or the like which will include provisions to permanently protect the threatened species occurring in these areas (i.e. the Coolamon, the Rough-shelled Bush Nut and the Red Lilly Pilly);
- At least a 10 m buffer to be provided between any of the Coolamon, Rough-shelled Bush Nut and Red Lilly Pilly plants present in Area 4 and any development. No earthworks, construction, clearing, stockpiling of material etc. is allowed in the buffer;
- All the buffers should be clearly identified during site works with flagging tape, a temporary fence or similar;
- A programme of trapping and relocating animals to nearby suitable habitat to be implemented for the period immediately prior to site works; and
- an ecologist to be present during initial site clearing works in the case that any animals utilising the site are disturbed and/or injured.

7. Conclusion

This detailed flora and fauna assessment under Section 5A of the *NSW Environmental Planning and Assessment Act 1979* has been prepared to provide information to assist with the application for rezoning of Lot 16 DP 856265 Terranora Road, Banora Point. It is submitted that:

- The criteria contained in SEPP 44 have been addressed and a Koala Management Plan is not required;
- A number of listed plant species have been detected at the site and a number of threatened fauna species potentially occur at the site. As a result, various management strategies have been recommended to retain all significant habitat at the site so as to minimise any potential impacts on these species. Consequently, the development will not result in a significant effect (as described in Section 5A of the EP&A Act) on a threatened species (as listed in the TSC Act). Therefore, a Species Impact Statement is not required;
- The proposed development will not result in a significant effect on the threatened species listed in the *NSW Fisheries Management Act 1994*, therefore a Species Impact Statement is not required;
- The proposed development will not have a significant impact on matters of NES as described in the EPBC Act and therefore does not need to be referred to the Minister;
- The forest vegetation on the site is to be largely retained apart from Area 1 which is already cleared and weed infested; and
- Long term protection of the retained forested land will be ensured via the instigation of an Environmental Management Plan to be administered by the Body Corporate or other formal arrangement.

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9. Appendices

9.1 Appendix A – Native Flora Species Detected

Area 1

Native Flora Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Walking survey
 Duration:
 Date: 21/22-1-04

Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)
Upper Storey		
<i>Casuarina glauca</i>	Swamp Oak	I
<i>Acacia melanoxylon</i>	Black Wattle	VC
<i>Macaranga tanarius</i>	Macaranga	C
<i>Guioa semiglauca</i>	Guioa	C
<i>Araucaria cunninghamii</i>	Hoop Pine	I
<i>Glochidion ferdanandi</i>	Cheese Tree	I
Mid Storey		
<i>Omolanthus populifolius</i>	Bleeding Heart	I
<i>Cupaniopsis anacardioides</i>	Tuckeroo	I
Lower Storey		
<i>Stephania japonica</i>	Snake Vine	O
<i>Rubus sp.</i>	Native Raspberry	O
<i>Phragmites australis</i>	Common Reed	O
<i>Pteridium esculentum</i>	Bracken Fern	O
<i>Imperata cylindrica</i>	Blady Grass	O

Key: # threatened species listed in the TSC Act 1995
 * ROTAP listed species (Briggs & Leigh, 1995)

Area 2

Native Flora Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Walking survey
 Duration:
 Date: 21/22-1-04

Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)
Upper Storey		
<i>Acacia melanoxylon</i>	Black Wattle	VC
<i>Guioa semiglauca</i>	Gioa	VC
<i>Mallotus philippensis</i>	Red Kamala	O
<i>Macaranga tanarius</i>	Macaranga	VC
Mid Storey		
<i>Acacia melanoxylon</i>	Blackwood	C
<i>Glochidion sumatranum</i>	Umbrella Cheese Tree	O
<i>Guioa semiglauca</i>	Guioa	VC
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	O
<i>Commersonia bartramia</i>	Brown Kurrajong	O
<i>Cupaniopsis anacardioides</i>	Tuckeroo	O
<i>Cupaniopsis newmanii</i> *	Long-leaved Tuckeroo	I
<i>Elaeocarpus obovatus</i>	Hard Quandong	I
<i>Ficus coronata</i>	Creek Sandpaper Fig	O
<i>Jagera pseudorhus</i>	Foambark	O
<i>Macaranga tanarius</i>	Macaranga	C
<i>Mallotus philippensis</i>	Red Kamala	O
<i>Omolanthus populifolius</i>	Bleeding Heart	O
<i>Pittosporum undulatum</i>	Sweet Pittosporum	O
<i>Diosporus fasciculosa</i>	Grey Ebony	I
<i>Lepiderema pulchella</i>	Fine-leaved Tuckeroo	I
<i>Glochidion ferdinandi</i>	Cheese Tree	O
<i>Streblus brunonianus</i>	Whalebone Tree	I
<i>Ficus virens</i>	White Fig	I
<i>Dysoxylum fraserianum</i>	Rosewood	I
<i>Dysoxylum muelleri</i>	Red Bean	I
<i>Claoxylon australe</i>	Brittlewood	I
<i>Dysoxylum rufum</i>	Hairy Rosewood	I
<i>Cryptocarya obovata</i>	Pepperberry	I
<i>Sarcopteryx stipata</i>	Steelwood	I
<i>Sloanea australis</i>	Maiden's Blush	I

Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)
<i>Acalypha capillipes</i>	Small-leaved Acalypha	I
<i>Ehretia acuminata</i>	Koda	I
<i>Arytera distylis</i>	Twin-leaved Coogera	I
<i>Rapanea variabilis</i>	Muttonwood	I
<i>Pilidistigma glabrum</i>	Plum Myrtle	I
<i>Aphananthe philippinensis</i>	Rough-leaved Elm	I
Lower Storey		
<i>Breynia oblongifolia</i>	Coffee Bush	O
<i>Cyathea cooperi</i>	Straw Treefern	I
<i>Wikstroemia indica</i>	Thai Bush	O
<i>Austromyrtus dulcis</i>	Midgen Berry	O
Groundlayer/Vines		
<i>Geitonoplesium cymosum</i>	Scrambling Lily	
<i>Maclura cochinchinensis</i>	Cockspur	
<i>Oplismenus sp.</i>	Basket Grass	
<i>Alpinia caerulea</i>	Native Ginger	O
<i>Commelina cyanea</i>	Hairy Commelina	C
<i>Derris involuta</i>	Native Derris	O
<i>Hibbertia scandens</i>	Climbing Guinea Flower	O
<i>Smilax australis</i>	Smilax	O
<i>Platynerium bifurcatum</i>	Elkhorn	I
<i>Ghania sp.</i>		I
<i>Lycopodium cernuum</i>	Scrambling Clubmoss	I
<i>Gleichenia dicarpa</i>	Coral Fern	I
<i>Sticherus flabellatus</i>	Umbrella Fern	I
<i>Christella dentata</i>		I
<i>Adiantum hispidulum</i>	Rough Maidenhair	C - O

Key: # threatened species listed in the TSC Act 1995

* ROTAP listed species (Briggs & Leigh, 1995)

Area 3

Native Flora Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Walking survey
 Duration:
 Date: 21/22-1-04

Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)
Upper Storey		
<i>Macaranga tanarius</i>	Macaranga	C
<i>Acacia melanoxylon</i>	Black Wattle	C
<i>Guioa semiglauc</i>	Guioa	C
<i>Cupaniopsis anacardioides</i>	Tuckeroo	O
<i>Ficus fraseri</i>	Sandpaper Fig	O
<i>Glochidion sumatranum</i>	Umbrella Cheese Tree	O
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	O
Mid Storey		
<i>Glochidion sumatranum</i>	Umbrella Cheese Tree	O
<i>Guioa semiglauc</i>	Guioa	O
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	O
<i>Mallotus philippensis</i>	Red Kamala	O
<i>Omolanthus populifolius</i>	Bleeding Heart	O
<i>Amorphospermum antilogum</i>	Brown Pearwood	I
<i>Mallotus discolor</i>	Yellow Kamala	I
<i>Dysoxylum muelleri</i>	Red Bean	O
<i>Breynia oblongifolia</i>	Breynia	C
<i>Streblus brunonianus</i>	Whalebone Tree	O
<i>Arytera distylis</i>	Twin-leaved Coogera	I
Groundlayer/Vines		
<i>Cissus antarctica</i>	Water Vine	O
<i>Cyathea cooperi</i>	Hairy Treefern	I
<i>Parsonsia straminea</i>	Common Silkpod	C
<i>Maclura cochinchinensis</i>	Cockspur	VC
<i>Mucuna gigantea</i>	Burny Bean	
<i>Rubus rosifolius</i>	Rose-leaf Bramble	

Key: # threatened species listed in the TSC Act 1995
 * ROTAP listed species (Briggs & Leigh, 1995)

Area 4

Native Flora Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Assessment and walking survey, mainly
 Duration:
 Date: 21/22-1-04

Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)	Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)
Upper Storey					
<i>Sloanea woollsii</i>	Yellow Carabeen	O	<i>Acmena brachyandra</i>	Red Apple	I
<i>Pentaceras australe</i>	Crow's Ash	O	<i>Argyrodendron trifoliolatum</i>	White Booyong	O
<i>Macadamia tetraphylla</i> #	Rough-shelled Bush Nut	O	<i>Baloghia lucida</i>	Brush Bloodwood	C
<i>Guioa semiglauca</i>	Guioa	C	<i>Jagera pseudorhus</i>	Foam Bark Tree	C
<i>Mallotus discolor</i>	Yellow Kamala	O	<i>Ficus fraseri</i>	Sandpaper Fig	O
<i>Gmelina leichhardtii</i>	White Beech	I	<i>Cryptocarya obovata</i>	Pepperberry	C
<i>Syzygium moorei</i> #	Coolamon	O			
Mid Storey					
<i>Acacia melanoxydon</i>	Blackwood	VC	<i>Dysoxylum muelleri</i>	Red Bean	C
<i>Glochidion sumatranum</i>	Umbrella Cheese Tree	C	<i>Clerodendrum floribundum</i>	Smooth Clerodendrum	O
<i>Guioa semiglauca</i>	Guioa	VC	<i>Syzygium hodgkinsoniae</i> #	Red Lilly Pilly	I
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	O	<i>Cryptocarya triplinervis</i>	Three-veined Cryptocarya	O
<i>Commersonia bartramia</i>	Brown Kurrajong	O	<i>Dysoxylum fraserianum</i>	Rosewood	O
<i>Cupaniopsis anacardioides</i>	Tuckeroo	O	<i>Croton verreauxii</i>	Native Cascarilla	O
<i>Elaeocarpus obovatus</i>	Hard Quandong	O	<i>Sarcopteryx stipata</i>	Steelwood	O
<i>Ficus coronata</i>	Creek Sandpaper	O	<i>Capparis aborea</i>	Capparis	O

Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)	Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)
	Fig				
<i>Jagera pseudorhus</i>	Foambark	C	<i>Sarcomelicope simplicifolia</i>	Yellowwood	O
<i>Macaranga tanarius</i>	Macaranga	VC	<i>Aphananthe philippinensis</i>	Rough-leaved Elm	O
<i>Mallotus philippensis</i>	Red Kamala	C	<i>Endiandra prbens</i>	Hairy Walnut	O
<i>Omolanthus populifolius</i>	Bleeding Heart	C	<i>Streblus brunonianus</i>	Whalebone Tree	O
<i>Wilkiea huegeliana</i>	Veiny Wilkiea	O	<i>Neolitsea dealbata</i>	White Bolly Gum	C
<i>Croton verreauxii</i>	Native Cascarilla	O	<i>Litsea reticulata</i>	Bolly Gum	O
<i>Cassine australis</i>	Red Olive Plum	O			
<i>Archidendron muellerianum</i> *	Veiny Lace Flower	I			
<i>Cupaniopsis newmanii</i> *	Long-leaved Tuckeroo	I			
<i>Symplocos thwaitesii</i>	Buff Hazelwood	I			
Lower Storey					
<i>Eustrephus latifolius</i>	Wombat Berry	C	<i>Dysoxylum muelleri</i>	Red Bean	O
<i>Breynia oblongifolia</i>	Coffee Bush	C	<i>Diospyrus pentamera</i>	Myrtle Ebony	I
<i>Canthium lamprophyllum</i>	Large-leaved Canthium	O	<i>Elattostachys nervosa</i>	Green Tamarind	I
<i>Cordyline petiolaris</i>	Broad-leaved Palm Lilly	O	<i>Hedraianthera porphyropetala</i>		O
<i>Hedraianthera porphyropetala</i>	Hedraianthera	O	<i>Lepiderema pulchella</i>	Fine-leaved Tuckeroo	O
<i>Pilidiostigma glabrum</i>	Plum Myrtle	C	<i>Cinnamomum virens</i>	Red-barked Sassafras	O
<i>Pittosporum undulatum</i>	Sweet Pittosporum	C	<i>Trema aspera</i>	Poison Peach	O
<i>Rapanea variabilis</i>	Muttonwood	O	<i>Bridelia exaltata</i>	Brush Ironbark	C
<i>Rubus hillii</i>	Native Raspberry	C	<i>Argyrodendron trifoliolatum</i>	White Booyong	O
<i>Cryptocarya laevigata</i>	Glossy-leaved Laurel	O	<i>Austromyrtus hillii</i>	Scaly Myrtle	O
<i>Acmena smithii</i>	Lilly Pilly	O	<i>Floydia praelata</i>	Ball Nut	I
Groundlayer/Vines					
<i>Cissus antarctica</i>	Water Vine	O	<i>Smilax australis</i>	Native Sarsparilla	O

Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)	Botanical Name	Common Name	Abundance (Very Common, Common, Occasional, Infrequent)
<i>ODerris involuta</i>	Native Derris	C	<i>Adiantum hispidulum</i>	Black Coral Fern	
<i>Dioscorea transversa</i>	Native Yam	O	<i>Pseuderanthemum variable</i>	Pastel Flower	C
<i>Geitonoplesium cymosum</i>	Scrambling Lily	C	<i>Millettia megasperma</i>	Native Wisteria	
<i>Maclura cochinchinensis</i>	Cockspur	C	<i>Hibbertia scandens</i>	Climbing Guinea Flower	C
<i>Oplismenus sp.</i>	Basket Grass	C	<i>Cordyline petiolaris</i>	Broad-leaved Palm Lilly	
<i>Parsonsia straminea</i>	Common Silkpod	O			

Key: # threatened species listed in the TSC Act 1995
 * ROTAP listed species (Briggs & Leigh, 1995)

9.2 Appendix B – Environmental Weed Species Detected

Area 1

Weed Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Walking survey
 Date: 21/22-1-04

Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position	Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position
Camphor Laurel	<i>Cinnamomum camphora</i>	C	Upper	Coastal Morning Glory	<i>Ipomoea cairica</i>	VC	Vine
Cobbler's Pegs	<i>Bidens pilosa</i>	VC	Ground	Hairy Commelina	<i>Commelina benghalensis</i>	C	Ground
Crofton Weed	<i>Ageratina adenophora</i>	O	Ground	Kikuyu	<i>Pennisetum clandestinum</i>	VC	Ground
Dandelion	<i>Taraxacum officinale</i>	C	Ground	Rag Weed	<i>Ambrosia artemisiifolia</i>	VC	Ground
Droopy Head	<i>Erechites valerianifolia</i>	O	Ground	Siratro	<i>Macroptilium atropurpureum</i>	O	Vine
Fleabane	<i>Conyza sp</i>	O	Mid-ground	Green Desmodium	<i>Desmodium intortum</i>	O	Vine
Lantana	<i>Lantana camara</i>	VC	Mid	Rhodes Grass	<i>Chloris sp.</i>	VC	Ground
Paddy's Lucerne	<i>Sida rhombifolia</i>	C	Ground	Cotton Bush	<i>Gomphocarpus physocarpus</i>	C	Ground
Paspalum	<i>Paspalum dilatatum</i>	VC	Ground	Setaria	<i>Setaria sp.</i>	C	Ground
Purple Top	<i>Verbena bonariensis</i>	C	Ground	Whisky Grass	<i>Agrostis capillaris</i>	C	Ground
Silver leaved Desmodium	<i>Desmodium uncinatum</i>	C	Vine/ground	Parramatta Grass	<i>Sporobolus africanus</i>	C	Ground
Tobacco-wild	<i>Solanum mauritianum</i>	C	Mid		<i>Xanthium sp.</i>	C	Ground
Blue Billy Goat	<i>Ageratum houstonianum</i>	O	Ground	Barner Grass	<i>Pennisetum sp.</i>	C	Ground

Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position	Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position
Winter Senna	<i>Senna pendula</i> var. <i>glabrata</i>	O	Ground/mid	Panic Grass	<i>Panicum</i> sp.	C	Ground
Gold Fern	<i>Pityrogramma austroamericana</i>			Wild Sorghum	<i>Sorghum</i> sp.	O	Ground

Area 2

Weed Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Walking survey
 Date: 21/22-1-04

Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position	Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position
Asparagus-Fern	<i>Protoasparagus africanus</i>	I	Ground cover	Coastal Morning Glory	<i>Ipomoea cairica</i>	C	Vine
Blackberry Nightshade	<i>Solanum nigrum</i>	O	Ground	Molasses Grass	<i>Melinis minutiflora</i>	C	Ground
Camphor Laurel	<i>Cinnamomum camphora</i>	VC	Canopy/mid	Burr	<i>Xanthium</i> sp.	C	Ground
Cobbler's Pegs	<i>Bidens pilosa</i>	O – C	Ground	Groundsel Bush	<i>Baccharis halimifolia</i>	O	Mid-storey
Corky Passionfruit	<i>Passiflora suberosa</i>	O	Vine	Climbing Nightshade	<i>Solanum seafforthianum</i>	O	Vine
Crofton Weed	<i>Ageratina adenophora</i>	O	Ground	Green Desmodium	<i>Desmodium intortum</i>	O	Vine
Droopy Head	<i>Erechites valerianifolia</i>	I	Ground	Gold Fern	<i>Pityrogramma austroamericana</i>	I	Ground
Lantana	<i>Lantana camara</i>	VC	Mid-storey	Climbing Asparagus	<i>Protoasparagus plumosus</i>		
Mist Flower	<i>Ageratina riparia</i>	C – VC	Ground	Slash Pine	<i>Pinus elliottii</i>	I	Canopy
Ochna	<i>Ochna</i>	O	Mid	Singapore		I - C	Ground

Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position	Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position
	<i>serrulata</i>			Daisy			
Orange Jessamine	<i>Murraya paniculata</i>	I	Ground/mid	Setaria Grass	<i>Setaria sp.</i>	O	Ground
Paddy's Lucerne	<i>Sida rhombifolia</i>	C	Ground	Whisky Grass	<i>Agrostis capillaris</i>	C	Ground
Passionfruit	<i>Passiflora edulis</i>	I	Vine	Paspalum Grass	<i>Paspalum sp.</i>	C	Ground
Purple Top	<i>Verbena bonariensis</i>	O		Guava	<i>Psidium guajava</i>	I	Small tree/shrub
Senna-winter	<i>Senna pendula var glabrata</i>	C	Mid-storey	Brazilian Cherry	<i>Eugenia uniflora</i>	I	Small tree/shrub
Silver leaved Desmodium	<i>Desmodium uncinatum</i>	C	Vine				
Tobacco-wild	<i>Solanum mauritianum</i>	O	Mid-storey				
Tropical Chickweed	<i>Drymaria cordata subsp. Diandra</i>	O	Ground				
Umbrella Tree	<i>Schefflera actinophylla</i>	O	Mid-storey				
White Passionflower	<i>Passiflora subpeltata</i>	C	Vine				

Area 3

Weed Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Walking survey
 Date: 21/22-1-04

Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position
Lantana	<i>Lantana camara</i>	VC	Mid/lower
Orange Jessamine	<i>Murraya paniculata</i>	O	Shrub, seedlings/ground
Tobacco-wild	<i>Solanum mauritianum</i>	C	Tree/Upper, mid, lower
White Passionflower	<i>Passiflora subpeltata</i>	C	Upper, mid, ground
Elephant Barny Grass	<i>Pennisetum sp.</i>	C	
Burr	<i>Xanthium sp.</i>	C	
Corky Passion Flower	<i>Passiflora suberosa</i>	C	Vine/Upper, mid, ground
Coastal Morning Glory	<i>Ipomoea cairica</i>	VC	Vine/Upper, mid, ground
Green Desmodium	<i>Desmodium intortum</i>	C	Vine/mid, ground
Molases Grass	<i>Melinis minutiflora</i>	VC	
Groundsel Bush	<i>Baccharis halimifolia</i>		

Area 4

Weed Survey: Lot 16 DP 856265, 225 Terranora Road, Banora Point, 2486 NSW
 Prepared by: D. Roche, J. Farrell and P. Poroprat
 Methods: Walking survey
 Date: 21/22-1-04

Common Name	Botanical Name	Abundance (Very Common, Common, Occasional, Infrequent)	Form/strata position
Blackberry Nightshade	<i>Solanum nigrum</i>	C	Ground
Camphor Laurel	<i>Cinnamomum camphora</i>	VC	Ground, middle layer, canopy
Cobbler's Pegs	<i>Bidens pilosa</i>	VC	Ground
Corky Passionfruit	<i>Passiflora suberosa</i>	C	Canopy, ground
Crofton Weed	<i>Ageratina adenophora</i>	C	Ground
Droopy Head	<i>Erechites valerianifolia</i>	C	Ground
Fleabane	<i>Conyza sp</i>	VC	Ground
Lantana	<i>Lantana camara</i>	VC	Ground, middle layer
Mist Flower	<i>Ageratina riparia</i>	C	Ground
Ochna	<i>Ochna serrulata</i>	C	Ground
Senna-winter	<i>Senna pendula var glabrata</i>		
Tobacco-wild	<i>Solanum mauritianum</i>		
Umbrella Tree	<i>Schefflera actinophylla</i>		
White Passionflower	<i>Passiflora subpeltata</i>		
Climbing asparagus	<i>Protoasparagus plumosus</i>	C	Canopy

9.3 Appendix C – Fauna Habitat Conservation Values

The conservation categories in regard to fauna habitat listed below and their specifications are based on Gilmore, *et als* (1985).

1. High Conservation Value

Good vegetative structure

Low degradation due to exotic species occurrence

Observed or good potential habitat for a diversity of fauna including endangered fauna

Good diversity of habitat type

Above 4 hectares in size

Is linked or provides link to other areas of significant habitat

Functioning as an important corridor for fauna

Contains vegetation communities or associations of regional, state or national significance

2. Medium Conservation Value

Recognisable vegetative structure

Some degradation due to exotic species occurrence

Unlikely to provide significant habitat for endangered fauna

Low diversity of habitat types

1 to 4 hectares in size

Is linked or provides links to other areas of habitat

Functioning as a corridor for fauna

Good potential for rehabilitation

Contains vegetation communities or associations of local and in some cases regional significance

3. Low Conservation Value

Poor vegetative structure

Highly degraded due to exotic species and grazing and/or logging

Very highly unlikely to provide habitat for endangered fauna

Poor or no habitat diversity

< 1 hectare in size

Not functioning as a viable corridor or has low value as a fauna corridor

Poor rehabilitation potential

Vegetation communities or associations not considered of local, regional or national significance

ATTACHMENT 3

BIONET ATLAS THREATENED SPECIES RECORDS



Data from the 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 0.1°C; ^^ rounded to 0.01°C).

Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) Entities in selected area [North: -28.17 West: 153.47 East: 153.57 South: -28.27] returned a total of 2,167 records of 89 species.

Kingdom	Class	Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Aves	Rallidae	0053	<i>Amaurornis moluccana</i>	Pale-vented Bush-hen	V,P		10
Animalia	Aves	Anseranatidae	0199	<i>Anseranas semipalmata</i>	Magpie Goose	V,P		7
Animalia	Aves	Procellariidae	0072	<i>Ardenna carneipes</i>	Flesh-footed Shearwater	V,P	J,K	1
Animalia	Aves	Burhinidae	0174	<i>Burhinus grallarius</i>	Bush Stone-curlew	E1,P		14
Animalia	Aves	Scolopacidae	0161	<i>Calidris ferruginea</i>	Curlew Sandpiper	E1,P	CE,C,J,K	45
Animalia	Aves	Scolopacidae	0165	<i>Calidris tenuirostris</i>	Great Knot	V,P	CE,C,J,K	4
Animalia	Aves	Cacatuidae	0265	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V,P,2	V	1
Animalia	Reptilia	Cheloniidae	2004	<i>Caretta caretta</i>	Loggerhead Turtle	E1,P	E	16
Animalia	Aves	Monarchidae	0376	<i>Carterornis leucotis</i>	White-eared Monarch	V,P		6
Animalia	Mammalia	Vespertilionidae	1354	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V,P		1
Animalia	Aves	Charadriidae	0141	<i>Charadrius leschenaultii</i>	Greater Sand-plover	V,P	V,C,J,K	15
Animalia	Aves	Charadriidae	0139	<i>Charadrius mongolus</i>	Lesser Sand-plover	V,P	E,C,J,K	10
Animalia	Reptilia	Cheloniidae	2007	<i>Chelonia mydas</i>	Green Turtle	V,P	V	7
Animalia	Aves	Climacteridae	8127	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P		1
Animalia	Aves	Campephagidae	0428	<i>Coracina lineata</i>	Barred Cuckoo-shrike	V,P		2
Animalia	Amphibia	Myobatrachidae	3137	<i>Crinia tinnula</i>	Wallum Froglet	V,P		97
Animalia	Aves	Neosittidae	0549	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P		4
Animalia	Mammalia	Dasyuridae	1008	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V,P	E	5
Animalia	Aves	Ciconiidae	0183	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1,P		44
Animalia	Aves	Burhinidae	0175	<i>Esacus magnirostris</i>	Beach Stone-curlew	E4A,P		7
Animalia	Aves	Psittacidae	0260	<i>Glossopsitta pusilla</i>	Little Lorikeet	V,P		3
Animalia	Aves	Haematopodidae	0131	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V,P		44
Animalia	Aves	Haematopodidae	0130	<i>Haematopus longirostris</i>	Pied Oystercatcher	E1,P		192
Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P		114

Kingdom	Class	Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Aves	Accipitridae	0225	<i>Hieraaetus morphnoides</i>	Little Eagle	V,P		3
Animalia	Aves	Jacanidae	0171	<i>Irediparra gallinacea</i>	Comb-crested Jacana	V,P		26
Animalia	Aves	Ardeidae	0196	<i>Ixobrychus flavicollis</i>	Black Bittern	V,P		1
Animalia	Aves	Meliphagidae	0610	<i>Lichenostomus fasciocularis</i>	Mangrove Honeyeater	V,P		22
Animalia	Aves	Scolopacidae	0152	<i>Limosa limosa</i>	Black-tailed Godwit	V,P	C,J,K	5
Animalia	Amphibia	Hylidae	3202	<i>Litoria olongburensis</i>	Olongburra Frog	V,P	V	30
Animalia	Mammalia	Molossidae	1329	<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V,P		1
Animalia	Mammalia	Miniopteridae	1346	<i>Miniopterus australis</i>	Little Bent-winged Bat	V,P		54
Animalia	Mammalia	Miniopteridae	3330	<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V,P		13
Animalia	Mammalia	Vespertilionidae	1357	<i>Myotis macropus</i>	Southern Myotis	V,P		16
Animalia	Aves	Strigidae	0246	<i>Ninox connivens</i>	Barking Owl	V,P,3		2
Animalia	Aves	Strigidae	0248	<i>Ninox strenua</i>	Powerful Owl	V,P,3		1
Animalia	Mammalia	Pteropodidae	1290	<i>Nyctimene robinsoni</i>	Eastern Tube-nosed Bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1336	<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V,P		8
Animalia	Mammalia	Molossidae	1937	<i>Ozimops lumsdenae</i>	Northern Free-tailed Bat	V,P		14
Animalia	Aves	Accipitridae	8739	<i>Pandion cristatus</i>	Eastern Osprey	V,P,3		346
Animalia	Mammalia	Petauridae	1137	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P		3
Animalia	Mammalia	Phascolarctidae	1162	<i>Phascolarctos cinereus</i>	Koala	E1,P	E	200
Animalia	Insecta	Noctuidae	I021	<i>Phyllodes imperialis southern subspecies</i>	Southern Pink Underwing Moth	E1	E	7
Animalia	Mammalia	Dasyuridae	1045	<i>Planigale maculata</i>	Common Planigale	V,P		10
Animalia	Mammalia	Pteropodidae	1280	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V	57
Animalia	Aves	Columbidae	0025	<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V,P		4
Animalia	Aves	Columbidae	0021	<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	V,P		16
Animalia	Mammalia	Emballonuridae	1321	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V,P		4
Animalia	Aves	Laridae	0117	<i>Sternula albifrons</i>	Little Tern	E1,P	C,J,K	41
Animalia	Mammalia	Pteropodidae	1294	<i>Syconycteris australis</i>	Common Blossom-bat	V,P		5
Animalia	Gastropoda	Camaenidae	I002	<i>Thersites mitchellae</i>	Mitchell's Rainforest Snail	E1	CE	20
Animalia	Aves	Alcedinidae	0327	<i>Todiramphus chloris</i>	Collared Kingfisher	V,P		59

Kingdom	Class	Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Aves	Tytonidae	0252	<i>Tyto longimembris</i>	Eastern Grass Owl	V,P,3		3
Animalia	Aves	Tytonidae	0250	<i>Tyto novaehollandiae</i>	Masked Owl	V,P,3		2
Animalia	Aves	Tytonidae	9924	<i>Tyto tenebricosa</i>	Sooty Owl	V,P,3		1
Animalia	Aves	Scolopacidae	0160	<i>Xenus cinereus</i>	Terek Sandpiper	V,P	C,J,K	30
Plantae	Flora	Fabaceae (Mimosoideae)	3711	<i>Acacia bakeri</i>	Marblewood	V		17
Plantae	Flora	Euphorbiaceae	9466	<i>Acalypha eremorum</i>	Acalypha	E1		2
Plantae	Flora	Rutaceae	6457	<i>Acronychia littoralis</i>	Scented Acronychia	E1	E	42
Plantae	Flora	Fabaceae (Mimosoideae)	7757	<i>Archidendron hendersonii</i>	White Lace Flower	V		35
Plantae	Flora	Rutaceae	5765	<i>Bosistoa transversa</i>	Yellow Satinheart	V	V	10
Plantae	Flora	Fabaceae (Caesalpinioideae)	1892	<i>Cassia marksiana</i>	Brush Cassia	E1		27
Plantae	Flora	Orobanchaceae	7884	<i>Centranthera cochinensis</i>	Swamp Foxglove	E1		1
Plantae	Flora	Lauraceae	3477	<i>Cryptocarya foetida</i>	Stinking Cryptocarya	V	V	64
Plantae	Flora	Sapindaceae	5887	<i>Cupaniopsis serrata</i>	Smooth Tuckeroo	E1		1
Plantae	Flora	Ebenaceae	2564	<i>Diospyros mabacea</i>	Red-fruited Ebony	E1	E	4
Plantae	Flora	Ebenaceae	14710	<i>Diospyros yandina</i>	Shiny-leaved Ebony	E1		6
Plantae	Flora	Sapindaceae	5889	<i>Diploglottis campbellii</i>	Small-leaved Tamarind	E1,2	E	11
Plantae	Flora	Polypodiaceae	8156	<i>Drynaria rigidula</i>	Basket Fern	E1,3		2
Plantae	Flora	Lauraceae	3491	<i>Endiandra hayesii</i>	Rusty Rose Walnut	V	V	6
Plantae	Flora	Lauraceae	8480	<i>Endiandra muelleri</i> subsp. <i>bracteata</i>	Green-leaved Rose Walnut	E1		5
Plantae	Flora	Orchidaceae	6672	<i>Geodorum densiflorum</i>	Pink Nodding Orchid	E1,P,2		12
Plantae	Flora	Myrtaceae	11894	<i>Gossia fragrantissima</i>	Sweet Myrtle	E1	E	1
Plantae	Flora	Grammitidaceae	9471	<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E1,3		1
Plantae	Flora	Proteaceae	5372	<i>Grevillea hilliana</i>	White Yiel Yiel	E1		22
Plantae	Flora	Sapindaceae	8291	<i>Lepiderema pulchella</i>	Fine-leaved Tuckeroo	V		63
Plantae	Flora	Lindsaeaceae	8129	<i>Lindsaea fraseri</i>	Fraser's Screw Fern	E1,3		1
Plantae	Flora	Proteaceae	5446	<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	V	V	62
Plantae	Flora	Sapotaceae	11957	<i>Niemeyera whitei</i>	Rusty Plum, Plum Boxwood	V		2
Plantae	Flora	Orchidaceae	4479	<i>Peristeranthus hillii</i>	Brown Fairy-chain Orchid	V,P,2		4
Plantae	Flora	Orchidaceae	4480	<i>Phaius australis</i>	Southern Swamp Orchid	E1,P,2	E	3

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Plantae	Flora	Rubiaceae	8297	<i>Randia moorei</i>	Spiny Gardenia	E1	E	46
Plantae	Flora	Myrtaceae	4282	<i>Rhodamnia maideniana</i>	Smooth Scrub Turpentine	E4A		16
Plantae	Flora	Myrtaceae	4283	<i>Rhodamnia rubescens</i>	Scrub Turpentine	E4A	CE	3
Plantae	Flora	Myrtaceae	4284	<i>Rhodomyrtus psidioides</i>	Native Guava	E4A	CE	5
Plantae	Flora	Fabaceae (Faboideae)	3032	<i>Sophora tomentosa</i>	Silverbush	E1		1
Plantae	Flora	Myrtaceae	4290	<i>Syzygium hodgkinsoniae</i>	Red Lilly Pilly	V	V	6
Plantae	Flora	Myrtaceae	4292	<i>Syzygium moorei</i>	Durobby	V	V	30
Plantae	Flora	Flacourtiaceae	3114	<i>Xylosma terrae-reginae</i>	Queensland Xylosma	E1		1