



# Port Macquarie Airport Master Plan and Port Macquarie - Hastings Council owned land within the Thrumster Area 13 Urban Release Area

Biodiversity Certification Assessment Report & Biocertification Strategy –  
Application to Minister

Prepared for  
**Port Macquarie – Hastings Council**  
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# Abbreviations

Abbreviation	Description
ARA	Adjacent Remnant Area
BAR	Biodiversity Assessment Report
BCAA	Biodiversity Certification Assessment Area
BCAM	Biodiversity Certification Assessment Methodology
BCS	Biodiversity Certification Strategy
CASA	Civil Aviation Safety Authority
CBD	Central Business District
CEEC	Critically Endangered Ecological Community
CKPoM	Comprehensive Koala Plan of Management
CMA	Catchment Management Authority
DCP	Development Control Plan
DECCW	NSW Department of Environment, Climate Change and Water (now OEHL)
DLWC	Department of Land and Water Conservation
DP&I	NSW Department of Planning and Infrastructure (formerly NSW Department of Planning)
DPE	NSW Department of Planning and Environment (formerly NSW Department of Planning)
DoE	Commonwealth Department of the Environment (formerly Department of Sustainability, Environment, Water Population and Communities)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELA	Eco Logical Australia Pty Ltd
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
ERM	Environmental Resources Management
IoM	Improve or Maintain
LEP	Local Environment Plan
LGA	Local Government Area
MALD	More Appropriate Local Data
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	NSW National Parks and Wildlife Service (now part of OEHL)
NSW	New South Wales
OEHL	NSW Office of Environment and Heritage (formerly DECCW, DECC, DEC)

Abbreviation	Description
OLS	Obstacle Limitation Surface
PMHC	Port Macquarie – Hastings Council
RoTAP	Rare or Threatened Australian Plant
TSC Act	<i>NSW Threatened Species Conservation Act 1995</i>
TSPD	Threatened Species Profile Database
URA	Urban Release Area

# Definitions

The following table provides definitions for the terminology used in biocertification assessments. Where these terms have been used in the report they have been included in 'quotation marks'.

Specific plans have also been included.

DEFINITION	DESCRIPTION
Area of High Biodiversity Conservation Value	As described under Section 2.3 of the BCAM. Areas include critically endangered and endangered ecological communities (CEEC and EEC) not in low condition, threatened species that cannot withstand further loss, areas of vegetation that have regional or state conservation significance, and state and regional biodiversity corridors. Also termed Red Flag Areas.
Biodiversity Certification Assessment Area	As described in the BCAM, it includes land where certification is proposed to be conferred and any surrounding or adjacent land. Surrounding and adjacent land may be proposed for biodiversity conservation, or neither certification or development (Retained Land).
BioMetric Vegetation Type	A plant community classification system used in BioMetric Tools, including the BioBanking Tool, Biodiversity Certification Tool and Property Vegetation Planning Tool
Conservation Area	Land within the Biodiversity Certification Assessment Area that is proposed for conservation measures.
Conservation Measures	The range of measures identified in Section 126L of the TSC Act
Credit Discounting	Applies where there are existing legal obligations to undertake conservation management actions on land.
Development Area	Land within the Biodiversity Certification area that is proposed for development
Ecosystems Credit	As described under the BCAM, the class of credit for biodiversity certification that are generated for conservation measures or required for the land proposed for certification. Ecosystem credits are also generated for some threatened species that are assumed to be present based on the location of the site and the vegetation types present.
Low BioMetric Condition	As described in Section 2.3 of the BCAM. To meet the 'low condition' threshold a number of criteria described in the method must be met, including <50% of the lower benchmark value of over storey percent cover for the relevant vegetation type or native vegetation with a site value score of less than 34 (Site value score is described in Section 3.6.2 of the BCAM)
Managed and Funded Conservation Measure	As described under Section 8.1.1 of the BCAM. Examples include entering into a Biodiversity Banking Agreement with respect to the land under Part 7A of the TSC Act and the reservation of land under the NPW Act.
Managed Conservation Measure	As described under Section 8.1.2 of the BCAM. Examples include entering into a conservation agreement under Division 12, Part 4 of the NPW Act and entering into a planning agreement under the EP&A Act that makes provision for development contributions to be used for or applied towards the conservation or enhancement of the natural environment.
Moderate-Good BioMetric Condition	As described in Section 2.3 of the BCAM. Any vegetation that is not in 'low condition' is in 'moderate to good' condition

DEFINITION	DESCRIPTION
MALD	More appropriate local data. As described in 3.4 of the BCAM, the Director General may certify that more appropriate local data can be used instead of the data in the Vegetation Benchmark Database and Vegetation Types Database, where local data more accurately reflects local environmental conditions.
Planning Instrument Conservation Measure	As described under 8.1.3 of the BCAM. Application of this measure requires a number of conditions to be met that are described under the relevant Section of the method.
Port Macquarie Airport Master Plan	Port Macquarie Airport Master Plan 2010 and the companion Addendum Report 2013
Red Flags	As described in Section 2.3 of the BCAM. See 'Areas of High Biodiversity Conservation Value' above.
Retained Land	Land within the Biodiversity Certification Assessment Area that is not land proposed for biodiversity certification or subject to proposed conservation measures.
Species credit	As described in the BCAM, the class of credits for biodiversity certification that are generated for a conservation measure or are required for the land proposed for certification

# Executive Summary

Eco Logical Australia Pty Ltd was engaged by Port Macquarie – Hastings Council to undertake a Biodiversity Certification Assessment of the Port Macquarie Airport Master Plan 2010 and the companion Addendum Report 2013 (hereafter referred to as the Port Macquarie Airport Master Plan) and the Port Macquarie - Hastings Council owned land within the Thrumster Area 13 Urban Release Area within the Partridge Creek Residential, Partridge Creek Industrial and West Lindfield neighbourhoods, and prepare a Biocertification Strategy in accordance with the Biocertification Assessment Methodology (BCAM). The purpose of the assessment is to obtain '*biodiversity certification*' of the 'land' required for the ongoing operational use of the existing airport (maintenance of the runway strip and associated obstacle limitation surface (OLS)); the extension and/or relocation of critical aviation-related infrastructure and facilities in accordance with the revised Civil Aviation Safety Authority (CASA) Code 4C aerodrome standards (The revised standards are published in the Manual of Standards Part 139 – Aerodromes Version 1.12 November 2014 (Australian Government – Civil Aviation Safety Authority 2014), which include the Manual of Standards Part 139 Amendment Instrument 2014 (No. 1)); and land proposed for residential and light industrial development in the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area, and their associated roads, Asset Protection Zones (APZs), easements and firetrails. The proposal also includes development of future employment and airport related accommodation facilities within the Airport Business Park precinct and the establishment of flood-free road access to the airport consistent with the Airport Master Plan.

Biocertification is conferred by the Minister for the Environment if the '*conservation measures*' proposed in the biocertification application result in an overall '*improvement or maintenance*' in biodiversity values.

The '*Biodiversity Certification Assessment Area*' (BCAA) defined for the study encompasses a total area of 1,024.48 ha and includes 629.60 ha of native vegetation communities comprising ten biometric vegetation types. Four of these biometric vegetation types are listed as three endangered ecological communities (EECs) under the NSW *Threatened Species Conservation Act 1995* (TSC Act). The remaining 394.88 ha of the assessment area is exotic/planted vegetation, cleared land and water associated with the existing operational use of the airport. Whilst a number of threatened flora and fauna species have been recorded in the assessment area only five vulnerable species; *Crinia tinnula* (Wallum Froglet), *Phascolarctos cinereus* (Koala), *Petaurus norfolcensis* (Squirrel Glider), *Pseudomys gracilicaudatus* (Eastern Chestnut Mouse) and *Cynanchum elegans* (White-flowered Wax Plant), require specific assessment under the BCAM as they are classified as '*species credits*' and their impacts cannot be assessed by the vegetation types.

The BCAA and proposed impacts are described in **Section 1**. The Biodiversity values of the BCAA are described in the Biodiversity Assessment Report (BAR) in **Section 2**. An application for more appropriate local data (MALD) (Vegetation type benchmarks and per cent cleared in Catchment Management Area) has been made in accordance with section 3.4 of the BCAM as in the opinion of the accredited assessor '*they more accurately reflects local environmental conditions*'. The request for MALD is provided in **Section 3**. The credit calculations and strategy for achieving an 'improve or maintain' outcome are provided in **Section 5** and **7** respectively.

The application proposes to directly impact 320.48 ha (31%) of the assessment area of which 118.50 ha is mapped as native vegetation and threatened species habitats and includes 23.65 ha of three EECs in biometric moderate to good condition, 13.36 ha of vegetation within SEPP 14 Wetlands, 1.34 ha of vegetation within riparian buffers, and 0.32 ha of a '*state*' and 36.12 ha of a '*regional biodiversity link*'.

These attributes are categorised as ‘red flag areas’ or ‘areas of high biodiversity conservation value’ by the BCAM.

A number of options that meet the effective existing operational requirements of the airport and revised CASA standards have been considered to avoid and minimise impacts to the maximum extent possible. In addition, a number of mitigation measures including construction environmental management plans, pre-clearance surveys, storm water quality control and management, fauna underpasses associated with new roads, fauna exclusion fencing (where required) and fauna friendly fencing (where required) will be implemented to reduce indirect impacts to native vegetation and threatened species and their habitats.

Of the 118.5 ha of native vegetation to be impacted, 29.28 ha (or 24.70%) has already been approved for ‘cropping’ as part of a previous development application to maintain the original OLS. Further parts of the impact area are subject to an existing Private Native Forestry Approval that permits selective logging (6.07 ha in addition to the OLS approved cropping) (i.e. of the up to 118.50 ha of vegetation and threatened species habitat that will be impacted by the Port Macquarie Airport Master Plan and Council owned residential and industrial land within the Thrumster Area 13 Urban Release Area, 35.35 ha has already been approved for cropping or Private Native Forestry.

Impacts to red flag areas that cannot be avoided require a ‘variation’ from the Minister before Biocertification can be conferred. A request for a red flag variation is included in **Section 4**. The remaining areas to be impacted are not ‘areas of high biodiversity conservation value’, or are cleared of native vegetation.

The application proposes to permanently protect and manage for conservation 444.17ha (43% of the BCAA) of Council owned operational land and some currently private land within the assessment area and an additional 40-50 ha off-site offset areas to provide additional protection for Koala. Some of this land (19.99 ha) already has some environmental management commitments arising from the Thrumster Area 13 LEP and the associated Planning Agreement and Development Control Plan (PMHC 2013). In accordance with the BCAM, the conservation benefit of these areas has been ‘discounted’ by 20% to reflect the up to 20 year commitments in the Thrumster Area 13 Planning Agreement. The on-site conservation areas include 221.99 ha of the three red flag EECs, 111.24 ha of SEPP 14 Wetlands, 26.70 ha of riparian buffers and 8.77 and 61.78 ha of state and regional biodiversity links.

It is proposed that these conservation areas will be registered as a Biobank Site under Part 7A of the TSC Act within 12 months of the Minister conferring biocertification. A BioBanking Agreement is recognised as a ‘100% permanently managed and funded’ conservation measure under s.126L(i) of the TSC Act and Section 8.1.1 of the BCAM will provide in perpetuity conservation protection and management on the land title. The on-site conservation area will be actively managed for conservation prior to any clearing associated with the project.

The Biodiversity Certification Assessment has found that **3,741** biocertification ecosystem credits are required for direct impacts to ten biometric vegetation types and **4,087** and ecosystem credits are generated by the proposed conservation measures within the BCAA. A number of vegetation types have a credit deficit that, subject to the approval of a variation, can be met by a surplus of credits that have been generated for ‘similar’ or matching vegetation types in the same vegetation formation. A request for a variation to the offset rules for ecosystem credits is provided in **Section 6**. This request for variation is made on the basis that all reasonable measures have been taken to secure credits that match the credit profile and that the BCAM requires where possible, that an ‘improve or maintain’ outcome is met within the BCAA. A ‘surplus’ of 798 ecosystem credits remain after this variation. As the proposed conservation measure is within the Biocertification Assessment area, all credits, including these 798 surplus ecosystem credits, will be ‘retired’ as part of the conditions of certification. These additional credits that are not

required for impacts further compensate for the impacts to 23.91 ha of red flagged EECs, SEPP 14 wetlands and Regional Corridors.

Offsets for one vegetation type, '*Blackbutt – Tallowwood dry grassy open forest*' cannot be met within the BCAA and has a 452 credit deficit. This deficit of Blackbutt – Tallowwood credits is required for impacts within lands that already have approval for sustainable selective logging under a Private Native Forestry Agreement. However, as PMHC cannot rely on this private native forestry operation to meet its OLS requirements, PMHC will need to secure an additional offset area containing between 40 to 50 ha of Blackbutt –Tallowwood forest outside the BCAA (**Section 7**). This requirement will be met by purchasing credits from a registered Biobank site or by purchasing suitable private land that is offered for sale and committing to manage this area for conservation consistent with the BCAM. Where possible and practical, this additional offset will be secured from within the Port Macquarie LGA and as close to the project site as possible.

Similarly, **5,861** '*species credits*' are required for impacts to four threatened fauna species (Koala, Squirrel Glider, Eastern Chestnut Mouse and Wallum Froglet). A single specimen of one threatened plant (*Cynanchum elegans*) was recorded in the assessment area which will not be impacted. A total of **6,740** species credits are generated for these same species. However, as for vegetation types, there is a small credit deficit (323 credits) for one of the species (Koala). Subject to the approval of a variation, this credit deficit can be met by the surplus credits generated for Squirrel Glider and Eastern Chestnut Mouse, however, will most likely be met by securing the additional offset required for Blackbutt-Tallowwood forest as this is likely to also support Koala habitat. A request for a variation to the offset rules for species credits is provided in **Section 6** should additional koala offsets not be able to be secured. This request for variation is made on the basis that all reasonable measures have been taken to secure 'like for like' credits where possible (a significant proportion of the credit requirement has been met for Koala with 1,776 (or 85%) of the 2,099 credits required). and the BCAM requires where possible, that an 'improve or maintain' outcome is met within the BCAA. Further, all of the deficit comprises impact to Koala habitat within land that is already subject to the Private Native Forestry agreement. The additional credits required are likely to be obtained within the same additional offset area as for the Blackbutt - Tallowwood dry grassy open forest, which provides habitat for the Koala (**Section 7**).

Indirect impacts have been considered in accordance with the BCAM and have been determined to be negligible on the basis that all direct impacts have been assessed on the assumption of complete loss of all biodiversity values including for Asset Protection Zones and clearing within the OLS where these impacts will only be a partial loss (i.e. retention of native ground cover throughout the OLS clearing area and the removal of over-storey trees only at the southern end of the runway. In effect the APZ areas will provide a buffer between the employment and residential lands and the adjacent conservation areas, thereby mitigating any indirect impacts such as increased weeds, storm water run-off, changed noise and light conditions to threatened species, including Wallum Froglet, and their habitats. These issues will be addressed in further detail at the development application stage and guided by the implementation of a Construction Environmental Management Plan. Similarly the OLS clearing adjacent to the existing runway will result in an area of mown/slashed native vegetation and a '*Coastal freshwater meadows and forblands of lagoons and wetlands*' to the south of the runway, retaining a number of biodiversity values for a range of species, buffering any indirect impacts to the adjacent conservation areas and maintaining water quality in SEPP 14 wetlands.

This application for BioCertification was placed on public exhibition between 17 May and 17 June 2016 as required by section 126N of the TSC Act. A total of six submissions were received with concerns generally relating to impacts to local Koala populations and suitability of proposed Koala offsets. These submission have been taken into consideration as part of finalising this application.



Subject to the Minister's approval of the requests for MALD, red flag variations and offset rules, the proposal can meet an 'improve or maintain' outcome and is eligible for biodiversity certification. If the Minister confers biocertification on the requested land, Port Macquarie - Hastings Council as the consent authority for future development applications, is no longer required to assess impacts to biodiversity values as these have already been addressed by the Minister and conservation areas will be required to be managed in perpetuity for conservation.

A staging plan has been provided in the application that provides an indication on the likely timing of each component of the application, the area of vegetation to be impacted and the number of credits required for each stage. The timing and area of impact in each stage may vary due to CASA requirements, lower or higher demand for business, residential or industrial land in the Airport Business Park and/or Council owned land within the Thrumster Area 13 Urban Release Area. The likely variation in the exact timing of impacts and number of credits required is addressed by Council's commitment to register and commence active management of the proposed biobank site within 12 months of biocertification being conferred by the Minister and to purchase and retire all credits at the end of year seven.

PMHC will prepare and implement a Construction Environment Management Plan for vegetation clearing within the OLS consistent with CASA and Airport Master Plan requirements and the Thrumster Area 13 Planning Agreement, including the Area 13 Koala Plan of Management and a Fauna Pre-clearance protocol, to guide the development outlined in this biocertification assessment and ensure that all direct and indirect impacts (e.g. APZs, utilities, access, stormwater run-off) are contained within the development footprint and appropriate mitigation measures are put in place to minimise indirect impacts to threatened fauna including Koala, Squirrel Glider and Wallum Froglet.

This will include, but not be limited to:

- The proposed Biobank site will be assessed and submitted for registration within 1 year of Biocertification being conferred by the Minister and prior to any clearing required for Stage 1. All credits generated will be categorised as 'committed' in the credit register and not available for use in any other project.
- The management of the Biobank site will be fully funded by Council on a year to year basis for the first seven years, after which the Total Fund Deposit amount will be recalculated and all credits 'retired'.
- The deficit Blackbutt – Tallowwood and Koala credits will be secured prior to any impacts that trigger the need for these additional credits.
- A Management Plan, including a Bushfire Management Plan that meets ecological burning regimes, will be prepared and implemented for the Biobank site on an annual basis prior to the first stage of clearing that will progressively and in proportional to the staging plan, manage all biodiversity values within the Biobank site in perpetuity
- Temporary and permanent protective fencing will be erected around all areas identified for conservation prior to clearing activities to minimise any inadvertent damage, including security fencing of the airport operational precinct to prevent Koala's and other fauna from entering operational areas
- Pre-clearance surveys of threatened fauna, including a consideration of the need to relocate any Koala, will be undertaken in accordance with a fauna pre-clearance protocol prior to any clearing of vegetation
- Protocols for clearing vegetation and adaptive reuse of vegetative material for restoration and habitat augmentation in areas indicated for restoration activity (i.e. outer E3 zone of Thrumster Area 13) will be prepared and implemented

- The Thrumster Area 13 Koala Plan of Management (Biolink 2008) will be implemented as required for all Council owned land within the Thrumster Area 13 URA including aspects relating to fencing of residential lots, road speed limits, provision of Koala underpasses on arterial and collector roads, protection of preferred koala food trees within residential areas.

# 1 Preamble

## 1.1 Project background

Port Macquarie Airport (the Airport) is owned and operated by Port Macquarie Hastings Council (PMHC). It is located on the Mid North Coast of New South Wales (NSW), approximately 380 km north of Sydney and 550 km south of Brisbane. The Airport is located 5 km west of the Port Macquarie Central Business District (CBD) (**Figure 1**).

The Airport was owned by the Commonwealth of Australia until circa 1970 when the ownership was transferred to the local Council of the time and subsequently became the PMHC Regional Airport. In 2004, PMHC adopted its first formal Master Plan for the Airport and its long-term plan to upgrade the Airport from a Civil Aviation Safety Authority (CASA) Code 3C Airport to Code 4C i.e. the Port Macquarie Airport Master Plan. However, prior to implementing the Port Macquarie Airport Master Plan to upgrade the airport from a Code 3C to Code 4C Airport, the airport required an upgrade to cater for the introduction of medium jet aircraft operations and comply with CASA Code 3C Aerodrome standards. The Code 3C aerodrome standards required 2% take-off surfaces at each end of the runway and therefore modifications to the existing Obstacle Limitation Surface (OLS), imaginary reference surfaces in airspace which determine when an object may become an obstacle to aircraft manoeuvring in the vicinity of an Airport. These surfaces are defined by reference to the runway ends and elevation of the Aerodrome Reference Point. The modifications required an Environmental Impact Statement (EIS) under Part IV of the *Environmental Planning and Assessment Act 1979* (EP&A Act) due to impacts to endangered ecological communities, threatened species and their habitats and SEPP 14 Wetlands.

The EIS was prepared by GHD (2008) and was approved on 24 February 2010 by PMHC as the Consent Authority following consultation with the then Department of Planning and Infrastructure (DP&I) and NSW Office of the Environment and Heritage (OEH) and subsequently modified in June 2010 (PMHC 2010 - DA 2008/184 & 2008/466). The EIS outlined impacts to biodiversity in the form of ‘cropping’ native vegetation penetrating the OLS (31.22 ha) and the loss of koala habitat. The conditions of approval required all cropping activities to be undertaken in accordance with a Vegetation Management Plan (GHD 2010a) and Koala Plan of Management (KPoM) (GHD 2010b) and to avoid any impacts outside of the OLS, and in particular, to SEPP 14 wetlands. The KPoM required 200 Koala food trees to be planted in an area outside of the OLS and be maintained for three years to compensate for loss of Koala habitat (**Figure 2**).

In February 2012, PMHC granted consent to an Airport Upgrade including a runway extension, expanded passenger terminal and car parking, which together with CASA approval, allowed the Airport to operate as a full Code 4C airport (DA-2011/438) subject to the implementation of all the mitigation measures outlined in the Statement of Environmental Effects prepared by GHD 2011 (Port Macquarie Airport Upgrade Statement of Environmental Effects, July 2011). CASA subsequently made changes to Code 4C aerodrome standards in 2014 (The revised standards are published in the Manual of Standards Part 139 – Aerodromes Version 1.12 November 2014 (Australian Government – Civil Aviation Safety Authority 2014), which include the Manual of Standards (MOS) Part 139 Amendment Instrument 2014 (No. 1)).

PMHC wishes to implement a strategic and sustainable approach to the management and offsetting of environmental impacts associated with the long term operation and future development of essential infrastructure related to the Airport. The Code 4C requirements require larger OLS boundaries to be maintained which have high ongoing costs maintaining the OLS free of obstacles. The Port Macquarie Airport Master Plan is included **Appendix A** and shown in **Figure 3**.

While the Manual of Standards Part 139 – Aerodromes allows for previous standards to be met until such time an airport is upgraded (see 2.1.2 of the Standards [Australian Government 2014]), CASA has issued an exemption for Port Macquarie Airport for an initial period of 3 years. During this time, PMHC ‘must continue to provide CASA with particulars of its progress in achieving compliance with paragraph 6.2.18.2 and Table 6.2.6, and paragraph 7.1.3.4 and Table 7.1-1 of Manual of Standards Part 139 – Aerodromes’. This exemption may be extended further subject to CASA review at that time and thus affect the timing of any clearing required to meet the OLS.

Following a review and analysis of the necessary approvals, the conferral of ‘Biodiversity Certification’ (hereafter biocertification) of the proposed impacts in accordance with Part 7AA of the TSC Act and any additional Commonwealth Government *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approvals required, combined with a commitment to implement recognised ‘conservation measures’ on PMHC owned land to ‘*improve or maintain*’ overall biodiversity values within the assessment area, was identified as the most strategic and sustainable approach to the management and offsetting of environmental impacts, whilst avoiding significant financial burden on the Port Macquarie-Hastings community.

PMHC held preliminary discussions with the OEH in 2013 who indicated support to the biocertification approach of the assessment of the impacts associated with implementing the Port Macquarie Airport Master Plan. As the assessment progressed, further discussions were held regarding the inclusion of Council owned land within the Thrumster Area 13 Urban Release Area. An application for biocertification must follow the Biodiversity Certification Assessment Methodology (BCAM) (DECCW 2011) and meet the requirements of Section 126K of the TSC Act, i.e. be accompanied by a Biodiversity Certification Strategy (BCS).

The BCAM was developed by the OEH and was gazetted by the NSW government in February 2011. The methodology may be applied to land for which ‘*biocertification is sought*’, and is conferred by the Minister for the Environment if the ‘*conservation measures*’ proposed in the biocertification application result in an overall ‘*improvement or maintenance*’ in biodiversity values. This is referred to under the methodology as satisfying the ‘improve or maintain test’ (IoM test).

The methodology provides an equitable, transparent and scientifically robust framework with which to address the often competing demands of urban development and biodiversity conservation. If the Minister for the Environment is satisfied that an IoM outcome has been achieved, he/she may confer biocertification on ‘land’. If the Minister confers biocertification on land, a consent/approval authority does not have to take biodiversity issues into consideration when assessing development applications, i.e. for the purpose of s.5A of the EP&A Act, the development or activity is not subject to an Assessment of Significance for threatened species, populations or ecological communities.

Only a ‘*Planning Authority*’ as defined by section 126G of the TSC Act may apply to the Minister for biocertification. PMHC is a Planning Authority as defined by section 126G.

Eco Logical Australia Pty Ltd (ELA) was engaged by PMHC to apply the BCAM to assess the impacts and conservation outcomes of the proposed Port Macquarie Airport Master Plan as well as residential and light industrial development of Council owned land in the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area, located immediately south of the airport, and implementation of the required Asset Protection Zones, (APZs), easements and fire trails within the Biodiversity Certification Assessment Area (BCAA), and prepare the BCS. Application of the BCAM was done by assessing the loss of biodiversity values associated with vegetation clearance on the impacted land and the biodiversity gains that will be achieved as a result of ‘conservation

measures' on PMHC and privately owned land within the BCAA adjacent to the airport. The net result was then considered in the context of the 'improve or maintain' test defined under the BCAM (**Section 7**).

This Biocertification Strategy and the associated credit calculations were undertaken under the supervision of a two accredited assessors (Antony Von Chrismar, Accreditation Number 0080 and Dr Enhua Lee, Accreditation Number 0176) and supported by other ELA staff (Joanne Daly, and Robert Humphries) and field ecologists who undertook additional ecological investigations of the BCAA.

## 1.2 Project Description

The land being sought for biocertification includes the following proposed works:

- widening (and ongoing maintenance) of the existing Code 3C 150m wide runway strip to Code 4C 300 m wide and associated 1:7 transitional Obstacle Limitation Surface (OLS)
- ongoing establishment and maintenance of the existing Code 3C 2% OLS surfaces at each end of the runway 03/21 (150 m approach and 180 m take-off surfaces)
- widening and ongoing maintenance of the existing Code 3C 2% OLS surfaces at each end of runway 03/21 to comply with CASA Code 4C aerodrome standards
- potential future development/extension and/or relocation of critical aviation-related infrastructure and facilities within the aviation uses precinct to comply with CASA Code 4C aerodrome standards and cater for forecast growth in air services and passenger numbers, including (though not limited to) a potential new Regular Public Transport (RPT) apron, passenger terminal building and car parking, and a future parallel taxiway to the east of the runway
- the establishment of an Airport Precinct Business Park (new employment lands) and potential future Airport related accommodation/mixed use facility
- the establishment of flood free road access between the Oxley Highway and Hastings River Road Drive via Port Macquarie Airport, the Airport Precinct Business Park and an upgrade to boundary road (the current access to the airport)
- Residential and light industrial development on Council owned land in the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area and establishment of associated roads and APZs. Development would provide for a village centre, residential areas of up to 820 lots (700 in Partridge Creek and 120 in West Linfield) bordered by environmental lands, conventional residential development, and an employment hub (15ha) containing a diverse range of employment generating uses for the Thrumster Urban Release Area
- Establishment of water and sewer easements to meet expected future needs of the Thrumster Urban Release Area and fire trails within the conservation areas to aid in strategic fire and conservation management

### 1.2.1 Strategic Context

The strategic context of the biocertification application is outlined in the Port Macquarie Airport Master Plan (**Appendix A**), the Mid North Coast Regional Strategy (DoP 2009) and PMHC Urban Growth Management Strategy (PMHC 2011) regarding the airport employment lands and the PMHC Development Control Plan (DCP) 2013 for the Council owned land within the Thrumster Urban Release Area. In general, the Thrumster Urban Release Area is to become a diverse, integrated, and sustainable community distinguished by its distinct neighbourhoods that are defined by topographic, bush land and other natural features of the location (PMHC 2013). As a result of undertaking the biocertification assessment and avoiding and minimising impacts to biodiversity values where possible, a number of minor changes will be required to the PMH Local Environment Plan 2011 (LEP).

### 1.3 Description of project timelines, management and governance

The Port Macquarie Airport Master Plan and development of the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area that fall within the boundary of the BCAA is expected to be implemented in up to five stages over a 20+ year timeframe (subject to demand and CASA requirements) and will be subject to the necessary Part 4 and/or Part 5 approvals under the *Environmental Planning and Assessment Act (EP&A Act) 1979* and PMHC Development Control Plan 2013. No clearing of mapped vegetation will commence in any stage until PMHC has purchased and retired the required number of credits as indicated in **Section 7.4.1**.

A breakdown of the works in each stage and indicative timeframes are provided in **Table 1** and shown in **Figure 4**.

**Table 1: Indicative implementation Stages of Port Macquarie Airport Master Plan and development of the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area**

Stage	Indicative Timeframe	Components
Stage 1	0-5 Years	<p>Clear vegetation within 300m RWS plus 54m (approx..) east and west of north-south runway</p> <p>Clear/crop vegetation associated with 150m and 300m approach OLS immediately to the south of the runway</p> <p>Clear vegetation for relocated Bureau of Meteorology weather station</p> <p>Clear vegetation within Boundary Street, The Binnacle road and alternative flood free access road to Airport Precinct Business Park</p> <p>Clear vegetation within Stages 1 and 2 of Airport Precinct Business Park (northern and mid sections)</p>
Stage 2	5-10 Years	<p>Clear vegetation within 150m approach OLS, north and south</p> <p>Clear vegetation on the western side of the Partridge Creek Residential neighbourhood (including in development areas 1 and 2 as shown in the PMHC DCP (2013) of the Thrumster Urban Release Area that fall within the BCAA boundary</p> <p>Clear vegetation associated with sewer rising mains west of Airport</p>
Stage 3	10-15 years	<p>Clear vegetation associated with 300m approach OLS north and south</p> <p>Clear vegetation within 300m transitional surface on Crown land south east of runway</p> <p>Clear vegetation on south eastern side of the Partridge Creek Residential (including in development areas 1 and 2 as shown in the PMHC DCP (2013) neighbourhood of the Thrumster Urban Release Area that falls within the BCAA boundary</p>
Stage 4	15-20 Years	<p>Clear vegetation within Stage 3 (southern part) of the Airport Precinct Business Park</p> <p>Clear vegetation on north eastern side of the Partridge Creek Residential (development area 2 as shown in the PMHC DCP (2013) neighbourhood of the Thrumster Urban Release Area that falls within the BCAA boundary</p>

Stage	Indicative Timeframe	Components
		Clear vegetation on the eastern side of the Partridge Creek Industrial (development area 2 as shown in the PMHC DCP (2013) neighbourhood of the Thrumster Urban Release Area that fall within the BCAA boundary
Stage 5	20+ years	Clear vegetation for new apron, terminal building and car park precinct Clear vegetation within Outer Link/Orbital Road Clear vegetation for relocated existing Non-Directional Beacon (NDB) Clear vegetation on West Lindfield Residential neighbourhood of the Thrumster Urban Release Area that falls within the BCAA boundary

## 1.4 Community Consultation and Stakeholder Engagement

The Port Macquarie Airport Master Plan has undergone community and stakeholder consultation since 2009, with the Port Macquarie Airport Master Plan 2010 (PMHC 2010) exhibited as a Discussion Paper from 1<sup>st</sup> to 30<sup>th</sup> June 2009, and the companion Addendum Report 2013 (PMHC 2013) placed on public exhibition from 4<sup>th</sup> October to 1<sup>st</sup> November 2013.

Subsequently PMHC has corresponded with all affected landholders within the OLS regarding the proposed biocertification application. Further, consistent with section 126N of the TSC Act, the proposal to seek biocertification of land within the BCAA will be placed on public exhibition and a report prepared responding to any submissions received.

Following consultation with OEH in 2015, various amendments were made to the project including relocating the proposed Airport mixed use/accommodation precinct from the eastern side of the airport precinct to within the Airport Business Park precinct. This has avoided/reduced impacts to high quality koala habitat and EECs and will involve various future zoning amendments to the Airport precinct within the PMH LEP 2011.

This application for BioCertification was placed on public exhibition between 17 May and 17 June 2016 as required by section 126N of the TSC Act. A total of six submissions were received with concerns generally relating to impacts to local Koala populations and suitability of proposed Koala offsets. These submission have been taken into consideration as part of finalising this application.

Further, as Matters of National Environmental Significance (MNES) will also be impacted, a referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1992 has been prepared that will also be placed on exhibition with the biocertification application and LEP amendment.

### 1.4.1 Biocertification Assessment Process and Implications

Under the BCAM, the impact of development and conservation measures on biodiversity values is quantified using 'biodiversity credits' which are defined by each of the vegetation types (ecosystem credits) and threatened species present (species credits). In this regard, the methodology determines the number of credits that are required to offset the adverse impacts of development on biodiversity values, and, the number of credits that can be generated by undertaking recognised conservation measures as outlined in s126L of the TSC Act that will improve biodiversity values within the BCAA. Where the number of credits that are created is equal to, or exceeds the number required, the 'improve or maintain' test described under the methodology is considered to be satisfied, provided 'red flags' have been avoided, or a red flag variation has been approved by the Director General of OEH.

Red flags are regarded as areas of high biodiversity conservation value in section 2.3 of the BCAM, and include vegetation types that are >70% cleared in the Catchment Management Authority Area (CMA), Critically Endangered Ecological Communities (CEECs) and Endangered Ecological Communities (EECs) listed under the TSC Act and/or EPBC Act, certain threatened species that are regarded as not being able to withstand further loss in the CMA and areas that are recognised as biodiversity corridors of state or regional significance.

The BCAA includes the following red flag entities that will be impacted by the proposal:

- Three EECs – *Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*, *Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*, and *Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*
- A biometric vegetation type that is classified as being >70% cleared in the Northern Rivers CMA (Wet heathland and shrubland of coastal lowlands of the North Coast)
- SEPP 14 Wetlands
- Riparian Buffers on major rivers, minor creeks and minor watercourses
- A biodiversity link regarded by OEH as being of regional significance identified in the Mid North Coast Regional Strategy (DoP 2009).

The measures taken to avoid, minimise and mitigate impacts to these red flag areas is provided in **Section 4**. As all impacts are not possible to avoid, this assessment report includes a red flag variation request (**Section 4**).

A request is also included to use *'more appropriate local data'* (MALD) for the classification of *'Wet heathland and shrubland of coastal lowlands of the North Coast'* as being >70% cleared in the Northern Rivers CMA, (i.e. the per cent cleared being more accurately estimated at 60% cleared) and revisions to the default benchmarks for each of the vegetation types in the BCAA on the basis that they do not accurately reflect benchmarks for these vegetation types in the local area (**Section 3**).

## **1.5 Biodiversity certification assessment area, existing and other proposed uses and confirmation of assessment methodology**

### **1.5.1 Biodiversity Certification Assessment Area**

The BCAA encompasses a total area of 1,024.48 ha comprising the Airport and business park, adjacent PMHC owned land and private land within the OLS (**Figure 5**). The BCAA includes all land subject to native vegetation impacts relating to the implementation of the Port Macquarie Airport Master Plan, residential and light industrial development in the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area that fall within the BCAA, implementation of easements and fire trails, and available/potential offset areas. This includes the relocated airport infrastructure, proposed Airport Precinct Business Park and Airport Accommodation Precinct as shown in **Figure 3**, the revised OLS boundary, PMHC owned land available as biodiversity offsets within the airport precinct and adjoining PMHC owned land, private land within the Area 13 Urban Impact Area and private land to the north of the airport (**Figure 5**).

The BCAA comprises a mix of land zoned under the Port Macquarie – Hastings Local Environmental Plan 2011 (LEP): SP2 (Infrastructure - Air Transport Facility), E2 (Environmental Conservation), E3



(Environmental Management), RU1 (Primary Production), B7 (Business Park), RE1 (Public Recreation), R1 (General Residential), IN2 (Light Industrial) (**Figure 6**).

The BCAA includes approximately 118.50 ha and 440.11 ha of mapped native vegetation that will be impacted or protected by conservation measures, respectively. The remaining area comprises existing airport infrastructure, urban development, recreational areas (sports fields), exotic pastures and cleared land or vegetation that will neither be impacted or conserved and is classified by the BCAM as '*retained land*'. Retained land is defined under the BCAM as "*land within a BCAA that is not land proposed for biodiversity certification or subject to a proposed conservation measure*" (DECCW 2011).

Vegetation within the BCAA includes ten biometric vegetation types, four of which are listed as three Endangered Ecological Communities (EECs) (three EECs in total as two vegetation types comprise one EEC) under the NSW TSC Act (**Table 2**).

**Table 2** shows areas of mapped native vegetation that will be impacted or protected by conservation measures, as well as the area of retained land in the BCAA according to land ownership and land use. **Figure 7** shows land ownership.

### 1.5.2 Assessment Methodology/Consultation with OEH

In accordance with OEH's draft operational guidelines for Biocertification assessments and combined with the complexities of this Biocertification assessment, PMHC and ELA have consulted with OEH throughout the assessment to ensure that all decisions and assumptions meet the intent of the BCAM (**Appendix B**). OEH were also consulted on the proposed impacts to '*red flag*' areas and the 'likelihood' that these would be supported (**Appendix C**).

For this assessment this has included the following:

- the version of the Biocertification calculator tool to be used for calculations – version 1.9 is to be used
- the presence of 'State' and 'Regional' biodiversity links as identified in the Mid North Coast Regional Strategy (DoP 2009)
- confirmation of which threatened species were to be considered as species credit species due to recent changes to the category of some species – Squirrel Glider and Koala, which had recent changes in categories, are to be considered species credits. Note that there were no changes to other species' categories and thus were or were not considered as species credit species, as relevant
- the assessment of degraded/modified vegetation within the existing operational areas of the airport
- the assessment of partial versus complete/full impacts – all impacts within the BCAA are to be considered full impacts regardless of whether they are partial or not
- consideration of minor cropping of individual trees in the proposed conservation areas – this should be addressed via the 'gain' side of the calculator and the default increase for over-story reduced. Individual trees should be cropped and then poisoned to prevent regrowth and to minimise indirect impacts to surrounding retained vegetation and retain hollows and perching areas for avifauna
- consideration of existing approvals (Private Native Forestry and residential DA) – if these are acted on in accordance with the approval conditions prior to any clearing required for the airport, the impacts will not be considered airport impacts

**Table 2: BioMetric Vegetation types and conservation status in the BCAA**

Vegetation types	Area (Ha)	TSC Act	EPBC Act
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	41.63	-	-
Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	161.44	-	-
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	6.74	-	-
Paperbark swamp forest of the coastal lowlands of the North Coast *	162.10	EEC	-
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	49.78	-	-
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast *	23.48	EEC	-
Swamp Oak swamp forest of the coastal lowlands of the North Coast	16.25	EEC	-
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	22.84	-	-
Wet heathland and shrubland of coastal lowlands of the North Coast	70.91	-	-
Coastal freshwater meadows and forblands of lagoons and wetlands	74.42	EEC	-
Cleared	394.88	-	-
<b>Total</b>	<b>1,024.48</b>		

EEC: Endangered Ecological Community. \* These vegetation types together comprise a single EEC, 'Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions'

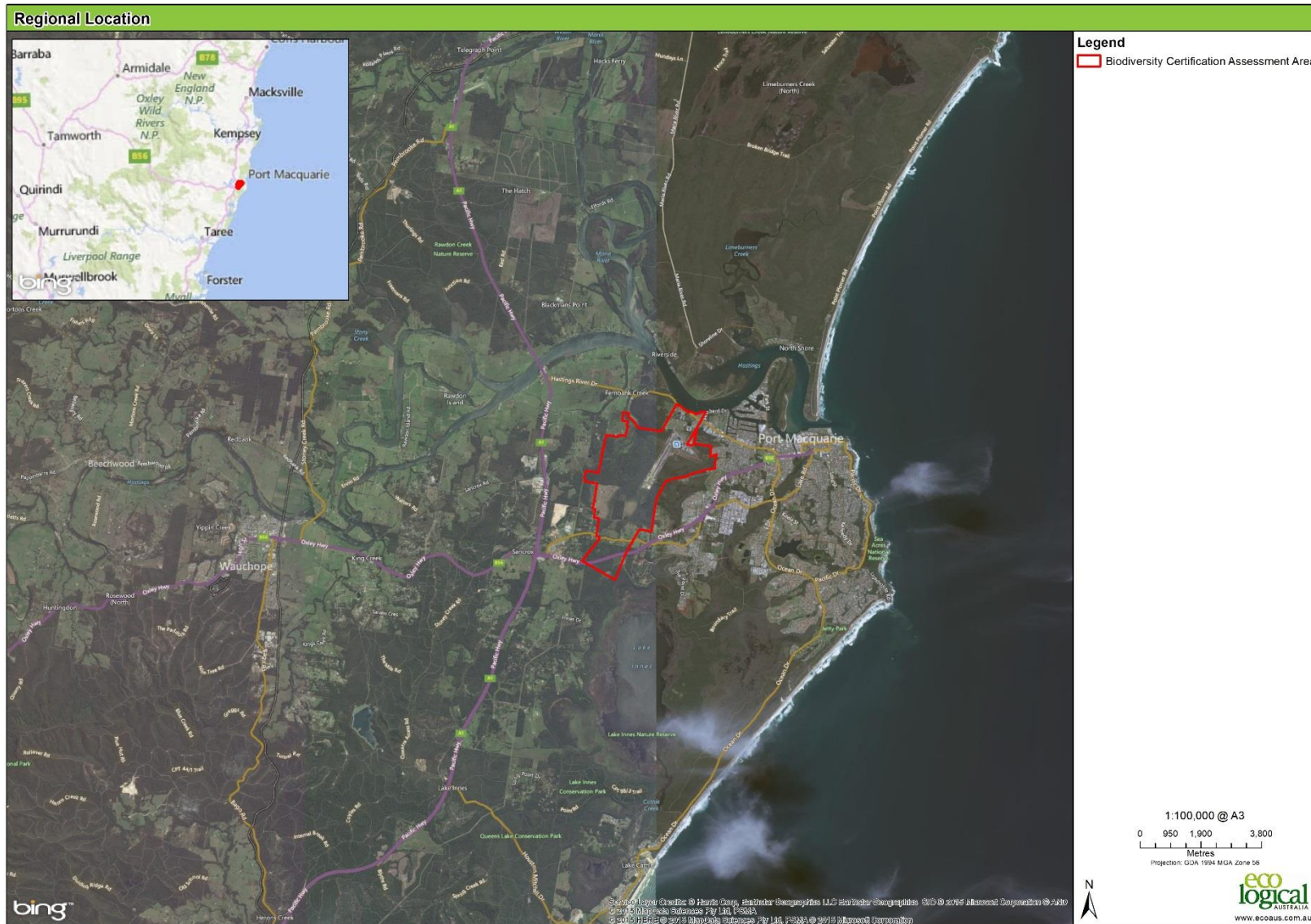


Figure 1: Regional location of Port Macquarie Airport

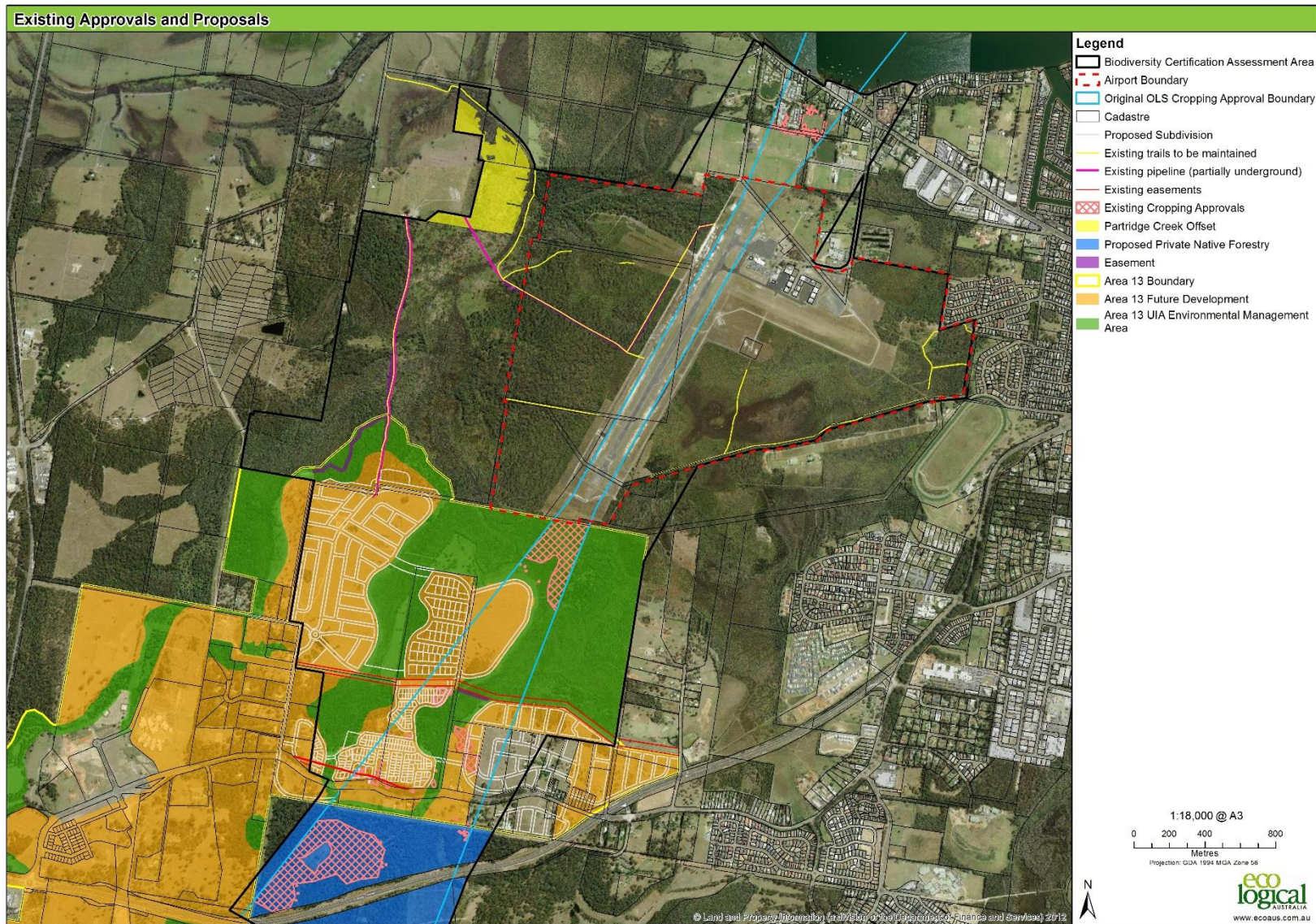
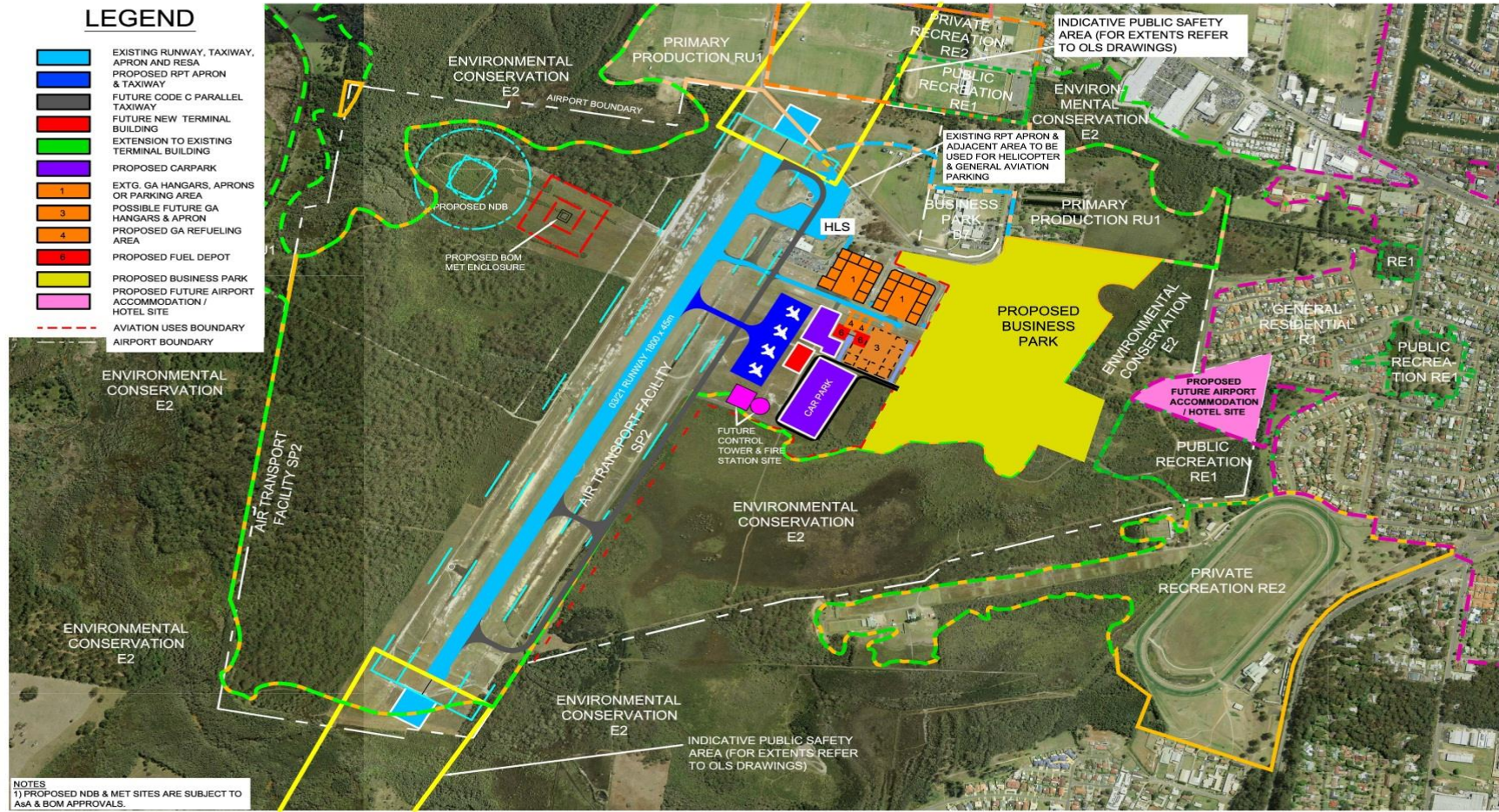
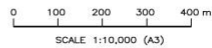


Figure 2: Approved OLS cropping areas (DA 2008/184 and 2008/466) and other existing approvals or proposals within the BCAA



DATE: 2-05-13



PORT MACQUARIE AIRPORT MASTERPLAN 2010 ADDENDUM

FIGURE 13-2 MASTERPLAN - OPTION 2 2013

Figure 3: Port Macquarie Airport Master Plan 2013 (indicative layout of proposed relocation of airport infrastructure)

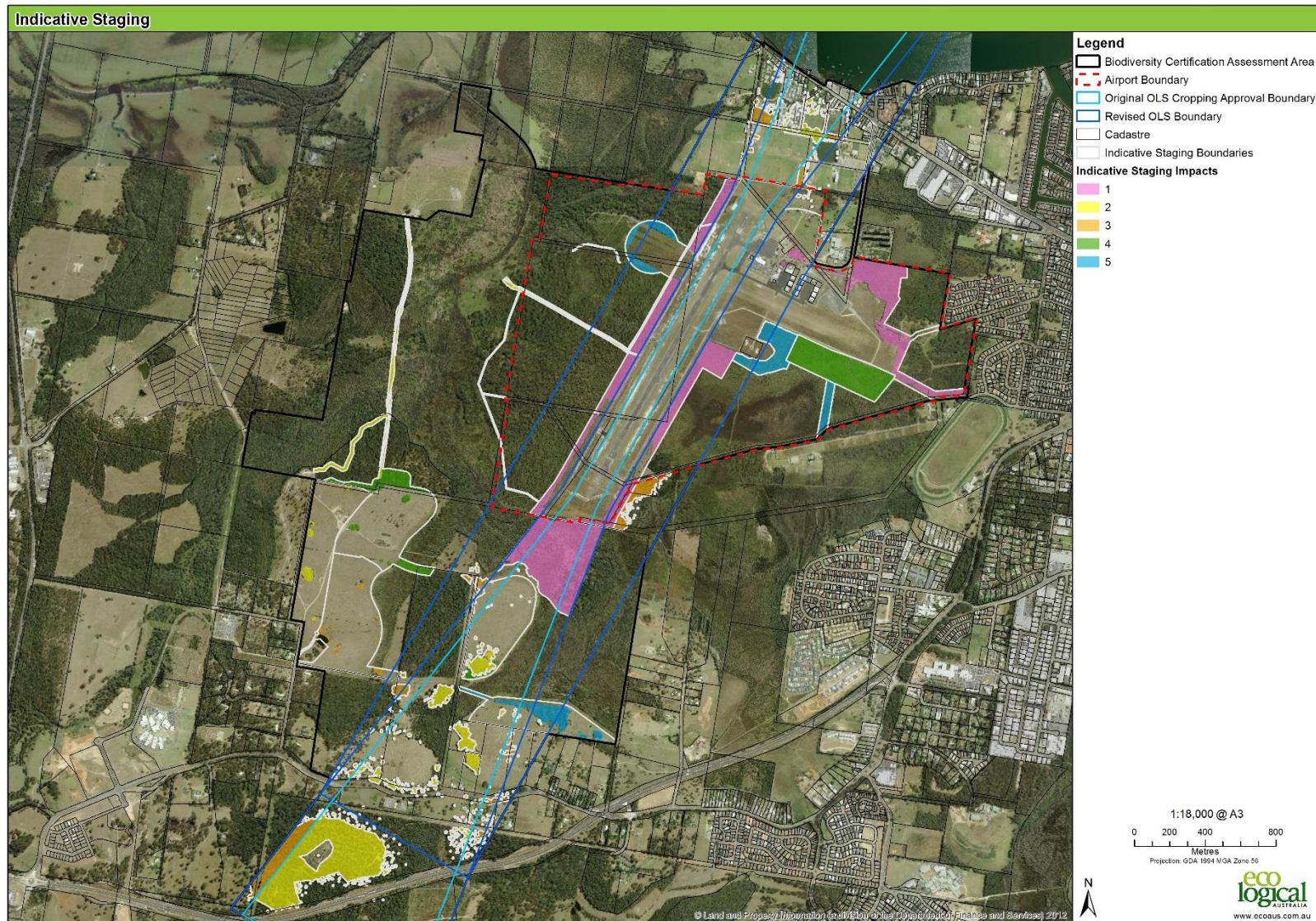


Figure 4: Indicative clearing stages for implementation of Port Macquarie Airport Master Plan

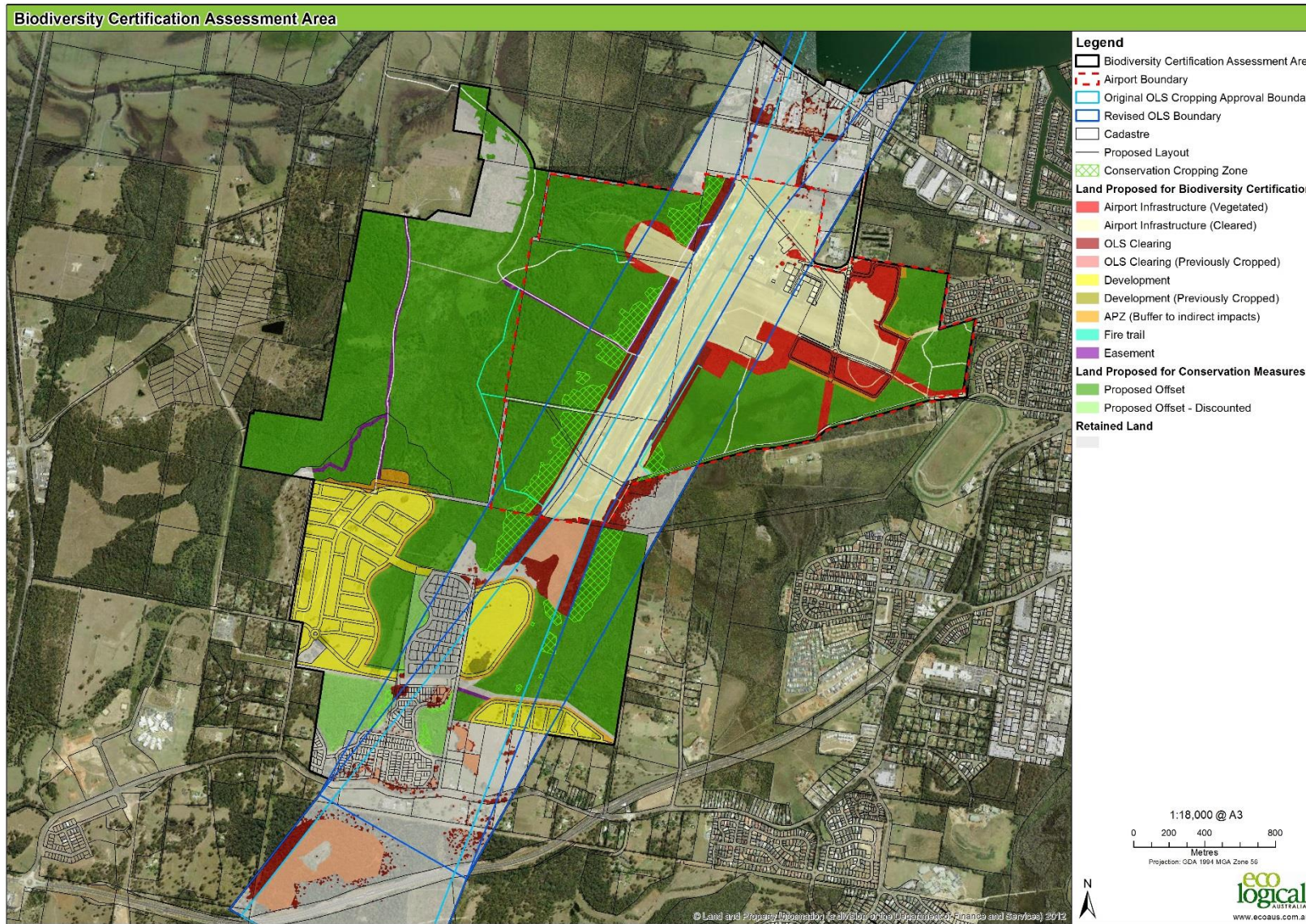


Figure 5: Biodiversity Certification Assessment Area showing land proposed for certification and conservation measures

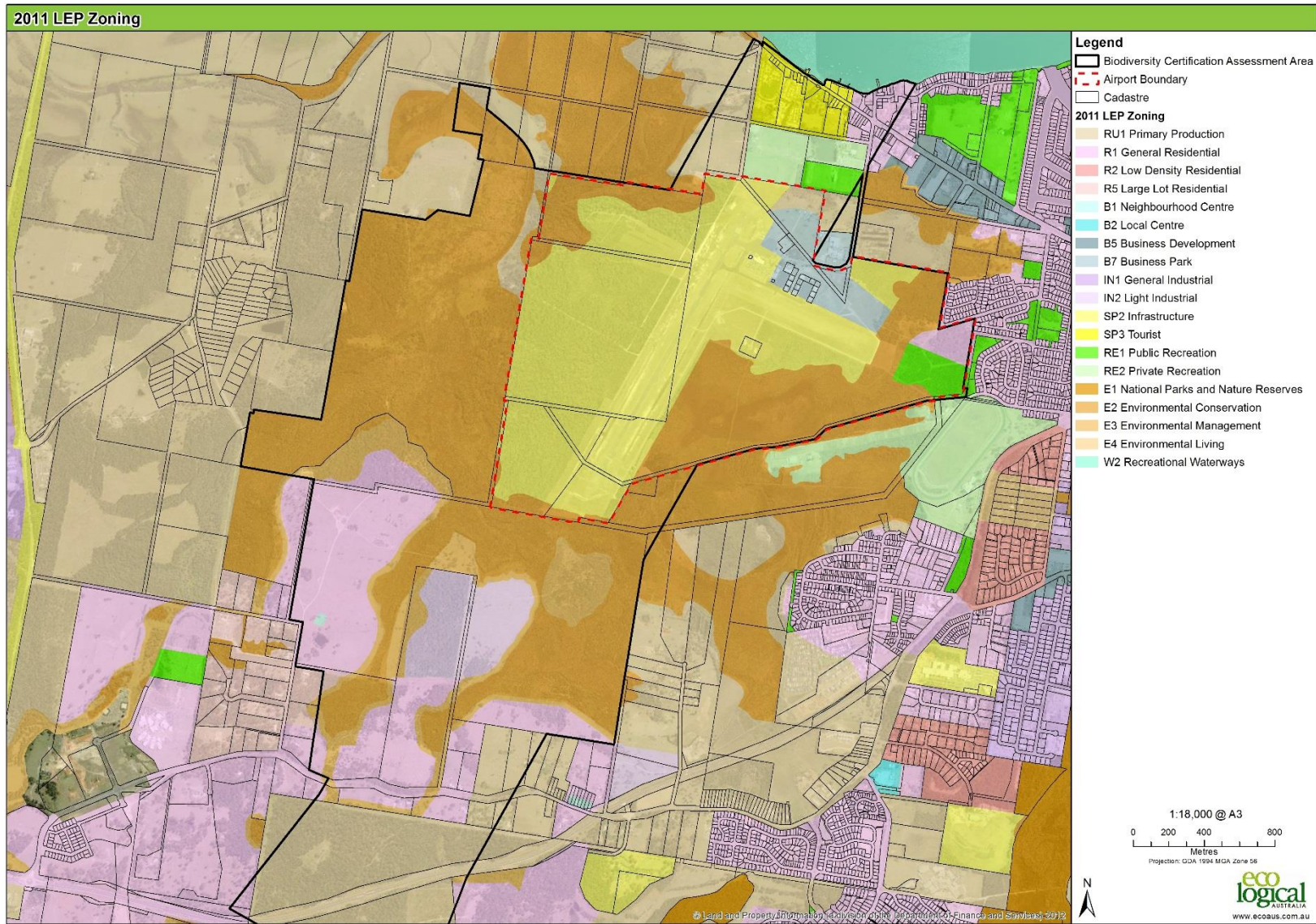


Figure 6: Existing zoning of BCAA and surrounding lands



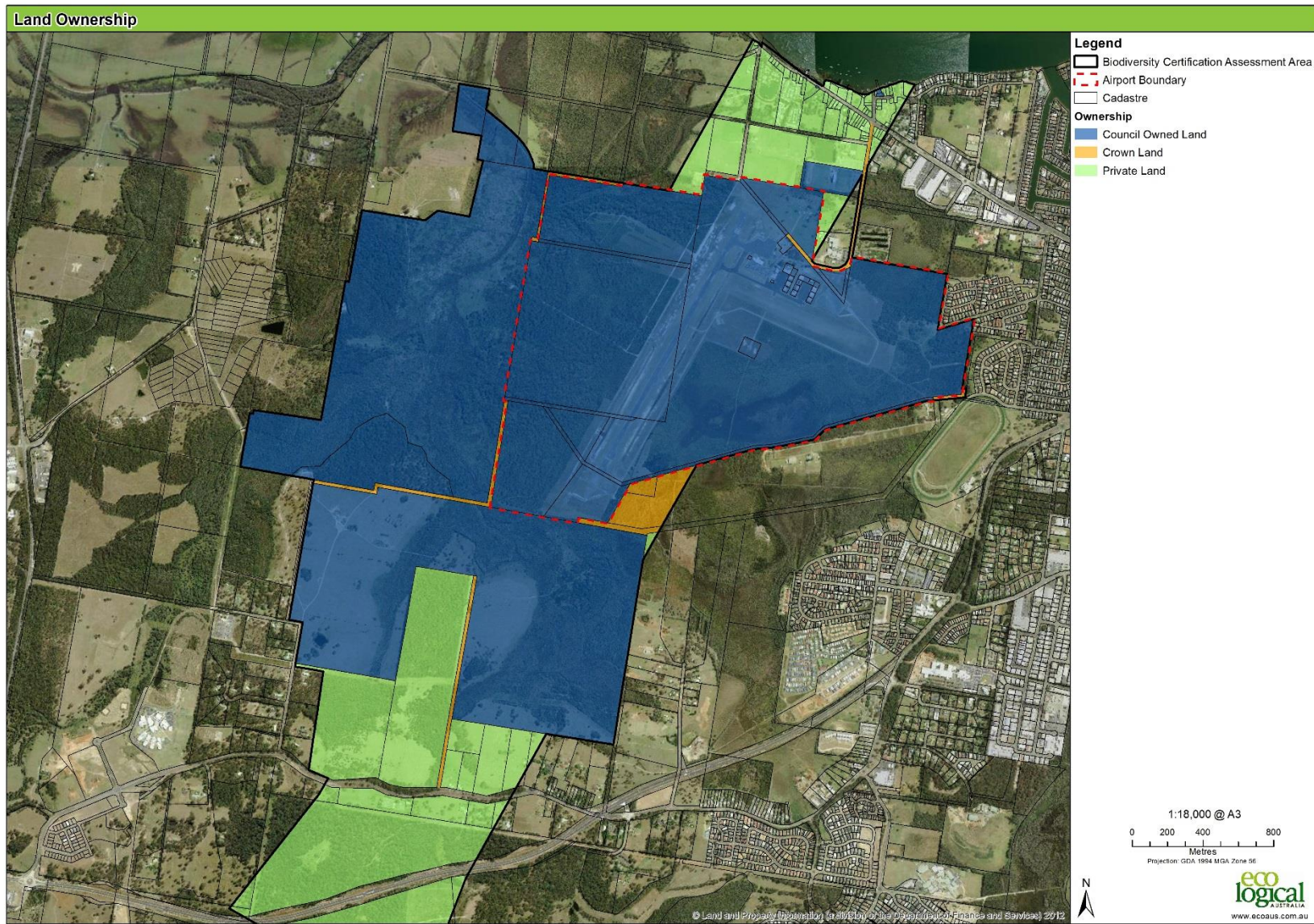


Figure 7: Land ownership within the BCAA

## 2 Assessment of Ecological Values in Biocertification Assessment Area

An application for biodiversity certification must include an assessment of the biodiversity values of the BCAA undertaken in accordance with the BCAM. The results of the assessment of ecological values is to be included in a report titled '**Biodiversity Assessment Report**'. This section addresses this requirement.

Information from a number of previous studies was used to prepare the Biodiversity Assessment Report (BAR). Additional information collected by ELA, gathered to fill gaps in survey effort and meet BCAM requirements was also used. The following sections summarise all survey information and results of previous studies and ELA's survey with regard to the BCAA. Note that ELA's survey (Section 2.1.4) was undertaken following review of previous effort (Section 2.1.1), determination of biometric vegetation type and number of biometric plots required (Section 2.1.2), and assessment of species requiring survey for determination of species credits (Section 2.1.3).

### 2.1 Methods

#### 2.1.1 Literature and data review

The BCAA has been the subject of a number of previous studies mapping the vegetation types and biodiversity values of the area and surrounding lands including:

- *Partridge Creek Acid Sulphate Soil Hotspot Project Targeted Fauna Survey and 8 Part test Assessment* (Department of Land and Water Conservation [DLWC] 2002)
- *Eight-Part Test Assessment and Matters of National Environmental Significance for Proposed Clearing of Land for Hastings Airport Flight Safety, Charley Land, Oxley Highway* (Darkheart Eco Consultancy 2005).
- *Area 13 Urban Investigation Area Local Environmental Study (Ecological Constraints)* (Biolink 2006)
- *Area 13 UIA Koala Plan of Management* (Biolink Ecological Consultants [Biolink] 2008)
- *Thrumster Sewage Transfer Scheme Ecological Impact Assessment* (Environmental Resources Management [ERM] 2008)
- *PMHC Report on Port Macquarie Airport Obstacle Limitation Surface: Ecological Assessment Stage 2* (GHD 2008)
- *Port Macquarie Airport Precinct Ecological Assessment* (Biolink 2012)
- *Vegetation of the Port Macquarie – Hastings Local Government Area* (Biolink 2013a)
- *Port Macquarie – Hastings Koala habitat and population assessment* (Biolink 2013b)
- *Staged Residential and Industrial Subdivision Lot 206 DP 754434 and Lot 3 DP 565437, John Oxley Drive, Port Macquarie: Flora and Fauna Survey* (Peter Parker Environmental Consultants 2014).

The study areas for each of these studies are shown in **Figure 8**.

These reports were reviewed for vegetation types and biodiversity values. Given the reports were used to determine the level of additional survey to be undertaken by ELA to meet BCAM requirements, results are summarised in subheadings below, as well as in **Table 3** through to **Table 8**, rather than in Section

2.2 Results. Survey effort is shown in Section 2.1.4 to show total survey effort (previous effort plus ELA's survey effort).

Relevant legislation and standard technical resources such as the *Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities* (DEC 2004) underpinned the survey methodologies and provided background information for the ecological assessment.

In addition to the database searches of the *Atlas of NSW Wildlife* and *EPBC Protected Matters Search Tool* undertaken by previous studies, ELA used the biocertification credit calculator v 1.9 to determine ecosystem and species credit threatened species and validated these against the threatened species profile ecological data from the *BioNet Atlas of NSW Wildlife* (see Step 1 in Section 2.1.3).

*Partridge Creek Acid Sulfate Soil Hotspot Project Targeted Fauna Survey and 8 Part Test Assessment (DLWC 2002)*

A targeted fauna survey of a 542 ha area, focussed around Partridge Creek and some artificial drainage and located west of Port Macquarie Airport, was undertaken in August 2002 (specific dates unspecified) to determine the distribution of *Pseudomys gracilicaudatus* (Eastern Chestnut Mouse) and *Tyto capensis* (Grass Owl) in the study area and subsequently assess the potential impacts of acid sulphate remediation works to be undertaken around Partridge Creek on these species. These species were previously detected by Environmental Resources Management Australia (ERM), earlier in the same year. The target species were surveyed through spotlight surveys, call playback, and Elliot trapping at ten survey sites, and were supplemented by scat surveys along roads and tracks. Habitat information (floristics, structure and cover abundance of flora species) was collected per survey site.

A total of 92 fauna species, including five threatened species, was recorded. The threatened species recorded were Grass Owl, *Lophoictinia isura* (Squared-tailed Kite), Eastern Chestnut Mouse, *Pteropus poliocephalus* (Grey-headed Flying Fox), and *Crinia tinnula* (Wallum Froglet). The survey recorded four main groups of vegetation, which could be broken into seven discreet groups if the on-site variables were taken into consideration. A total of nine (two male and seven female) Eastern Chestnut Mouse and at least two Grass Owl were recorded. Eastern Chestnut Mouse was mostly recorded in vegetation characterised by the presence of *Callistemon pachyphyllus* (Wallum Bottlebrush) (two sites), but it was also recorded at a third site which did not contain *Callistemon pachyphyllus*. However, sites where the species was recorded occurred within one main vegetation group (*Melaleuca quinquenervia/Casuarina glauca* – *Leptospermum juniperinum/Callistemon pachyphyllus* - *Juncus usitatus/Lepironia articulata* – *Axonopus fissifolius/Paspalum orbiculare*). Grass Owl was recorded in the same vegetation group as Eastern Chestnut Mouse.

*Eight-Part Test Assessment and Matters of National Environmental Significance for Proposed Clearing of Land for Hastings Airport Flight Safety, Charley Land, Oxley Highway (Darkheart Eco Consultancy 2005)*

A flora and fauna assessment of a 1 ha area proposed to be cleared for Hastings Airport Flight Safety was undertaken by Darkheart Eco Consultancy in January 2005. Survey involved vegetation community, and targeted flora and fauna, surveys, with fauna surveys focussing on *Phascolarctos cinereus* (Koala) and habitat assessment.

One vegetation type, Dry Sclerophyll Forest, was recorded. This did not correlate with recognised vegetation communities. A total of 64 flora species, comprising 59 native species and five introduced species, and six fauna species (three birds, two mammals, and one reptile) was recorded. Of the fauna species recorded, one species, Koala, is threatened. No threatened flora species were recorded. The site was assessed as unlikely to support any threatened flora species; however, there was potential for the site to support *Calyptrorhynchus lathamii* (Glossy Black Cockatoo), *Petaurus norfolcensis* (Squirrel

Glider), Grey-headed Flying-fox, *Dasyurus maculatus* (Spotted-tailed Quoll), *Phascogale tapoatafa* (Brush-tailed Phascogale), *Miniopterus australis* (Little Bentwing Bat), *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat), *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat), *Mormopterus norfolkensis* (Eastern Free-tail Bat), and *Scoteanax rueppelli* (Greater Broad-nosed Bat).

*Area 13 Urban Investigation Area Local Environmental Study (Ecological Constraints) (Biolink 2006)*

A flora and fauna assessment of an 820 ha area (the Area 13 Urban Investigation Area), adjacent to Port Macquarie Airport, was undertaken by Biolink in March and April 2005. Survey involved vegetation community and targeted flora and fauna surveys. Vegetation and threatened flora species were surveyed using 25 m radial-based plots at 150 m grid cell intersections, and supplemented by random meander through small patches of vegetation scattered through the survey area. Fauna were surveyed using Elliot, pitfall, and harp traps, hair funnels, Anabat recordings, spotlight transects, call playback, predator scat analysis and opportunity observation.

At least 16 distinct vegetation communities were recorded, of which three were EECs: 'Broad-leaved Paperbark/Swamp Mahogany/Swamp Oak Open Forest', 'Swamp Oak Open Forest', and 'Flooded Gum Open Forest'. One threatened flora species and 13 threatened fauna species were recorded. These were *Melaleuca biconvexa*, *Crinia tinnula* (Wallum Froglet), Glossy Black Cockatoo, *Climacteris picumnus* (Brown Treecreeper), *Lophoictinia isura* (Square-tailed Kite), *Tyto novaehollandiae* (Masked Owl), Little Bentwing Bat, Eastern Bentwing Bat, Eastern Free-tail Bat, *Myotis macropus* (Southern Myotis), Greater Broad-nosed Bat, *Petaurus australis* (Yellow-bellied Glider), Koala, and Grey-headed Flying Fox. While not recorded during the survey, seven other threatened species were considered to have the potential to occur: *Litoria aurea* (Green and Golden Bell Frog), Spotted-tailed Quoll, *Lathamus discolor* (Swift Parrot), *Ninox strenua* (Powerful Owl), *Tyto capensis* (Grass Owl), *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), and *Pseudomys gracilicaudatus* (Eastern Chestnut Mouse).

*Area 13 UIA Koala Plan of Management (Biolink 2008)*

An integrated Structure Plan / Koala Plan of Management for the Area 13 Urban Investigation Area was prepared by Biolink. The Plan was comprised of two parts, with Part A providing the ecological data for the Plan and Part B providing a general discussion and interpretation of the ecological data to build the framework upon which management decisions should be based. Field survey built on previous survey by Biolink undertaken in 2002 and involved replicated spotlighting transects and Spot Assessment Technique (SAT)-based assessments. Survey was undertaken in the period 15 September to 21 November 2003.

The study area was assessed as supporting a Koala population of  $78 \pm 32$ . Including opportunistic observations, a total of 25 observations of free-ranging Koala was recorded during the course of fieldwork. Excluding known instances of repeat sightings ( $n=4$ ) and a single observation outside the study area, 75% of the remaining observations (15/20) occurred within the mapped boundaries of Core Koala Habitat as previously modelled by Biolink. Key threats identified as ongoing were removal of over-storey vegetation including Tallowwood and Swamp Mahogany from an area of Core Koala habitat (northwest of the study area in Lot 6 DP 809161), under-scrubbing and removal of mid-stratum vegetation including Tallowwood from an area of Core Koala habitat (northeast of the study area in Lot 249 DP 754434), and removal of mature vegetation including Tallowwood, Swamp Mahogany, Grey Gum and Forest Red Gum, mid-stratum and understorey from an area of likely Core Koala habitat (south of the study area in Lot 5 DP 809815). Also, road mortality was a threat to Koala. Dog attacks and high fire frequency were likely to be threats.

*Thrumster Sewerage Transfer Scheme Ecological Impact Assessment (ERM 2008)*

A flora and fauna assessment of a linear area proposed for a sewage pipeline and sewage pump station, located to the west, north and east of Port Macquarie Airport was undertaken by ERM over eight days in September and October 2007 (specific dates unspecified other than for some fauna survey) to determine the impact of the proposed Thrumster Sewerage Transfer Scheme. Survey involved vegetation community and targeted flora and fauna surveys. Vegetation and threatened flora species were surveyed via quadrats and through random meander transects. Fauna were surveyed using Elliot, Anabat recordings, spotlight transects, call playback, and opportunity observation.

The survey recorded three EECs: Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast Sydney Basin and South East Corner Bioregions, and Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions. Six threatened fauna species were recorded: Koala, Wallum Froglet, *Ephippiorhynchus asiaticus* (Black-necked Stork), Grey-headed Flying-fox, Little Bentwing Bat, Eastern Freetail Bat.

*PMHC Report on Port Macquarie Airport Obstacle Limitation Surface: Ecological Assessment Stage 2 (GHD 2008)*

A flora and fauna assessment of a 6 ha area, comprising OLS areas in seven lots associated with Port Macquarie Airport, was undertaken by GHD in June and August 2008. Survey focussed on fauna, but also involved vegetation community validation and targeted flora surveys. Fauna were surveyed through SEPP 44 sampling quadrats (focussing on Koala feed trees and Koala activity); fauna habitat assessment, which included hollow-bearing tree transects; habitat searches; bird census; Anabat recordings; and spotlight transects. No detail was provided for how vegetation communities were validated or targeted flora survey.

Four vegetation communities were recorded, none of which are EECs. No threatened flora species were recorded; however, two threatened fauna species were recorded; Koala and Little Bentwing Bat. While not recorded, the study area was considered to potentially support Glossy Black Cockatoo, Powerful Owl, Masked Owl, Swift Parrot, *Apus pacificus* (Fork-tailed Swift), *Hirundapus caudacutus* (White-throated Needletail), *Monarcha melanopsis* (Black-faced Monarch), *Myiagra cyanoleuca* (Satin Flycatcher), Squirrel Glider, Yellow-Bellied Glider, Spotted-tailed Quoll, Grey Headed Flying Fox, Eastern False Pipistrelle, Eastern Free-tail Bat, and Greater Broad-nosed Bat.

*Port Macquarie Airport Precinct Ecological Assessment (Biolink 2012)*

A flora and fauna assessment of a 162 ha area (comprising a designated Employment Investigation Area., PMHC-owned land proposed to be used for offset purposes and an emergency access road, and a conceptual link road alignment corridor), adjacent to Port Macquarie Airport, was undertaken by Biolink between 12 March and 27 May 2011. Survey involved vegetation community and targeted flora and fauna surveys. Vegetation and threatened flora species were surveyed using 25 m radial-based plots at 175 m grid cell intersections, and supplemented by random meander between plots. Fauna were surveyed using primary and secondary sampling stations, with primary sampling stations comprising Elliot, pitfall, cage, and arbor traps, and hair funnels, and secondary sampling stations comprising arbor traps and hair funnels. Fauna were also surveyed using harp traps, Anabat recordings, spotlight transects, call playback, frog surveys, Koala habitat assessment, predator scat analysis and opportunity observation.

Twelve vegetation communities were recorded, of which three are EECs: 'Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions', 'Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions', and 'Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East

*Corner Bioregions*'. One threatened flora species, *Allocasuarina defungens*, and ten threatened fauna, were recorded. The threatened fauna species recorded were Wallum Froglet, *Glossopsitta pusilla* (Little Lorikeet), Square-tailed Kite, *Ixobrychus flavicollis* (Black Bittern), Little Bentwing Bat, Eastern Bentwing Bat, Eastern Free-tail Bat, Grey-headed Flying Fox, Koala, and Squirrel Glider.

*Vegetation of the Port Macquarie – Hastings Local Government Area (Biolink 2013a)*

A vegetation mapping project covering the Port Macquarie Hastings Local Government Area (LGA) was undertaken by Biolink. Vegetation mapping was undertaken in two stages. The first stage involved polygon capture down to a minimum patch size of 0.25 ha (0.1ha for littoral rainforest) using task-specific software and a combination of satellite, aerial and digital imagery, while the second stage comprised of field survey. Field survey was undertaken from May 2010 to November 2012; survey sampled 457 sites (219 of which conformed to the requirements of Modules 1 and 2 of the Native Vegetation Type Standard, and 238 of which were rapid assessment plots).

A minimum of 76 native vegetation communities representing 9 Formations and 24 Classes of native vegetation were considered to occur. Approximately 70% of the mapped vegetation communities aligned with vegetation communities recognised by the NSW Northern Rivers Catchment Management Area's (CMA) Vegetation Classification System, with the remainder constituting novel ecological entities for the Northern Rivers CMA that have not been detailed. A further four plant communities, two comprising disturbed stands of native species and two being primarily derived through cultivation, were mapped and also were not aligned to the classification hierarchy.

Several plant species and communities of biogeographic and/or conservation importance were recorded, including the following EECs:

- 'Lowland Rainforest in the NSW North Coast Bioregion'
- 'Littoral rainforest in the NSW north coast, Sydney basin and South East corner Bioregions'
- 'Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion'
- 'Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions'
- 'Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions'
- 'Montane peatlands and swamps of New England Tableland, NSW North Coast'
- 'Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East corner Bioregions'
- 'Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East corner Bioregions'
- 'Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East corner Bioregions'.

Two of these occur within the BCAA: 'Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East corner Bioregions' and 'Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East corner Bioregions'.

*Port Macquarie – Hastings Koala habitat and population assessment (Biolink 2013b)*

Biolink undertook a Koala habitat and population assessment across 405 field sites focused around areas of significant koala activity within the coastal portion of the PMHC. The study found that koalas occupied approximately 24% of available habitat and was most commonly recorded from freehold lands and national park estate. A conservative population size estimate of 2,000 koala was determined for the LGA with more than half within the coastal strip east of the Pacific Highway. This area includes a nationally significant source population with an estimated population of greater than 500 individuals surrounding

Lake Innes, which includes the project site. Consistent with previous studies, Forest Red Gum (*Eucalyptus tereticornis*), Swamp Mahogany (*E. robusta*), Tallowwood (*E. microcorys*) and Grey Gum (*E. propinqua*), were identified as the tree species most preferred by koalas in the PMHC area.

*Stage Residential and Industrial Subdivision Lot 206 DP 754434 and Lot 3 DP 565437, John Oxley Drive, Port Macquarie: Flora and Fauna Survey (Peter Parker Environmental Consultants 2014).*

A vegetation and flora and fauna assessment of a 64.35 ha area (an area within the Area 13 Urban Investigation Area), adjacent to Port Macquarie Airport, was undertaken by Peter Parker Environmental Consultants from 22 to 24 April 2013. Survey included vegetation community mapping and targeted flora and fauna surveys. Vegetation communities were first extrapolated using aerial photography and then validated in the field via meandering transects and vegetation plots. Flora were surveyed by random meander and plots during vegetation community validation. Fauna were surveyed using Elliot (A and B) and cage traps, mist nets (bats), hair tubes, infrared cameras, active searches, bird census, Anabat and songmeter recordings, spotlight transects, call playback, and opportunity observation.

Five vegetation communities were recorded, none of which are EECs. No threatened flora species were recorded; however, four threatened fauna were recorded: Masked Owl, Koala, Little Bentwing Bat, and Grey-headed Flying Fox. Following additional survey effort, a single specimen of *Cynanchum elegans* was recorded below a single paddock tree in an area that has subsequently been excluded from the proposed residential footprint to protect Koala food tree habitat.

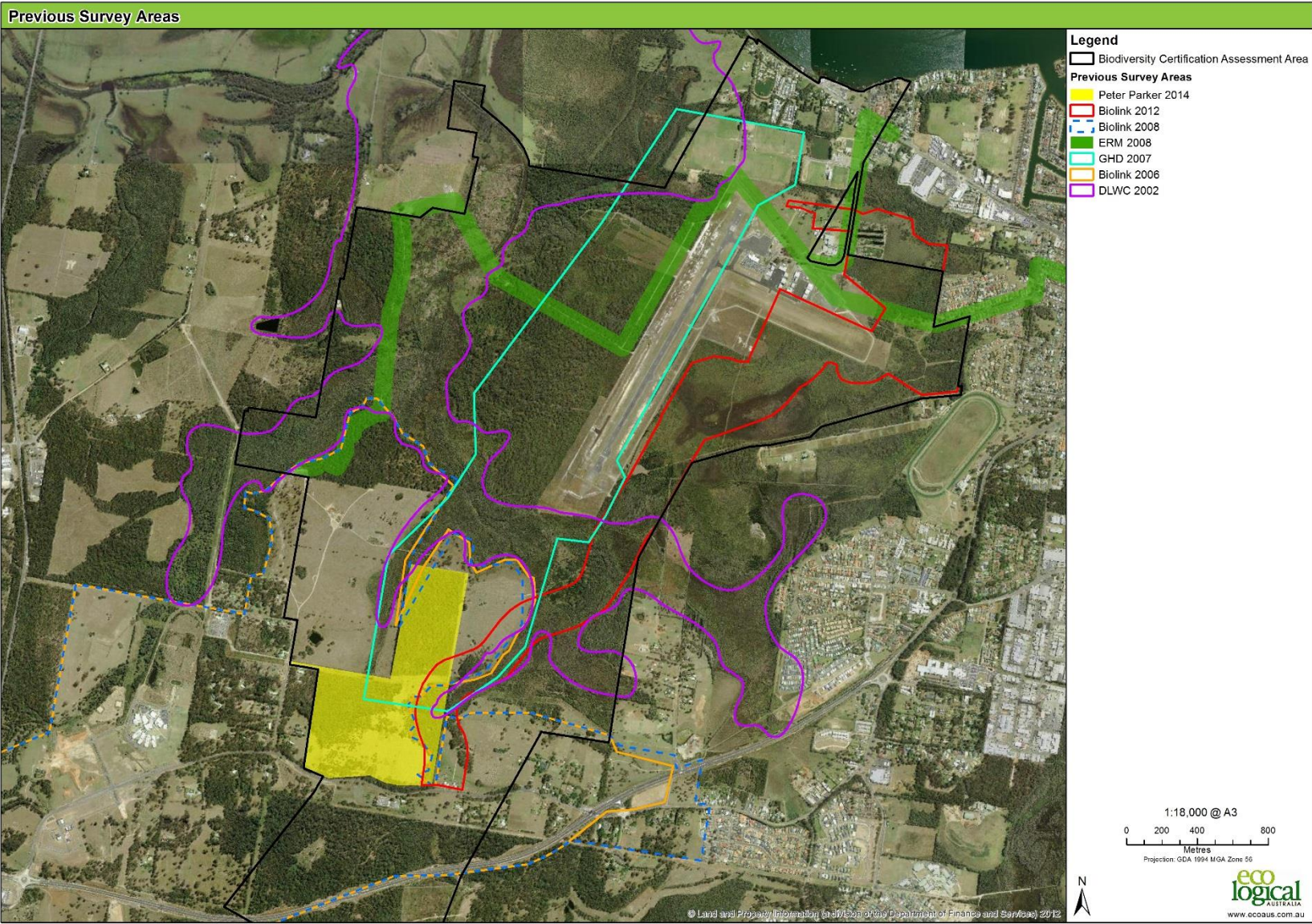


Figure 8: Study area boundaries of previous flora and fauna assessments within the BCAA



**Table 3: Previous survey effort for vegetation and flora**

Surveyors	Location	Effort	Results
Darkheart Eco Consultancy (2005)	Area proposed for clearing for Hastings Airport Flight Safety (1 ha), Charley Land, Oxley Highway	<ul style="list-style-type: none"> <li>- One-day survey on 14 January 2005.</li> <li>- Vegetation was mapped by visual inspection. Searches of threatened flora were made (total effort unspecified).</li> </ul>	<ul style="list-style-type: none"> <li>- Vegetation was described as Dry Sclerophyll Forest. Vegetation was not assessed to correlate with any State Forest Types but was similar to a form of Type 60 – Mahogany/Ironbark/Grey Gum, also referred to as ‘Mixed Hardwood’.</li> <li>- No threatened flora species were recorded.</li> </ul>
Biolink (2006)	Area 13 Urban Investigation Area (820 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- 15-day survey period: 16-20 March 2005 and 13-22 April 2005.</li> <li>- Vegetation and flora were surveyed using 25 m radial-based plots at 150 m grid cell intersections (59 in total), and some random meanders (total effort unspecified).</li> </ul>	<ul style="list-style-type: none"> <li>- 16 distinct vegetation communities were recorded, of which three are EECs: ‘<i>Broad-leaved Paperbark/Swamp Mahogany/Swamp Oak Open Forest</i>’, ‘<i>Swamp Oak Open Forest</i>’, and ‘<i>Flooded Gum Open Forest</i>’</li> <li>- One threatened flora species, <i>Melaleuca biconvexa</i>, was recorded.</li> </ul>
ERM (2008)	Linear area proposed for a sewage pipeline and sewage pump station, located to the west, north and east of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Eight-day survey in September and October 2007.</li> <li>- Vegetation and flora were surveyed via quadrats and through random meander transects. There were a total of three quadrats sampled.</li> </ul>	<ul style="list-style-type: none"> <li>- Six main vegetation communities were recorded, of which three are EECs: ‘<i>Freshwater Wetlands</i>’, ‘<i>Swamp Sclerophyll Forest</i>’, and ‘<i>Swamp Oak Floodplain Forest</i>’.</li> <li>- No threatened flora species were recorded.</li> </ul>
GHD (2008)	Lot 206 754434 Lot 2 619643 Lot 3 619643 Lot 3 565437 Lot 3 826241 Lot 1 552051 Lot 1 1087368	<ul style="list-style-type: none"> <li>- Four-day survey on 25 June 2008 and 5-7 August 2008.</li> <li>- It is unclear how vegetation and flora were surveyed. However, SEPP 44 sampling quadrats targeting Koala were undertaken, which collected floristic information. Quadrats were 20 m x 20 m and were placed randomly in the study area. The total number of quadrats was not specified.</li> </ul>	<ul style="list-style-type: none"> <li>- Four vegetation communities were recorded, none of which are EECs.</li> <li>- No threatened flora species were recorded.</li> </ul>

Surveyors	Location	Effort	Results
Biolink (2012)	Airport Precinct area (162 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Survey between 12 March and 27 May 2011.</li> <li>- Vegetation and flora were surveyed using 25 m radial-based plots at 175 m grid cell intersections (total number of plots unspecified), meanders between plots, and opportunistically.</li> <li>- Approximately 4.3 ha were searched systematically for <i>Allocasuarina defungens</i>.</li> </ul>	<ul style="list-style-type: none"> <li>- Twelve vegetation communities were recorded, of which three are EECs: 'Swamp Oak Floodplain Forest; Swamp Sclerophyll Forest' and 'Freshwater Wetlands on Coastal Floodplains'.</li> <li>- A number of possible <i>Allocasuarina defungens</i> were recorded at two locations, and the Area of Occupancy was estimated to be 3.75 ha.</li> </ul>
Biolink (2013a)	Port Macquarie Hastings LGA	<ul style="list-style-type: none"> <li>- Field survey was undertaken between May 2010 and November 2012.</li> <li>- Vegetation mapping was undertaken in two stages. The first stage involved polygon capture down to a minimum patch size of 0.25ha using task-specific software and a combination of satellite, aerial and digital imagery, while the second stage comprised of field survey.</li> <li>- Field survey sampled 457 sites. 219 of these conformed to the requirements of Modules 1 and 2 of the Native Vegetation Type Standard, 238 were rapid assessment. A further 138 sites were converted data from earlier studies.</li> </ul>	<ul style="list-style-type: none"> <li>- A minimum of 76 native vegetation communities representing nine Formations and 24 Classes of native vegetation were considered to occur.</li> <li>- Nine EECs were recorded.</li> </ul>
Peter Parker Environmental Consultants (2014)	Lot 206 754434 Lot 3 565437	<ul style="list-style-type: none"> <li>- Three-day survey from 22 to 24 April 2013.</li> <li>- Vegetation communities were extrapolated using aerial photography and then vegetation communities and flora were ground-truthed/surveyed for through meandering transects and 20 m x 20 m Biobanking plots (three plots).</li> </ul>	<ul style="list-style-type: none"> <li>- Five vegetation communities were recorded, none of which are EECs.</li> <li>- No threatened flora species were recorded.</li> </ul>

**Table 4: Previous survey effort for frogs**

Surveyors	Location	Effort	Results
DLWC (2002)	542 ha area, focussed around Partridge Creek and some artificial drainage and located west of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Unspecified survey period in August 2002.</li> <li>- Frogs were surveyed opportunistically. The total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Five threatened fauna species were recorded, one of which is a frog: Wallum Froglet.</li> </ul>
Darkheart Eco Consultancy (2005)	Area proposed for clearing for Hastings Airport Flight Safety (1 ha), Charley Land, Oxley Highway	<ul style="list-style-type: none"> <li>- One-day survey on 14 January 2005.</li> <li>- Frogs were surveyed through habitat evaluation; survey of hollow-bearing trees, general habitat searches for threatened fauna species (total effort unspecified); and incidental observations of fauna on the site.</li> </ul>	<ul style="list-style-type: none"> <li>- No threatened frog species were recorded.</li> </ul>
Biolink (2006)	Area 13 Urban Investigation Area (820 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- 15-day survey period: 16-20 March 2005 and 13-22 April 2005.</li> <li>- Call playback for threatened frogs (species not specified) at water bodies and during rainfall events. As the number of water bodies was not specified, the total survey effort for frogs is unclear.</li> <li>- Opportunistic searches of scats and other signs. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- 13 threatened fauna species were recorded, one of which is a frog: Wallum Froglet.</li> </ul>
ERM (2008)	Linear area proposed for a sewage pipeline and sewage pump station, located to the west, north and east of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Eight-day survey in September and October 2007.</li> <li>- Call playback was undertaken for Wallum Froglet at three locations (five minutes of calls followed by five minutes of listening for approximately half an hour per location).</li> <li>- Opportunistic observations during duration of survey period.</li> </ul>	<ul style="list-style-type: none"> <li>- 6 threatened fauna species were recorded, one of which is a frog: Wallum Froglet.</li> </ul>

Surveyors	Location	Effort	Results
GHD (2008)	Lot 206 754434 Lot 2 619643 Lot 3 619643 Lot 3 565437 Lot 3 826241 Lot 1 552051 Lot 1 1087368	<ul style="list-style-type: none"> <li>- Four-day survey on 25 June 2008 and 5-7 August 2008.</li> <li>- Fauna habitat assessment undertaken via hollow-bearing tree transects, where meandering transects were undertaken per vegetation community. The total effort was not specified.</li> <li>- Habitat searches were undertaken for signs of fauna activity. The total effort was not specified.</li> <li>- Spotlighting targeting threatened reptiles, amphibians and nocturnal birds was undertaken via foot on one night over 1 km.</li> </ul>	<ul style="list-style-type: none"> <li>- Two threatened fauna species were recorded, neither of which are frogs.</li> </ul>
Biolink (2012)	Airport Precinct area (162 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Survey between 12 March and 27 May 2011.</li> <li>- Pitfall traps: 26 trap nights. Trapping was undertaken at 24 locations. Due to rain and wet areas, only four locations recorded four consecutive trapping nights.</li> <li>- Spotlighting was undertaken on foot. The total effort was 6.4 person hours, although the number of nights and transects were unspecified.</li> <li>- Frog searches: 5.25 person hours. The number of locations sampled, and number of nights undertaken was not specified.</li> <li>- Opportunistic searches of scats and other signs. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Ten threatened fauna species were recorded, one of which is a frog: Wallum Froglet.</li> </ul>
Peter Parker Environmental Consultants (2014)	Lot 206 754434 Lot 3 565437	<ul style="list-style-type: none"> <li>- Three-day survey from 22 to 24 April 2013.</li> <li>- Active searches: two hours per day.</li> <li>- Spotlight transects: two hours per night for three nights.</li> <li>- Opportunistic observations: a total of eight hours was undertaken for frogs.</li> </ul>	<ul style="list-style-type: none"> <li>- Four threatened fauna were recorded, none of which are frogs.</li> </ul>

**Table 5: Previous survey effort for reptiles**

Surveyors	Location	Effort	Results
DLWC (2002)	542 ha area, focussed around Partridge Creek and some artificial drainage and located west of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Unspecified survey period in August 2002.</li> <li>- Reptiles were surveyed opportunistically. The total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Five threatened fauna species were recorded, none of which are reptiles.</li> </ul>
Darkheart Eco Consultancy (2005)	Area proposed for clearing for Hastings Airport Flight Safety (1 ha), Charley Land, Oxley Highway	<ul style="list-style-type: none"> <li>- One-day survey on 14 January 2005.</li> <li>- Reptiles were surveyed through habitat evaluation; survey of hollow-bearing trees, general habitat searches for threatened fauna species (total effort unspecified); and incidental observations of fauna on the site.</li> </ul>	<ul style="list-style-type: none"> <li>- No threatened reptile species were recorded.</li> </ul>
Biolink (2006)	Area 13 Urban Investigation Area (820 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- 15-day survey period: 16-20 March 2005 and 13-22 April 2005.</li> <li>- Pitfall traps (although this targeted Coastal Planigale): 175 trap nights (five traps were deployed at four sites; the number of nights at each site was not specified).</li> <li>- Spotlighting (although this targeted Yellow-bellied Glider, Squirrel Glider, Koala, and Forest Owls) along four walked transects (total survey effort unclear).</li> <li>- Opportunistic searches of scats and other signs. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- 13 threatened fauna species were recorded, none of which are reptiles.</li> </ul>
ERM (2008)	Linear area proposed for a sewage pipeline and sewage pump station, located to the west, north	<ul style="list-style-type: none"> <li>- Eight-day survey in September and October 2007.</li> <li>- Spotlighting surveys over three nights across the study area for approximately 1.5 hours per night</li> <li>- Opportunistic observations during duration of survey period.</li> </ul>	<ul style="list-style-type: none"> <li>- 6 threatened fauna species were recorded, none of which are reptiles.</li> </ul>

Surveyors	Location	Effort	Results
	and east of Port Macquarie Airport		
GHD (2008)	Lot 206 754434 Lot 2 619643 Lot 3 619643 Lot 3 565437 Lot 3 826241 Lot 1 552051 Lot 1 1087368	<ul style="list-style-type: none"> <li>- Four-day survey on 25 June 2008 and 5-7 August 2008.</li> <li>- Fauna habitat assessment undertaken via hollow-bearing tree transects, where meandering transects were undertaken per vegetation community. The total effort was not specified.</li> <li>- Habitat searches were undertaken for signs of fauna activity. The total effort was not specified.</li> <li>- Spotlighting targeting threatened reptiles, amphibians and nocturnal birds was undertaken via foot on one night over 1 km.</li> </ul>	<ul style="list-style-type: none"> <li>- Two threatened fauna species were recorded, neither of which are reptiles.</li> </ul>
Biolink (2012)	Airport Precinct area (162 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Survey between 12 March and 27 May 2011.</li> <li>- Pitfall traps: 26 trap nights. Trapping was undertaken at 24 locations. Due to rain and wet areas, only four locations recorded four consecutive trapping nights.</li> <li>- Spotlighting was undertaken on foot. The total effort was 6.4 person hours, although the number of nights and transects were unspecified.</li> <li>- Opportunistic searches of scats and other signs. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Ten threatened fauna species were recorded, none of which are reptiles.</li> </ul>
Peter Parker Environmental Consultants (2014)	Lot 206 754434 Lot 3 565437	<ul style="list-style-type: none"> <li>- Three-day survey from 22 to 24 April 2013.</li> <li>- Infrared cameras: none survey nights. Three cameras were set for three nights. The number of locations was unclear.</li> <li>- Active searches: two hours per day.</li> <li>- Spotlight transects: two hours per night for three nights.</li> <li>- Opportunistic observations: Searches of scats and other signs was undertaken. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Four threatened fauna were recorded, none of which are reptiles.</li> </ul>

**Table 6: Previous survey effort for birds**

Surveyors	Location	Effort	Results
DLWC (2002)	542 ha area, focussed around Partridge Creek and some artificial drainage and located west of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Unspecified survey period in August 2002.</li> <li>- Spotlighting at 10 survey sites targeting Grass Owl and opportunistically surveying Powerful Owl, Masked Owl, Barking Owl, Australasian Bittern, and Black Bittern, over a 2-hour period, weather permitting.</li> <li>- Call playback at 10 survey sites targeting Grass Owl. An initial 2 minute period of listening was followed by call playback for 5 minutes in 30 second bursts, and 5 minutes listening.</li> <li>- Birds were also surveyed opportunistically. The total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Five threatened fauna species were recorded, 2 of which are birds: Grass Owl and Square-tailed Kite.</li> </ul>
Darkheart Eco Consultancy (2005)	Area proposed for clearing for Hastings Airport Flight Safety (1 ha), Charley Land, Oxley Highway	<ul style="list-style-type: none"> <li>- One-day survey on 14 January 2005.</li> <li>- Birds were surveyed through habitat evaluation; survey of hollow-bearing trees, general habitat searches for threatened fauna species (total effort unspecified); and incidental observations of fauna on the site.</li> </ul>	<ul style="list-style-type: none"> <li>- No threatened bird species were recorded.</li> <li>- No large trees with hollows were present, although some foraging habitat was present for Glossy Black Cockatoo.</li> </ul>
Biolink (2006)	Area 13 Urban Investigation Area (820 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- 15-day survey period: 16-20 March 2005 and 13-22 April 2005.</li> <li>- Spotlighting targeting Forest Owls (along with other species: Yellow-bellied Glider, Squirrel Glider, Koala) along four walked transects (total survey effort unclear).</li> <li>- Call playback at four locations for Powerful and Masked Owls (along with Squirrel and Yellow-bellied Gliders), totalling two hours.</li> <li>- Opportunistic searches of scats and other signs. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- 13 threatened fauna species were recorded in total, 4 of which are birds: Glossy Black Cockatoo, Brown Treecreeper, Square-tailed Kite, Masked Owl.</li> </ul>
ERM (2008)	Linear area proposed for a sewage pipeline and sewage pump station, located to the west, north	<ul style="list-style-type: none"> <li>- Eight-day survey in September and October 2007.</li> <li>- Spotlighting surveys over three nights across the study area for approximately 1.5 hours per night</li> <li>- Call playback at three sites targeting Masked, Powerful and Barking Owl (along with Koala and Squirrel Glider). Each survey consisted of 10 minutes call playback followed by 5 minutes listening.</li> </ul>	<ul style="list-style-type: none"> <li>- 6 threatened fauna species were recorded, 1 of which is a bird species: Black-necked Stork.</li> </ul>

Surveyors	Location	Effort	Results
	and east of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Opportunistic observations during duration of survey period.</li> </ul>	
GHD (2008)	Lot 206 754434 Lot 2 619643 Lot 3 619643 Lot 3 565437 Lot 3 826241 Lot 1 552051 Lot 1 1087368	<ul style="list-style-type: none"> <li>- Four-day survey on 25 June 2008 and 5-7 August 2008.</li> <li>- Fauna habitat assessment undertaken via hollow-bearing tree transects, where meandering transects were undertaken per vegetation community. The total effort was not specified.</li> <li>- Habitat searches were undertaken for signs of fauna activity. The total effort was not specified.</li> <li>- Bird surveys targeting Swift Parrot and Glossy Black Cockatoo: 20 minute, 1 ha searches were undertaken in the early morning and late afternoon on two occasions. The number of sites surveyed was not specified.</li> <li>- Spotlighting targeting threatened reptiles, amphibians and nocturnal birds was undertaken via foot on one night over 1 km.</li> </ul>	<ul style="list-style-type: none"> <li>- Two threatened fauna species were recorded, neither of which are birds.</li> </ul>
Biolink (2012)	Airport Precinct area (162 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Survey between 12 March and 27 May 2011.</li> <li>- Spotlighting was undertaken on foot. The total effort was 6.4 person hours, although the number of nights and transects were unspecified.</li> <li>- Call playback for Powerful, Masked and Grassed Owls (along with Squirrel and Yellow-bellied Gliders): 3.5 hours. The number of locations sampled, and number of nights undertaken was not specified.</li> <li>- Opportunistic searches of scats and other signs, with predator scat analyses undertaken. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Ten threatened fauna species were recorded, three of which are birds: Little Lorikeet, Square-tailed Kite, Black Bittern.</li> </ul>
Peter Parker Environmental Consultants (2014)	Lot 206 754434 Lot 3 565437	<ul style="list-style-type: none"> <li>- Three-day survey from 22 to 24 April 2013.</li> <li>- Infrared cameras: none survey nights. Three cameras were set for three nights. The number of locations was unclear.</li> <li>- Bird census: 40 minutes per day (morning and evening census) for three days. The number of locations was unclear.</li> <li>- Spotlight transects: two hours per night for three nights.</li> <li>- Call playback for Masked, Grass, Powerful and Barking Owls and Bush Stone Curlew. A total of 45 minutes was undertaken per night over three nights.</li> </ul>	<ul style="list-style-type: none"> <li>- Four threatened fauna were recorded, one of which one is a bird: Masked Owl.</li> </ul>



Surveyors	Location	Effort	Results
		<ul style="list-style-type: none"> <li>- Opportunistic observations: Searches of scats and other signs was undertaken. Total effort was unspecified.</li> </ul>	

**Table 7: Previous survey effort for bats**

Surveyors	Location	Effort	Results
DLWC (2002)	542 ha area, focussed around Partridge Creek and some artificial drainage and located west of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Unspecified survey period in August 2002.</li> <li>- Spotlighting at 10 survey sites, over a 2-hour period, weather permitting.</li> </ul>	<ul style="list-style-type: none"> <li>- Five threatened fauna species were recorded, 1 of which is a bat: Grey-headed Flying Fox.</li> </ul>
Darkheart Eco Consultancy (2005)	Area proposed for clearing for Hastings Airport Flight Safety (1 ha), Charley Land, Oxley Highway	<ul style="list-style-type: none"> <li>- One-day survey on 14 January 2005.</li> <li>- Bats was surveyed through habitat evaluation; survey of hollow-bearing trees, general habitat searches for threatened fauna species (total effort unspecified); and incidental observations of fauna on the site.</li> </ul>	<ul style="list-style-type: none"> <li>- No threatened bat species were recorded.</li> <li>- No large trees with hollows were present, although some marginal roosting habitat was identified for microchiropteran bats. Foraging habitat was present for bats.</li> </ul>
Biolink (2006)	Area 13 Urban Investigation Area (820 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- 15-day survey period: 16-20 March 2005 and 13-22 April 2005.</li> <li>- Harp traps: Total trap nights unknown since the number of nights was not specified. One trap was deployed at eight sites; thus the minimum number of trap nights is eight.</li> </ul>	<ul style="list-style-type: none"> <li>- 13 threatened fauna species were recorded, six of which are bats: Little Bentwing Bat, Eastern Bentwing Bat,</li> </ul>

Surveyors	Location	Effort	Results
		<ul style="list-style-type: none"> <li>- Anabat recordings: 405 minutes of recordings from a single anabat unit deployed at none sites. Total trap nights is unknown since the number of nights was not specified.</li> <li>- Spotlighting along four walked transects (total survey effort unclear).</li> <li>- Opportunistic searches of scats and other signs. Total effort was unspecified.</li> </ul>	<p>Eastern Free-tail Bat, Southern Myotis, Greater Broad-nosed Bat, and Grey-headed Flying Fox.</p>
ERM (2008)	Linear area proposed for a sewage pipeline and sewage pump station, located to the west, north and east of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Eight-day survey in September and October 2007.</li> <li>- Spotlighting surveys over three nights across the study area for approximately 1.5 hours per night</li> <li>- Anabat recordings: recordings at 3 locations for two nights.</li> <li>- Opportunistic observations during duration of survey period.</li> </ul>	<ul style="list-style-type: none"> <li>- 6 threatened fauna species were recorded, 3 of which are bats: Grey-headed Flying Fox, Little Bentwing Bat, and Eastern Free-tail Bat.</li> </ul>
GHD (2008)	<p>Lot 206 754434</p> <p>Lot 2 619643</p> <p>Lot 3 619643</p> <p>Lot 3 565437</p> <p>Lot 3 826241</p> <p>Lot 1 552051</p> <p>Lot 1 1087368</p>	<ul style="list-style-type: none"> <li>- Four-day survey on 25 June 2008 and 5-7 August 2008.</li> <li>- Fauna habitat assessment undertaken via hollow-bearing tree transects, where meandering transects were undertaken per vegetation community. The total effort was not specified.</li> <li>- Habitat searches were undertaken for signs of fauna activity. The total effort was not specified.</li> <li>- Anabat recordings: recordings over two consecutive nights. The total number of trap nights is unknown as the number of anabats deployed and number of sites was not specified.</li> <li>- Spotlighting was undertaken via foot on one night over 1 km.</li> </ul>	<ul style="list-style-type: none"> <li>- Two threatened fauna species were recorded, one of which is a bat: Little Bentwing Bat.</li> </ul>
Biolink (2012)	Airport Precinct area (162 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Survey between 12 March and 27 May 2011.</li> <li>- Harp traps: 3.5 trap nights. The number of locations sampled was not specified.</li> <li>- Anabat recordings: 72 hours of recordings from a single anabat unit. The number of locations sampled was not specified. Also, the number of trap nights is unknown since the number of nights was not specified.</li> <li>- Spotlighting was undertaken on foot. The total effort was 6.4 person hours, although the number of nights and transects were unspecified.</li> <li>- Opportunistic searches of scats and other signs. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Ten threatened fauna species were recorded, of which four are bats: Little Bentwing Bat, Eastern Bentwing Bat, Eastern Free-tail Bat, and Grey-headed Flying Fox.</li> </ul>

Surveyors	Location	Effort	Results
Peter Parker Environmental Consultants (2014)	Lot 206 754434 Lot 3 565437	<ul style="list-style-type: none"> <li>- Three-day survey from 22 to 24 April 2013.</li> <li>- Mist nets: nine mist net hours. Trapping was undertaken for three hours at three locations.</li> <li>- Anabat and songmeter recordings: 12 detector nights. A total of three anabats and one songmeter were used for three nights at four locations.</li> <li>- Spotlight transects: two hours per night for three nights.</li> <li>- Opportunistic observations: Searches of scats and other signs was undertaken. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Four threatened fauna were recorded, two of which are bats: Little Bentwing Bat and Grey-headed Flying Fox.</li> </ul>

**Table 8: Previous survey effort for non-flying mammals (i.e. excluding bats)**

Surveyors	Location	Effort	Results
DLWC (2002)	542 ha area, focussed around Partridge Creek and some artificial drainage and located west of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Unspecified survey period in August 2002.</li> <li>- Elliot A ground traps targeting Eastern Chestnut Mouse and Common Planigale: 1000 trap nights (trapping was undertaken for four consecutive nights at 10 sites, with 25 traps per site).</li> <li>- Spotlighting at 10 survey sites, over a 2-hour period, weather permitting.</li> <li>- Scat and track survey targeting Eastern Chestnut Mouse and Common Planigale. Total effort unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Five threatened fauna species were recorded, 1 of which is a non-flying mammal: Eastern Chestnut Mouse.</li> </ul>
Darkheart Eco Consultancy (2005)	Area proposed for clearing for Hastings Airport Flight Safety (1 ha), Charley Land, Oxley Highway	<ul style="list-style-type: none"> <li>- One-day survey on 14 January 2005.</li> <li>- Non-flying mammals were surveyed through habitat evaluation; survey of hollow-bearing trees and potential Koala browse species; signs of Koala activity, general habitat searches for threatened fauna species (total effort unspecified); and incidental observations of fauna on the site.</li> </ul>	<ul style="list-style-type: none"> <li>- Koala was the only threatened species recorded. Koala activity was low, but the site was assessed to be of value to a local Koala population.</li> <li>- No large trees with hollows were present.</li> </ul>

Surveyors	Location	Effort	Results
			Foraging habitat was present for Koala and gliders.
Biolink (2006)	Area 13 Urban Investigation Area (820 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- 15-day survey period: 16-20 March 2005 and 13-22 April 2005.</li> <li>- Elliot A ground traps targeting Eastern Chestnut Mouse and Coastal Planigale: 775 trap nights (trapping was generally undertaken for four consecutive nights at eight sites, with 25 traps per site, but this was not consistent so the total trap night was less than the possible 800 traps nights).</li> <li>- Hair funnels (terrestrial) targeting Eastern Chestnut Mouse, Coastal Planigale, and Long-nosed Potoroo: 395 trap nights (ten traps were each deployed at eight sites, the number of nights at each site was not specified).</li> <li>- Pitfall traps targeting Coastal Planigale: 175 trap nights (five traps were deployed at four sites; the number of nights at each site was not specified).</li> <li>- Spotlighting targeting Yellow-bellied Glider, Squirrel Glider, Koala (along with Forest Owls) along four walked transects (total survey effort unclear).</li> <li>- Call playback at four locations for Squirrel and Yellow-bellied Gliders (along with Powerful and Masked Owls), totalling two hours.</li> <li>- Opportunistic searches of scats and other signs, with predator scat analysis targeting Eastern Chestnut Mouse, Coastal Planigale, Koala, Squirrel Glider. Total effort was unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- 13 threatened fauna species were recorded, two of which are non-flying mammals: Yellow-bellied Glider, Koala.</li> </ul>
Biolink (2008)	Area 13 Urban Investigation Area (820 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Survey was undertaken in the period 15 September to 21 November 2003.</li> <li>- Replicated spotlighting transects (4 linear transects approximately 1 km in length) and Spot Assessment Technique (SAT)-based assessments (33 SAT sites).</li> <li>- Opportunistic observations during duration of survey period.</li> </ul>	<ul style="list-style-type: none"> <li>- A total of 25 Koala were recorded. The study area was assessed as supporting a Koala population of <math>78 \pm 32</math>. 75% of observations occurred within the mapped boundaries of Core Koala Habitat.</li> </ul>

Surveyors	Location	Effort	Results
ERM (2008)	Linear area proposed for a sewage pipeline and sewage pump station, located to the west, north and east of Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Eight-day survey in September and October 2007.</li> <li>- Elliot A ground traps: 136 trap nights. Trapping was undertaken at four locations for four nights. A total of 34 traps were set.</li> <li>- Elliot B traps (arboreal): 80 trap nights. Trapping was undertaken at three locations for four nights. A total of 20 traps were set.</li> <li>- Call playback at three sites targeting Koala and Squirrel Glider (along with Masked, Powerful and Barking Owl). Each survey consisted of 10 minutes call playback followed by 5 minutes listening.</li> <li>- Spotlighting surveys over three nights across the study area for approximately 1.5 hours per night.</li> <li>- Opportunistic observations during duration of survey period.</li> </ul>	<ul style="list-style-type: none"> <li>- 6 threatened fauna species were recorded, 1 of which is a non-flying mammal: Koala.</li> </ul>
GHD (2008)	Lot 206 754434 Lot 2 619643 Lot 3 619643 Lot 3 565437 Lot 3 826241 Lot 1 552051 Lot 1 1087368	<ul style="list-style-type: none"> <li>- Four-day survey on 25 June 2008 and 5-7 August 2008.</li> <li>- SEPP 44 sampling quadrats targeting Koala: Quadrats were 20 m x 20 m and were placed randomly in the study area. The total number of quadrats was not specified.</li> <li>- Fauna habitat assessment undertaken via hollow-bearing tree transects, where meandering transects were undertaken per vegetation community. The total effort was not specified.</li> <li>- Habitat searches were undertaken for signs of fauna activity. The total effort was not specified.</li> <li>- Spotlighting was undertaken via foot on one night over 1 km.</li> </ul>	<ul style="list-style-type: none"> <li>- Two threatened fauna species were recorded, one of which is a non-flying mammal: Koala.</li> </ul>
Biolink (2012)	Airport Precinct area (162 ha) adjacent to Port Macquarie Airport	<ul style="list-style-type: none"> <li>- Survey between 12 March and 27 May 2011.</li> <li>- Elliot A ground traps: 384 trap nights. Trapping was undertaken at 24 locations for four nights.</li> <li>- Arbor traps (arboreal): 60 trap nights.</li> <li>- Hair funnels (terrestrial): 441 trap nights. Trapping was undertaken at 47 locations for 9-10 nights.</li> <li>- Cage traps: 97 traps nights. Trapping was undertaken at 24 locations, generally for four nights.</li> <li>- Pitfall traps: 26 trap nights. Trapping was undertaken at 24 locations. Due to rain and wet areas, only four locations recorded four consecutive trapping nights.</li> <li>- Spotlighting was undertaken on foot. The total effort was 6.4 person hours, although the number of nights and transects were unspecified.</li> </ul>	<ul style="list-style-type: none"> <li>- Ten threatened fauna species were recorded, of which two are non-flying mammals: Koala, and Squirrel Glider.</li> </ul>

Surveyors	Location	Effort	Results
		<ul style="list-style-type: none"> <li>- Call playback for Squirrel and Yellow-bellied Gliders (along with Powerful, Masked and Grassed Owls): 3.5 hours. The number of locations sampled, and number of nights undertaken was not specified.</li> <li>- Koala habitat assessment was undertaken at regular intervals, with Koala searches also undertaken at these locations via 25 m radial searches. The total number of assessments was not specified.</li> <li>- Opportunistic searches of scats and other signs, with predator scat analyses undertaken. Total effort was unspecified.</li> </ul>	
Biolink 2013b	PMHC LGA	<ul style="list-style-type: none"> <li>- Undertook a koala habitat and population assessment across the PMHC LGA, which included mapping areas of koala activity, including areas within the BCAA.</li> </ul>	<ul style="list-style-type: none"> <li>- Estimated Koala population in PMHC at greater than 2,000 individuals including over 500 in the Lake Innes area.</li> </ul>
Peter Parker Environmental Consultants (2014)	Lot 206 754434 Lot 3 565437	<ul style="list-style-type: none"> <li>- Three-day survey from 22 to 24 April 2013.</li> <li>- Elliot A ground traps: 150 trap nights. Trapping was undertaken at two locations for three nights, with 25 traps per location.</li> <li>- Elliot B traps (arboreal): 60 trap nights. Trapping was undertaken at two locations for three nights, with ten traps per location.</li> <li>- Cage traps: 15 traps nights. Trapping was undertaken for three nights, with five traps used.</li> <li>- Hair tubes: 75 trap nights (ground), 30 trap nights (tree). A total of 25 traps set on the ground and ten traps set in trees were set for three nights. Note there was inconsistency in the number of trap nights stated in the report, with 108 trap nights also cited as the total effort for traps set on the ground.</li> <li>- Infrared cameras: nine survey nights. Three cameras were set for three nights. The number of locations was unclear.</li> <li>- Spotlight transects: two hours per night for three nights.</li> </ul>	<ul style="list-style-type: none"> <li>- Four threatened fauna were recorded, of which one is a non-flying mammal: Koala.</li> </ul>

Surveyors	Location	Effort	Results
		- Opportunistic observations: Searches of scats and other signs was undertaken. Total effort was unspecified.	

## 2.1.2 BioMetric vegetation type, condition and threatened status

As indicated in Section 2.1.1, Biolink (2012 and 2013) identified 12 and 76 vegetation communities. Of these, 25 separate vegetation communities were mapped within the BCAA (**Table 9**).

Using floristic information collected by Biolink (2013), a desktop comparative analysis with BioMetric vegetation types was undertaken to determine the likely BioMetric vegetation types present in the BCAA. The results of the analysis identified 14 potential BioMetric vegetation types in the BCAA, with one vegetation community not matching to a BioMetric vegetation type. Four of these BioMetric vegetation types correspond to three threatened ecological communities listed under the TSC and EPBC Acts (**Table 9**). **Figure 9** shows the indicative Biometric vegetation types in the BCAA based on this assessment.

**Table 9: Vegetation communities and equivalent BioMetric vegetation types in the BCAA and relationship to threatened ecological communities**

Vegetation community (Biolink 2013)	BioMetric equivalent (DECC 2008)	TSC / EPBC Acts
Blackbutt Coastal Dune Satinwood Forest	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	-
Blackbutt Grassy Forest	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	-
Blackbutt Shrubby Moist Forest	Blackbutt tall moist forest of the coastal ranges of the central and southern North Coast	-
Broad-leaved Paperbark - Mixed Eucalypt Swamp Forest Complex	Paperbark swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
Broad-leaved Paperbark - Swamp Mahogany Swamp Forest	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
Broad-leaved Paperbark Swamp Woodland/Forest	Paperbark swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
Flax-leaved Paperbark - Mixed Eucalypt Coastal Floodplain Wetlands Forest Complex	Paperbark swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
Flax-leaved Paperbark - Prickly-leaved Tea Tree Forests	Paperbark swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions



Vegetation community (Biolink 2013)	BioMetric equivalent (DECC 2008)	TSC / EPBC Acts
Flooded Gum Moist Riparian and Gully Forest	Flooded Gum - Tallowood - Brush Box moist open forest of the coastal ranges of the North Coast	-
Grey Gum - Grey Ironbark Moist Forest	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	-
Grey Mangrove Woodland/Forest	Mangrove - Grey Mangrove low closed forest of the NSW Coastal Bioregions	-
Heath-leaved Banksia Sandplain Shrublands	Banksia dry shrubland on coastal sands of the North Coast	-
Lepironia Coastal Lagoon Sedgeland	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	-
Lepironia Coastal Lagoon Sedgeland (Derived)	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	-
Partridge Creek Coastal Lagoon Sedgeland Complex	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	-
Scribbly Gum Dune Heathy Woodland	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	-
Sea Rush Saltmarsh Sedgeland	Saltmarsh complex of the North Coast	Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions
She-oak Scrub (Disturbed)	No match - requires ground assessment	-
Swamp Banksia Heathy Sandplain Shrubland	Wet heathland and shrubland of coastal lowlands of the North Coast	-
Swamp Mahogany Forest	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
Swamp Oak - Mixed Eucalypt Coastal Floodplain Wetland Forest Complex	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions
Swamp Oak Coastal Floodplain Wetland Forest	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions

Vegetation community (Biolink 2013)	BioMetric equivalent (DECC 2008)	TSC / EPBC Acts
Tea-tree Heathy Shrubland	Wet heathland and shrubland of coastal lowlands of the North Coast	-
Twig-rush Coastal Lagoon Sedgeland	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	-
White Stringybark - Tallowwood - Grey Gum Dry Forest	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	-

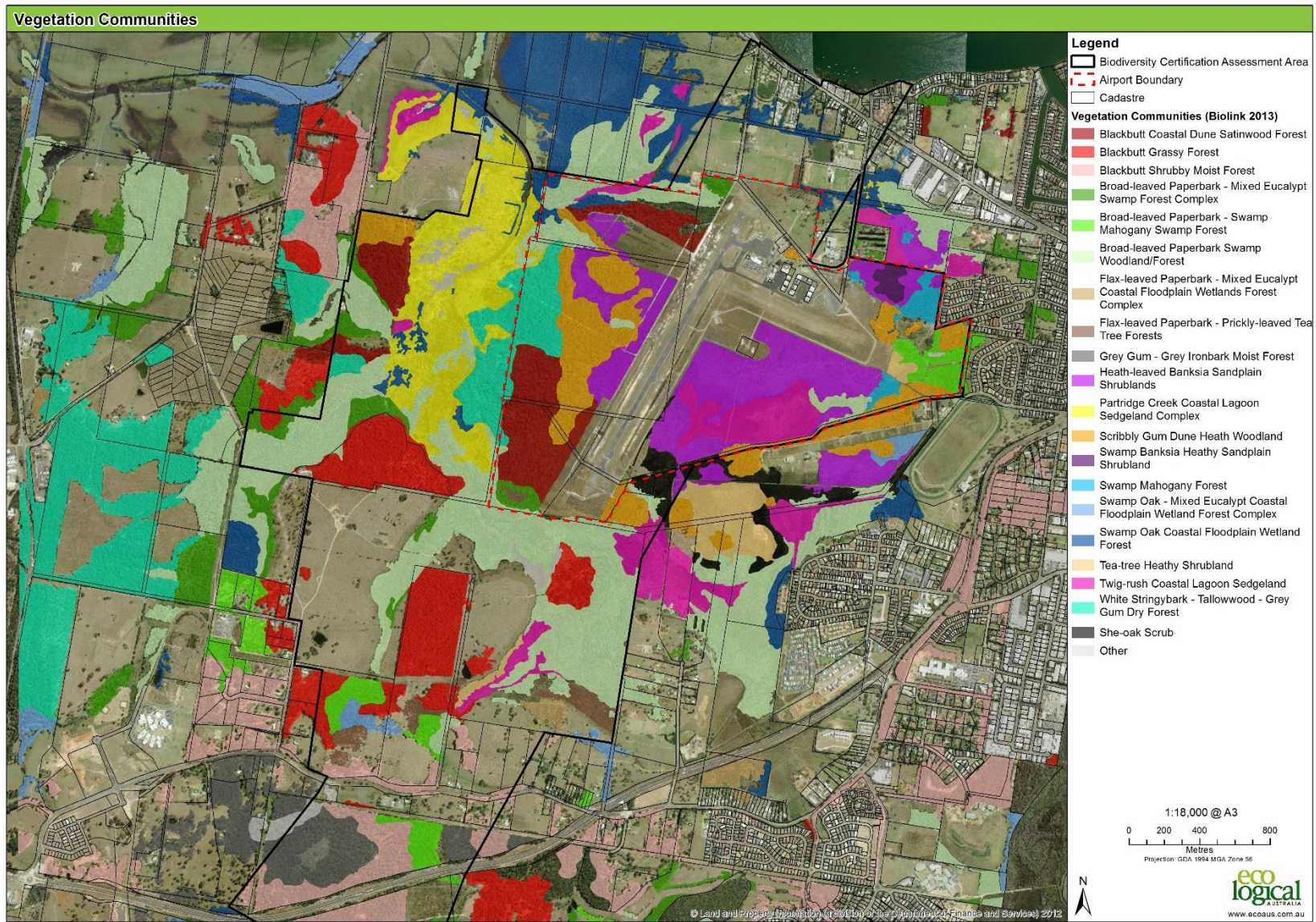


Figure 9: Indicative Biometric vegetation types in the BCAA based on Biolink 2012 & 2013

### 2.1.3 Determination of species credit species requiring survey

'Species credits' are the class of biodiversity credit created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. All threatened flora and approximately half of all threatened fauna species are classified as species credits by the BCAM. Furthermore, some species credit species are also 'red flag species' which the BCAM defines as "a species that cannot withstand further loss in the CMA because it is extremely rare/critically endangered, restricted or its ecology is poorly known".

The BCAM requires targeted survey for threatened flora and fauna considered to be 'species credit' species, on the land that will be impacted by development. Where a survey or expert report confirms that a species credit species is present or likely to use potential habitat on land proposed for biodiversity certification then a survey must also be undertaken or expert report prepared for that species on land to be used as an offset confirming its presence or likely presence. The biocertification credit calculator will use the survey results to calculate the number of credits required to offset the loss of the threatened species on land to be certified and the number of credits generated on land subject to conservation measures to determine whether the 'improve or maintain' test is satisfied provided a Red Flag species is not impacted.

Species that require species credits for the land proposed for biodiversity certification or are being used to generate species credits for a proposed conservation measure were identified and assessed in accordance with the seven steps outlined in Section 4.3 of the BCAM. The results of the candidate species identification and assessment process are presented in **Appendix D**.

#### *Step 1. – Identify candidate species for initial assessment*

A list of candidate species was filtered into the BCAA using biocertification credit calculator version 1.9 and validated against the threatened species profile ecological data from the BioNet Atlas of NSW Wildlife. This list is presented in **Appendix D**.

#### *Step 2. – Review list to include additional species*

The list of candidate species was reviewed to include additional species for assessment. This was undertaken using the results of Biolink (2006, 2011), Darkheart Eco Consultancy (2005), GHD (2008), and Peter Parker Environmental Consultants (2014), and database searches undertaken by ELA which included:

- A search of the Atlas of NSW Wildlife database (OEH 2014) undertaken to identify records of threatened flora and fauna species located within 10 km radius of the site
- A search of the EPBC Act protected matters search tool website to generate a report to assist to determine whether matters of national environmental significance (NES) were located within 10 km radius of the site

#### *Step 3. – Identify candidate species for further assessment*

The list of candidate species was reviewed to identify only those species that required further assessment in the BCAA. The species that were removed and a justification supporting the removal of these species from the candidate list are provided in **Appendix D**.

The following species are those identified as candidate species requiring further assessment:

#### Flora

- *Acronychia littoralis* (Scented Acronychia)
- *Arthraxon hispidus* (Hairy-joint Grass)

- *Asperula asthenes* (Trailing Woodruff)
- *Cryptostylis hunteriana* (Leafless Tongue-orchid)
- *Cynanchum elegans* (White-flowered Wax Plant)
- *Dendrobium melaleucaphilum* (Spider Orchid)
- *Galium australe* (Tangled Bedstraw)
- *Marsdenia longiloba* (Slender Marsdenia)
- *Maunderia triglochoides*
- *Melaleuca biconvexa* (Biconvex Paperbark)
- *Oberonia titania* (Red-flowered King of the Fairies)
- *Parsonsia dorrigoensis* (Milky Silkpod)
- *Phaius australis* (Lesser Swamp Orchid)
- *Persicaria elatior* (Tall Knotweed)
- *Psilotum complanatum* (Flat Fork Fern)
- *Senna acclinis* (Rainforest Cassia)
- *Streblus pendulinus* (Siah's Backbone)
- *Tylophora woollsii* (Cryptic Forest twiner)

#### Fauna

- *Crinia tinnula* (Wallum Froglet)
- *Litoria aurea* (Green and Golden Bell Frog)
- *Litoria brevipalmata* (Green-thighed Frog)
- *Botaurus poiciloptilus* (Australasian Bittern)
- *Carterornis leucotis* (White-eared Monarch)
- *Ephippiorhynchus asiaticus* (Black-necked Stork)
- *Ixobrychus flavicollis* (Black Bittern)
- *Pandion cristatus* (Eastern Osprey)
- *Pezoporus wallicus wallicus* (Ground Parrot)
- *Argyreus hyperbicus* (Laced Fritillary)
- *Petalura gigantea* (Giant Dragonfly)
- *Cercartetus nanus* (Eastern Pygmy-possum)
- *Petaurus norfolcensis* (Squirrel Glider)
- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- *Planigale maculata* (Common Planigale)
- *Phascolarctos cinereus* (Koala)
- *Pseudomys gracilicaudatus* (Eastern Chestnut Mouse)
- *Myotis macropus* (Southern Myotis) - Breeding only
- *Pteropus poliocephalus* (Grey-headed Flying Fox) - Breeding (camps) only
- *Hoplocephalus stephensii* (Stephens' Banded Snake)

Note that *Allocasuarina defungens* (Dwarf Heath Casuarina) was not considered to require further assessment. Records and presence of this species in the BCAA has been assessed as erroneous by Philip Rose and Karen Wilson of the Sydney Botanic Gardens (Rose et al 2014). All the plants at Port Macquarie Airport previously attributed to *A. defungens* are considered to be *A. thalassoscopica*. This species is not listed as a threatened species in NSW as it is common in coastal heath north from Port Macquarie.

*Steps 4 and 5. – Identify potential habitat for species requiring further assessment and determine whether species is present*

Several candidate species have already been recorded within the BCAA and thus were identified as requiring targeted survey to determine abundance (flora) and habitat polygons (fauna). These species were *Melaleuca biconvexa*, Wallum Froglet, Black Bittern, Squirrel Glider, Koala, and Southern Myotis. The list did not include Grey-headed Flying Fox as there are no Grey-headed Flying Fox camps.

*Step 6 – identify the threatened species that trigger a red flag*

There were no species confirmed as likely to have habitat on site that trigger a red flag. *Allocasuarina defungens* is a red flag species. However, as mentioned above (Step 3), records and presence of this species in the BCAA was assessed as erroneous. All the plants at Port Macquarie Airport previously attributed to *A. defungens* are considered to be *A. thalassocypica* (Rose et al 2014).

*Step 7 finalise the boundary of the species polygon and area of impact*

For each species requiring species credits identified within the BCAA, a 'habitat polygon' including known records and habitat will need to be identified and the number of species credits required or generated calculated.

Because previous and targeted survey confirmed the presence of Wallum Froglet, Koala, Squirrel Glider, and Eastern Chestnut Mouse, habitat polygons for these species was mapped. In addition, habitat for the Koala was mapped consistent with previous habitat mapping undertaken as part of Comprehensive Koala Plans of Management for Area 13 (BioLink 2008), the Airport (GHD 2010b) and PMHC LGA (Biolink 2013b).

Habitat polygons for other species were based on the confirmed presence of species and ELA expert opinion of the habitat areas combined with the BioMetric vegetation types recognised by the Threatened Species Profile Database (BioNet) as being habitat for these species.

#### **2.1.4 Field assessment**

Field assessment was designed to meet BCAM requirements for mapping and surveying Biometric vegetation types and to fill gaps in survey effort. Previous survey effort by Biolink (2002, 2006, 2008, 2012 and 2013), Darkheart Eco Consultancy (2005), GHD (2008), and Peter Parker Environmental Consultants (2014) were outlined in **Tables 3 to 8**.

In relation to Biometric vegetation, ELA senior botanists Lachlan Copeland and Liz Brown used the desktop assessment (see Section 2.1.2) to target on-ground validation of the biometric vegetation types and threatened flora species within the BCAA between 1 and 5 and 15-19 September 2014. This led to a revision of the Biometric vegetation types from 14 to nine vegetation types.

These nine biometric vegetation types were further mapped into 21 'vegetation zones' based on vegetation type and vegetation condition ('low' or 'moderate to good') which were further stratified using ancillary codes as per the BCAM (DECCW 2011) (**Table 10**). An ancillary code is an optional field which splits zones further to reflect a more homogenous condition state. The ancillary code was used in the BCAA to identify zones that were in good condition, were regrowth, regeneration, cropped, or mowed, had a mowed or weedy understorey, or was cleared and proposed to be restored).

Based on the area and number of vegetation zones ELA calculated that 42 BioMetric quadrats/transects were necessary to meet the minimum requirements of BCAM (DECCW 2011; **Table 10**). The assessment was undertaken to confirm vegetation types and extent within the BCAA, correlate previous vegetation communities to biometric vegetation types, and ensure the minimum number of plots was surveyed. The

field survey targeted locations that were considered likely to be representative of the mapped vegetation communities in their various condition states.

Field assessment involved vegetation assessment with 45 biometric plots conducted in accordance with the requirements of the BCAM. Two of the plots in cleared areas (vegetation zones 3 and 18) were subsequently not required and not used in the assessment as these zones were excluded from impact calculations (cleared land) or conservation measures (i.e. areas are not proposed to be restored). The number of remaining plots was above the effort required for four vegetation types, but below the effort required for two vegetation types (**Table 10**). For one of the vegetation zones with lower effort (Zone 4) the lower number of plots undertaken was due to changes to vegetation zone boundaries that increased the size of the zone after field work was complete. For the other vegetation type (Zone 22) the lower number of plots than required was due to the creation of a new vegetation type following the OEH site audit in September 2015. The assessment was undertaken to confirm vegetation types and extent within the BCAA, correlate previous vegetation communities to biometric vegetation types, and ensure the minimum number of plots was surveyed. The field survey targeted locations that were considered likely to be representative of the mapped vegetation communities in their various condition states. The final mapped vegetation types and zones together with the location of plots are shown in **Figure 10**.

**Table 10: Vegetation zones in the BCAA, plot requirements, and plots completed.**

# Minimum number of required plots not met due to changes to BCAA boundary and vegetation types after OEH audit

Veg Zone ID	BioMetric Vegetation Type	Condition	Ancillary Condition Code	Area	Plots required (BCAM)	Plots completed
1	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Moderate to good	Good	38.83	3	3
2	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Moderate to good	Regrowth	2.81	1	1
3	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Cleared	Cleared (to regenerate)	0	0	1
4	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Moderate to good	Good	122.39	5	4#
5	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Moderate to good	Cropped	19.19	2	2
6	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Low	Mowed Understorey	7.97	1	1
7	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Low	Cleared (to regenerate)	11.89	2	3

Veg Zone ID	BioMetric Vegetation Type	Condition	Ancillary Condition Code	Area	Plots required (BCAM)	Plots completed
8	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	Moderate to good	Good	6.74	1	1
9	Paperbark swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	156.75	5	5
10	Paperbark swamp forest of the coastal lowlands of the North Coast	Moderate to good	Cropped	5.35	1	1
11	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Moderate to good	Good	49.14	3	4
12	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Low	Mowed Understorey	0.63	1	1
13	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	22.33	2	2
14	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Low	Regeneration	1.15	1	1
15	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	9.32	1	2
16	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Moderate to good	Weedy Understorey	1.15	1	1
17	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Low	Cropped and/or Mown Understorey	5.78	1	1
18	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Low	Cleared (to regenerate)	0	0	1
19	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	Moderate to good	Good	22.84	2	2
20	Wet heathland and shrubland of coastal lowlands of the North Coast	Moderate to good	Good	69.23	4	4
21	Wet heathland and shrubland of coastal lowlands of the North Coast	Low	Mowed	1.68	1	1
22	Coastal freshwater meadows and forblands of lagoons and wetlands	Moderate to good	Good	74.42	4	3#
<b>Total</b>					<b>42</b>	<b>45</b>



In relation to additional flora and fauna survey above the effort undertaken by previous consultants, ELA determined that targeted surveys were required for all candidate species (see Section 2.1.3 for candidate species). Determination of additional surveys did not follow formal methods whereby an assessment was made of previous survey effort against the minimum survey requirements outlined in *Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities* (DEC 2004), in terms of effort per stratification unit. Rather, the spread, or spatial distribution, of survey effort for flora species and different fauna species groups across the BCAA was examined, and survey was designed to target areas not previously surveyed. Notwithstanding this, a focus on impact areas rather than offset areas within the BCAA was given in the placement of additional survey sites; it was considered more important to focus on impact rather than offset areas since detection of candidate species within impact areas affects credit requirements to meet an improve or maintain outcome. Less emphasis was placed on actual survey effort required i.e. numbers of traps nights and survey hours, than survey locations. Even so, standard survey effort (e.g. number of traps per survey site and time spent undertaking active searches/census), as outlined in the DEC survey guidelines (DEC 2004), was employed and exceeded.

Previous survey effort concentrated in the south of the BCAA in the Area 13 Urban Investigation Area, particularly in Lot 206 754434 and Lot 3 565437 (studies by DLWC (2002), GHD (2008), Biolink (2006, 2008 and 2012), and Peter Parker Environmental Consultants (2014) all overlapped this area). Previous survey also occurred in the areas directly adjacent to the airport runway, both on the eastern and western sides, and to the east of the airport around the proposed business park (**Figure 11**). As such, and favouring impact areas over offset areas, additional survey areas were generally located:

- In the southern corner of the BCAA, to the south of Lot 206 754434 and Lot 3 565437
- In the north-west corner of the BCAA, to the west of the GHD (2008) and parts of the ERM (2008) survey areas, and overlapping parts of the DLWC (2003) survey area
- Directly adjacent to the airport runway, on both the eastern and western sides (overlapping the GHD (2008), ERM (2008), and Biolink (2012) survey areas)
- In the north-eastern corner of the BCAA, overlapping the Biolink (2012) survey area.

The locations of flora and fauna survey effort is shown in **Figure 11**.

Within the survey areas, care was taken to sample broad habitat types and target candidate flora and fauna species within these types. For the purposes of the survey, broad stratification units were classed as Forest / Open Forest, and Heathland / Shrubland / Sedgeland / Rushland (collectively referred to as 'Forest' and 'Heathland', respectively). However, in targeting species such as Southern Myotis and waterbirds (Australasian Bittern, Black-necked Stork, Black Bittern), the vegetation unit, Swamp Oak Swamp Forest, and waterbodies were targeted.

The targeted surveys were undertaken using recognised survey methods outlined in DEC (2004) as well as methods recently demonstrated as successful methods for surveying Eastern Pygmy Possum and Brush-tailed Phascogale (Rueegger et al 2013). The specific survey effort was as outlined in **Table 11**.

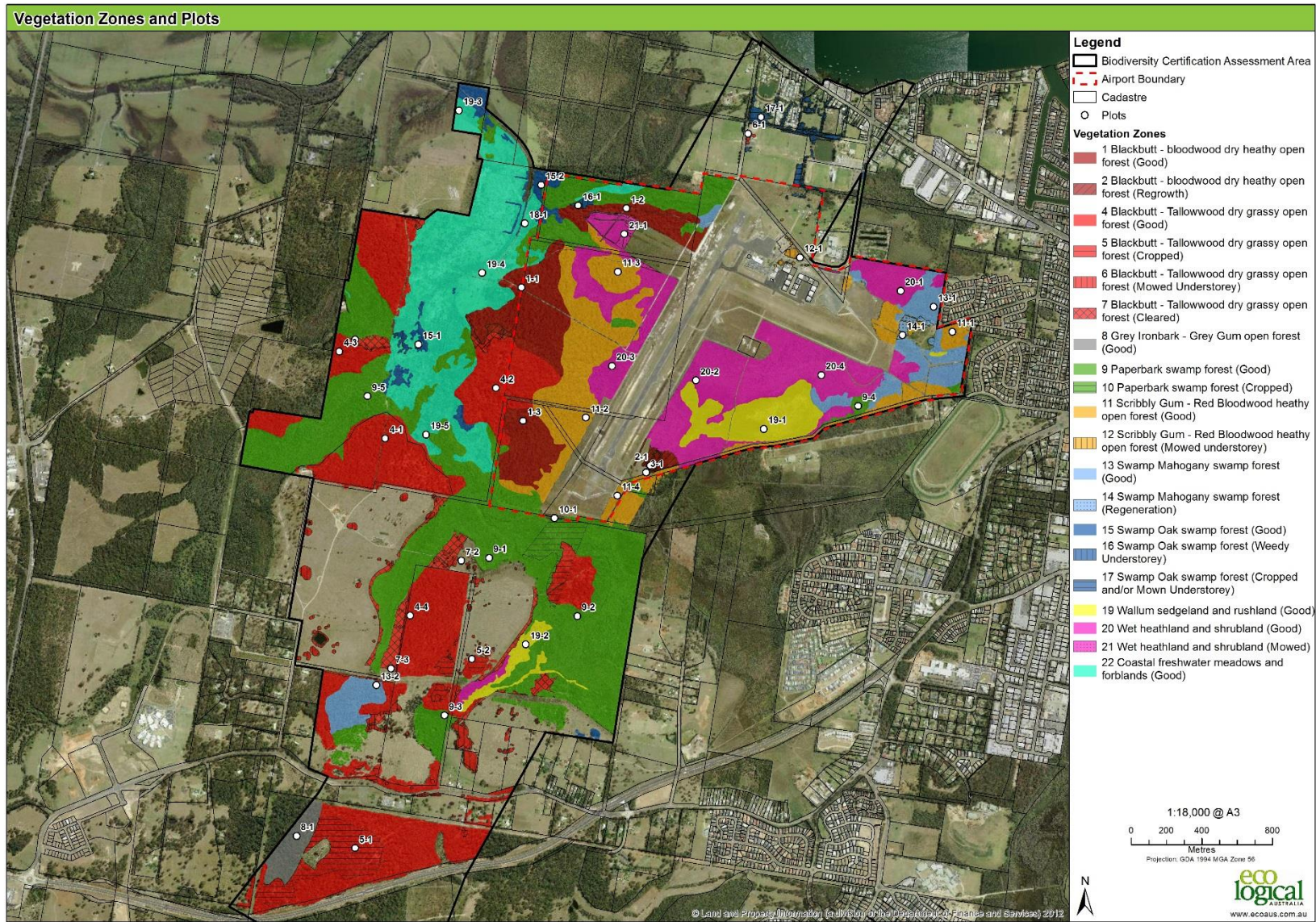


Figure 10: Validated BioMetric Vegetation Types in BCAA and location of plots used in credit calculations

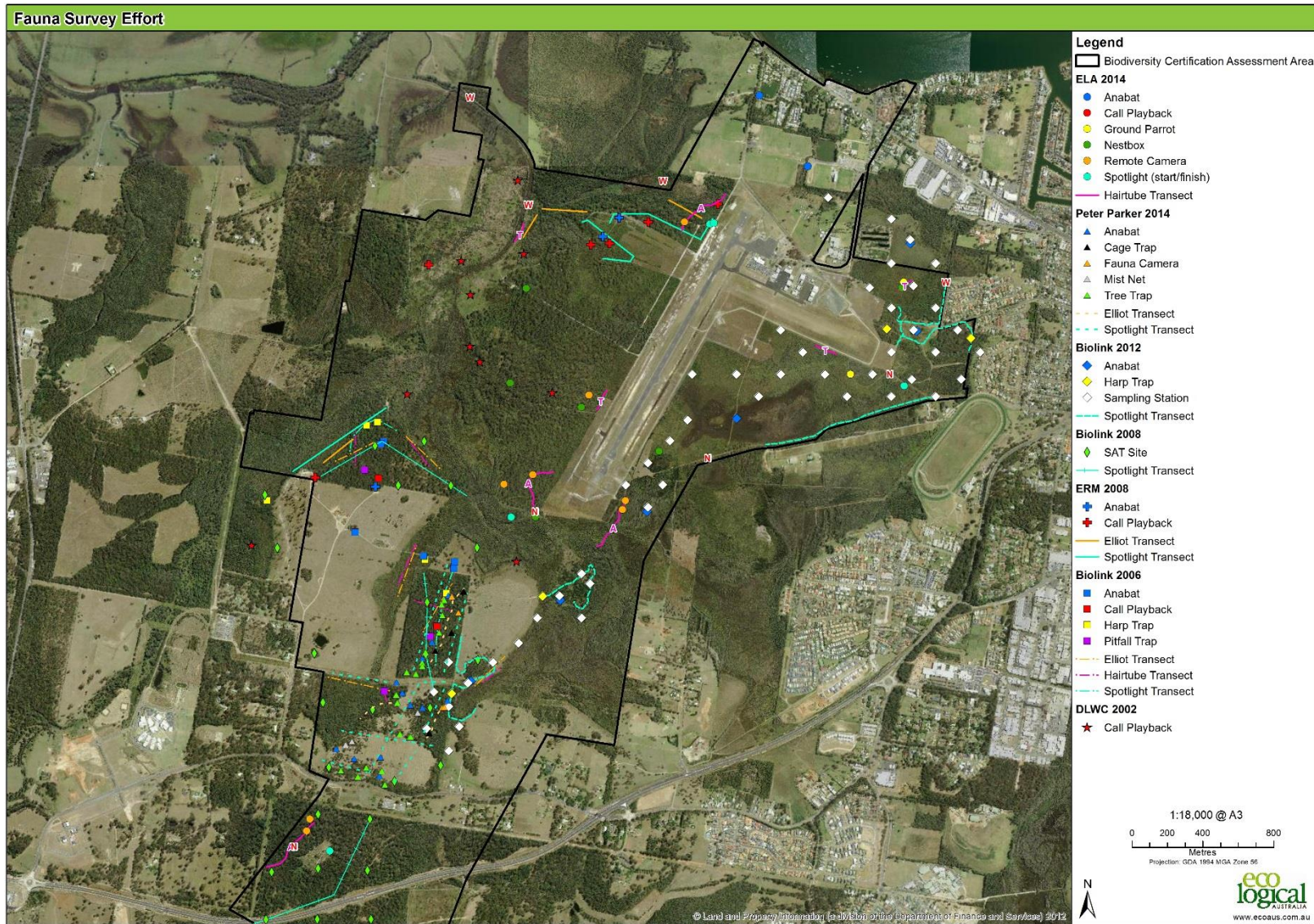


Figure 11: Previous and current fauna survey effort in the BCAA

**Table 11: Additional fauna survey effort within the BCAA– ELA October 2014**

Survey method	Candidate species targeted *	Effort	Number of traps per site	Number of sites	Location of sites	Comments
Terrestrial hairtubes	Common Planigale, Eastern Chestnut Mouse, Brush-tailed Phascogale, Spotted-tailed Quoll	720 trap nights	Ten x 40 mm Ten x 60 mm	4	One site in an impact area across both Forest and Heathland Three sites in offset areas in Heathland	Hairtubes were set for nine nights
Arboreal hairtubes with remote cameras	Brush-tailed Phascogale, Eastern Pygmy Possum, Squirrel Glider	396 trap nights	Ten x 60 mm One camera	4	All sites in impact areas in Forest	Hairtubes/cameras were set for nine nights
Nest boxes with remote cameras	Brush-tailed Phascogale, Eastern Pygmy Possum	108 trap nights	One, either small or large One camera	6	Three sites in impact areas in Forest Three sites in offset areas, two in Forest, one in Heathland	Boxes/cameras were set for a nine nights
Spotlighting	Koala, Squirrel Glider, Bitterns, Grey-headed Flying Fox	6 person hours	-	4	All sites in impact areas in Forest	Spotlighting occurred on four separate nights
Bait stations and remote cameras	Spotted-tailed Quoll	35 trap nights	One camera	4	Two sites in impact areas in Forest Two sites in offset areas in Forest	Cameras were set for a minimum of eight nights, and up to nine nights. The two sites in offset areas were directly adjacent to impact areas
Call playback	Koala, owls, Ground Parrot	6 person hours	-	6	Four sites in impact areas, two in Forest, two in Heathland Two sites in offset area in Forest and Heathland	Call playback occurred over five nights. Koala was targeted at three sites, Grass Owl was targeted at three sites, other owls were targeted at one site, and

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Survey method	Candidate species targeted *	Effort	Number of traps per site	Number of sites	Location of sites	Comments
						Ground Parrot was targeted at two sites
Anabat recording	Southern Myotis	4 trap nights	One anabat	2 + roaming while spot-lighting	Both sites in impact areas in Swamp Oak Swamp Forest	
Diurnal bird census	White-eared Monarch, Eastern Osprey, Black-necked Stork, Australasian Bittern, Black bittern	8 person hours	-	5	Four sites in offset areas, two in Forest, two in Heathland One site just outside of BCAA	Surveys were undertaken in the morning on four separate days. A species time curve was applied for this survey method
Waterbird survey	Australasian Bittern, Black bittern	4 hours	-	4	Three sites in offset area in Swamp Oak Swamp Forest and Heathland One site just outside of BCAA	Waterbird surveys were undertaken on three separate days
Frog survey	Wallum Froglet, Green and Golden Bell Frog, Green-thighed Frog	3 person hours	-	3	One site in impact area in Heathland Two sites in offset areas in Heathland and Swamp Oak Swamp Forest	Surveys occurred over three days for a period of 30 minutes. Two surveys were undertaken in the morning. The Heathland survey was undertaken at night.
Opportunistic observations	All species, including Stephens' Banded Snake	Duration of survey	-	-	-	Logs, rocks and debris were opportunistically turned during the duration of survey

\* While not candidate species, Spotted-tailed Quoll and owls were targeted as survey effort for these either overlapped with other candidate species or were not onerous.

The timing of surveys generally coincided with survey guidelines. Details of survey dates and field personnel are provided in **Table 12**. The total number of field days was 17 days (33 person days).

**Table 12: Survey dates and field personnel**

Survey dates	Survey personnel	Survey Team
1 to 5 September 2014	Lachlan Copeland, Liz Brown	Flora
15 to 19 September 2014	Lachlan Copeland, Liz Brown	Flora
7 October 2014	Lachlan Copeland	Flora
13 to 15 October 2014	Alicia Scanlon, Emily Southwell	Fauna 1
22 to 24 October 2014	Antony Von Chrismar, Emily Southwell	Fauna 2

Weather conditions during the survey period were generally considered to be favourable for detecting flora and fauna. The survey was undertaken under average weather conditions with some rain. Rain fell on 3 and 17 September 2014, as well as 14-15 and 22-23 October 2014, which may have encouraged frog species to emerge from refuge sites. Rain fell in the two weeks prior to the first week of flora survey (137.2 mm in the period 18-31 August 2014), as well as in the week prior to the second week of flora survey (21 mm in the period 6-14 September 2014), which likely would have elicited flowering in flora species.

Daily weather conditions from the Port Macquarie Airport weather station (station 060139) are shown in **Table 13** (BOM 2014).

**Table 13: Weather conditions during survey**

Date	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)	Relative humidity (%) at 9am	Relative humidity (%) at 3pm
1/09/2014	8.9	22.0	0	80	68
2/09/2014	11.8	22.0	0	90	77
3/09/2014	9.9	17.8	6.6	51	43
4/09/2014	10.6	19.0	0	50	42
5/09/2014	12.2	16.1	0	67	64
15/09/2014	8.4	22.1	0	71	64
16/09/2014	10.1	24.3	0	84	69
17/09/2014	7.3	23.7	0.6	42	48
18/09/2014	7.1	21.8	0	39	43
19/09/2014	6.0	19.3	0	60	49
7/10/2014	14.9	28.3	0	63	43
13/10/2014	16.0	27.1	0	65	59
14/10/2014	15.9	20.7	10.8	81	89
15/10/2014	3.9	20.9	5.4	69	44

Date	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)	Relative humidity (%) at 9am	Relative humidity (%) at 3pm
22/10/2014	13.2	22.4	0.8	75	57
23/10/2014	10.8	25.4	0.2	77	55
24/10/2014	12.3	26.2	0	76	64

## 2.2 Results

### 2.2.1 Vegetation types and condition

Field survey confirmed ten BioMetric vegetation types in the BCAA, and the presence of 22 'vegetation zones'. Also, field survey confirmed the boundaries of vegetation communities mapped by Biolink (2013); generally, the boundaries were not modified, other than for minor changes with regard to refining the boundaries of vegetation zones.

Full profiles of each biometric vegetation type within the BCAA, including the different ancillary codes identified, are provided in **Appendix E** together with a justification for the selection of the type.

### 2.2.2 Flora

A total of 387 flora species were recorded in biometric plots by ELA. A full list of species recorded in plots is provided in **Appendix F**

#### *Threatened flora species*

No threatened flora species were recorded by ELA in the BCAA, despite previous records of *Melaleuca biconvexa* in the far south recorded by Biolink (2006), and searches of this general area by ELA to relocate previously recorded individuals.

A single specimen of *Cynanchum elegans* (White-flowered Wax Plant) was recorded by Parker (2014) in a grazed paddock near a remnant tree to the south of the runway. The location of this plant is included in the impact footprint for the OLS vegetation, however will not be impacted by the proposal clearing (i.e. a nearby tree will be cleared to meet OLS requirements).

It is considered that all the recent records of *Allocasuarina defungens* for the area (Biolink 2012) are erroneous. This species is endemic to the Nabic area to the south and all the plants at Port Macquarie airport previously attributed to *A. defungens* are considered to be *A. thalassoscopica*. This species is not listed as threatened in NSW as it is common in coastal heath north from Port Macquarie (Rose et al 2014).

Only one species of conservation significance was recorded by ELA within the BCAA. This species, *Goodenia fordiana*, is a Rare of Threatened Australian Plant (ROTAP) species.

The BCAA contained suitable habitat for *Melaleuca biconvexa* and *Maundia triglochoides*. These species were considered to potentially occur in the BCAA.

### 2.2.3 Fauna species

A total of 105 species, comprising nine frogs, one reptile, 63 birds, 20 non-flying mammals, and 12 bats, were recorded in the BCAA by ELA. Of these, a number of species were considered to be uncommon, and included raptors (*Circus approximans* (Swamp Harrier) and *Accipiter novaehollandiae* (Grey Goshawk)), *Centropus phasianinus* (Pheasant Coucal), and *Malurus lamberti* (Variegated Fairy Wren). A full list of species recorded by ELA is provided in **Appendix F**. A detailed anabat report is provided in **Appendix G**.

### *Threatened and migratory fauna species*

A total of 22 threatened and migratory species have been recorded in or in the vicinity of the BCAA during previous surveys and/or by ELA. These species are Wallum Froglet, Brown Treecreeper, Eastern Osprey, Glossy Black Cockatoo, Black Bittern, Black-necked Stork, Square-tailed Kite, Little Lorikeet, Sooty Owl, Masked Owl, *Haliaeetus leucogaster* (White-bellied Sea-eagle), *Merops ornatus* (Rainbow Bee-eater), Little Bentwing Bat, Eastern Bentwing Bat, Eastern Free-tail Bat, Southern Myotis, Greater Broad-nosed Bat, Grey-headed Flying Fox, Eastern Chestnut Mouse, Koala, Yellow-bellied Glider, and Squirrel Glider. The locations of threatened and migratory species recorded within and around the BCAA by ELA and previous surveys are shown in **Figure 12**.

There was potential for Ground Parrot to occur in the BCAA given the presence of large areas of wet heath in good condition but has not been recorded to date. Also, there was potential for Powerful Owl to occur given the presence of foraging habitat (breeding habitat, large hollow bearing trees, was marginal in the BCAA).

Of the above species, only five requiring species credits have been identified as being impacted by the land to be certified. The other four species requiring species credits that have been recorded within the BCAA (Black Bittern, Black-necked Stork, Eastern Osprey and Southern Myotis) have no habitat within the land to be certified so do not require credits species (**Figure 12**).

### *Species Credit Habitat Maps*

A total of 384.55 ha of habitat for Wallum Froglet, 432.12 ha of habitat for Koala (220.55 ha of primary and 211.57 ha of secondary habitat), 419.29 ha of habitat for Squirrel Glider, and 343.79 ha of habitat for Eastern Chestnut Mouse have been mapped on land proposed for Biocertification, land subject to conservation measures and retained areas in the BCAA (**Figures 13-17**).

## **2.2.4 Red flags**

### *Vegetation types and other areas recognised as having regional or state biodiversity conservation significance.*

The three EECs recorded in the BCAA, 'Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions', 'Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions', and 'Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions', are red flag communities.

In addition, SEPP 14 Wetlands, vegetation within riparian buffers, and state and regional biodiversity links within the BCAA are also red flag areas.

The distribution of all red flag areas across the BCAA is shown in **Figure 18**.

### *Threatened species*

One threatened species, *Cynanchum elegans*, is considered a red flag species in the Northern Rivers CMA. However, the TSPD allows negligible loss considered to be up to two individuals.



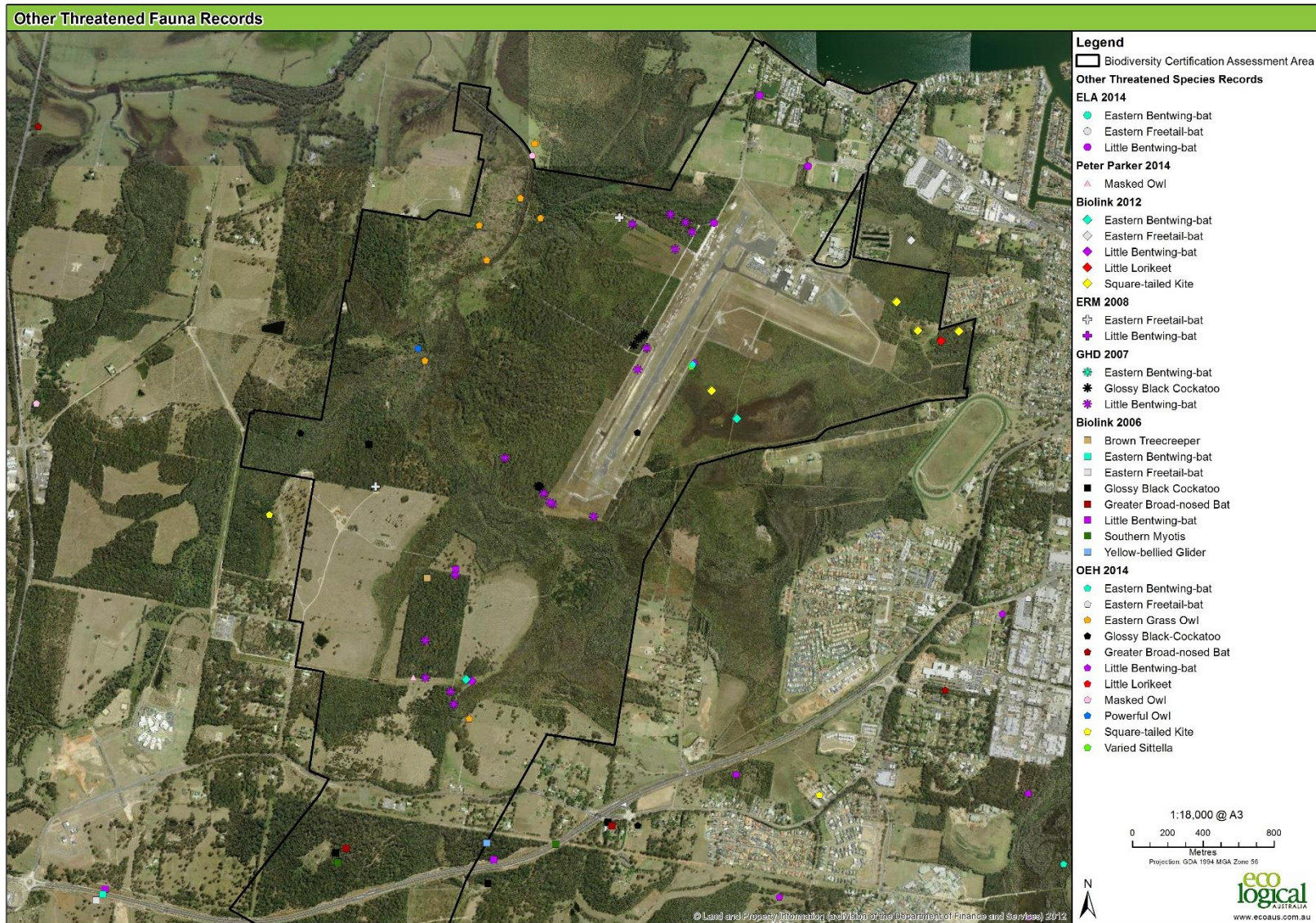


Figure 12: Recorded locations of threatened fauna and migratory species not requiring species credits recorded in the BCAA

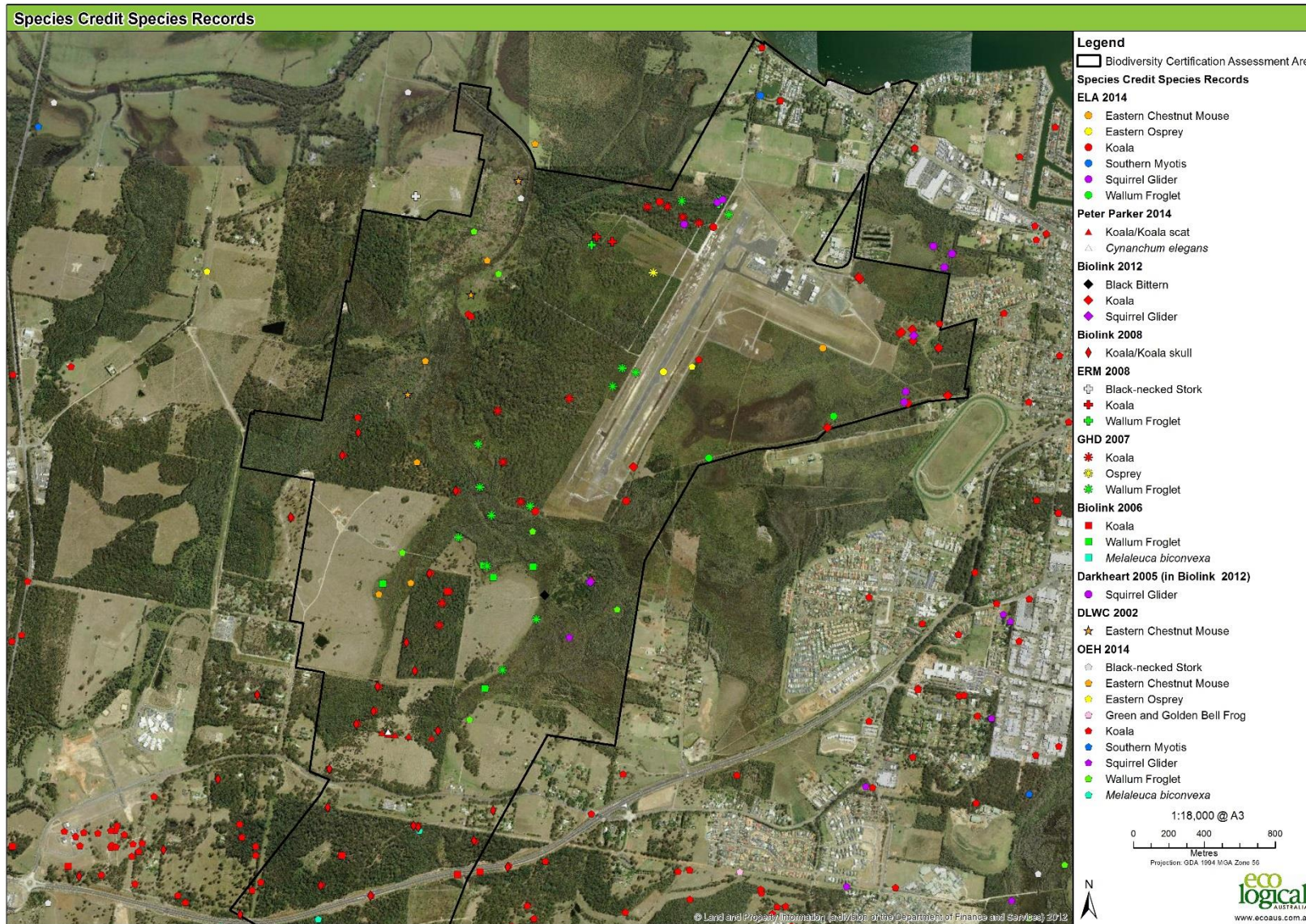


Figure 13: Recorded locations of threatened species requiring species credits in the BCAA

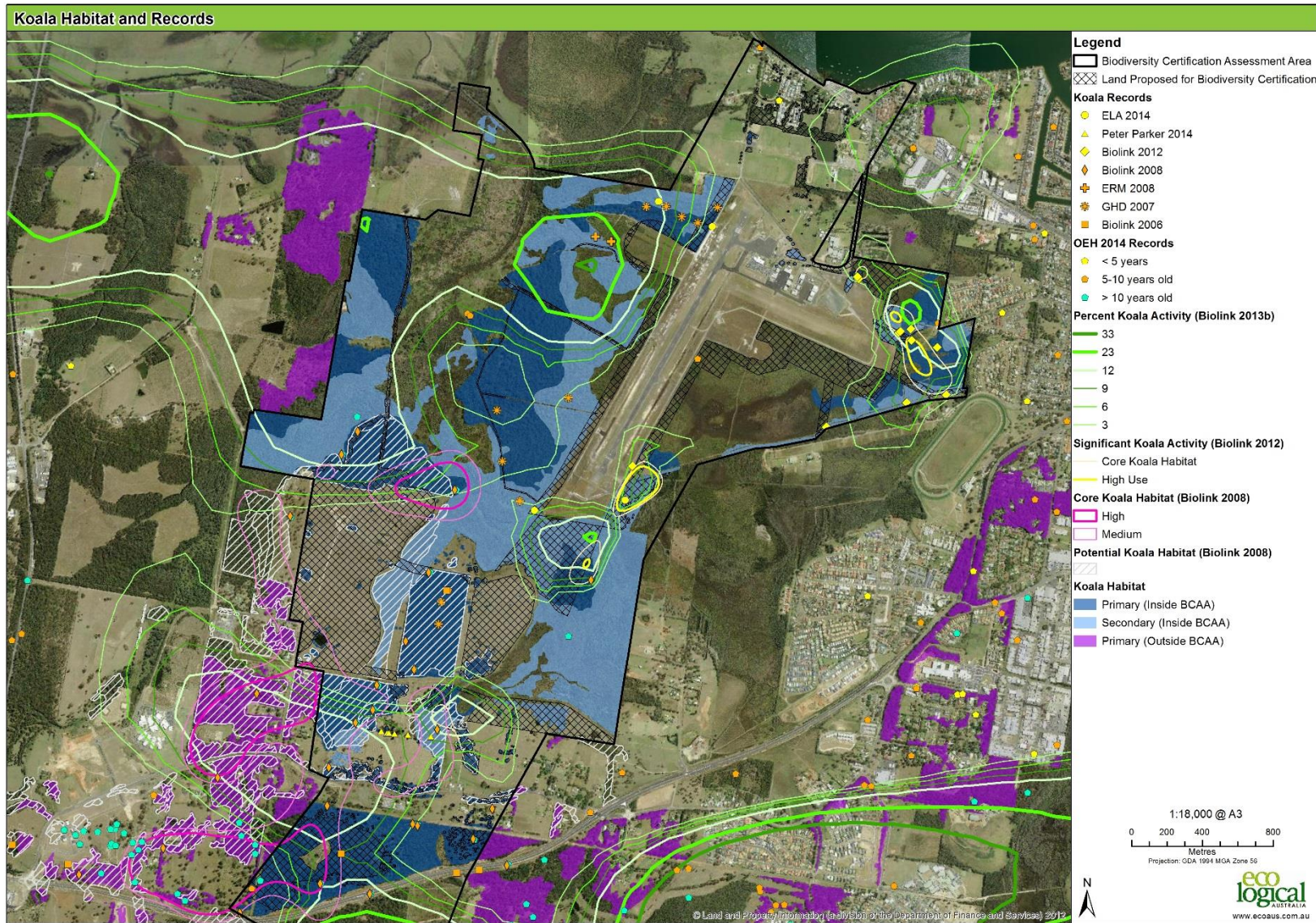


Figure 14: Habitat polygon and records for Koala

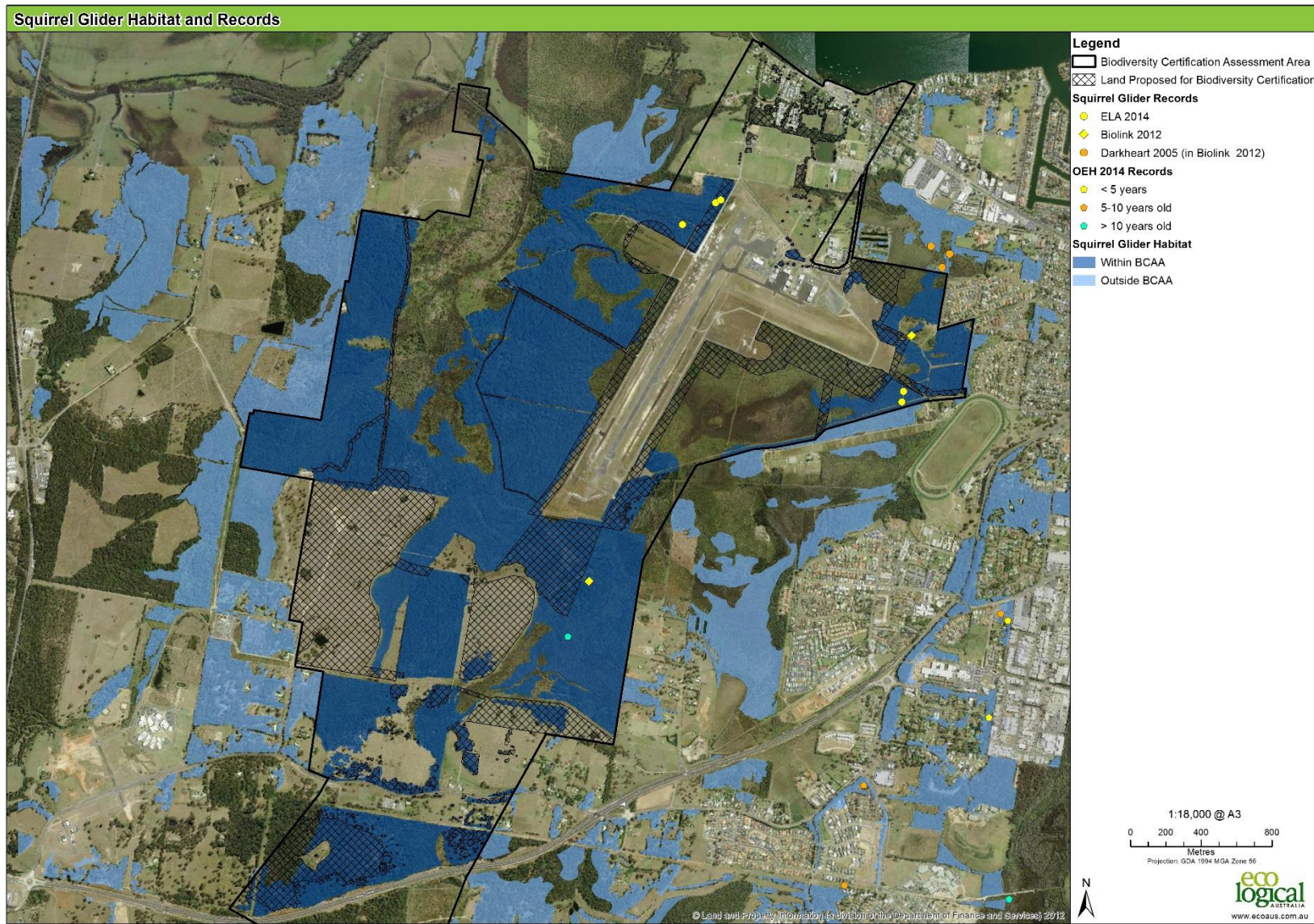


Figure 15: Habitat polygon and records for Squirrel Glider

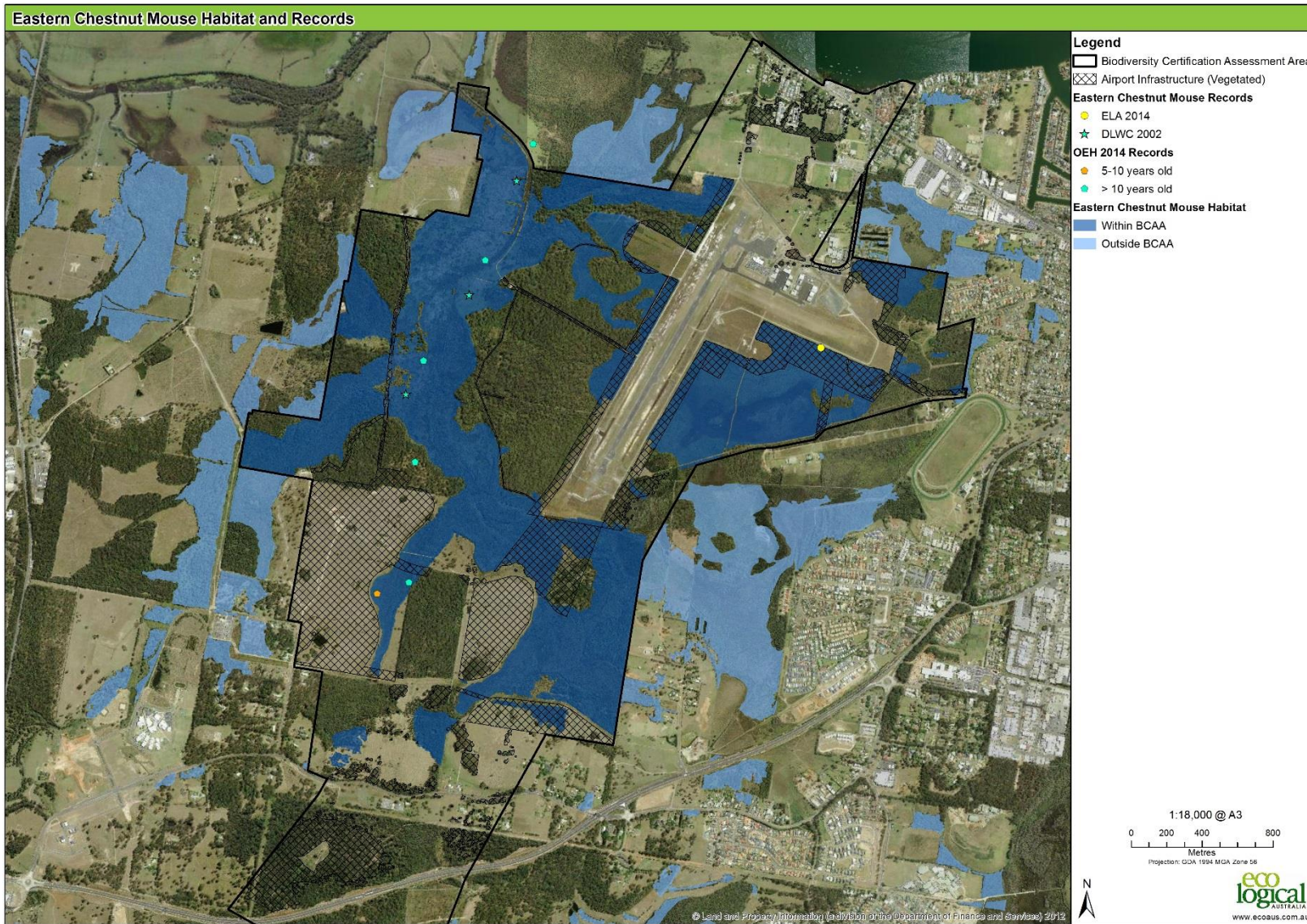


Figure 16: Habitat polygon and records for Eastern Chestnut Mouse

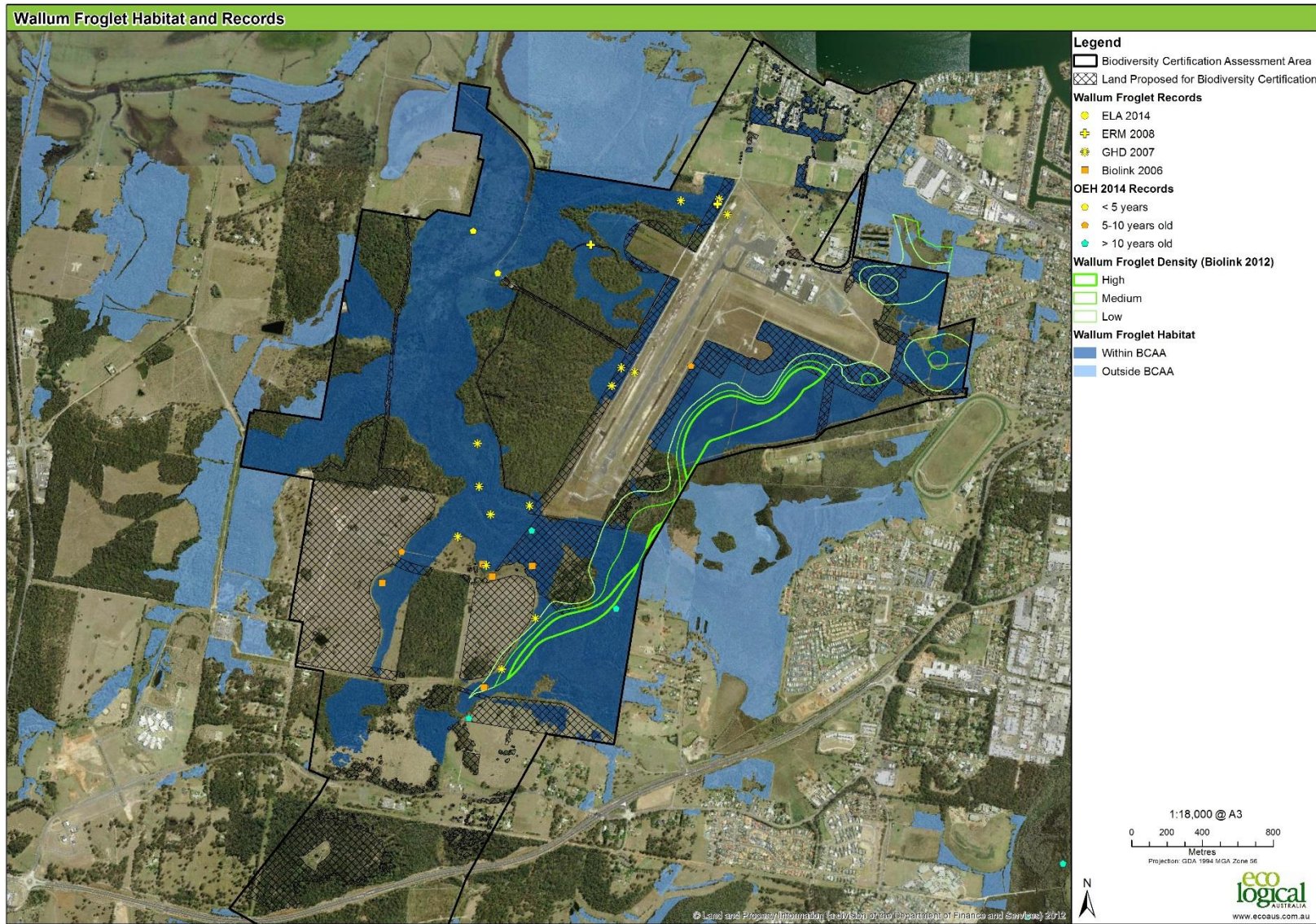


Figure 17: Habitat polygon and records for Wallum Froglet

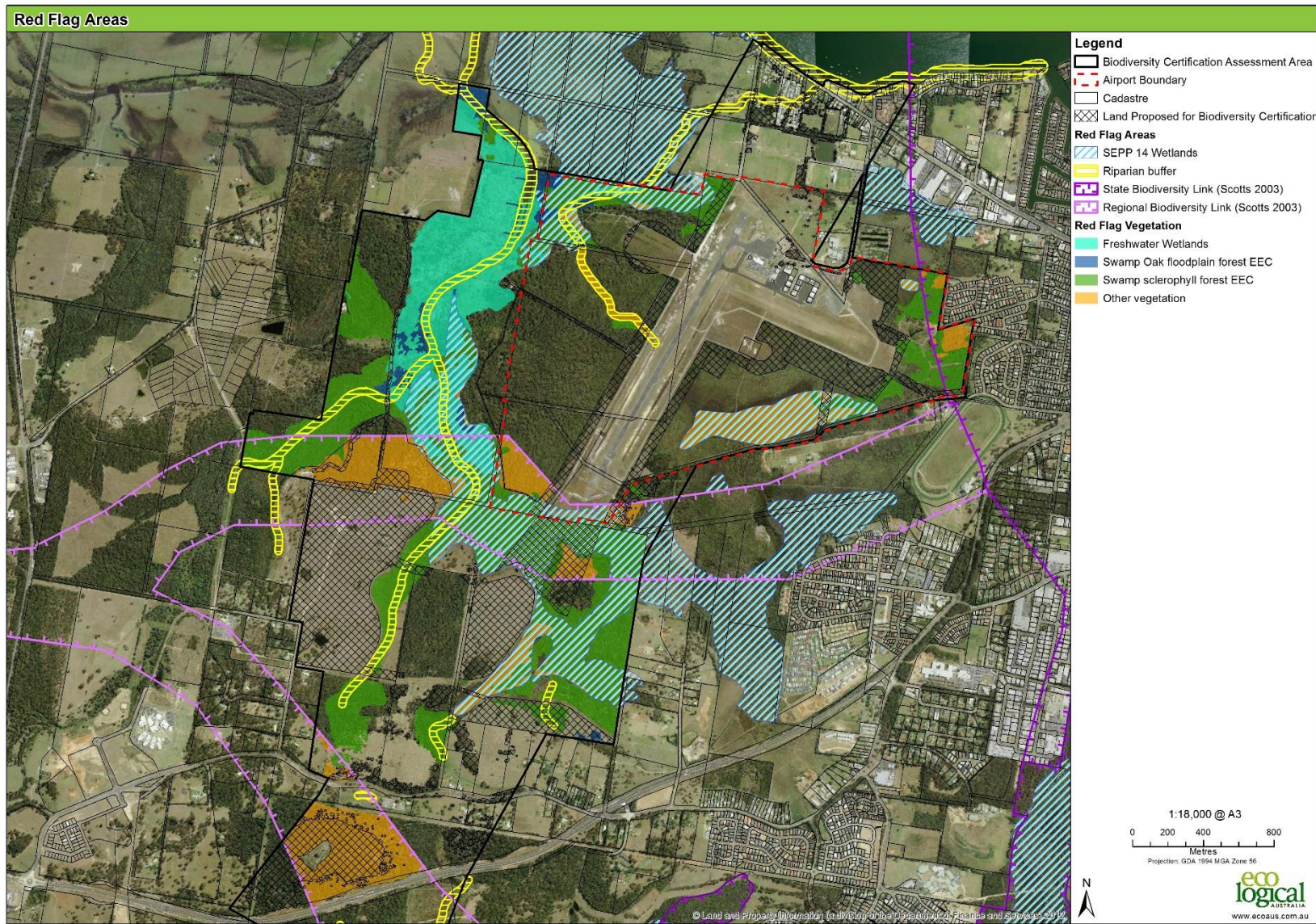


Figure 18: Red flag areas within the BCAA

### 3 Use of more appropriate local data in the Biocertification Assessment

The BCAM outlines the methods by which general biodiversity values are assessed and measured in the BCAA to determine whether the conferral of biodiversity certification on land, as demonstrated in the application for biodiversity certification, improves or maintains biodiversity values (DECCW 2011). These methods, along with the methods by which measurements of threatened species, assessments of indirect impacts on biodiversity values, and calculations of ecosystem and species credits are made, were followed in the Biocertification Assessment (**Section 5**).

According to the methodology, vegetation types are used as surrogates for assessing general biodiversity levels. Information on each vegetation type, including a description, the vegetation class and formation to which it belongs, and percent cleared value, are contained within the Vegetation Types Database held by OEH. A range of quantitative measures that represent the benchmark conditions for vegetation types are contained within the Vegetation Benchmark Database, also held by OEH. The Vegetation Benchmark Database is organised by CMA, and as such, information for the same vegetation types that may occur across different CMAs are repeated across CMAs, although the range of measures representing benchmark conditions can differ between CMAs to reflect variations in vegetation types across their range.

Generally, default data contained in the Vegetation Benchmark Database are used when undertaking an assessment of, and measuring, general biodiversity values. Percent cleared values, contained in the Vegetation Types Database, are used in determining vegetation types (not in 'low condition') that are greater than 70% cleared, and therefore classified as red flag areas. However, the BCAM specifies that the Director General may certify that '*more appropriate local data*' (MALD) can be used instead of the data in these databases, '*where local data more accurately reflects local environmental conditions*' (section 3.4 of the BCAM). Benchmark data that more accurately reflect the local environmental conditions for a vegetation type may be collected from local reference sites, or obtained from relevant published sources. Data other than benchmark data may also be obtained from relevant published sources. The Director General must provide justifications for certifying the use of local data. The certified local data can then be used in applying the methodology.

ELA considered that the range of benchmark values for the vegetation types occurring in the BCAA, as contained in the Vegetation Benchmark Database, was not an accurate reflection of the benchmark condition of the different vegetation types. This is because they contained very high or low benchmark values that were not consistent with these vegetation types e.g. 100% native over storey cover for Open Forest vegetation types, or zero values for many attributes e.g. hollow-bearing trees, which would be expected to have some hollows when in benchmark condition. Also, ELA judged that more accurate data than that contained in the Vegetation Types Database existed for the percent cleared value for the vegetation type, '*Wet heathland and shrubland of coastal lowlands of the North Coast*' (e.g. within ELA 2005).

ELA consulted with OEH in September and October 2014 to request in principle support for the use of more appropriate local data, rather than the default data contained in the Vegetation Benchmark Database, in assessing and measuring general biodiversity values for use in this Biocertification Assessment.



In ELA's request, more realistic benchmark ranges for vegetation types and a more appropriate percent cleared value for '*Wet heathland and shrubland of coastal lowlands of the North Coast*' were presented for consideration by OEH. In assigning more realistic benchmark ranges for vegetation types for OEH's consideration, ELA applied expert opinion and consulted benchmark ranges for the same vegetation types in immediately adjacent CMAs; it was considered that the condition of vegetation types should not vary to a great extent between immediately adjacent CMAs as it might between more separated CMAs. In relation to assigning a more appropriate percent cleared value for '*Wet heathland and shrubland of coastal lowlands of the North Coast*', ELA consulted an unpublished vegetation mapping report undertaken for the Northern Rivers CMA (ELA 2005) which estimated the percent cleared figure for this vegetation type in the Northern Rivers CMA as 40%. While unpublished, this report was prepared and submitted to a government organisation (i.e. Northern Rivers CMA). The findings of the report have not been disputed to date. ELA is not aware of better percent cleared estimates for this vegetation type.

OEH subsequently convened a panel of its own ecologists and provided ELA with benchmarks recommended for used in this assessment via e-mail 8 September 2014 (**Table 14**). On 10 October 2014, OEH advised via e-mail that there appeared to be a strong case to revise the percent cleared value for '*Wet heathland and shrubland of coastal lowlands of the North Coast*' to 40% cleared.

In a separate letter received on 11 March 2015 in response to ELA's formal request for use of more appropriate data made on 22 February 2015, OEH advised that the amended benchmark figures should be used in the credit calculations (**Appendix C**). Accordingly, these revised values were used in the Biocertification Assessment (**Section 5**). The default benchmarks have been used for the new vegetation type '*Coastal freshwater meadows and forblands of lagoons and wetlands*' due to the late inclusion of this vegetation type in the assessment.

**Table 14: OEH-revised benchmark ranges for vegetation types within the BCAA**

BioMetric Vegetation Type	NPS*	Native over storey cover		Native mid storey cover		Native ground cover (grasses)		Native ground cover (shrubs)		Native ground cover (other)		NTH*	FL*
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper		
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	30	15	50	5	45	5	40	10	60	5	40	1.5	10
Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	40	20	50	8	40	10	50	5	20	5	60	2	20
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	30	20	40	5	40	10	60	5	20	5	40	1	10
Paperbark swamp forest of the Coastal lowlands of the North Coast <sup>^</sup>	15	10	70	5	80	5	50	5	60	5	60	1	5
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	30	15	40	5	45	1	40	10	60	5	40	1.5	10
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	25	10	70	5	80	5	50	1	20	5	60	1	10
Swamp Oak swamp forest of the coastal lowlands of the North Coast	10	10	50	5	50	2	20	0	10	1	50	0.5	1
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	30	5	80	5	80	0	20	20	75	5	60	0	0
Wet heathland and shrubland of coastal lowlands of the North Coast	30	5	80	5	80	0	20	20	75	5	60	0	0

\* NPS = Number of native plant species, NTH = Number of trees with hollows, FL = Number of fallen logs

<sup>^</sup> The benchmark ranges for Paperbark swamp forest of the coastal lowlands of the North Coast were not revised by OEH but revised by ELA to be consistent, where appropriate, with other Forest Wetland vegetation types and expert opinion of the range of this vegetation type on the NSW mid north coast

## 4 Red Flag Variation Request

### 4.1 Impact on Red Flagged Areas

The Biodiversity Assessment Report for the ecological values within the BCAA (**Section 2**) identified a number of red flag areas as defined by the BCAM that would be impacted by the land proposed for biocertification. The BCAM requires each of the criteria set out in Section 2.4 of the BCAM to be addressed in order for the Director-General to be satisfied that impacts to these red flag areas are able to be offset. This section addresses this requirement.

A red flag is triggered under the BCAM when there is an impact on any of the following:

- a vegetation type >70% cleared in the CMA for which it is mapped (not in 'low condition')
- a critically endangered (CEEC) or endangered ecological community (EEC) listed under the TSC Act or EPBC Act (not in 'low condition')
- a threatened species that cannot withstand further loss
- areas of vegetation recognised as having regional or state biodiversity conservation significance

The Biocertification Operational Manual (OEH 2015) states that each red flag area within the proposed biodiversity certification area should be numbered and listed in a table and shown on a map. Each red flag area impacted will require a separate red flag variation request unless the responses are the same for each entity, i.e. vegetation type is the same, patches are of similar condition, patches have the same connectivity etc.

Four vegetation types recorded within the BCAA are equivalent to '*Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*', '*Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*', and/or '*Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*'. These are EECs listed on the schedules of the TSC Act and will be impacted by the proposed development. Six out of nine vegetation zones are in moderate to good condition, and all six of these vegetation zones (zones 9, 10, 13, 15, 16 and 22) will be impacted, totalling 23.65 ha (0.51 ha of '*Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*', 22.39 ha of '*Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*' and 0.75 ha of '*Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*').

In addition, four areas of land with regional or state conservation significance (SEPP 14 Wetlands, vegetation within riparian buffers, and two fauna corridors regarded by OEH (letter to ELA 20 October 2014) as a '*state biodiversity link*' and '*regional biodiversity link*') will also be impacted. A total of 13.36 ha of SEPP 14 Wetlands, 1.34 ha of vegetation within riparian buffers, 0.32 ha of the state biodiversity link, and 36.12 ha of the regional biodiversity link will be impacted.

There are no other vegetation types >70% cleared in the Northern Rivers CMA that will be impacted other than '*Wet heathland and shrubland of coastal lowlands of the North Coast*' for which a request for MALD has been made on the basis of the percent cleared figure, which would mean this was not a red flag (**Section 3**). There are no threatened species requiring species credits that cannot withstand further loss that will be impacted.

In accordance with the procedures outlined by the OEH in undertaking a biocertification assessment, OEH were consulted throughout 2014 to determine whether a red flag impact and request for variation of

this magnitude would likely be approved by the Director-General of OEH. At meetings with OEH on 25 September and 8 October 2014 and a subsequent formal request for in principle support to these red flag variations in February 2015, OEH officers advised that further justification for impacts to EECs was required for each component of the project (**Appendix C**). This section provides this additional justification.

Impacts on red flagged areas according to Biometric vegetation types are shown in **Table 15**. It should be noted that only native vegetation within red flag areas are considered in **Table 15** (red flag areas such as land mapped or defined as a state or regional biodiversity link can contain urban development). Also, some areas of vegetation meet the definition of an EEC, SEPP 14 wetland, riparian buffer and biodiversity link. These areas have been calculated for each red flag area/entity and are not additive. If all overlap is removed, the combined total red flag vegetation impacted is 49.33 ha or 4.8% of the BCAA.

**Table 15: Impacted red flag vegetation**

BioMetric Vegetation Type	Impact (cleared and previously cropped)				
	EECs	SEPP 14 Wetlands	Riparian buffer	State Biodiversity Link	Regional Biodiversity Link
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	0	0	0	0	0.09
Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	0	0.04	0	0	19.28
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	0	0	0	0	3.10
Paperbark swamp forest of the coastal lowlands of the North Coast	19.85	11.20	0.80	0.23	11.88
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	0	0.99	0.01	0.09	1.77
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	2.54	0.34	0	0	0
Swamp Oak swamp forest of the coastal lowlands of the North Coast	1.01	0	0.26	0	0
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	0	0.29	0	0	0
Wet heathland and shrubland of coastal lowlands of the North Coast	0	0.49	0.26	0	0
Coastal freshwater meadows and forblands of lagoons and wetlands	0.51	0	0.01	0	0
<b>Total</b>	<b>23.91</b>	<b>13.36</b>	<b>1.34</b>	<b>0.32</b>	<b>36.12</b>

Further in response to OEH’s request to provide justification of each component of the Master Plan implementation on EECs, **Table 16** provides the area of each EEC impacted by each component of the Master Plan. **Table 17** provides the area of SEPP 14 wetlands, riparian buffers, and state and regional biodiversity links impacted by each component of the Master Plan. Impacts from proposed development and APZs in Council owned land within the Thrumster Area 13 Urban Release Area, easements and fire trails are also included in **Table 16** and **Table 17**.

The distribution and size of red flag vegetation on land proposed for biodiversity certification is discussed below for each of the red flag variation criteria outlined in section 2.4 of the BCAM, and are presented in **Table 18** and shown in **Figure 19** and **Figure 20**.

**Table 16: Area of EECs impacted by each component of the Airport Master Plan and from residential and light industrial development, easements and fire trails**

Master Plan Component	EEC			Total (ha)
	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (ha)	Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (ha)	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions (ha)	
OLS Clearing	0	15.84	0	15.84
Airport Infrastructure (Terminal Building, Car Park, Weather Stations, Flood free access road)	0	0.88	0.08	0.96
Airport Precinct Business and Accommodation Park	0	1.44	0	1.44
<b>Sub total (Airport Master Plan)</b>	<b>0</b>	<b>18.16</b>	<b>0.08</b>	<b>18.24</b>
Development and APZ	0	3.62	0.49	4.11
Easements and fire trails	0.51	0.60	0.18	1.29
<b>Sub total (development, easements, fire trail)</b>	<b>0.51</b>	<b>4.22</b>	<b>0.67</b>	<b>5.40</b>
<b>Total</b>	<b>0.51</b>	<b>22.38</b>	<b>0.75</b>	<b>23.65</b>
<b>% of impact required for OLS and CASA operational requirements</b>	<b>0%</b>	<b>74.71%</b>	<b>0%</b>	<b>71.07%</b>

**Table 17: Area of other red flags (with regional or state biodiversity conservation significance) impacted by each component of the Airport Master Plan and from residential and light industrial development, easements and fire trails**

Master Plan Component	SEPP 14 Wetlands	Riparian buffer	State Biodiversity Link	Regional Biodiversity Link
OLS Clearing	12.10	0.47		31.31
Airport Infrastructure (Terminal Building, Car Park, Weather Stations, Flood free access road)	0.97			
Airport Precinct Business and Accommodation Park			0.32	
<b>Sub total (Airport Master Plan)</b>	<b>13.07</b>	<b>0.47</b>	<b>0.32</b>	<b>31.31</b>
Development and APZ		0.71		3.26
Easements and fire trails	0.29	0.16		1.55
<b>Sub total (development, easements, fire trail)</b>	<b>0.29</b>	<b>0.87</b>		<b>4.81</b>
<b>Total</b>	<b>13.36</b>	<b>1.34</b>	<b>0.32</b>	<b>36.12</b>
<b>% impact required for OLS</b>	<b>91%</b>	<b>35%</b>	<b>0%</b>	<b>87%</b>
Area previously approved for cropping	4.41 ha	0	0	18.98 ha
Area approved for PNF	0 ha	0	0	15.21 ha

**Table 18: EEC red flag groups on land proposed for biodiversity certification**

EEC red flag groups	Type of impact	EEC	Condition	Ancillary	Location	Area impacted (ha)
FW	Easement and fire trail	Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Moderate to good	Good	West of the airport boundary on land zoned as environmental conservation (E2)	0.51
<b>Sub-Total</b>						<b>0.51</b>
SSF1	Development and APZ	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Moderate to good	Good	South of the airport boundary on land zoned as general residential (R1)	2.67
SSF2	OLS clearing (previously cropped)	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Moderate to good	Cropped	Directly south of the airport boundary on land zoned as environmental conservation and management (E2, E3)	5.35
SSF3	Airport infrastructure, OLS clearing, development, easement and fire trail	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Moderate to good	Good	Within, west and south of the airport boundary on land zoned environmental conservation and management, public recreation, infrastructure, primary production and business park (E2, E3, RE1, SP2, RU1 and B7)	14.38
<b>Sub-Total</b>						<b>22.39</b>
SOFF1	Airport infrastructure, development and APZ	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Moderate to good	Good, Weedy understorey	Along Boundary Road and south of the airport boundary on land zoned as primary production (RU1) (along Boundary Road), and general residential (in south) ( R1)	0.51

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EEC red flag groups	Type of impact	EEC	Condition	Ancillary	Location	Area impacted (ha)
SOFF2	Airport infrastructure and easement	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Moderate to good	Good, Weedy understorey	Along Boundary Road and west of the airport boundary on land zoned as environmental conservation (E2)	0.24
<b>Sub-Total</b>						<b>0.75</b>
						<b>23.65</b>



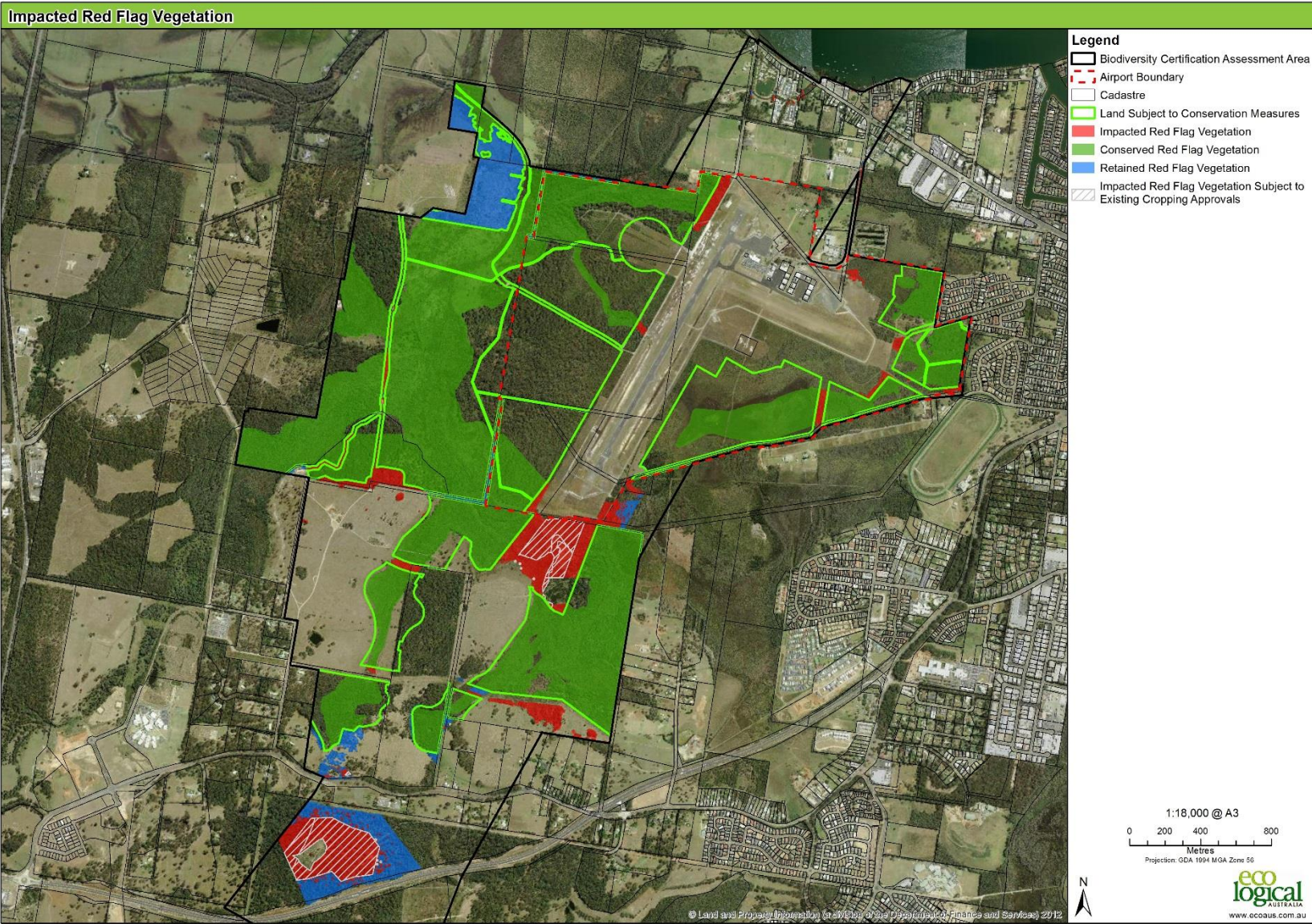


Figure 19: Impacted red flag vegetation

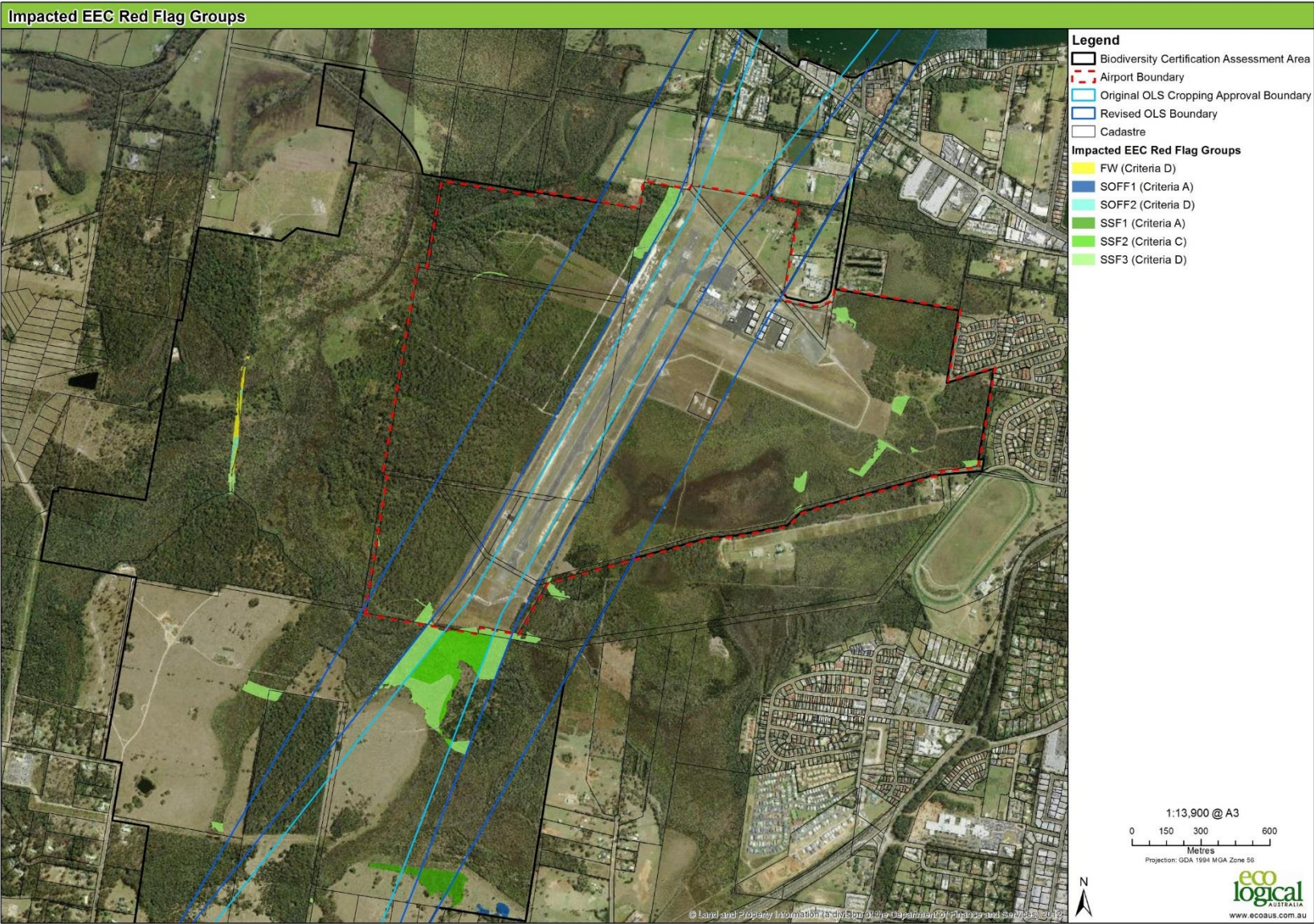


Figure 20: Impacted EEC red flag groups

## 4.2 Red Flag Variation Criteria

The presence of Red Flags within the proposed development area means that Biocertification of the land cannot be conferred unless a red flag variation is granted by the Director General of OEH. An application for a red flag variation must satisfactorily address the criteria in Section 2.4 of the BCAM (DECCW 2011) for a proposal to be regarded as improving or maintaining biodiversity values.

The following criteria must be addressed for a vegetation type which is greater than 70% cleared or is a critically endangered or endangered ecological community:

1. Feasibility of options to avoid impacts on red flag area(s) where biodiversity certification is conferred (Section 2.4.1 of the BCAM)
2. Viability must be low or not viable (Section 2.4.2.1 of the BCAM)
3. Contribution to regional biodiversity values must be low (Section 2.4.2.2 of the BCAM)

The following criteria, as outlined in Section 2.4.4 of the BCAM must be addressed for areas with regional or state biodiversity conservation significance:

1. The width of a riparian buffer with regional or state biodiversity significance must not be substantially reduced
2. The ecosystem functioning of a state or regional biodiversity link, considering migration, colonisation and interbreeding of plants and animals between two or more larger areas of habitat, must not be substantially impacted,
3. The water quality of a major or river, major or minor creek, or a listed SEPP 14 wetland must not be significantly impacted

The remaining red flag variation criteria (2.4.3 – species that cannot withstand further loss) does not need to be addressed in this application as there are no red flag species to be impacted in the BCAA.

The following sections provide the information required for OEH to assess a red flag variation for the impacted areas of the endangered ‘*Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*’, ‘*Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*’ and ‘*Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*’ (Section 4.2.1, 4.2.2), and the impacted areas with regional or state biodiversity conservation significance in the BCAA (Sections 4.2.1, 4.2.3). All of the EECs will be considered at the same time when addressing each criterion in Section 4.2.2 because the related information and mapping is broadly the same for each red flag.

### 4.2.1 Avoiding and Minimising Impacts on Red Flags (Criteria 2.4.1)

*The Director General must be satisfied that the feasibility of options to avoid impacts on red flag areas has been considered in the application for biodiversity certification. An application for biodiversity certification can address this requirement by demonstrating that:*

- a) *all reasonable measures have been taken to avoid adverse impacts on the red flag areas and to reduce impacts of development on vegetation remaining within the biodiversity certification area*

*b) appropriate conservation management arrangements cannot be established over the red flag area given its current ownership, status under a regional plan and zoning and the likely costs of future management.*

There is very little scope for exploring options to avoid adverse impacts on the majority of red flag areas. Port Macquarie Airport is an existing, operational airport and the revised OLS boundary and associated vegetation management requirements are required to be met to meet CASA operating requirements as a Code 4C airport. Implementation of CASA requirements is critical to ensuring the safety of aircraft operations. The airport has existed and operated since 1955 and approval to operate the airport as a Code 4C airport was granted in 2013. The OLS boundary and clearing requirements imposed by CASA was defined through reference to the runway ends and elevation of the Aerodrome Reference Point. The airport must also allocate area for critical aviation-related infrastructure and facilities within the aviation uses precinct to comply with CASA Code 4C aerodrome standards. In this context, the opportunities for red flagged vegetation to be avoided and for impacts on vegetation remaining within the OLS to be reduced and comply with CASA requirements are limited. Nevertheless, PMHC has assessed a number of alternative options to meet the OLS requirements including options that will result in partial impacts (as described below) to avoid and minimise impacts to the maximum extent possible.

Of the 23.65 ha of impacts to EECs, 16.8 ha (or 71.07%) is related to meeting the OLS and other CASA airport operational requirements. Only 1.44 ha (6.09%) is related to the Airport Business Park and mixed use precinct, which has been relocated to the Business Park to minimise impacts to EECs and Koala habitat and 5.41 ha (22.87%) to the development in Thurmster Area 13 (**Table 16**). In the context of the overall Airport Master Plan and the extent of these EECs to be permanently protected and managed for conservation (221.99ha), these impacts are considered to be relatively small and the vast majority cannot be avoided if the airport is to continue to operate and meet CASA requirements.

Of the impacts to red flag areas with regional or state biodiversity conservation significance, the majority of impacts is again related to meeting the OLS and other CASA airport operational requirements (13.07 ha of 13.36 ha of impacts to SEPP 14 wetlands or 97.83%), 0.47 ha of 1.34 ha of impacts to riparian buffers or 35.07%, and 31.31 ha of 36.12 ha of impacts to a regional biodiversity links or 86.68%). Further, 4.41 ha or 33% of the impacts to SEPP14 wetlands are already approved for cropping, and 18.98 ha or 52.54% of the regional corridor is already approved for cropping and/or private native forestry (**Table 17**). In the context of the overall Airport Master Plan and the extent of these red flag areas with regional or state biodiversity conservation significance to be permanently protected and managed for conservation (111.24 ha SEPP 14 wetlands, 26.70 ha riparian buffers, 8.77 ha of a state biodiversity link, and 61.78 ha of a regional biodiversity link), these impacts are considered to be relatively small.

The impacts to red flag vegetation have been minimised to the maximum extent possible. Within the OLS boundary, only those areas where there is a high density of vegetation needing to be managed has an OLS clearing boundary of 54 m (thus achieving the Code 4C 300 m wide runway strip) been identified rather than an OLS cropping boundary. A 54 m clearing area allows maximum operational certainty and efficiency in ongoing airport operations whilst reducing ongoing operational expenses associated with the need to re-crop areas every 2-3 years due to rapid regrowth of vegetation. Up to 20.9 ha has been identified outside of this corridor within land proposed for conservation measures for tree cropping only, and only if required. This area is labelled as 'conservation cropping' and includes areas where there are occasional trees that may require management based on predicted growth models and where vegetation does not require complete clearing. In consultation with OEH it has been identified that only single trees will be 'pruned' and subsequently poisoned to prevent regrowth. These trees will be left in-situ to provide fauna habitat (stags) and pruned material will not removed from site to minimise indirect impacts and other disturbances. Subsequently, the number of credits generated in these areas have been discounted

by 10% due to the weighting that ‘over-story’ has in credit calculations rather than reducing the ‘default gain’ in the credit calculator tool as the canopy attribute is already at benchmark and cannot be reduced. No other attributes are expected to be impacted, although there is expected to be an increase in hollow-bearing trees and logs on the ground). As only occasional trees will be removed, this is considered to be an overly conservative estimate on the area to which the 10% reduction in number of credits generated has been applied. Approximately 9.56 ha of ‘*Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*’ will be subject to selective cropping in conservation areas.

Where clearing is proposed east and west of the runway, as is the case with vegetation management in the existing OLS boundary, vegetation will not be cleared to bare earth but to a managed native ground cover, similar to an urban asset protection zone. These areas will retain biodiversity values and act as ‘buffers’ to retained vegetation, reducing indirect impacts, however for the purposes of the BCAM have been calculated as 100% loss. Further the area of ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’ at the southern end of the runway is proposed to be managed to permanently remove the trees only but retain the characteristics of the ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’. This is an EEC and will maintain water quality and functioning of the SEPP14 wetland, whilst avoiding attracting water birds that pose a risk to aviation operations. Where possible, some trees will be retained in the area south of the runway, and glider poles and ropes will be installed to maintain a link between conserved vegetation to the east and west of the runway (see **Section 4.2.3**). The photographs in Plate 1 show the current structure of the ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’, the areas that are currently cropped, and what the area would look like after tree removal showing the retained ground cover of sedges, rushes and forbs. The resulting vegetation structure will continue to provide habitat for Eastern Chestnut Mouse, Wallum Froglet, Grass owl and other species.

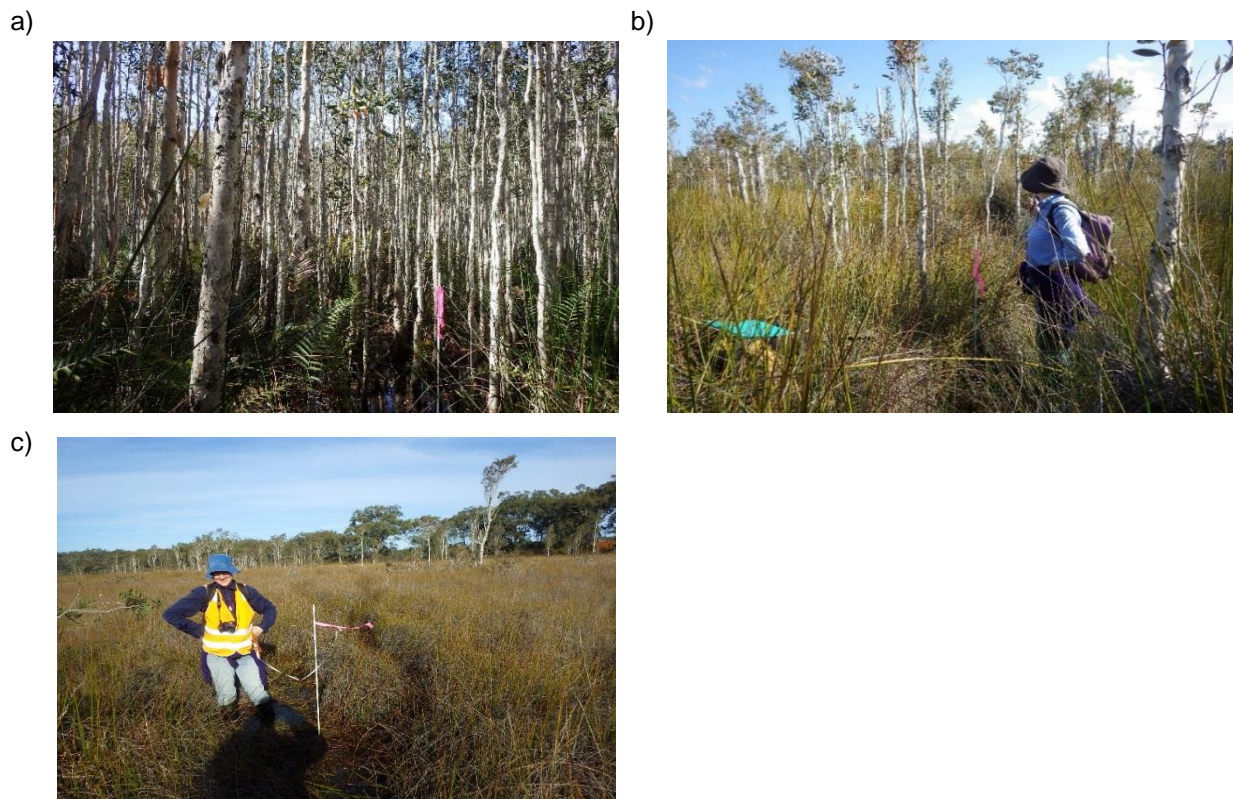


Plate 1: Paperbark swamp forest before tree removal (a) and after tree removal (b), resulting in a Coastal freshwater meadow and forbland (c)

#### 4.2.2 Assessment criteria for red flag areas that contain EECs (Criteria 2.4.2)

##### *Viability (Criteria 2.4.2.1)*

The BCAM states that:

*The application for biodiversity certification must demonstrate to the satisfaction of the Director General that the viability of biodiversity values in the red flag area is low or not viable.*

*For the purpose of the methodology, viability is defined as the ability of biodiversity values at a site to persist for many generations or long time periods. The ecological viability of a site and its biodiversity values depend on its:*

- *condition*
- *the area of the patch of native vegetation and its isolation*
- *current or proposed tenure and zoning under any relevant planning instrument*
- *current and proposed surrounding land use*
- *whether mechanisms and funds are available to manage low viability sites such that their viability is improved over time*

*In making an assessment that the viability of biodiversity values in the red flag area is low or not viable, the Director General must be satisfied that one of the following factors applies:*

*a) The current or future uses of land surrounding the red flag area where biodiversity certification is to be conferred reduce its viability or make it unviable. Relatively small areas of native vegetation surrounded or largely surrounded by intense land uses, such as urban development, can be unviable or have low viability because of disturbances from urbanisation, including edge effects; or*

*b) The size and connectedness of the vegetation in the red flag area where biodiversity certification is to be conferred to other native vegetation is insufficient to maintain its viability. Relatively small areas of isolated native vegetation can be unviable or have low viability; or*

*c) The condition of native vegetation in the red flag area where biodiversity certification is to be conferred is substantially degraded, resulting in loss of or reduced viability. Native vegetation in degraded condition can be unviable or have low viability. ‘Degraded condition’ means substantially outside benchmark for many of the vegetation condition variables as listed in Table 1 of the methodology (s.3.6.2), without the vegetation meeting the definition of low condition set out in section 2.3. Vegetation that is substantially outside benchmark due to a recent disturbance such as a fire, flood or prolonged drought is not considered degraded for the purposes of the methodology; or*

*d) The area of a vegetation type in a red flag area on land where biodiversity certification is conferred is minor relative to the area containing that vegetation type on land subject to proposed conservation measures.*

Reference is made to **Table 18** and **Figure 20** when addressing the viability of the red flag vegetation that comprises EECs in the BCAA.

In summary, 22.39 ha of red flagged Swamp sclerophyll forest, comprised of two biometric vegetation types (Paperbark swamp forest and Swamp Mahogany swamp forest), 0.75 ha of Swamp Oak Floodplain Forest, and 0.51 ha of Freshwater Wetlands will be impacted by the proposal.

Note that different criteria/factors (a, b, c or d) are considered in assessing the viability of the separate EEC red flag areas. Only one factor is discussed per EEC red flag area to demonstrate that viability of biodiversity values in red flag areas is low or not viable. **Table 19** summarises the criteria that are satisfied by the EEC red flag area, with detail provided under each criteria.

**Table 19: Criteria satisfied by EEC red flag groups**

EEC red flag group	Section 2.3.2.2. criteria satisfied
FW	D – area impacted is minor relative to the area proposed to be conserved
SSF1	A - current and/or future proposed land use surrounding red flag area reduces viability
SSF2	C - red flag area is substantially degraded
SSF3	D – area impacted is minor relative to the area proposed to be conserved
SOFF1	A - current and/or future proposed land use surrounding red flag area reduces viability
SOFF2	D - area impacted is minor relative to the area proposed to be conserved

**a) Current or Future Land Use surrounding the red flag area**

The ongoing operational use of an existing airport and proposed urban development in Thurmster Area 13 which surrounds the red flag areas SSF1 and SOFF1 are considered existing “*current and future uses*” for the purposes of criteria ‘a’. Further, associated infrastructure for an existing airport is considered “*future uses*” for the purposes of criteria ‘a’ since the Mid North Coast Regional Strategy (DoP 2009) identifies two proposed employment land areas that comprise the proposed Airport Precinct Business Park, and the original Airport Accommodation Precinct was zoned ‘residential’ and is an integral component of the Master Plan providing accommodation associated with the operation of the Airport. The relocation of the original Airport Accommodation Precinct to the Airport Business Park precinct to reduce impacts to red flag areas as well as meeting the CASA OLS requirements will require various amendments to the PMH LEP 2011. The Council owned lands to be developed in the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area are also zoned ‘residential’ or ‘industrial’, are mainly located on cleared land, and are subject to the provisions of the PMH Development Control Plan (PMHC 2013).

The current and future land uses on and surrounding EEC red flag groups SSF1 and SOFF1 reduce the viability of ‘*Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*’ and ‘*Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions*’. This is because land in these areas is or will be subject to disturbance from urbanisation (from residential development and an operational airport). Land zoning where SOFF1 and SSF1 is located does not guarantee protection of vegetation. Land is zoned general residential in the south of the BCAA where part of SOFF1 and all of SSF1 are located, and a Council road reserve (Boundary Street) where the remaining part of SOFF1 is located (**Table 18, Figure 6 and Figure 20**).

Currently, the area in the south of the BCAA where part of SOFF1 and all of SSF1 are located is cleared of vegetation and is separated from areas proposed for conservation measures by a high voltage powerline easement that is regularly maintained by slashing. The area of red flagged Swamp Oak Forest in the south of the BCAA comprises three separate patches totalling only 0.49 ha. Similarly, the patch on Boundary Street is only 0.02 ha in area, is within the verge of an existing road, is adjacent to a private residence and is regularly mown. As such, the red flag groups, SSF1 and SOFF1, fringe open, exotic

grassed areas. Current land use is likely to result in on-going long-term impacts on the edges of the patches comprising red flag groups SOFF1 and SSF1. These impacts, termed “edge effects” describe the various consequences on vegetation and wildlife, which occur as a result of vegetation sharing a border with a developed/cleared area. The type of edge effects likely to impact the vegetation patches at these locations include nutrient enrichment, weed invasion, illegal dumping and unauthorised clearing.

Although the vegetation in the red flag group SSF1 may have a good level of plant species diversity and is in good condition (**Table 18**), because this land is not required to be managed for conservation under any legislative provisions, and these impacts are currently not actively managed or will not be managed in the future, current land use will result in a long-term decline in biodiversity values. Accordingly, due to the current and proposed future land uses and their small size, these areas are considered to be unviable.

**c) Vegetation substantially outside of benchmark condition (or degraded condition)**

Red flag group SSF2 combined patches of ‘Cropped’ ‘Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions’, which were all classified as vegetation zone 10. Plot data for vegetation zone 10 showed that some vegetation condition variables were outside benchmark. Native over-storey cover, mid-storey cover, native ground cover (grass), native ground cover (shrubs), and number of trees with hollows were below benchmark for plot 10-1, including zero values for native mid-storey cover, native ground cover (shrubs), and number of trees with hollows, and low values for native over-storey cover and native ground cover (grass). The benchmark ranges for ‘Paperbark swamp forest of the Coastal lowlands of the North Coast’ are 10-70 for native over-storey cover, 5-80 for native mid-storey cover, 5-50 for native ground cover (grass), and 5-60 for native ground cover (shrubs), with the benchmark value for the numbers of trees with hollows being 1 (**Table 14**). Indeed, the site value score for veg zone 10 was 40.43, compared to 73.44 for Zone 9 (Paperbark Swamp Forest in good condition). A site value score of less than 34 is considered to be in “low” condition and does not constitute a red flag. SSF2 is thus substantially outside benchmark condition and very close to not being classified as a red flag area.

**d) Relative area of red flag vegetation impacted compared to land subject to conservation measures**

The areas and proportions of the EECs impacted and conserved in the BCAA are detailed in **Table 20**. Also included in **Table 20** are details of the relative amount of EECs impacted compared to EECs in land subject to conservation measures. Note that the areas of EECs impacted are calculated for red flag groups that have not been addressed for low viability by criteria ‘a’ or ‘c’ i.e. residual areas.

The OEH has indicated that a 5-10% range of EECs impacted compared to EECs in land subject to conservation measures represents a ‘relatively minor’ impact. The percentage of each EEC impacted compared to conserved is below the range indicated by OEH as representing a ‘relatively minor’ impact. The amount of ‘Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions’ that will be impacted (0.51 ha) compared to the amount conserved (56.12 ha) is 0.91%. The amount of ‘Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions’ that will be impacted (0.24 ha) compared to the amount conserved (9.20 ha) is 2.61%. The amount of ‘Swamp sclerophyll forest of coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions’ that will be impacted (14.38ha) compared to the amount conserved (156.67 ha) is 9.18%.

Combining the EECs, the percentage of EECs impacted compared to conserved is also below the range representing a ‘relatively minor’ impact. The combined amount of EECs impacted (14.62 ha) compared to conserved (221.99 ha) is 6.59%.



**Table 20: EECs on development and conservation land and proportion of EECs impacted relative to conserved. Note that the areas of EECs impacted are calculated for red flag groups that have not been addressed for low viability by criteria ‘a’ or ‘c’ i.e. residual areas**

EEC red flag group	EEC Name	Area within BCAA (ha)	Area Impacted (ha)	Proportion in BCAA Impacted (%)	Area Conserved (ha)	Proportion in BCAA Conserved (%)	Proportion impacted relative to conserved (%)
FW	Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	74.42	0.51	0.69	56.12	75.41	0.91
SSF3	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	184.43	14.38	7.80	156.67	84.95	9.18
SOFF2	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	10.47	0.24	2.29	9.20	87.87	2.61
Total for both EECs		269.32	14.62	5.43	221.99	82.43	6.59

*Contribution to Regional Biodiversity Values (Criteria 2.4.2.2)*

The BCAM states that:

*The application for biodiversity certification must demonstrate to the satisfaction of the Director General that the red flag area on land proposed for biodiversity certification makes a low contribution to regional biodiversity values.*

*In making an assessment that the contribution of the red flag area to regional biodiversity values is low, the Director General must consider the following factors for each vegetation type or critically endangered or endangered ecological community regarded as a red flag area:*

*a) relative abundance: that the vegetation type or critically endangered or endangered ecological community comprising the red flag area is relatively abundant in the region; and*

*b) percent remaining is high: that the percent remaining of the vegetation type or critically endangered or endangered ecological community comprising the red flag area is relatively high in the region; and*

*c) percent native vegetation (by area) remaining is high: that the percent remaining of all native vegetation cover in the region is relatively high.*

*'Region' for the purposes of section 2.4.2.2 means the CMA subregion in which the red flag area is located and any adjoining CMA subregions.*

The contribution to regional biodiversity values was assessed for both red flagged EECs in the BCAA, using regional datasets where available. Under the BCAM the 'region' is defined as both the CMA subregion where the red flag area is located (in this case the Macleay-Hastings subregion of the Northern Rivers CMA) and adjoining CMA subregions: the Comboyne Plateau, Upper Manning, Macleay Gorges, Carrai Plateau and Coffs Coast & Escarpment as shown in **Figure 21**.

The use of regional vegetation datasets in this assessment, while the best data currently available, does have limitations. The data in some cases is several years old and therefore the extant mapping may require revision.

In addition, most regional vegetation mapping products only map patches greater than a minimum size (for example 0.5 ha) and generally only map vegetation in reasonably good condition. It is highly likely that smaller patches of the red flag vegetation type exists in the relevant regions, however have not been included in this assessment as the patches are too small to map, or the condition is disturbed and therefore has not been mapped.

Information on the contribution to regional biodiversity values, including an assessment of the relative abundance of the red flagged vegetation type, the percent remaining of the vegetation type, and percent native vegetation remaining in the region, is provided below.

**a) Relative Abundance**

The first measure for the contribution to regional biodiversity values criteria is a measure of relative abundance of the red flagged vegetation types in the 'region'.

Analysis was conducted into the relative abundance of the red flagged vegetation types across the entire 'region'. The associated data layers that were assessed included:

- *Vegetation Map for the Northern Rivers Catchment Management Authority to Support Application of the Biodiversity Forecast Toolkit (ELA 2005)*

- *Comprehensive Regional Assessment Aerial Photographic Interpretation (CRAFTI) Floristic Layer for the Upper North East* (National Parks and Wildlife Service [NPWS] 2001a)
- *CRAFTI Floristic Layer for the Lower North East* (NPWS 2001b)

ELA is confident that the data used capture the majority of the BioMetric vegetation types ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’, ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’, ‘*Swamp Mahogany swamp forest of the coastal lowlands of the North Coast*’, and ‘*Swamp Oak swamp forest of the coastal lowlands of the North Coast*’ as the extent of these vegetation types are restricted to the ‘region’ as defined by the BCAM and is largely incorporated into the mapping used.

The results of the analysis for each vegetation type can be seen in **Table 21** and the distribution of the vegetation types is displayed in **Figure 22**. Note that ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’, ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’, ‘*Swamp Mahogany swamp forest of the coastal lowlands of the North Coast*’, and ‘*Swamp Oak swamp forest of the coastal lowlands of the North Coast*’ did not occur in the sub CMAs Carrai Plateau, Comboyne Plateau, Macleay Gorges or Upper Manning, so these are not shown in **Table 21**.

**Table 21: Relative abundance of red flag vegetation types/EECs in surrounding regions**

BioMetric Vegetation Type	Area impacted (ha)	Area in Hunter / Central Rivers CMA (ha) (NPWS 2001a and b)	Area in Northern Rivers CMA (ha) (ELA 2005)		Total Area in CMAs (ha)
		Sub CMA: Macleay Hastings	Sub CMA: Coffs Coast & Escarpment	Sub CMA: Macleay Hastings	
Coastal freshwater meadows and forblands of lagoons and wetlands	0.51	680	89	640	1,409
Paperbark swamp forest of the coastal lowlands of the North Coast	19.85	1,969	1,779	17,780	21,528
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	2.54	171	277	1,411	1,859
Swamp Oak swamp forest of the coastal lowlands of the North Coast	0.75	0	295	937	1,231
<b>Total</b>	<b>23.65</b>	<b>2,820</b>	<b>2,439</b>	<b>20,768</b>	<b>26,027</b>

**Table 21** demonstrates that each EEC is relatively abundant in the region, with ‘*Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregion*’ the most abundant of the EECs.

The results for impacts to ‘*Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregion*’ in a regional context are summarised below:

- 640 ha is recorded within the Northern Rivers CMA (Macleay Hastings subregion), in which the BCAA is located. The clearing of 0.51 ha represents 0.08% of the total extent of the vegetation type in the Northern Rivers CMA (Macleay Hastings subregion)
- In the region, 0.51 ha to be impacted by this proposal represents 0.04% of the extant '*Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregion*'.

The results for impacts to '*Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregion*' in a regional context are summarised below:

- 19,191 ha is recorded within the Northern Rivers CMA (Macleay Hastings subregion), in which the BCAA is located. The clearing of 22.39 ha represents 0.11% of the total extent of the vegetation type in the Northern Rivers CMA (Macleay Hastings subregion)
- In the region, 22.39 ha to be impacted by this proposal represents 0.10% of the extant '*Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregion*'.

The results for impacts to '*Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregion*' in a regional context are summarised below:

- 937 ha is recorded within the Northern Rivers CMA (Macleay Hastings subregion), in which the BCAA is located. The clearing of 0.75 ha represents 0.08% of the total extent of the vegetation type in the Northern Rivers CMA (Macleay Hastings subregion)
- In the region, 0.75 ha to be impacted by this proposal represents 0.06% of the extant '*Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregion*'.

The above information indicates that the impact to the red flagged vegetation types/EECs from the proposal is 'relatively minor' when compared to the amount mapped in the analysed regions.



Figure 21: 'Region' derived from adjacent CMA subregions

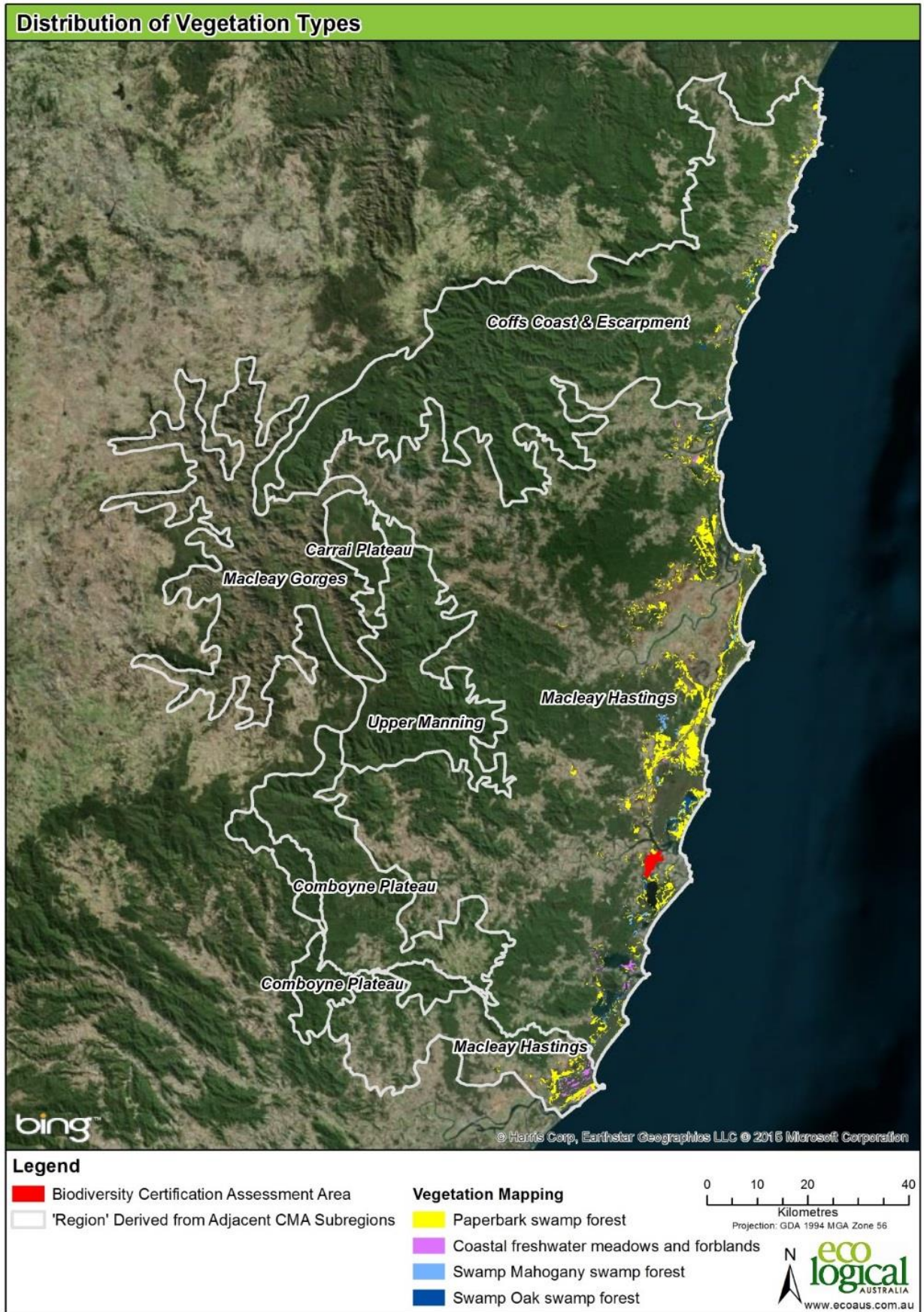


Figure 22: Regional distribution of vegetation types

**b) Percent Remaining is high**

There are few data sources available to determine the percent remaining of each vegetation type in the ‘region’. While the OEH Vegetation Types Database (DECC 2008) has estimates for the percent remaining of each vegetation type, estimates are for entire CMAs, not for individual CMA subregions. Information at the subregion level is required to estimate the percent remaining of each vegetation type in the ‘region’ given the definition of ‘region’ includes the CMA subregion in which the BCAA occurs and adjoining CMA subregions.

Given the lack of data sources to determine the percent remaining of each vegetation type in the ‘region’, information on the percent remaining of each vegetation type in the Northern Rivers CMA and the Hunter-Central Rivers CMA is provided. It is acknowledged that the percent remaining of each vegetation type in the Northern Rivers and Hunter-Central Rivers CMAs may not be an accurate reflection of the percent remaining in the ‘region’. The results of the analysis are shown in **Table 22**.

The OEH vegetation types database records ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’ as being 40% cleared within the Northern Rivers CMA. This leaves 60% of the vegetation type remaining in the Northern Rivers CMA.

The OEH vegetation types database records ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’ as being 75% cleared within both the Northern Rivers and Hunter-Central Rivers CMAs. This leaves 25% of the vegetation type remaining in the Northern Rivers and Hunter-Central Rivers CMAs.

The OEH vegetation types database records ‘*Swamp Mahogany swamp forest of the coastal lowlands of the North Coast*’ as being 75% cleared within the Northern Rivers CMA, and 60% cleared within the Hunter-Central Rivers CMA. This leaves somewhere between 25% and 40% of the vegetation type remaining in the Northern Rivers and Hunter-Central Rivers CMAs.

The OEH vegetation types database records ‘*Swamp Oak swamp forest of the coastal lowlands of the North Coast*’ as being 75% cleared within both the Northern Rivers and Hunter-Central Rivers CMAs. This leaves 25% of the vegetation type remaining in the Northern Rivers and Hunter-Central Rivers CMAs.

Therefore, the percent remaining of ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’ in the region is high. In contrast, the percent remaining of other EECs in the region is not as high.

**Table 22: Percent remaining of each vegetation type/EEC**

Biometric Vegetation Type	Area Impacted (ha)	% Remaining in Northern Rivers CMA (DECC 2008)	% Remaining in the Hunter-Central Rivers CMA (DECC 2008)
Coastal freshwater meadows and forblands of lagoons and wetlands	0.51	60	N/A
Paperbark swamp forest of the coastal lowlands of the North Coast	19.85	25	25
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	2.54	25	40
Swamp Oak swamp forest of the coastal lowlands of the North Coast	0.75	25	25

**c) Percent Native Vegetation (by area) is high**

The area of native vegetation was calculated for the region, being the Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Macleay Gorges, and Upper Manning CMA subregions, is shown in **Table 23** and **Figure 23**. The OEH state-wide vegetation extent layer was used for the assessment (Keith and Simpson 2006) and was intersected with the six CMA subregions to determine the proportion of each region with native vegetation cover.

**Table 23: Native vegetation cover of CMA subregions**

Native Vegetation Cover	Carrai Plateau (ha)	Coffs Coast and Escarpment (ha)	Comboyne Plateau (ha)	Macleay Gorges (ha)	Macleay Hastings (ha)	Upper Manning (ha)	Total (ha)
Cleared	1,225 (6%)	53,573 (17%)	15,753 (13%)	7,667 (5%)	272,876 (38%)	285 (0.34%)	351,380 (25%)
Vegetated	18,862 (94%)	253,762 (83%)	107,481 (87%)	145,517 (95%)	449,517 (62%)	82,837 (99.66%)	1,058,054 (75%)
Total	20,087 (100%)	307,335 (100%)	123,234 (100%)	153,262 (100%)	722,393 (100%)	83,123 (100%)	1,409,434 (100%)

In total, 75% (1,058,054 ha) of the assessment region contains native vegetation cover. The proportion of vegetation cover for five of the CMA subregions is high, with Upper Manning containing 99.7%, Macleay Gorges containing 95%, Carrai Plateau containing 94%, Comboyne Plateau containing 87% and Coffs Coast and Escarpment containing 83% vegetation cover. The CMA subregion, Macleay Hastings, in which the BCAA occurs, has been cleared to a greater extent and contains 62% native vegetation cover.

Despite the clearing in the Macleay Hastings CMA, the percent of native vegetation in the region is high.



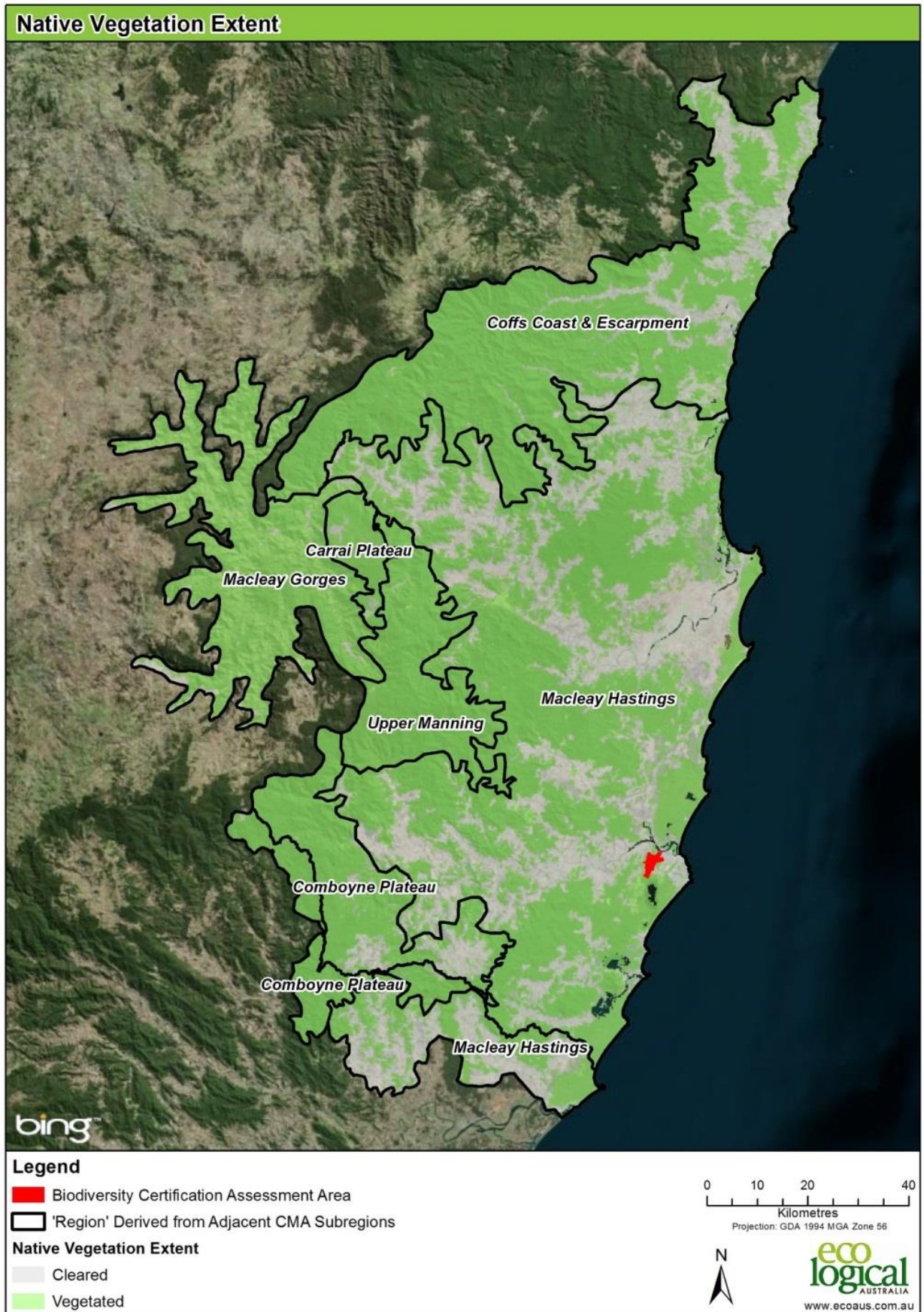


Figure 23: Native vegetation extent

#### 4.2.3 Additional Assessment criteria for areas with regional or state biodiversity conservation significance (Criteria 2.4.4)

##### *Width of riparian buffer with regional or state biodiversity significance (Criteria 2.4.4a)*

The width of a riparian buffer with regional or state biodiversity significance (i.e. the riparian buffers on major or minor creeks and rivers) must not be substantially reduced.

The proposal will reduce the riparian buffer on streams within the BCAA (**Table 15** and **Figure 24**). However, the reduction is not considered to be substantial. The BCAA contains a total of 29.48 ha of riparian buffers of regional or state biodiversity significance. The amount impacted represents 4.55% of riparian buffers present in the BCAA. Approximately 90.58% of the riparian buffers in the BCAA occur in land proposed for conservation (**Table 24**), with the remainder either cropped or occurring in retained land.

The riparian buffers that will be impacted are located on the western edge of the airport runway, in the west and south of the BCAA on lands that will be developed for the Thrumster Urban Release Area, and in the west where an easement for likely future demand is proposed.

The riparian buffers impacted on the western edge of the airport runway and in the south of the BCAA on land to be developed will be impacted at the origins of minor creeks rather than at a mid-point or mouth of the minor creeks (**Figure 24**). Approximately 220 m of the start of the minor creek at the edge of the airport runway, and 195 m of the start of the minor creek in the south of the BCAA, will be impacted. The start points of minor creeks are usually small since they are tributaries feeding larger creeks. Until they develop and collect more water further from the origin, they do not generally support vegetation associated with drainage/creeks i.e. riparian vegetation. Thus, the riparian corridors that will be impacted at these sections of the minor creeks will most likely contain minimal riparian vegetation supporting and associated with the stream. While an important part of the riparian area, reduction by 220 m, 195 m at the origin of the minor creeks is not considered to be a substantial reduction of the riparian corridor.

It is noted that a part of the riparian corridor located at the edge of the airport runway that will be impacted has previously been impacted by the airport runway and existing OLS management. ELA's calculations for the width of riparian buffers impacted have been made on the drainage layer. This layer extends into areas already cleared for the airport runway by 85 m. As such, the area of riparian corridor impacted is less than that calculated. Assuming a length of 85 m and a width of 40 m, the area already impacted is approximately 0.34 ha. Thus, the area of riparian corridor that will be impacted by the proposal is approximately 1.0 ha.

In contrast to the riparian buffers impacted on the western edge of the airport runway and in the south of the BCAA, the riparian buffers impacted in the west of the BCAA on land to be developed and in proposed easement areas will be impacted at points other than the origin or mouth of minor creeks. However, impacts will be from proposed roads and easements. The width of the impact from the road is approximately 20 m within an indicated 50m corridor, while the width of the impact from the easement is approximately 30 m at its widest point. This is not considered to be a substantial reduction in the riparian corridor. Culverts and fauna underpasses will be incorporated into roads at the points where the roads cross these riparian buffers to maintain the function of these riparian areas (PMH DCP 2013).

**Table 24: Riparian corridors on development and conservation land**

BioMetric Vegetation Type	Area within BCAA (ha)	Area Impacted (ha)	Proportion Impacted (%)	Area Conserved (ha)	Proportion Conserved (%)
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	0.30	0	0	0.30	100
Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	0.03	0	0	0.02	62.54
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	0	0	0	0	0
Paperbark swamp forest of the coastal lowlands of the North Coast	14.21	0.80	5.60	13.07	91.96
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	0.79	0.01	0.95	0.79	0.05
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	0.76	0	0	0.76	100
Swamp Oak swamp forest of the coastal lowlands of the North Coast	2.65	0.26	9.82	2.24	84.78
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	0	0	0	0	0
Wet heathland and shrubland of coastal lowlands of the North Coast	1.92	0.26	13.83	1.65	86.17
Coastal freshwater meadows and forblands of lagoons and wetlands	8.83	0.01	0.15	7.88	89.17
<b>Total</b>	<b>29.48</b>	<b>1.34</b>	<b>4.55</b>	<b>26.70</b>	<b>90.58</b>

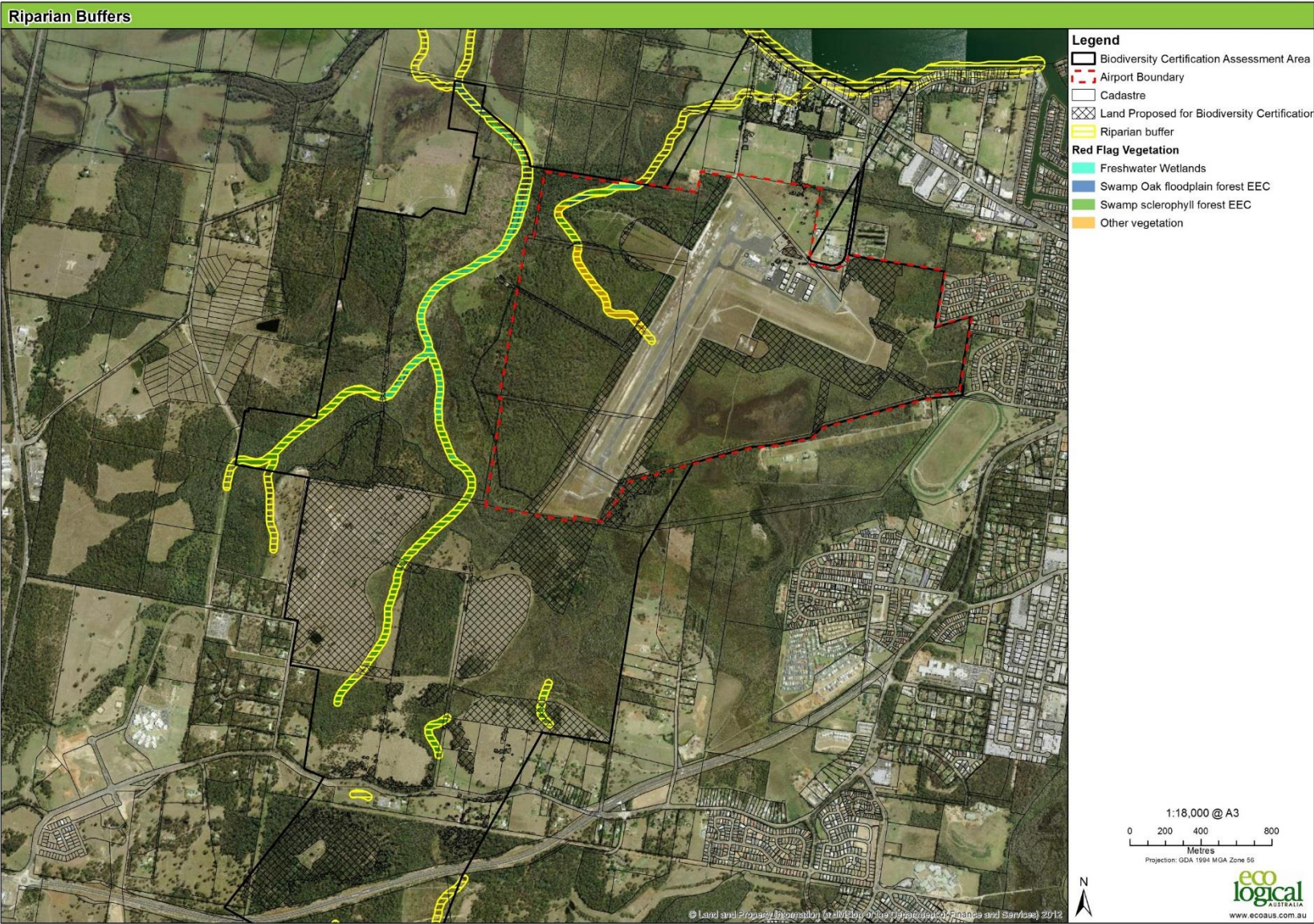


Figure 24: Riparian buffers with regional or state biodiversity significance impacted

*Ecosystem functioning of a state or regional biodiversity link (Criteria 2.4.4b)*

The ecosystem functioning of a state biodiversity link or a regional biodiversity link must not be substantially impacted, considering migration, colonisation and interbreeding of plants and animals between two or more larger areas of habitat.

The proposal will impact 0.32 ha of vegetation within a state biodiversity link identified in the Mid North Coast Regional Strategy (DOP 2009) (**Table 15** and **Figure 25**). The impacted area represents a minor proportion of the state biodiversity link in the BCAA, with 3.45% of the proportion of the link within the BCAA impacted and a negligible proportion of the link as a whole impacted. (**Table 25**). The impact to the link are caused by two proposed access roads into the airport precinct that are currently largely cleared fire and management trails. Vegetation and habitat directly adjacent to the state biodiversity link to the west will be retained in the BCAA (**Figure 25**). While not within the boundary of the state biodiversity link, vegetation and habitat directly adjacent to the state link would continue to connect vegetation and habitat to the north and south of the impacted area within the biodiversity link, allowing for migration, colonisation and interbreeding of flora and fauna using this habitat. Hence, the ecosystem functioning of the state biodiversity link will not be substantially impacted by the proposal.

The proposal will impact 36.12 ha of vegetation within a regional biodiversity link identified in the Mid North Coast Regional Strategy (DOP 2009) (**Table 15** and **Figure 25**). However, of the 36.12 ha of vegetation impacted, 18.89 ha or 52.54% has been previously approved for cropping at the southern end of the runway and to the south of Oxley Drive and 15.21 ha of the area approved for cropping has also been approved for a Private Native Forestry Operation (**Table 17** and **Table 26**).

The total area to be impacted (36.12 ha) represents a moderate proportion (31.73%) of the regional biodiversity link in the BCAA. However, given the existing approvals for cropping over part of this total impact area in the biodiversity link, the additional area to be impacted as part of the proposal comprises 17.23ha, which represents a small proportion (15.14%) of the regional biodiversity link in the BCAA.

The current approved cropping and Private Native Forestry Operation are existing impacts on the ecosystem functioning of the regional biodiversity link particularly in regards to the movement and interbreeding of some of the animals between the retained vegetation east and west of the runway. However, under the proposal significant areas of un-impacted vegetation will remain (and be protected for active conservation management) both east and west of the impacted area providing north-south connectivity, particularly for mobile fauna such as Koala and Squirrel Glider, between the protected conservation lands east and west of the main runway and national parks estate to the south of the BCAA.

Further, it is proposed to permanently remove trees only from the area immediately south of the runway, retaining the characteristics of '*Coastal freshwater meadows and forblands of lagoons and wetlands*' to mitigate impacts to fauna movement and protect water quality in the SEPP 14 wetlands whilst avoiding attracting water birds that pose a risk to aviation operations. Where possible, some trees will be retained in the area south of the runway, and glider poles and ropes will be installed to maintain a link between conserved vegetation to the east and west of the runway. There is also the potential to allow some low revegetation/landscaping in the land

As such, overall, the ecosystem functioning of the regional biodiversity link is not considered to be substantially impacted by the proposal and to some extent will be enhanced as a result of proposed mitigation measures above the existing situation, to enable continued migration, colonisation and interbreeding of plants and animals between habitat either side of the link. These measures will be detailed in a Vegetation Management Plan for the proposal.

**Table 25: State biodiversity link on development and conservation land**

BioMetric Vegetation Type	Area within BCAA (ha)	Area Impacted (ha)	Proportion Impacted (%)	Area Conserved (ha)	Proportion Conserved (%)
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	0	0	0	0	0
Blackbutt - Tallowood dry grassy open forest of the central parts North Coast	0	0	0	0	0
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	0	0	0	0	0
Paperbark swamp forest of the coastal lowlands of the North Coast	0.38	0.23	61.32	0.15	38.68
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	2.07	0.09	4.32	1.95	93.95
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	6.05	0	0	5.95	98.36
Swamp Oak swamp forest of the coastal lowlands of the North Coast	0	0	0	0	0
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	0.14	0	0	0.14	100
Wet heathland and shrubland of coastal lowlands of the North Coast	0.63	0	0	0.59	93.94
Coastal freshwater meadows and forblands of lagoons and wetlands	0	0	0	0	0
<b>Total</b>	<b>9.27</b>	<b>0.32</b>	<b>3.49</b>	<b>8.77</b>	<b>94.64</b>

**Table 26: Regional biodiversity link on development and conservation land**

BioMetric Vegetation Type	Area within BCAA (ha)	Area Impacted (ha)	Proportion Impacted (%)	Area Conserved (ha)	Proportion Conserved (%)
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	4.01	0.09	2.15	3.92	97.78
Blackbutt - Tallowood dry grassy open forest of the central parts North Coast	47.80	19.28	40.33	15.86	33.18
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	3.87	3.10	80.07	0	0
Paperbark swamp forest of the coastal lowlands of the North Coast	50.15	11.88	23.69	36.64	73.07
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	3.91	1.77	45.35	1.32	33.73
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	0	0	0	0	0
Swamp Oak swamp forest of the coastal lowlands of the North Coast	0	0	0	0	0
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	0	0	0	0	0
Wet heathland and shrubland of coastal lowlands of the North Coast	0	0	0	0	0
Coastal freshwater meadows and forblands of lagoons and wetlands	4.08	0	0	4.04	98.95
<b>Total</b>	<b>113.82</b>	<b>36.12</b>	<b>31.73</b>	<b>61.78</b>	<b>54.28</b>

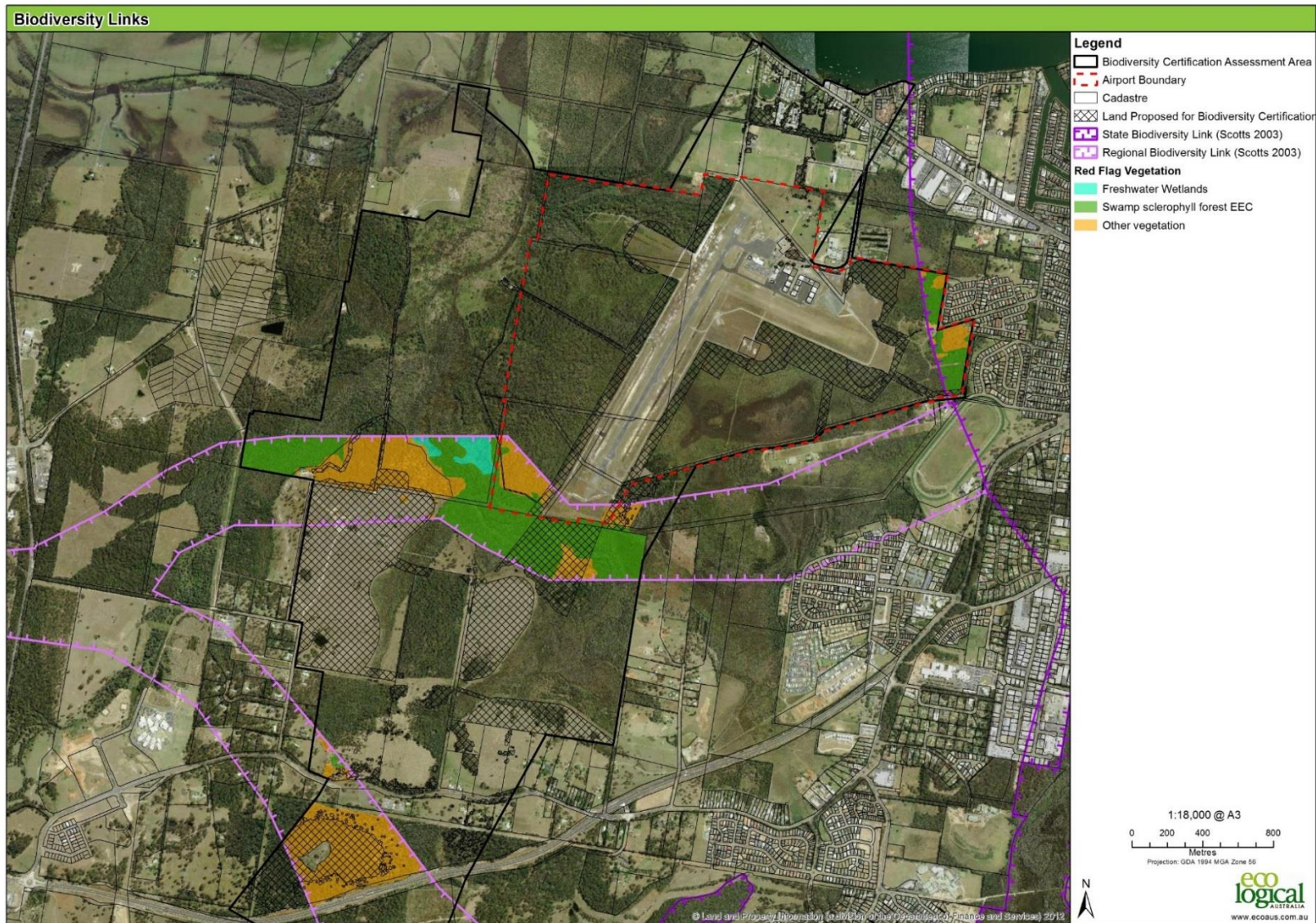


Figure 25: State and regional biodiversity links impacted



*Water quality of SEPP 14 wetland (Criteria 2.4.4c)*

The water quality of a major river, minor river, major creek, minor creek, or a listed SEPP 14 wetland must not be significantly impacted.

Removal or modification of vegetation from within listed SEPP 14 wetlands or minor creeks could significantly impact water quality where clearing occurs in vegetation types categorised as belonging to the broad vegetation formations ‘freshwater wetland’ and ‘forested wetlands’ unless appropriate controls are put in place. Standing water is present in freshwater wetland and forested wetland communities and so water quality would be impacted as sediment was disturbed during clearing/vegetation management activities and dispersed. Also, removal of the trees in vegetation communities lying directly adjacent to SEPP 14 wetlands could impact the water quality of listed wetlands in these areas if controls were not in place protecting adjacent wetlands from sediment-laden water or any pollutants. Following the removal of vegetation within SEPP 14 wetlands, the water quality of SEPP 14 wetland could be impacted by run-off of water from man-made structures (e.g. roads) entering wetlands. An alternate flood free access road is proposed through a SEPP 14 wetland in the north east of the BCAA, south of the proposed business park.

The proposal will result in impacts to 13.36 ha of three SEPP 14 wetlands by clearing vegetation for the flood free access road (0.97 ha), registered fire trail (0.13 ha), pipeline easement (0.16 ha), and revised OLS requirements at the southern end of runway (12.10 ha) (**Figure 26**). Of these impacts, 4.41 ha or 33% is already approved for cropping within the SEPP14 boundaries and all of the 12.10 ha of impacts to vegetation within SEPP 14 wetlands to meet the OLS requirements will be partial impacts only i.e. the cropping and poisoning of trees to prevent regrowth and left in-situ. The proposal will also likely disturb soils adjacent to SEPP 14 wetlands through the removal of trees and earthworks associated with residential and industrial development mostly to the south of the runway in the Thrumster Area 13 Urban Release Area and Airport Business Park. The development of the Thrumster Area 13 lands and Airport Business Park will be subject to the PMH DCP and a detailed Construction Environment Management Plan (see Sections 5.6 and 7.5) to minimise these impacts. Controls associated with diverting water from structures associated with airport infrastructure and away from sensitive habitat areas will also be implemented as part of the development approval process. These controls will prevent adverse impacts to water quality on SEPP 14 wetland and Wallum Froglet habitat adjacent to vegetation that will be cleared for the proposal (where soil will be exposed by the removal of trees) and SEPP 14 wetland adjacent to man-made structures.

The impact to SEPP 14 wetland represents 10.49% of SEPP 14 wetland in the BCAA (**Table 27**).

It is unlikely that clearing in the origin of the two minor creeks would impact water quality. This is because the creeks impacted are first and second order streams, with the second order stream on the edge of the runway no longer receiving waters from any first order streams (the existing runway removed these streams), and the second order stream in the south forming from two very short first order streams i.e. it is not a well established stream (**Figure 26**). The origins of the first and sometimes second order streams contain minimal riparian vegetation supporting and associated with the streams, and only minimal water is present during times of heavy rainfall.

Notwithstanding the controls that would be implemented to prevent impacts to SEPP 14 wetlands where ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’ will be removed, there is potential for additional controls and active, adaptive management to prevent impacts to or maintain the water quality and habitat values of SEPP 14 wetlands in the area south of the runway. Following removal of trees in this vegetation type, vegetation will be managed to transition the vegetation type to ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’ whilst avoiding attracting waterbirds that

pose a risk to airport operations. This vegetation type currently forms part of SEPP 14 wetlands, and as such the area would continue to function as a SEPP 14 wetland.

A detailed Vegetation Management Plan would be prepared to guide the removal of trees and maintenance of fauna habitat values, to establish and maintain a '*Coastal freshwater meadows and forblands of lagoons and wetlands*'.

Accordingly, the proposal is not considered to significantly impact the water quality of minor creeks or SEPP 14 wetlands within the BCAA.

**Table 27: SEPP 14 wetland on development and conservation land**

BioMetric Vegetation Type	Area within BCAA (ha)	Area Impacted (ha)	Proportion Impacted (%)	Area Conserved (ha)	Proportion Conserved (%)
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	1.65	0	0	1.65	100
Blackbutt - Tallowood dry grassy open forest of the central parts North Coast	2.08	0.04	1.84	2.01	96.55
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	0	0	0	0	0
Paperbark swamp forest of the coastal lowlands of the North Coast	78.94	11.20	14.19	65.71	83.24
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	1.29	0.99	76.75	0.23	18.11
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	1.67	0.34	20.68	1.32	79.32
Swamp Oak swamp forest of the coastal lowlands of the North Coast	2.12	0	0	1.95	91.94
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	17.91	0.29	1.63	17.36	96.93
Wet heathland and shrubland of coastal lowlands of the North Coast	4.03	0.49	12.19	3.48	86.29
Coastal freshwater meadows and forblands of lagoons and wetlands	17.62	0	0	17.52	99.45
<b>Total</b>	<b>127.31</b>	<b>13.36</b>	<b>10.49</b>	<b>111.24</b>	<b>87.37</b>

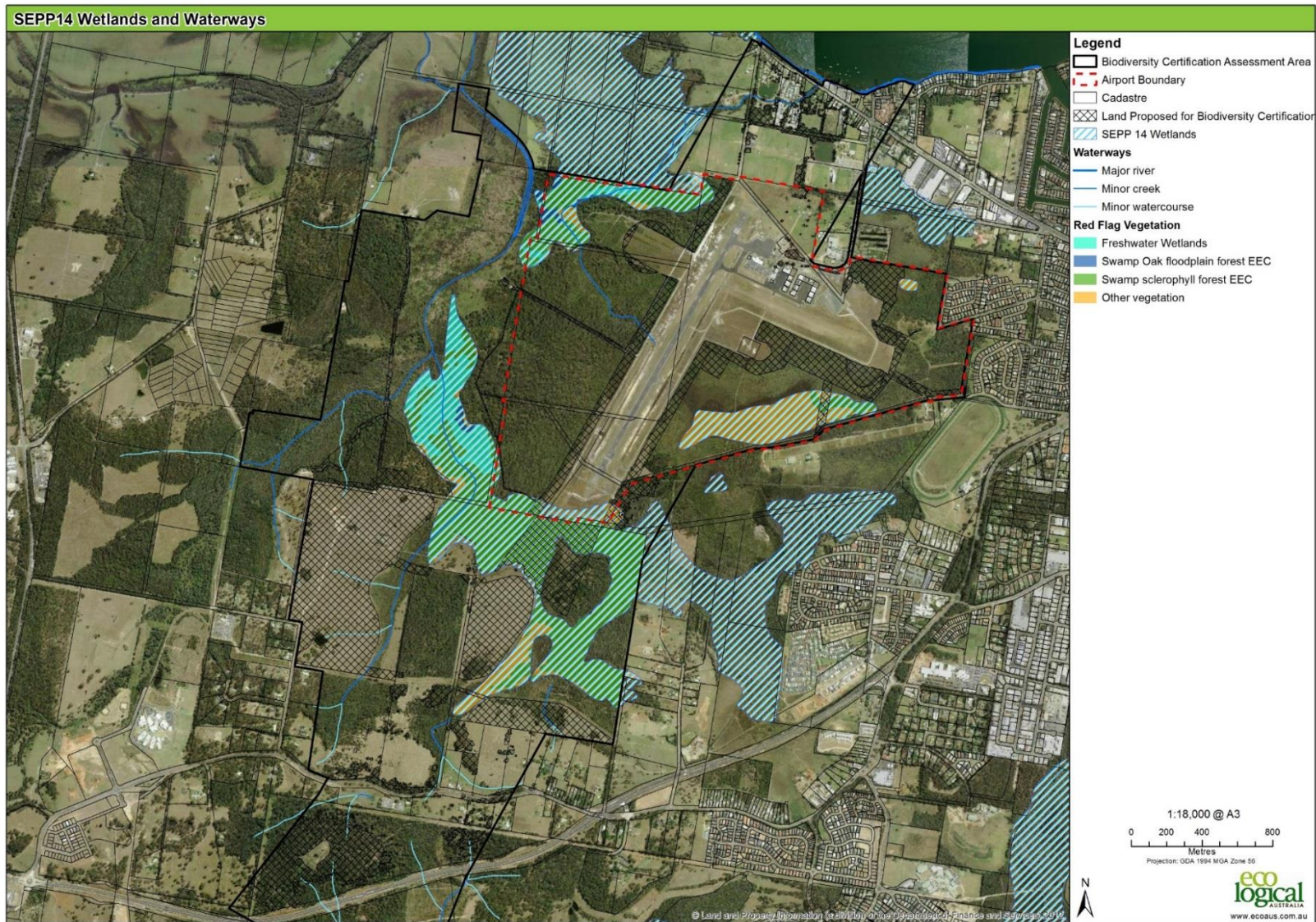


Figure 26: Waterways and SEPP 14 wetlands impacted

## 5 Biocertification Credit Assessment

This section details the results of the biodiversity certification assessment conducted to the requirements of the BCAM. Information is technical in nature, and relies on a broad understanding of the BCAM to understand the methods applied. Readers should make themselves familiar with the BCAM before reviewing this section of the document.

### 5.1 Biodiversity certification assessment area

The BCAA is shown in **Figure 5** and is comprised of:

- Land proposed for biodiversity certification (previous OLS cropping areas, new OLS clearing required to meet CASA requirements, relocated Airport Infrastructure to meet CASA requirements, employment and mixed use/accommodation lands within the airport precinct, Council owned lands for residential and light industrial development in the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Urban Release Area, roads, easements and fire trails) – impacts to native vegetation and threatened species habitat in these areas ‘requires’ biodiversity credits
- Land proposed for conservation (PMHC and private lands) with areas of tree cropping – ‘generates’ biodiversity credits
- Lands where the current land use will be maintained/not changed (retained lands) – neither requires nor generates biodiversity credits

#### 5.1.1 Lands proposed for Biocertification

Lands proposed for biocertification shown in **Figure 5** includes the following:

- All previously cleared areas within the operational boundary of the airport which are currently used for airport use
- All vegetation penetrating the OLS as determined by LIDaR imagery plus a 5 m growth prediction (King and Campbell 2014) within the CASA revised OLS boundary (CASA Manual of Standards Part 139 – Aerodromes Version 1.12 November 2014 and Manual of Standards Part 139 Amendment Instrument 2014 (No.1), 13 November 2014).
  - For ease on ongoing operational use, this includes the clearing of all vegetation to ground level 54 m either side of the existing runway centreline (150 + 54)
- All vegetation within the SP2 Infrastructure Zoned land where relocated airport infrastructure is required
- All vegetation within the proposed Airport Business Park generally consistent with the employment lands identified in the Mid North Coast Regional Strategy (DoP 2009)
- All vegetation on Council owned land in the portions of the Partridge Creek Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Area 13 Urban Release Area, and their associated roads and APZs
- All vegetation on land within proposed easements and fire trails.

The impacts within the land proposed for biodiversity certification are considered separately due to the ability to avoid/minimise impacts: those impacts resulting from the need to meet CASA requirements (i.e. clearing within the OLS and relocation of essential airport infrastructure) where it is not possible to avoid impacts and comply with CASA requirements, and those impacts associated with the employment and residential lands. Impacts from the development of Council owned land within the Partridge Creek

Residential, Partridge Creek Industrial, and West Lindfield neighbourhoods of the Thrumster Area 13 Urban Release Area and their APZs, and from easements and fire trails, are also considered separately.

The footprint proposed for biodiversity certification (development) is 320.48 ha (118.50 ha of which comprises native vegetation as defined by the BCAM) (Table 28 and Figure 5).

### 5.1.2 Lands proposed for conservation measures

Within the land proposed for conservation, there are areas where there are no existing legislative requirement to undertake management actions for conservation (i.e. Council owned SP2 Infrastructure, RE1 Recreation and Operational E2 land) and land where there are varying levels of existing obligations to manage land for conservation (i.e. 2.97 ha E2 and E3 zoned private land within the Area 13 Urban Release Area (URA) where the PMHC DCP 2013 requires maintenance and restoration of defined areas – labelled as ‘Offset Discounted’)..

There is also up to 20.9 ha of selective ‘cropping’ proposed in the conservation lands for patches of isolated trees that may penetrate the OLS. These trees will be monitored and if growth exceeds OLS height limits, these trees will be cropped with hand held tools, all pruned material left in-situ to minimise disturbance to surrounding vegetation and the trees poisoned to prevent regrowth. Poisoned trees will be left in-situ to provide hollow resources and perching opportunities for raptors.

The land proposed for conservation totals 444.17 ha (440.11 ha of which comprises native vegetation plus 4.06 ha of cleared land to be regenerated).

#### Land subject to existing conservation measures and potential credit discounting

Ecosystem and species credits may only be generated in respect of management actions that are additional to any existing conservation obligations that are required to be carried out on the land (section 8.4 of the BCAM). Where a new conservation measure is proposed on land on which there are existing obligations, the number of credits generated is ‘discounted’ in accordance with Table 7 of the BCAM. Section 8.4 of the BCAM provides a list of existing conservation obligations that are legally required management actions including the following:-

- Existing Biobanking or Conservation Agreements under the TSC and NPW Acts
- Community land under the *Local Government Act* 1993 that is categorised as a ‘natural area’ and is already managed under a plan of management
- Existing Planning Agreements under the EP&A Act which make provision for development contributions to be applied towards the conservation or enhancement of the natural environment
- Any other agreement entered into with a public authority under which the owner of the land receives funding for biodiversity conservation purposes.

The Planning Agreement and DCP for Area 13 requires environmental management and restoration of the E2/E3 lands as part of a development application process for 20 years and do not include the provision of development contributions for these measures. The Council owned land within Area 13 (i.e. Partridge Creek residential and Industrial land and West Lindfield residential land is not subject to any current development applications and as such the requirements of the DCP are not triggered. However, a parcel of private land is subject to a current development application and the E2/E3 lands within these parcels that have been included as proposed conservation measures in this biocertification assessment, have been calculated with a 20% credit discount on the assumption that the DA is approved prior to the application for biocertification (to reflect the 20 year management commitment in the DCP as a percentage of the in perpetuity requirements of a 100% Conservation Measure which is taken as 100 years for the purposes of calculations) and will be discussed further with OEH.

The 17 ha Link Road offset requirement (Condition of Approval 2 of DA 2000/782) requires Council to rehabilitate disturbed wetland areas in the Partridge Creek catchment area in accordance with the then Department of Urban Affairs and Planning 'Compensatory Wetlands Policy'. A 17 ha area has been identified in the Partridge Creek catchment in '*Coastal freshwater meadows and forblands of lagoons and wetlands*' that will be subject to the proposed BioBank Agreement but will not generate any ecosystem or species credits.

The up to/if required 20.90 ha cropping in the proposed conservation areas has had a 10% discount applied to the number of credits generated on the basis that over-story cover has a 10% weighting in the calculation of the site condition score which could not be compensated for by manually disallowing the default increase in over-story cover. As discussed above, the cropping of trees in this area will selectively prune the canopy only, poison the individual trees to prevent regrowth and retain the stag as fauna habitat. Not all trees in the canopy will be affected. No other attributes are expected to be adversely impacted to the extent that a changed site value score results (e.g. species richness, mid-story or ground cover). The number of hollow bearing trees and logs on ground are expected to increase as a result of the management of these areas. Accordingly a discount of 10% to the number of credits generated is considered to adequately compensate for this impact. A "Conservation Cropping Management Area" has been identified where trees are able to be removed, as and if required, under this biocertification application to assist in future audit processes.

### **5.1.3 Retained lands**

259.84 ha of land (71.00 ha of which comprises native vegetation) has been identified as maintaining its current land use, and has therefore been assessed as 'retained land' (i.e. credits are neither required nor generated).

**Table 28: Land use breakdown**

Development footprint	Type of impact/area	Area (ha)	Total area (ha)	% of Area	Area of native vegetation (ha)	Total area of native vegetation (ha)	% of native vegetation
Land Proposed for Biodiversity Certification (Development)	Airport infrastructure	121.13	320.48	31.28	30.36	118.50	18.82
	OLS clearing	105.71			69.12		
	Development and APZ	85.37			11.12		
	Easement and fire trail	8.26			7.90		
Land Proposed for Conservation Measures	Proposed offset	403.76	444.17	43.36	399.81	440.11	69.90
	Proposed offset - discounted	19.40			20.32		
	Cropping	20.32			19.40		
	Cropping - discounted	0.58			0.58		
Retained Lands (Land excluded from this assessment)			259.84	25.36		71.00	11.28
<b>Total</b>		<b>1,024.48</b>		<b>100</b>	<b>629.60</b>		<b>100</b>

As defined in the BCAM, different levels of conservation security and ongoing management result in the generation of a different number of credits. The credit entitlement for conservation areas are broken into three broad categories, being:

- Areas that are managed and funded in perpetuity (i.e. Biobank sites or national parks) – 100% credit entitlement
- Areas that are managed in perpetuity (e.g. NPW Act Conservation Agreements etc.) – 90% credit entitlement
- Areas that are secured through planning instrument (i.e. environmental zoning) – 25% credit entitlement

## 5.2 Vegetation mapping and zones

Section 2.1.2 outlined the process by which vegetation types were identified and mapped in the BCAA. In total, ten vegetation types (629.60 ha) were identified and mapped, with the dominant vegetation types being ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’ (156.75 ha), ‘*Blackbutt - Tallowood dry grassy open forest of the central parts North Coast*’ (122.39 ha), and ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’ (74.42 ha) (**Table 29**). The site also supports 394.88 ha of ‘cleared’ land, which in the context of the BCAM includes cleared areas, exotic vegetation, tracks and water.

**Table 29: Area of vegetation within the BCAA**

BioMetric Vegetation Type	Area (Ha)
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	41.63
Blackbutt - Tallowood dry grassy open forest of the central parts North Coast	161.44
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	6.74
Paperbark swamp forest of the coastal lowlands of the North Coast	162.10
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	49.78
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	23.48
Swamp Oak swamp forest of the coastal lowlands of the North Coast	16.25
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	22.84
Wet heathland and shrubland of coastal lowlands of the North Coast	70.91
Coastal freshwater meadows and forblands of lagoons and wetlands	74.42
<b>Total vegetation</b>	<b>629.60</b>
Cleared	397.88
<b>Grand total</b>	<b>1,024.48</b>

The ten vegetation types were separated into 22 vegetation zones for this assessment (**Table 10**). Fourteen zones were mapped in ‘moderate to good’ condition and eight vegetation zones were mapped in ‘low condition’. The following ancillary codes were used to further stratify the vegetation zones:

- Good
- Regrowth
- Cleared (to regenerate)
- Cropped
- Mowed understorey
- Regeneration
- Weedy understorey
- Cropped and/or mown understorey
- Mowed

**Table 30** shows the area of vegetation zones assessed within the BCAA in terms of land proposed for biodiversity certification, land proposed for conservation, and retained land.



**Table 30: Area of vegetation zones assessed within the BCAA**

<sup>1</sup> Condition as defined by the BCAM<sup>2</sup> Not assessed as area neither requires or generates credits

Veg Zone ID	BioMetric Vegetation Type	Condition <sup>1</sup>	Ancillary Condition Code	Area (ha)											
				Land Proposed for Biodiversity Certification					Land Proposed for Conservation					Retained Land <sup>2</sup>	Total
				Airport infrastructure	OLS clearing	Development and APZ	Easement and fire trail	Total	Offset	Offset – Existing mgt	Cropping in offset	Cropping – existing mgt	Total		
1	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Moderate to good	Good	0.92	0.61	0	1.05	2.58	34.66	0	1.42	0	36.08	0.16	38.83
2	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Moderate to good	Regrowth	0	0.29	0	0.02	0.31	1.72	0	0.77	0	2.50	0	2.81
4	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Moderate to good	Good	0	8.58	3.88	3.10	15.55	55.27	7.42	2.16	0.40	65.25	41.59	122.39
5	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Moderate to good	Cropped	0	17.37	0.92	0	18.28	0	0	0	0	0	0.91	19.19
6	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Low	Mowed Understorey	0	3.05	2.21	0	5.26	0.59	0.29	0	0.02	0.90	1.80	7.97

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Veg Zone ID	BioMetric Vegetation Type	Condition <sup>1</sup>	Ancillary Condition Code	Area (ha)											
				Land Proposed for Biodiversity Certification					Land Proposed for Conservation					Retained Land <sup>2</sup>	Total
				Airport infrastructure	OLS clearing	Development and APZ	Easement and fire trail	Total	Offset	Offset – Existing mgt	Cropping in offset	Cropping – existing mgt	Total		
7	Blackbutt - Tallowood dry grassy open forest of the central parts North Coast	Low	Cleared (to regenerate)	0	0	0	0	0.00	11.24	0.64	0.01	0	11.89	0.00	11.89
8	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	Moderate to good	Good	0	5.97	0	0	5.97	0	0	0	0	0.00	0.77	6.74
9	Paperbark swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	0.55	9.48	3.62	0.49	14.51	123.17	4.30	9.35	0.15	136.97	5.37	156.75
10	Paperbark swamp forest of the coastal lowlands of the North Coast	Moderate to good	Cropped	0	5.34	0	0	5.34	0	0	0.01	0	0.01	0.00	5.35
11	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Moderate to good	Good	2.88	4.70	0	1.07	8.65	33.29	0	6.15	0	39.45	1.04	49.14

Veg Zone ID	BioMetric Vegetation Type	Condition <sup>1</sup>	Ancillary Condition Code	Area (ha)											
				Land Proposed for Biodiversity Certification					Land Proposed for Conservation					Retained Land <sup>2</sup>	Total
				Airport infrastructure	OLS clearing	Development and APZ	Easement and fire trail	Total	Offset	Offset – Existing mgt	Cropping in offset	Cropping – existing mgt	Total		
12	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Low	Mowed Understorey	0.63	0	0	0	0.63	0	0	0	0	0.00	0.00	0.63
13	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	1.77	0.65	0	0.12	2.54	12.90	6.74	0.04	0	16.69	0.10	22.33
14	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Low	Regeneration	0.12	0	0	0	0.12	1.03	0	0	0	1.03	0.00	1.15
15	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	0.06	0	0.49	0.16	0.71	8.11	0	0	0	8.11	0.50	9.32
16	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Moderate to good	Weedy Understorey	0.02	0	0	0.02	0.04	1.10	0	0	0	1.10	0.02	1.15

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Veg Zone ID	BioMetric Vegetation Type	Condition <sup>1</sup>	Ancillary Condition Code	Area (ha)											
				Land Proposed for Biodiversity Certification					Land Proposed for Conservation					Retained Land <sup>2</sup>	Total
				Airport infrastructure	OLS clearing	Development and APZ	Easement and fire trail	Total	Offset	Offset – Existing mgt	Cropping in offset	Cropping – existing mgt	Total		
17	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Low	Cropped and/or Mown Understorey	0.01	5.31	0	0	5.32	0	0	0	0	0.00	0.00	5.78
19	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	Moderate to good	Good	0.17	0.20	0	0.15	0.52	22.05	0	0	0	22.05	0.27	22.84
20	Wet heathland and shrubland of coastal lowlands of the North Coast	Moderate to good	Good	22.41	7.20	0	1.22	30.82	37.71	0	0.39	0	38.10	0.30	69.23
21	Wet heathland and shrubland of coastal lowlands of the North Coast	Low	Mowed	0.82	0	0	0	0.82	0.86	0	0	0	0.86	0.00	1.68
22	Coastal freshwater meadows and forblands of lagoons and wetlands	Moderate to good	Good	0	0	0	0.51	0.51	56.12	0	0	0	56.12	17.79	74.42
<b>Total</b>				<b>30.36</b>	<b>69.12</b>	<b>11.12</b>	<b>7.90</b>	<b>118.50</b>	<b>399.81</b>	<b>19.40</b>	<b>20.32</b>	<b>0.58</b>	<b>440.11</b>	<b>71.00</b>	<b>629.60</b>

### 5.3 Transect/Plot data and site value scores

Appendix 4 of the BCAM defines the minimum number of transects/plots required per vegetation zone area (DECCW 2011). As outlined in Sections 2.1.2 and 2.1.4, data from a total of 45 BioMetric vegetation transects/plots were collected across the BCAA, with a transect/plot requirement of 42 transects/plots calculated from the combined area of conservation, development and retained lands (**Table 10**). Two vegetation zones did not meet the required minimum number of plots due to changes to the BCAA and vegetation types as outlined in **Section 2.1.4**. The collected transect/plot data is provided in **Appendix I**.

Current site value and future site value scores were calculated for each vegetation zone using the transect/plot data collected. The BCAM credit calculator was used to produce the current and future site value scores for both development and conservation areas (**Table 31**).

**Table 31: Site value scores allocated to each vegetation zone**

Veg Zone ID	BioMetric Vegetation Type	Ancillary Condition Code	Current site value score	Future site value score (Development)	Future site value score (Conservation)
1	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Good	67.19	0	89
2	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Regrowth	52.08	0	57
3	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Cleared	25.52	0	42
4	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Good	68.23	0	78
5	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Cropped	48.09	0	68
6	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Mowed Understorey	19.27	0	36
7	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Cleared (to regenerate)	22.57	0	40
8	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	Good	76.56	0	78
9	Paperbark swamp forest of the coastal lowlands of the North Coast	Good	73.44	0	77

Veg Zone ID	BioMetric Vegetation Type	Ancillary Condition Code	Current site value score	Future site value score (Development)	Future site value score (Conservation)
10	Paperbark swamp forest of the coastal lowlands of the North Coast	Cropped	40.63	0	60
11	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Good	75.52	0	89
12	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Mowed Understorey	19.79	0	37
13	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Good	72.39	0	78
14	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Regeneration	31.25	0	47
15	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Good	53.13	0	62
16	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Weedy Understorey	72.40	0	78
17	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Cropped and/or mown understory	25.00	0	40
18	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Cleared (to regenerate)	30.73	0	41
19	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	Good	43.96	0	62
20	Wet heathland and shrubland of coastal lowlands of the North Coast	Good	64.49	0	81
21	Wet heathland and shrubland of coastal lowlands of the North Coast	Mowed	33.33	0	58
22	Coastal freshwater meadows and forblands of lagoons and wetlands	Good	86.96	0	87

## 5.4 Landscape Score

The credit calculator calculated a landscape value score of 28 for the land to be certified and a score of 21.75 for the land subject to conservation measures. The landscape value is calculated from the sum of the scores obtained from the following three attributes:

- percent native vegetation cover in the landscape
- connectivity value
- adjacent remnant area determined according to the Mitchell landscape in which most of the land proposed for biocertification occurs.

Scores for the each landscape attribute for land to be certified and land subject to conservation measures are provided in **Table 32**. An explanation on how the score was determined for each attribute is provided in the sub sections below.

### 5.4.1 Percent Native Vegetation Cover Score

The percent native vegetation cover calculation was completed within a single 4,000 ha circle (**Figure 27**) and a scaling factor of 4 was used by the calculator (as the “standard” assessment circle is 1,000 ha in size). The area of vegetation cover was digitised from an aerial photograph at a scale of approximately 1:10,000. The results of the assessment are contained in **Table 32**.

A pre-certification score of 15 was determined with 1,863 ha ( $1,863/4,000 = 46.6\%$ ) native vegetation mapped within the 41-50% native vegetation cover class. Vegetation clearance would result in 1,745 ha of vegetation cover (43.6%) remaining in the assessment circle. The post certification score is also 15 because vegetation cover falls within the same 10% increment (41-50%).

**Table 32: Native vegetation cover in assessment circle**

Circle	Before Certification			After Certification		
	Area Of Vegetation Within Assessment Circle (Ha)	Native Vegetation Cover Class (%)	Score	Area Of Vegetation Within Assessment Circle (Ha)	Native Vegetation Cover Class (%)	Score
1 (4,000ha)	1,863 (46.6%)	41-50%	15	1,745 (43.6%)	41-50%	15

The land subject to conservation measures (post-biodiversity certification) is 444.17 ha, of which 440.11 ha is currently vegetated land. Therefore (using Table 3 of the BCAM) a gain of 4.4 is recorded for the percent native vegetation score after conferral of biodiversity certification.

### 5.4.2 Connectivity Value

The current connectivity value of the site was assessed according to Section 3.7.2 of the BCAM. There are three components of connectivity; these are areas approved as a ‘state’ or ‘regional’ biodiversity links by the Director General, the hierarchy and riparian zone width of water courses in accordance with Appendix 1 of the BCAM and an assessment of vegetation connectivity.

The OEH has advised that the BCAA includes a ‘state biodiversity link’ as shown in the draft Mid North Coast Regional Conservation Plan (DECCW (2010) and **Figure 28: Connectivity** (Refer to OEH letter in **Appendix B**). This state link occurs in both the areas for certification and conservation and therefore

was selected on both sides of the calculator. According to Table 4 of the BCAM the score for a state biodiversity link is 18.

#### **5.4.3 Adjacent Remnant Area**

The BCAA predominantly occurs on the Manning - Macleay Coastal Alluvial Plain Mitchell Landscape which is 57% cleared. The vegetation on site is well connected and as such has an adjacent remnant area (ARA) of >100 ha which receives the maximum score of 10 for Mitchell Landscapes within the 30-70% cleared range.

The land subject to conservation measures also occurs within the same Manning - Macleay Coastal Alluvial Plain Mitchell Landscape with the same ARA of >100 ha. Therefore the score allocated for the conservation lands is also 10.



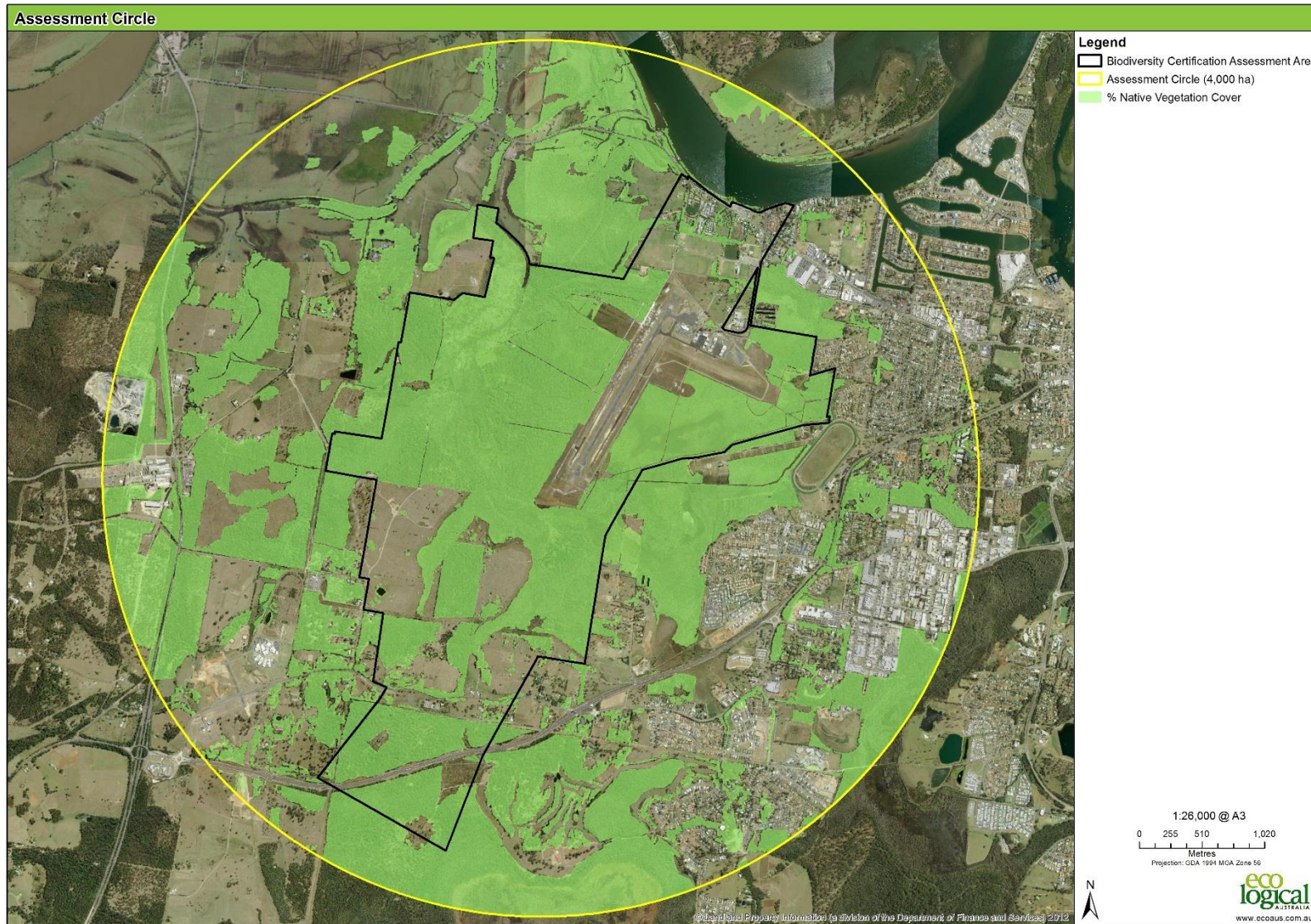


Figure 27: Assessment circle

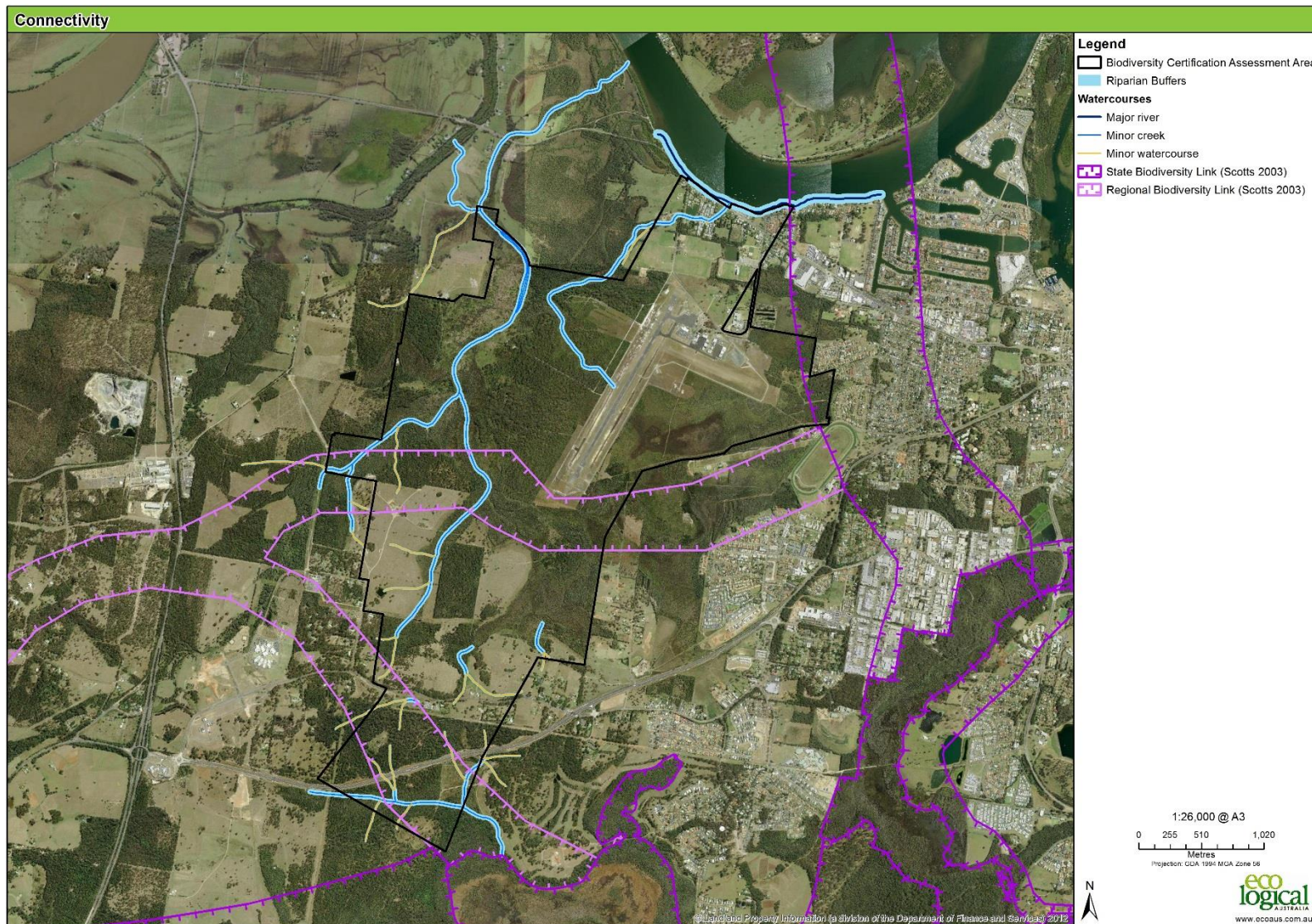


Figure 28: Connectivity

## 5.5 Red Flags

The vegetation types, 'Coastal freshwater meadows and forblands of lagoons and wetlands', 'Paperbark swamp forest of the coastal lowlands of the North Coast', 'Swamp Mahogany swamp forest of the coastal lowlands of the North Coast' and 'Swamp Oak swamp forest of the coastal lowlands of the North Coast' have been identified as comprising three EECs, and are also classified as over-cleared vegetation types (>70% of original extent in the CMA cleared). These vegetation types are therefore 'red-flagged' when in moderate to good condition under the BCAM. Other 'red-flagged' areas in the BCAA are areas of land with regional or state conservation significance: SEPP 14 Wetlands, vegetation within riparian buffers, and state and regional fauna corridors. The area of red flagged vegetation and other red flag land is shown in **Table 33** and **Figure 19** and **Figure 20**. Red flag areas should be avoided and can only be impacted in accordance with certain rules outlined in Section 2.4 of the BCAM.

Three zones of the vegetation types identified as EECs were in 'low' condition because the site value score for these vegetation zones was less than 34/100. These zones were 'Swamp Mahogany swamp forest of the coastal lowlands of the North Coast (Regeneration)', 'Swamp Oak swamp forest of the coastal lowlands of the North Coast (Cropped with Weedy Understorey)', and 'Swamp Oak swamp forest of the coastal lowlands of the North Coast (Cleared (to regenerate))'. Accordingly, these vegetation zones are not red flagged.

A total of 359.47 ha of red flagged vegetation/areas is present within the BCAA of which 49.33 ha or 13.72% would be impacted by the proposal. A red flag variation request prepared in accordance with the criteria set out in Section 2.4 of the BCAM is provided in **Section 4**. It is noted that a red flag variation request must be assessed and approved by OEH before biodiversity certification can be conferred.

**Table 33: Impacts to red flagged vegetation/other red flag areas**

Red flag vegetation (BioMetric Vegetation Type) / other red flag areas	EEC Name	Cleared within CMA	Area within BCAA (ha)	Area Impacted (ha)	Proportion Impacted (%)
Coastal freshwater meadows and forblands of lagoons and wetlands	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	40%	74.42	0.51	0.69
Paperbark swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	75%	162.10	19.85	12.25
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	75%	22.33	2.54	11.37

Red flag vegetation (BioMetric Vegetation Type) / other red flag areas	EEC Name	Cleared within CMA	Area within BCAA (ha)	Area Impacted (ha)	Proportion Impacted (%)
Swamp Oak swamp forest of the coastal lowlands of the North Coast	Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	75%	10.47	0.75	7.16
<b>Total for EEC</b>	NA	NA	269.32	23.65	8.78
Vegetation within SEPP 14 wetland	NA	NA	127.31	13.36	10.49
Vegetation within riparian buffers	NA	NA	29.48	1.34	4.55
Vegetation within State Biodiversity link	NA	NA	9.27	0.32	3.45
Vegetation within Regional Biodiversity link	NA	NA	113.82	36.12	31.73

## 5.6 Indirect Impacts

The BCAM requires that any application for formal biodiversity certification must demonstrate how the “*proposed ownership, management, zoning and development controls of the land proposed for biodiversity certification is intended to mitigate any indirect impacts on biodiversity values*” (DECCW 2011).

Indirect impacts have been considered in accordance with the BCAM and have been determined to be negligible on the basis that all direct impacts have been assessed on the assumption of complete loss of all biodiversity values including where these losses are only partial e.g. for Asset Protection Zones associated with airport infrastructure, proposed Airport Business Park and Council owned residential and industrial land within the Thrumster Area 13 URA and clearing of vegetation to ground level within the OLS. In effect the APZ areas will provide a buffer between the employment and residential lands and the adjacent conservation areas, thereby mitigating and buffering any indirect impacts such as increased weeds, run-off, changed noise and light conditions. Similarly the OLS clearing adjacent to the existing runway will result in an area of mown/slashed native vegetation, retaining a number of biodiversity values for a range of species, buffering any indirect impacts to the adjacent conservation areas.

Indirect impacts including erosion, sedimentation and run-off that may affect threatened species and their habitats will be further addressed at the DA stage and will be subject to a Construction Environment Management Plan.

There is potential for some indirect impacts resulting from the fragmentation of movement corridors or loss of foraging opportunities for some species. For example, removal of vegetation at the southern end of the airport runway could impede the movements of the species credit species, Koala, Squirrel Glider, Eastern Chestnut Mouse and Wallum Froglet, as well as other fauna species, in an east-west direction. Removal of vegetation within the BCAA for the OLS boundary would reduce foraging opportunities for a range of fauna groups.

There are no management actions or development controls to mitigate the potential impacts from fragmentation of movement corridors for the land proposed for biodiversity certification other than the potential to rehabilitate the SEPP 14 wetland area at the southern end of the runway to a wet heathland community whilst avoiding attracting water birds that pose a risk to airport operations. In the absence of this mitigation measure, the removal of vegetation at the southern end of the runway could impede the movement of some fauna, particularly those that are reluctant to cross cleared areas or traverse vegetation types that are not preferred, primary or secondary habitat. However, the area will continue to be used by some more mobile species and species willing to traverse cleared and open areas. Of the species credit species, Koala, Squirrel Glider and Eastern Chestnut Mouse are able to traverse open areas. The proposal to recreate this forested wetland area to a wet heathland and/or sedgeland will benefit these species and other less mobile species such as the Wallum Froglet.

## 5.7 Credit Calculations

### 5.7.1 Ecosystem Credits

Ecosystem credits have been calculated for the impact caused by the proposed impacts and improvement to biodiversity values resulting from the management of conservation lands. With regard to the improvement to biodiversity values, credits have been calculated with and without discounts applied depending on the interpretation of section 8.4 of the BCAM and the existing environmental management obligations arising from the PMHC DCP and the Thrumster URA. On the basis that credit discounting may apply, credits have been discounted by 20% in accordance with Step 4 in section 8.4 of the BCAM on the basis that the existing management obligations apply for 20 years, a 10% discount has been applied to cropping selected trees within the conservation areas on the basis of the weighting that over-storey cover has in site value score calculations (this is in lieu of not been able to limit the default increase for this attribute in the credit calculator tool as it is already in benchmark condition).

In total, **3,741** ecosystem credits are required for the proposed airport upgrade (**Table 34**).

Different levels of protection and management for conservation lands results in the generation of a different number of credits as outlined below:

- Areas that are managed and funded in perpetuity (i.e. Biobank sites or national parks) – 100% credit entitlement
- Areas that are managed in perpetuity (e.g. NPW Act Conservation Agreements etc) – 90% credit entitlement
- Areas that are secured through planning instrument (i.e. environmental zoning) – 25% credit entitlement

It is proposed that these conservation areas will be registered as a Biobank Site under Part 7A of the TSC Act. A BioBanking Agreement is recognised as a '100% permanently managed and funded' conservation measure under s.126L(i) of the TSC Act and Section 8.1.1 of the BCAM will provide in perpetuity conservation protection and management on the land title.

Depending on whether any credit discounting is applied, between **4,087** and **4,143** ecosystem credits are generated by a 100% conservation measure as shown in **Table 34**.

A number of vegetation types generate a surplus of credits (e.g. '*Blackbutt-bloodwood dry heathy open forest*', '*Wallum sedgeland and rushland of near coastal lowlands*' and '*Paperbark swamp forest of the coastal lowlands*') whilst others (e.g. '*Blackbutt – Tallowood dry grassy open forest*' and '*Grey Ironbark – Grey Gum open forest*') have a credit deficit.

Section 8.5 of the BCAM states that planning authorities should in the first instance attempt to generate all required credits from conservation measures within the BCAA. Section 10.2.1 of the BCAM provides a number of variation rules that permit the use of credits generated from vegetation types in the same vegetation formation to meet an IoM outcomes subject to the Director-General being satisfied that various matters have been met. An application and justification to use these variation rules has been provided in **Section 6**.

Subject to the Director-Generals approval of this variation request, the number of ecosystem credits generated by the proposed conservation measures exceeds the number of credits required for all vegetation types other than for '*Blackbutt – Tallowwood dry grassy open forest*', if required. PMHC has made a commitment to secure up to the required 452 credit deficit, if required, prior to any clearing of this vegetation type in excess of the number of credits generated by on-site conservation measures (see **Section 7.2**). In this context, setting aside the impacts on red flagged areas, the proposal meets the 'improve or maintain' test required for biodiversity certification to be conferred.

### 5.7.2 Species credits

Species credit requirements have been calculated for Wallum Froglet, Koala, Squirrel Glider and Eastern Chestnut Mouse which have been surveyed for, identified on site and mapped as species polygons for likely habitat. No other threatened fauna or flora species requiring species credits were detected and therefore have not been calculated for species credit requirements.

In summary, a total of 817 species credits are required for Wallum Froglet, 2,099 species credits are required for Koala (1,332 for primary habitat and 767 for secondary habitat), 1,563 species credits are required for Squirrel Glider and 1,382 species credits are required for Eastern Chestnut Mouse for the land proposed to be certified (**Table 35**).

The offset areas generate 1,685 credits for Wallum Froglet, 1,776 credits for Koala (732 for primary habitat and 1,044 for secondary habitat), 1,766 credits for Squirrel Glider and 1,513 credits for Eastern Chestnut Mouse using 100% conservation measures (90% and 25% conservation measures were not calculated). This equates to a surplus of 868 credits for Wallum Froglet, 203 credits for Squirrel Glider and 131 credits for Eastern Chestnut Mouse, and a deficit of 323 credits for Koala. **Section 6** and **7** outlines how the deficits of Koala are proposed to be met by a variation.

Subject to the Director-Generals approval of this variation request, the number of species credits generated by the proposed conservation measures exceeds the number of species credits required for all species other than for Koala, if required. PMHC has made a commitment to secure up to the required 323 credit deficit for Koala, if required, prior to any clearing of this vegetation type in excess of the number of credits generated by on-site conservation measures (see **Section 7.2**). In this context, the proposal meets the 'improve or maintain' test required for biodiversity certification to be conferred.

Table 34: Final ecosystem credit results

Veg Zone ID	BioMetric Vegetation Type	Condition <sup>1</sup>	Ancillary Condition Code	Credits														Credit status			
				Land Proposed for Biodiversity Certification					Land Proposed for Conservation									Vegetation zone	Vegetation type	Vegetation Form	
				Airport infrastructure	OLS clearing	Development and APZ	Easement and fire trail	Total credits required	Offset	Cropping in offset area	Cropping (10% discount)	Offset – discounted	Offset – discounted (20% discount)	Cropping - discounted	Cropping – discounted (30% discount)	Total credits generated (No discount)	Total credits generated (discounted)				
1	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Moderate to good	Good	33	22	0	38	94	436	18	16	0	0	0	0	454	452	358	369		
2	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	Moderate to good	Regrowth	0	8	0	1	9	14	6	6	0	0	0	0	20	19	10			
11	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Moderate to good	Good	116	189	0	43	347	356	66	59	0	0	0	0	422	415	68	58		185
12	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	Low	Mowed Understorey	10	0	0	0	10	0	0	0	0	0	0	0	0	0	-10			
8	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	Moderate to good	Good	0	242	0	0	242	0	0	0	0	0	0	0	0	0	-242	-242		
4	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Moderate to good	Good	0	323	146	116	585	529	21	19	71	57	4	3	625	608	23	-452	-452	
5	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Moderate to good	Cropped	0	497	26	0	523	0	0	0	0	0	0	0	0	0	-523			
6	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Low	Mowed Understorey	0	48	34	0	82	6	0	0	3	2	0	0	9	8	-74			
7	Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast	Low	Cleared (to re-generate)	0	0	0	0	0	116	0	0	7	5	0	0	123	122	122			
9	Paperbark swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	21	366	135	18	540	1,005	76	69	35	28	1	1	1,118	1,103	563	436	479	

Veg Zone ID	BioMetric Vegetation Type	Condition <sup>1</sup>	Ancillary Condition Code	Credits														Credit status		
				Land Proposed for Biodiversity Certification					Land Proposed for Conservation									Vegetation zone	Vegetation type	Vegetation Form
				Airport infrastructure	OLS clearing	Development and APZ	Easement and fire trail	Total credits required	Offset	Cropping in offset area	Cropping (10% discount)	Offset – discounted	Offset – discounted (20% discount)	Cropping - discounted	Cropping – discounted (30% discount)	Total credits generated (No discount)	Total credits generated (discounted)			
10	Paperbark swamp forest of the coastal lowlands of the North Coast	Moderate to good	Cropped	0	127	0	0	127	0	0	0	0	0	0	0	0	0	-127		
13	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	66	24	0	4	95	111	0	0	58	47	0	0	170	158	63	71	
14	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	Low	Regeneration	2	0	0	0	2	10	0	0	0	0	0	0	10	10	8		
15	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Moderate to good	Good	2	0	14	4	20	73	0	0	0	0	0	0	73	73	53		
16	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Moderate to good	Weedy Understorey	0	0	0	1	1	10	0	0	0	0	0	0	10	10	9	-28	
17	Swamp Oak swamp forest of the coastal lowlands of the North Coast	Low	Cropped and/or Mown Understorey	0	90	0	0	90	0	0	0	0	0	0	0	0	0	-90		
19	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	Moderate to good	Good	4	5	0	3	12	244	0	0	0	0	0	0	244	244	232	232	
20	Wet heathland and shrubland of coastal lowlands of the North Coast	Moderate to good	Good	673	216	0	37	926	422	4	4	0	0	0	0	426	426	-501	-506	134
21	Wet heathland and shrubland of coastal lowlands of the North Coast	Low	Mowed	16	0	0	0	16	11	0	0	0	0	0	11	11	-5			
22	Coastal freshwater meadows and forblands of lagoons and wetlands	Moderate to good	Good	0	0	0	20	20	428	0	0	0	0	0	0	428	428	408		
<b>Total</b>				<b>943</b>	<b>2,157</b>	<b>355</b>	<b>286</b>	<b>3,741</b>	<b>3,772</b>	<b>192</b>	<b>173</b>	<b>174</b>	<b>139</b>	<b>5</b>	<b>4</b>	<b>4,143</b>	<b>4,087</b>	<b>346</b>	<b>-1,228</b>	<b>-452</b>



Table 35: Final species credit results

Species	Airport infrastructure		OLS clearing		Development and APZ		Easement and fire trail		Total credits required	Offset		Cropping in Offset Area			Offset – Existing Mgt Areas			Cropping – Existing Mgt Areas			Total Credits generated (With discount)	Credits status
	Area (ha) Impacted	Credits required	Area (ha) Impacted	Credits required	Area (ha) Impacted	Credits required	Area (ha) Impacted	Credits required		Area (ha) in Offset Area	Credits generated	Area (ha) in Offset Area	Credits generated	Discount (10%)	Area (ha) in Offset Area	Credits generated	Discount (20%)	Area (ha) in Offset Area	Credits generated	Discount (30%)		
Wallum Froglet	25.93	346	28.55	381	4.11	55	2.66	35	817	263.01	1,578	9.80	59	53	11.04	66	53	0.15	1	1	1,685	868
Koala (Primary)	2.81	74	36.52	961	7.00	184	4.29	113	1,332	106.17	637	4.40	26	24	14.45	87	69	0.43	3	2	732	-600
Koala (Secondary)	4.07	107	19.89	523	3.62	95	1.56	41	767	156.46	939	15.51	93	84	4.30	26	21	0.15	1	1	1,044	277
Squirrel Glider	6.75	150	49.33	1,096	8.42	187	5.84	130	1,563	261.02	1,566	19.91	119	108	18.76	113	90	0.58	3	2	1,766	203
Eastern Chestnut Mouse	23.95	630	22.58	594	3.62	95	2.36	62	1,382	239.90	1,439	9.76	59	53	4.30	26	21	0.15	1	1	1,513	131
<b>Total</b>		<b>1,307</b>		<b>3,556</b>		<b>617</b>		<b>381</b>	<b>5,861</b>		<b>6,160</b>		<b>356</b>	<b>321</b>		<b>317</b>	<b>254</b>		<b>9</b>	<b>6</b>	<b>6,740</b>	<b>-323</b>

## 6 Variation to the offset rules for using ecosystem and species credits

The BCAM outlines the rules which govern how the direct and indirect impacts on the biodiversity values of land on which biodiversity conservation is conferred are offset by the improvements in biodiversity values of land where conservation measures are proposed (DECCW 2011). Generally, credit profiles for credits generated for a proposed conservation measure are ‘matched’ against the credits required for biodiversity certification. The purpose of these offset rules is to ensure that losses of particular biodiversity values are offset by improvements on land with the same or similar biodiversity values. Notwithstanding these rules, the Director General may approve a variation to these (section 10.2.1 of the BCAM for ecosystem credit offset rules, and section 10.4.1 of the BCAM for species credit offset rules).

The BCAM (Section 10) allows ecosystem credits generated for one vegetation type to be offset with ecosystem credits generated by another vegetation type if it complies with the credit profile outlined in Table 9 of the methodology i.e. the predicted threatened species in the other vegetation types are the same as those predicted in the impacted vegetation type, and the other vegetation type has a per cent cleared value the same as or higher than the impacted vegetation type and the other vegetation type is in the same ‘Vegetation Formation’ as the impacted vegetation type. The species credits must be for the same species as that being impacted.

For each of the vegetation types that are in deficit, the surplus credits for the other vegetation types do not meet all of the attributes listed in Table 9 of the BCAM, in particular, providing habitat for the same suite of predicted or ecosystem threatened species (**Table 36**). Accordingly a request for a variation to the credit training rules is made in this section.

To meet the requirements for biocertification, ELA consulted with OEH throughout 2014 and formally requested in principle support from OEH in February 2015 for a variation in credit offset rules. The request was to use alternate ecosystem credits generated from conservation measures (credits from vegetation types from the same vegetation formation, instead of credits from the same vegetation type) to offset ecosystem credits required for biodiversity certification. Also, the request included the use of alternate species credits generated (credits from species in the same kingdom and same or higher conservation status) to offset species credits required. Specifically,

- ecosystem credits generated for ‘*Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern NSW North Coast Bioregion*’ (40% cleared in CMA) or ‘*Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the NSW North Coast Bioregion*’ (25% cleared in CMA) for those required by ‘*Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion*’ (15% cleared in CMA) (all within the vegetation formation ‘Dry sclerophyll forests’)
- ecosystem credits generated for ‘*Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion*’ (75% cleared in CMA) or ‘*Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion*’ (75% cleared in CMA) for those required by ‘*Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion*’ (75% cleared in CMA) (all within the vegetation formation ‘Forested wetlands’)
- ecosystem credits generated for ‘*Wallum sedgeland and rushland of near coastal lowlands of the NSW North Coast Bioregion*’ (70% cleared in CMA) or ‘*Coastal freshwater meadows and*

*forblands of lagoons and wetlands*' (80% cleared in CMA) for those required by 'Wet heathland and shrubland of coastal lowlands of the NSW North Coast Bioregion' (40% cleared in CMA) (all within the vegetation formation 'Freshwater wetlands')

- species credits generated for Squirrel Glider, and Eastern Chestnut Mouse for those required by Koala.

In a response from OEH on 13 March 2015 (**Appendix C**), OEH officers advised that the variation request for credit trading rules had been applied in accordance with the BCAM. The outcomes of surplus and deficit credits resulting from the changes to offset rules are presented in the Biocertification Strategy (**Section 7**).

ELA's response to the above criteria for varying offset rules are addressed below.

### **6.1 Variation for ecosystem credits**

In relation to ecosystem credits, a variation may be approved provided:

*A. Firstly, before varying the offset rules for using ecosystem credits, the Director General must be satisfied that:*

*a) all reasonable steps have been taken to secure conservation measures that generate credits that match the credit profile specified for ecosystem credits required for biodiversity certification in section 10.1 of the methodology*

*Or*

*b) the cost of securing a conservation measure capable of generating credits to match the credit profile specified for ecosystem credits required for biodiversity certification in section 10.1 of the methodology is disproportionate to the overall cost of the conservation measures identified in the application for biodiversity certification*

*And*

*c) the list of threatened species predicted to occur at the offset site is not significantly different to the list of threatened species that are assessed on land where biodiversity certification is proposed when assessed in accordance with section 4.2 of the methodology.*

*B. Secondly, in order to approve a variation of the offset rule in section 10.2, the Director General must also be satisfied that the alternate ecosystem credits are generated from conservation measures:*

*a) located on land within the same IBRA region as the land proposed for biodiversity certification, regardless of the CMA subregions identified in attribute 1*

*And*

*b) on land containing a vegetation type of the same vegetation class as the vegetation type specified in attribute 2 of the credit required for the land proposed for biodiversity certification as set out in section 10.1 of the methodology*

*Or*

c) if paragraph (b) cannot be complied with, on land containing a vegetation type from the same vegetation formation as the vegetation type specified in attribute 3 of the credit required for the land proposed for biodiversity certification as set out in section 10.1 of the methodology.

ELA calculated the number of credits required and generated in **Section 5**, and summaries for ecosystem and species credits are provided in **Table 34** and **Table 35** respectively.

In relation to the matters set out in Part A of Section 10.2.1 of BCAM, PMHC took all reasonable steps to secure conservation measures on the available Council and private land within the BCAA that generated credits to match the credit profile for ecosystem credits. This included consideration of multiple alternative development footprints and modifications to the preferred footprint to minimise impacts and thus the number of credits required, and increasing the area of Council owned land subject to conservation measures to generate the required number of credits. Thus, conservation measures were secured for all vegetation types impacted, with the exception of *'Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast'*, which was not present in the conservation areas.

The result of securing conservation measures was that all ecosystem credits were met (or exceeded) for six of the ten vegetation types whilst four vegetation types had a credit deficit, three of which could be met by the variation rules. Therefore, the variation request is for three vegetation types whilst the deficit for *'Blackbutt – Tallowwood forest'* will need to be met outside of the BCAA:

- *'Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast'* (242 credits)
- *'Swamp Oak swamp forest of the coastal lowlands of the North Coast'* (28 credits)
- *'Wet heathland and shrubland of coastal lowlands of the North Coast'* (506 credits).

Ecosystem credits were in surplus for a number of vegetation types within the same vegetation formations as those vegetation types in deficit:

- *'Blackbutt – bloodwood dry heathy forest on Quaternary sands of the northern North Coast'* (369 credit surplus)
- *'Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast'* (58 credit surplus)
- *'Paperbark swamp forest of the coastal lowlands of the North Coast'* (436 credit surplus)
- *'Swamp Mahogany swamp forest of the coastal lowlands of the North Coast'* (71 credit surplus)
- *'Wallum sedgeland and rushland of near coastal lowlands of the North Coast'* (232 credit surplus)
- *'Coastal freshwater meadows and forblands of lagoons and wetlands'* (408 credit surplus).

For the three vegetation types in deficit, which this variation request relates, whilst in most cases a significant proportion of the matching credit types was able to be generated (the exception was *'Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast'*), not all required credits could be generated in each case.

The list of threatened species predicted to occur within these similar vegetation types is not significantly different to the list assessed for the vegetation types impacted. Threatened species predicted to occur were generally very similar for vegetation types within the same formation (**Table 36**). However, there were some exceptions. For example, within the vegetation formation, dry sclerophyll forests, *Stagonopleura guttata* (Diamond Firetail), *Petroica boodang* (Scarlet Robin), and *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) were predicted to occur in *'Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion'* but were not predicted to occur in

'Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern NSW North Coast Bioregion' or 'Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the NSW North Coast Bioregion'. Within the same formation, Eastern Bentwing Bat was predicted to occur in 'Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern NSW North Coast Bioregion' and 'Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the NSW North Coast Bioregion', but not in 'Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the NSW North Coast Bioregion'. All other exceptions for species predicted in vegetation types within the same vegetation formations are indicated in **Table 36**.

**Table 36: Threatened species predicted to occur in vegetation types, with vegetation types grouped into vegetation formations**

Scientific name	Common name	Dry sclerophyll forests			Forested wetlands			Freshwater wetlands		
		Blackbutt - Bloodwood	Scribbly Gum – Red Bloodwood	Grey Ironbark- Grey Gum	Paperbark	Swamp Mahogany	Swamp Oak	Wallum sedgeland	Wet heathland	Meadows and forblands
% Cleared In CMA		40	25	15	75	75	75	70	60	80
<i>Rostratula australis</i>	Australian Painted Snipe						x			X
<i>Ninox connivens</i>	Barking Owl	x	x	x	x	x	x			
<i>Coracina lineata</i>	Barred Cuckoo-shrike	x	x	x	x	x	x			
<i>Oxyura australis</i>	Blue-billed Duck							x	x	X
<i>Grus rubicunda</i>	Brolga							x	x	X
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	x	x	x						
<i>Burhinus grallarius</i>	Bush Stone-curlew	x	x	x						
<i>Syconycteris australis</i>	Common Blossom-bat				x	x	x		x	
<i>Stagonopleura guttata</i>	Diamond Firetail			x						

Scientific name	Common name	Dry sclerophyll forests			Forested wetlands			Freshwater wetlands		
		Blackbutt - Bloodwood	Scribbly Gum – Red Bloodwood	Grey Ironbark- Grey Gum	Paperbark	Swamp Mahogany	Swamp Oak	Wallum sedgeland	Wet heathland	Meadows and forblands
% Cleared In CMA		40	25	15	75	75	75	70	60	80
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	x	x	x	x	x	x	x	x	X
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	x	x	x						
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle			x						
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	x	x	x	x	x	x	x	x	X
<i>Tyto longimembris</i>	Eastern Grass Owl							x	x	
<i>Stictonetta naevosa</i>	Freckled Duck						x			X
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	x	x	x	x	x	x			
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	x	x	x	x	x	x			
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	x	x	x	x	x	x		x	
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	x	x	x	x	x	x			
<i>Miniopterus australis</i>	Little Bentwing-bat	x	x		x	x	x	x	x	
<i>Hieraaetus morphnoides</i>	Little Eagle	x	x	x	x	x	x	x	x	X
<i>Glossopsitta pusilla</i>	Little Lorikeet	x	x	x	x	x				

Scientific name	Common name	Dry sclerophyll forests			Forested wetlands			Freshwater wetlands		
		Blackbutt - Bloodwood	Scribbly Gum – Red Bloodwood	Grey Ironbark- Grey Gum	Paperbark	Swamp Mahogany	Swamp Oak	Wallum sedgeland	Wet heathland	Meadows and forblands
% Cleared In CMA		40	25	15	75	75	75	70	60	80
<i>Potorous tridactylus</i>	Long-nosed Potoroo				x	x	x	x	x	
<i>Tyto novaehollandiae</i>	Masked Owl	x	x	x		x				
<i>Ninox strenua</i>	Powerful Owl	x	x	x	x	x	x			
<i>Petroica boodang</i>	Scarlet Robin			x						
<i>Myotis macropus</i>	Southern Myotis	x	x	x	x	x	x	x	x	X
<i>Circus assimilis</i>	Spotted Harrier							x	x	X
<i>Lophoictinia isura</i>	Square-tailed Kite	x	x	x	x	x	x	x	x	
<i>Lathamus discolor</i>	Swift Parrot	x	x	x	x	x				
<i>Daphoenositta chrysoptera</i>	Varied Sittella	x	x	x	x	x	x			
<i>Petaurus australis</i>	Yellow-bellied Glider	x	x	x	x	x				
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	x	x	x	x	x	x	x	x	

In relation to the matters set out in Part B of Section 10.2.1 of BCAM, the alternate ecosystem credits generated from conservation measures were located on land within the same IBRA region as the land proposed for biodiversity certification. The alternate ecosystem credits were located on land containing a vegetation type from the same formation as the vegetation type with credits required for the land proposed for biodiversity certification (see **Table 36** and **Table 37** for the vegetation types belonging in the same vegetation formations). Accordingly, surplus credits generated within the BCMA are eligible to be used to account for the deficit of other vegetation types.

The matters set out in Parts A and B of Section 10.2.1 of BCAM do not specifically outline that vegetation types to be used to account for deficits of other vegetation types have the same or greater percent cleared value. However, Table 9 of BCAM highlights this offset rule requirement. As such, **Table 37** shows the percent cleared values within the Northern Rivers CMA for relevant vegetation types. The percent cleared values are in accordance with the offset rules. Thus, the vegetation types ‘*Blackbutt – bloodwood dry heathy forest on Quaternary sands of the northern North Coast*’ or ‘*Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast*’ have greater percent cleared values than ‘*Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast*’. The vegetation types ‘*Paperbark swamp forest of the coastal lowlands of the North Coast*’ and ‘*Swamp Mahogany swamp forest of the coastal lowlands of the North Coast*’ have the same percent cleared value as ‘*Swamp Oak swamp forest of the coastal lowlands of the North Coast*’. The vegetation types ‘*Wallum sedgeland and rushland of near coastal lowlands of the North Coast*’ and ‘*Coastal freshwater meadows and forblands of lagoons and wetlands*’ have the same or greater percent cleared values than ‘*Wet heathland and shrubland of coastal lowlands of the North Coast*’.

**Table 37: Percent cleared values for each vegetation type in the Northern Rivers CMA**

Vegetation formation	Vegetation type	Percent cleared in the Northern Rivers CMA
Dry sclerophyll forests	Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	40
	Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	25
	Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	15
Forested wetlands	Paperbark swamp forest of the coastal lowlands of the North Coast	75
	Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	75
	Swamp Oak swamp forest of the coastal lowlands of the North Coast	75
Freshwater wetlands	Wallum sedgeland and rushland of near coastal lowlands of the North Coast	70
	Wet heathland and shrubland of coastal lowlands of the North Coast	60#
	Coastal freshwater meadows and forblands of lagoons and wetlands	40

# It is noted that the 60% cleared for this vegetation type is in accordance with the MALD request in Section 3 of this report



## 6.2 Variation for species credits

In relation to species credits, a variation may be approved provided:

*A. The Director General may only approve a variation of the offset rules for using species credits for biodiversity certification, by allowing the species credits generated for a conservation measure for another species to be used to offset the impacts of the conferral of biodiversity certification on land when satisfied that:*

*a) all reasonable steps have been taken to secure the number and types of species credits*

*And*

*b) the species to which the species credit relates is not listed as critically endangered on the TSC Act*

*And*

*c) a conservation measure in the form of a financial contribution for the value of the species credits in line with sections 9.3 and 9.3.1 of the methodology is not an appropriate conservation measure for this species.*

*B. In addition, the variation must only be approved where the Director General is satisfied that the alternate species credits:*

*a) relate to a species or population from the same kingdom as the species identified in the credit profile in accordance with section 10.3 of the methodology*

*And*

*b) are generated from conservation measures located on land within the same IBRA region as the land proposed for biodiversity certification*

*And*

*c) where the species credit required for land proposed for biodiversity certification relates to a species or population listed in Schedule 1 of the TSC Act, it relates to a species or population listed in either Schedule 1 or 1A of the TSC Act*

*Or*

*d) where the species credit required for land proposed for biodiversity certification relates to a species or population listed in Schedule 2 of the TSC Act, it relates to a species or population listed in either Schedule 1, 1A or 2 of the TSC Act.*

Species credits were in deficit for Koala (323 credits). Species credits are in surplus for Eastern Chestnut Mouse (131), Squirrel Glider (203 credits) and Wallum Froglet (868).

In relation to the matters set out in Part A of Section 10.4.1 of BCAM, PMHC took all reasonable steps to secure the number and types of species credits on the available Council and private land within the BCAA. This included consideration of multiple alternative development footprints and modifications to the preferred footprint to minimise impacts and thus the number of credits required, and increasing the area of Council owned land subject to conservation measures to generate the required number of credits. Thus, conservation measures were secured for all species impacted. The result of securing conservation

measures was that all species credits requirements were met for three of the four species. Therefore, the variation request is only for one species, Koala. Whilst a significant proportion of Koala credits was able to be generated by the on-site conservation measures (1,776 credits out of 2,099 credits required i.e. 84.61%), not all required Koala credits could be generated within the BCAA. A review of currently available credits from registered Biobank sites outside the BCAA found that there is currently a registered Biobank site in the Kempsey LGA (Biobank Site ID 212) that has 965 Koala credits and two potential biobank sites within the PMHC LGA were identified that were capable of generating Koala credits **Figure 29**). However, PMHC preference is to secure Koala credits from within the PMHC LGA and it is likely that these credits will be secured via the same site that is secured to meet the deficit of Blackbutt-Tallowood credits. However, should this not be achieved, this request for variation is made to use 'surplus' species credits from within the BCAA.

Koala is not listed as Critically Endangered on the TSC Act.

In relation to the matters set out in Part B of Section 10.4.1 of BCAM, alternate species credits relate to species from the same kingdom: the species with surplus species credits, Squirrel Glider, Wallum Froglet and Eastern Chestnut Mouse, are all of the Kingdom Animalia. Notwithstanding this, it is proposed that surplus credits from Squirrel Glider and Eastern Chestnut Mouse are used to offset impacts to Koala prior to surplus credits from Wallum Froglet. Squirrel Glider and Eastern Chestnut Mouse are both mammals, and therefore more similar to Koala than Wallum Froglet, a frog species and the Squirrel Glider utilises similar habitat.

Alternate species credits are generated from conservation measures located on land within the same IBRA region as the land proposed for biodiversity certification. The four species for which alternate species credits relate are all listed as vulnerable species in Schedule 2 of the TSC Act.

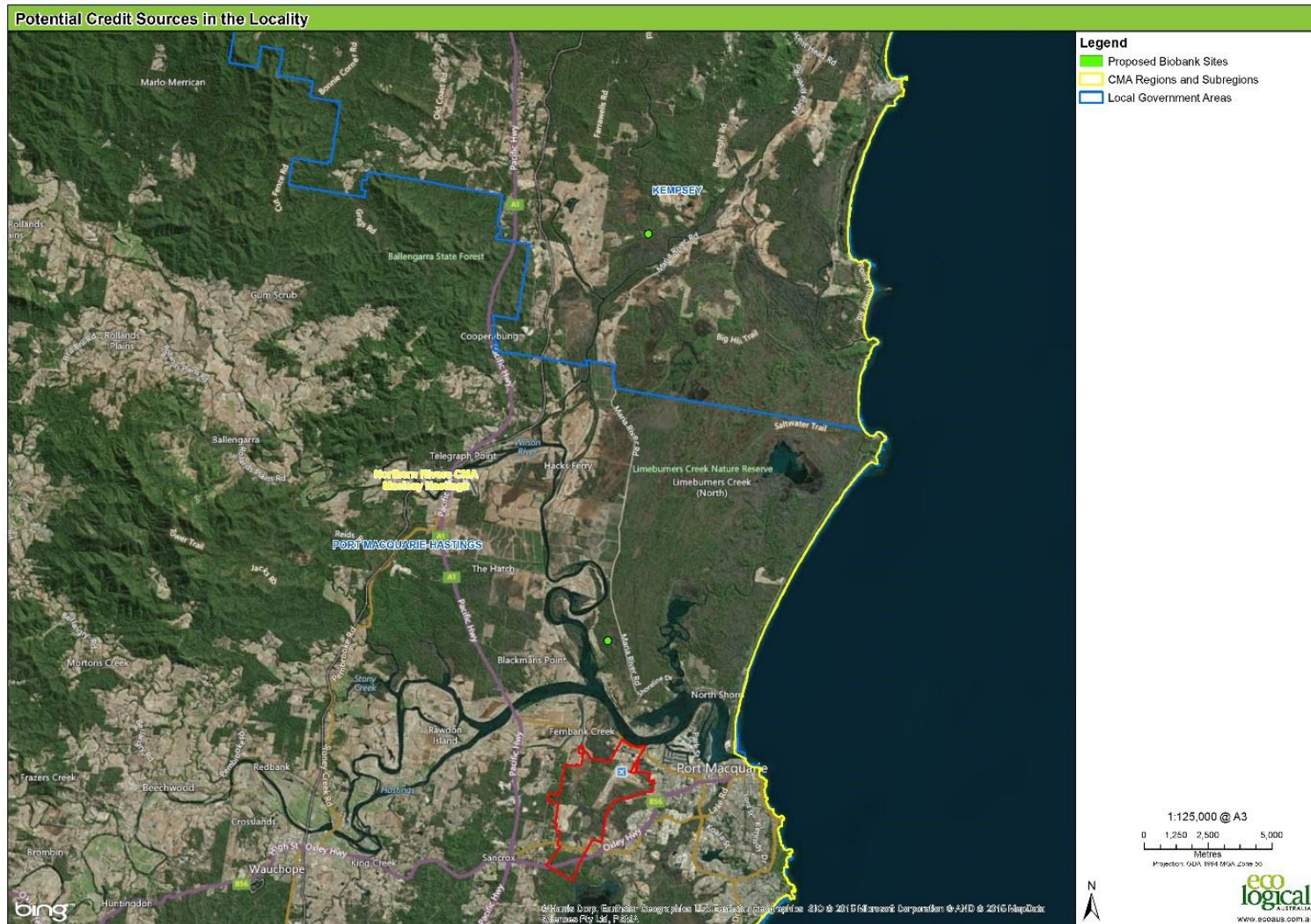


Figure 29: Potential Biobank sites and sources of credits in PMHC LGA

## 7 Biocertification Strategy

Section 126K of the TSC Act states that biocertification may only be conferred on land by the Minister if the applicant has a biocertification strategy.

Section 126K (2) states that a biocertification strategy is a policy or strategy for the implementation of conservation measures to ensure that the overall effect of biodiversity certification is to improve or maintain biodiversity values. The Biocertification strategy is to be used as the basis for the assessment of the application for biodiversity certification.

A biodiversity strategy is to include the following:

- (a) the land proposed for biodiversity certification
- (b) the land proposed for biodiversity conservation
- (c) the proposed conservation measures
- (d) any person or body proposed as a party to the biodiversity certification

This section addresses these requirements.

### 7.1 Land proposed for biodiversity certification

The land proposed for biodiversity certification is shown in **Figure 5** in **Section 1** of this report.

### 7.2 Land proposed for biodiversity conservation

#### *On-site conservation measures*

It is proposed that the land subject to conservation measures within the BCAA will be secured by entering into a BioBanking Agreement under Part 7A of the TSC Act within 12 months of biocertification being conferred and prior to any clearing on certified land taking place.

All credits generated will be categorised as ‘committed’ and not available for any other project. PMHC will commence active management of the Biobank site from year 1 and fully fund the management of the Biobank site for seven years. In year 7, the Total Fund Deposit amount will be recalculated and Council will purchase and retire all credits at the start of year 8 thus providing for the in perpetuity management of the BioBank site.

Port Macquarie - Hastings Council is a local government entity operating under the Local Government Act 1993. Council by formal resolution has committed to implementing and funding in full the requirements of this Biodiversity Certification Strategy. Council confirms that as a local government entity it has the financial capacity to meet its financial obligations arising from this Biodiversity Certification Strategy.

A BioBanking Agreement is a ‘Permanently Managed and Funded’ or 100% Conservation Measure as outlined in s126L(i) of the TSC Act and section 8.1.1 of the BCAM and will generate 100% of the calculated credits as shown in **Table 34** and **Table 35** respectively (i.e. between **4,087** and **4,143** ecosystem credits and **6,740** species credits).

The land proposed for biodiversity conservation is shown in **Figure 5** in **Section 1** of this report.

Subject to OEH’s consideration of any credit discounting and the request for variation of offset rules, if required, relating to both ecosystem and species credits, there will be a surplus of 798 ecosystem credits for some vegetation types generated by the proposed conservation measures and 879 species credits. As these credits are generated by a conservation measure from within the BCAA, all of these ‘surplus’ credits (185 Dry Sclerophyll Forest credits, 479 Forested wetland credits (all EECs), and 134 Freshwater wetland credit (mostly EEC) and 11 Eastern Chestnut Mouse and 868 Wallum Froglet species credits will be ‘retired’ as a condition of Biocertification. The retirement of these ‘surplus’ credits provides additional compensation for the impacts to red flag areas.

#### *Off-site conservation measures*

If required, PMHC will, and prior to any impacts that trigger the deficit credit requirement (i.e. clearing within private land subject to a Private Native Forestry Agreement within the OLS) secure an additional **452** credits for ‘*Blackbutt – Tallowood dry grassy open forest*’ (approximately 40 to 50 ha) and **323** credits for Koala (approximately 46 ha of Koala habitat), by either:-

1. securing additional privately owned land within PMHC LGA offered for sale that provides habitat for these species; or
2. purchasing credits from registered BioBank sites in PMHC LGA; or
3. purchasing credits from registered BioBank sites outside of PMHC LGA; or
4. purchasing the required credits from the proposed Biodiversity Conservation Fund, once available.

A review of the BioBanking Agreements and EOI register indicates that there is currently one registered BioBank site in the Kempsey LGA (BioBank Site ID 212) that has 965 Koala credits and 220 Blackbutt – Tallowood Forest credits available, and a private land owner in the PMHC LGA who has expressed interest in registering a Biobank site that would generate Koala and Blackbutt credits (**Figure 29**). Given the distribution of suitable habitat in the region, it is considered that securing these additional credits when required will not be overly difficult.

### **7.2.1 Existing management obligations**

Within the land proposed for conservation, there are areas where there are no existing legislative requirement to undertake management actions for conservation (i.e. Council owned SP2 Infrastructure, RE1 Recreation and Operational E2 land). There are also areas where there may be (subject to the approval of development applications currently before Council) obligations to manage land for conservation (i.e. 19.99 ha E2 and E3 zoned land within the Area 13 Urban Release Area (URA) where the Thrumster Area 13 Planning Agreement requires maintenance and restoration of defined areas for up to 20 years prior to the transfer of land to Council – labelled as ‘Offset Discounted’.

Ecosystem and species credits may only be generated in respect of management actions that are additional to any existing conservation obligations that are required to be carried out on the land (section 8.4 of the BCAM). Where a new conservation measure is proposed on land on which there are existing obligations, the number of credits generated is ‘discounted’ in accordance with Table 7 of the BCAM.

The DCP and Planning Agreement for the Thrumster Area 13 URA requires environmental management and restoration of the E2/E3 lands by the current land owners for up to 20 years (then transfer to Council) but is only activated on the approval of a development application.

The Council owned land within the Thrumster Area 13 URA (i.e. Partridge Creek residential and Industrial land and West Lindfield residential land) is not subject to any current development applications and as such the requirements of the DCP are not triggered. However, a parcel of private land in Area 13 is subject to a current development application and the E2/E3 lands within this parcel of land that have been included as proposed conservation measures in this biocertification assessment with the consent of the

land holder, have been calculated with a 20% credit discount on the basis that the DA will be approved. This is to reflect the 20 year management commitment in the Planning Agreement as a percentage of the in perpetuity requirements of a 100% Conservation Measure which is taken as 100 years for the purposes of calculations and will be discussed further with OEH.

The 17 ha Link Road offset requirement (Condition of Approval 2 of DA 2000/782) requires Council to rehabilitate disturbed wetland areas in the Partridge Creek catchment area in accordance with the then Department of Urban Affairs and Planning 'Compensatory Wetlands Policy'. This area shown in **Figure 2** will not generate any ecosystem or species credits.

The up to/if required 20.9 ha 'conservation cropping' in the proposed conservation areas has had a 10% discount applied to the number of credits generated on the basis that over-story cover has a 10% weighting in the calculation of the site condition score which could not be compensated for by manually disallowing the default increase in over-story cover. As discussed, the cropping of trees in this area will selectively prune the canopy only, poison the individual trees to prevent regrowth and retain the stag as fauna habitat.

### **7.3 Any person or body proposed as a party to the biodiversity certification**

PMHC will be solely responsible for the preparation and submission of the application for registration of a BioBank Agreement by an accredited assessor. The subsequent implementation, monitoring, reporting and review of the terms of the agreement will be the responsibility of PMHC

The BioBank Agreement will be registered on title and will be enforceable against the owner of the land (i.e. PMHC) or any future land owner. It is noted that the private land subject to conservation measures at the southern end of the BCAA is all within one ownership and an agreement has been reached between this landowner and PMHC to transfer this land to Council as part of the Thrumster Area 13 Planning Agreement conditions.

The BioBank site will be subject to the terms of the Biobank Agreement which includes annual conservation management in perpetuity, submission of an annual report to OEH regarding these management obligations and audit by OEH.

This management plan for the BioBank site will be implemented annually by PMHC (or suitably qualified and experienced contractors engaged by Council) in perpetuity and reviewed every 5 years in accordance with the terms of the BioBank Agreement.

An annual report will be prepared for the Minister by Council outlining the actions that have been undertaken in the previous 12 months, the response of the conservation area to the conservation management and any required modification of the management actions for the following 12 months.

The application for registration of the BioBank Agreement will be submitted to OEH within 12 months of biodiversity certification being conferred and prior to any clearing. This will provide in perpetuity protection on title.

#### **7.3.1 Timing of credit retirement**

**Table 38** and **Table 39** indicate the number of credits required for each stage of development as shown in **Figure 4** based on the area of vegetation expected to be cleared in each stage of the OLS clearing, relocation of the essential airport infrastructure and development of the employment and residential lands. These areas may vary due to changed CASA requirements for OLS clearance, lower or higher demand for business, residential or industrial land or as a result of other approvals for proposed development within the BCAA.

Regardless of which stage the impacts occur, Council has made a commitment to enter into a BioBanking Agreement under Part 7A of the TSC Act within 12 months of biocertification being conferred and prior to any clearing on certified land taking place. All credits generated will be categorised as 'committed' and not available for any other project. PMHC will commence active management of the Biobank site from year 1 and fully fund the management of the Biobank site for seven years. In year 7, the Total Fund Deposit amount will be recalculated and Council will purchase and retire all credits at the start of year 8 thus providing for the in perpetuity management of the BioBank site.

Active conservation management of the BioBank site will occur progressively in accordance with the staging plan. The proposed Biobank area and relevant stages of active management are show in **Figure 30**. It is proposed that the entire Biobank site will be actively managed for conservation for landscape features from the first stage of development (i.e. access control, feral animal management) with weed control and revegetation of vegetation zones requiring planting in stages consistent with development.

Development in areas with no mapped native vegetation may occur prior to the purchase and retirement of credits.

The requirements for the retirement of credits from the on-site BioBank site are expressed in this strategy as credits calculated using the BCAM. As the site will be secured as a BioBank site it will be the credits calculated using the BBAM 2014 that are actually retired. As the Biobank site is a conservation measure 'within' the BCAA, all credits generated by the Biobank Agreement, including any 'surplus' credits, will be retired.

#### **7.4 Is an Improve or Maintain Outcome Achieved?**

Subject to the Director-General's consideration and approval of the MALD request (**Section 3**), the red flag variation request (**Section 4**) and variation to the offset rules (**Section 6**) an improve or maintain outcome can be achieved within the BCAA if clearing on land subject to the Private Native Forestry approval is not required to be cleared for OLS requirements, or subject to PMHC securing up to an additional **452** Blackbutt – Tallowood and **323** Koala credits from a BioBank site or other private land purchase outside the BCAA.

If additional credits are required to clear vegetation within the OLS (i.e. the land subject to the DA is not approved by Council) Council has committed to registering and generating the additional credits required on a Council owned site and/or purchasing the required credits from a registered biobank site.

**Table 38: Indicative staging of development and number of ecosystem credits required**

Biometric Vegetation Type	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Total Area (ha)	Total Credits required
	Area (ha)	Credits required	Area (ha)	Credits required	Area (ha)	Credits required	Area (ha)	Credits required	Area (ha)	Credits required		
Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast	1.02	35	0.74	27	0.00	0	0.24	9	0.89	32	2.89	103
Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast	6.59	249	0.51	21	1.78	72	0.20	8	0.19	8	9.28	357
Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast	0.00	0	3.07	124	2.90	118	0.00	0	0.00	0	5.97	242
Blackbutt - Tallowood dry grassy open forest of the central parts North Coast	4.61	151	25.73	756	4.31	129	4.34	152	0.10	3	39.09	1190
Paperbark swamp forest of the coastal lowlands of the North Coast	15.08	490	0.30	11	0.66	24	1.09	40	2.72	101	19.85	667
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast	1.84	66	0.00	0	0.00	0	0.47	18	0.34	13	2.66	97
Swamp Oak swamp forest of the coastal lowlands of the North Coast	0.08	2	2.60	46	2.89	49	0.00	0	0.49	14	6.07	111
Wallum sedgeland and rushland of near coastal lowlands of the North Coast	0.20	5	0.00	0	0.00	0	0.00	0	0.32	7	0.52	12
Wet heathland and shrubland of coastal lowlands of the North Coast	15.77	472	0.16	5	0.00	0	8.83	265	6.89	200	31.64	942
Coastal freshwater meadows and forblands of lagoons and wetlands	0.00	0	0.50	20	0.00	0	0.01	0	0.00	0	0.51	20
	<b>45.21</b>	<b>1470</b>	<b>33.63</b>	<b>1010</b>	<b>12.55</b>	<b>392</b>	<b>15.18</b>	<b>492</b>	<b>11.94</b>	<b>378</b>	<b>118.50</b>	<b>3,741</b>
Proportion of total area/credits required (%)	<b>38.15%</b>	<b>39.29%</b>	<b>28.38%</b>	<b>26.99%</b>	<b>10.59%</b>	<b>10.47%</b>	<b>12.81%</b>	<b>13.16%</b>	<b>10.08%</b>	<b>10.10%</b>	<b>100.00%</b>	<b>100.00%</b>

**Table 39: Indicative staging of development and number of species credits required**

Species	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		Total Area (ha)	Total Credits required
	Area (ha)	Credits required	Area (ha)	Credits required	Area (ha)	Credits required	Area (ha)	Credits required	Area (ha)	Credits required		
Eastern Chestnut Mouse	31.06	817	0.97	26	0.66	17	9.92	261	9.92	261	52.52	1,382
Koala (Primary)	7.46	196	29.56	778	7.21	190	5.05	133	1.34	35	50.62	1,332
Koala (Secondary)	21.68	570	0.82	21	2.44	64	1.29	34	2.91	77	29.13	767
Squirrel Glider	28.98	644	26.00	578	5.34	119	5.83	130	4.19	93	70.34	1,563
Wallum Froglet	33.00	440	3.57	48	3.53	47	10.39	139	10.76	143	61.26	817



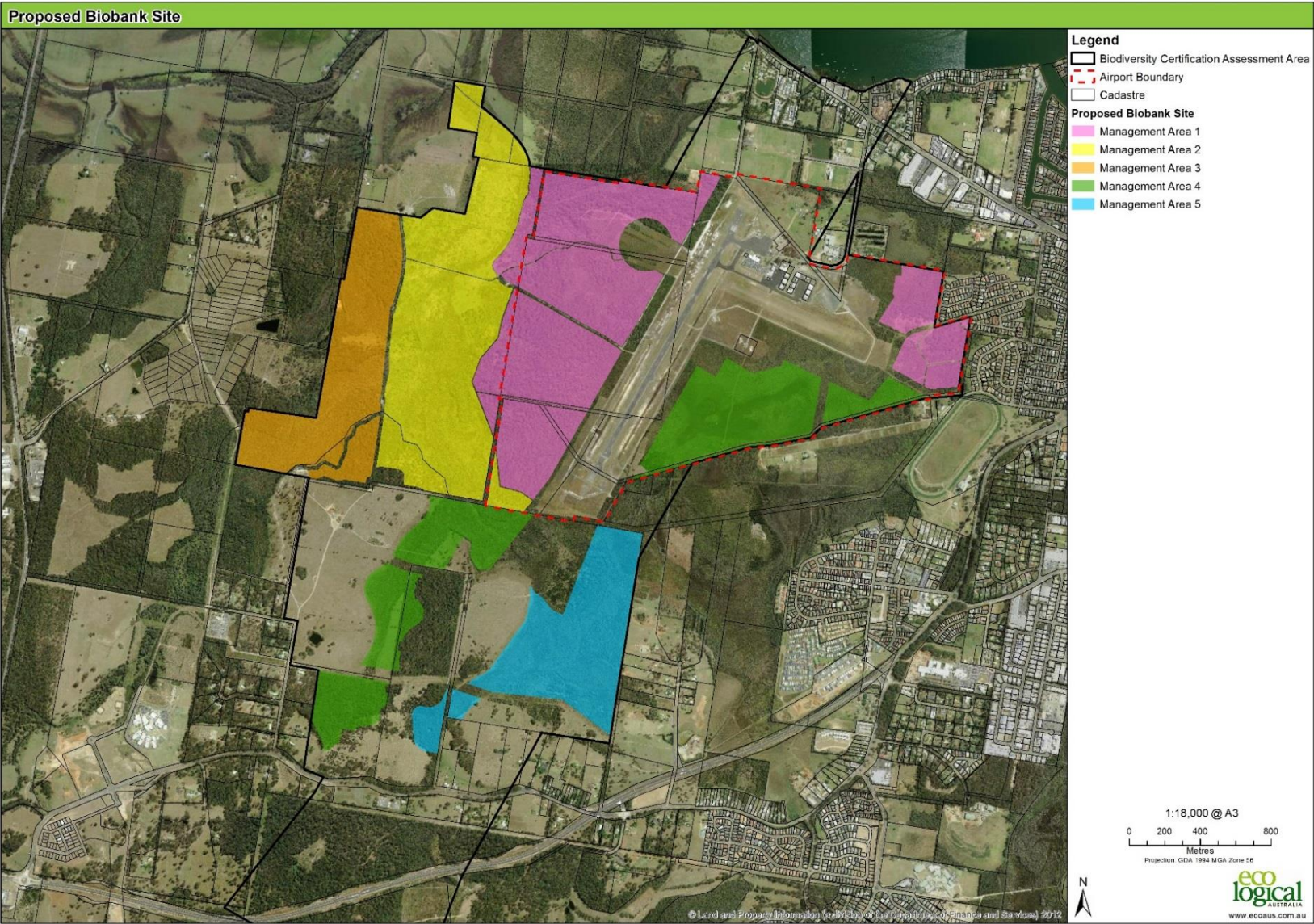


Figure 30: Land subject to proposed BioBank site and management stages

## 7.5 Statement of commitments

PMHC will prepare and implement a Construction Environment Management Plan for vegetation clearing within the OLS consistent with CASA and Airport Master Plan requirements and the Thrumster Area 13 Planning Agreement, including the Area 13 Koala Plan of Management and a Fauna Pre-clearance protocol, to guide the development outlined in this biocertification assessment and ensure that all direct and indirect impacts (e.g. APZs, utilities, access, stormwater run-off) are contained within the development footprint and appropriate mitigation measures are put in place to minimise indirect impacts to threatened fauna including Koala, Squirrel Glider and Wallum Froglet.

This will include, but not be limited to:

- A Management Plan, including a Bushfire Management Plan that meets ecological burning regimes, will be prepared and implemented for the Biobank site on an annual basis prior to the first stage of clearing that will progressively and in proportion to the staging plan, manage all biodiversity values within the Biobank site in perpetuity
- The proposed Biobank site will be assessed and submitted for registration within 1 year of Biocertification being conferred by the Minister and prior to any clearing required for Stage 1. All credits generated will be categorised as 'committed' in the credit register and not available for use in any other project.
- The management of the Biobank site will be fully funded by Council on a year to year basis for the first seven years, after which the Total Fund Deposit amount will be recalculated and all credits 'retired'.
- The deficit Blackbutt – Tallowood and Koala credits will be secured prior to any impacts that trigger the need for these additional credits.
- Temporary and permanent protective fencing will be erected around all areas identified for conservation prior to clearing activities to minimise any inadvertent damage, including security fencing of the airport operational precinct to prevent Koala's and other fauna from entering operational areas
- Pre-clearance surveys of threatened fauna, including where necessary, a Koala relocation strategy, will be undertaken in accordance with a Fauna pre-clearance protocol prior to any clearing of vegetation
- Protocols for clearing vegetation and adaptive reuse of vegetative material for restoration and habitat augmentation in areas indicated for restoration activity (i.e. outer E3 zone of Thrumster Area 13) will be prepared and implemented
- Implementation of a fauna habitat enhancement program for the modified Paperbark swamp forest/ SEPP14 wetland at southern end of runway to maintain habitat connectivity and not impose risk to airport operational requirements (avian/bat strike)
- The Thrumster Area 13 Koala Plan of Management (Biolink 2008) will be implemented as required for all Council owned land within the Thrumster Area 13 URA including aspects relating to fencing of residential lots, road speed limits, provision of Koala underpasses on arterial and collector roads, protection of preferred koala food trees within residential areas.

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# Appendix A: Port Macquarie Airport Master Plan

Provided as a separate document

# Appendix B: Clarification of aspects of the Assessment Methodology by OEH



Office of  
Environment  
& Heritage

Your reference: Port Macquarie Biocertification  
Our reference: DOC14/232539  
Contact: Krister Waern (02) 6640 2503

Mr Robert Humphries  
Eco Logical Australia Pty Ltd  
PO Box 12  
Sutherland NSW 1499

cc: Mr Ashley Grummitt, Business Enterprise Manager Port Macquarie-Hastings Council

Dear Mr Humphries *Rob*

**Re: Port Macquarie Airport Biocertification Assessment.**

Thank you for meeting with the Office of Environment and Heritage (OEH) on 25 September 2014 and 8 October 2014 to discuss the above proposal. The early engagement of OEH in these complex matters is encouraged and I look forward to assisting with the progress of this project.

OEH has reviewed the draft minutes provided by Eco Logical Australia for the meeting of 25 September 2014. OEH agrees that the minutes generally reflect the discussions at that meeting and provides further clarification as follows:

1. The current version of the Biodiversity Certification tool is version 1.9. OEH has no immediate plans to update this version. I understand you are about to commence the calculations for Biodiversity Certification and as such version 1.9 should be used. If during the course of the project another version of the tool is released by OEH, this will not impact this project and OEH will continue to assess the application in line with version 1.9.
2. You have advised that there is a proposed development currently being assessed by Port Macquarie Council that is positioned south of the airport. The biodiversity values of this property forms part of the Biodiversity Certification proposal. If the biodiversity values of the site are impacted for the purposes of the Biodiversity Certification proposal then these impacts will need to be considered and assessed accordingly in the proposal.
3. OEH can confirm that there is a regional corridor which intersects the Biodiversity Certification area. This is identified in the Mid North Coast Regional Strategy approved by the NSW Government and derived from *Scotts, D., 2003, Key Habitats and Corridors for Forest Fauna: A Landscape Framework for Conservation in North-east New South Wales, NSW NPWS Occasional Paper 32, NSW National Parks and Wildlife Service, Sydney.*
4. OEH can confirm that the Squirrel Glider is a species credit type for the Northern Rivers area.

Should you require further information or clarification please contact Senior Operations Officer, Mr Krister Waern, on (02) 6640 2503.

Yours sincerely

*Dimitri Young* 20 October 2014

**DIMITRI YOUNG**  
Senior Team Leader Planning, North East  
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# Appendix C: OEH Response to request for MALD, Credit trading rules variation request and impacts to Red Flag areas variation request



Office of  
Environment  
& Heritage

Your reference: 14SUTPLA-0014  
Our reference: DOC15/59431  
Contact: Krister Waern (02) 6640 2503

Mr Robert Humphries  
Eco Logical Australia Pty Ltd  
PO Box 12  
Sutherland NSW 1499

Cc: Mr Ashley Grummitt – Group Manager Commercial & Business Services Port Macquarie Hastings Council  
Mr Matt Rogers – Director Development & Environment Port Macquarie Hastings Council

Rob

Dear Mr Humphries

**Re: Preliminary Draft Biodiversity Assessment Report and Biocertification Strategy for Port Macquarie Airport.**

I refer to your email dated 22 February 2015 regarding the above proposal requesting comments from the Office of Environment and Heritage (OEH) on the Preliminary Draft Biodiversity Assessment Report. I appreciate the opportunity to provide input.

In your email your request that OEH focus on the following parts of the draft Report:

- Section 3 - Request for More Appropriate Local Data re benchmarks for vegetation types and % cleared for Wet Heathland in NR CMA
- Section 4 - Red Flag Variation Request –likelihood of red flag impacts being supported
- Section 6 - Credit Trading rule variations – substitution of surplus Wallum Froglet and Chestnut Mouse credits for deficit Koala and Squirrel Glider credits

Due to time constraints, OEH has not been able to review the draft report in detail, however the following comments are provided for consideration:


- The More Appropriate Local Data for the benchmarks appears to correspond to the benchmark amendments that OEH completed in October 2014. The use of these amended benchmark figures should be incorporated into the Biodiversity Certification calculations.
- The impacts on the red flag areas appear to require further justification, particularly the assessment criteria for red flag areas that contain Endangered Ecological Communities (Criteria 2.4.2). The proposal involves a number of different developments such as expanding the runway, airport infrastructure, proposed business park, and an accommodation precinct. The justification for each development component should be addressed separately in each red flag variation report. A separate red flag variation report should be prepared for each red flag entity.

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- Upon initial review it appears that the credit trading rule variation has been applied in accordance with the Biodiversity Certification Assessment Methodology, however a more detailed review will be undertaken once the reports are formally submitted to OEH.

Should you require further information or clarification, please contact Mr Krister Waern, Senior Operations Officer, on (02) 6640 2503.

Yours sincerely

 11 March 2015

**DIMITRI YOUNG**  
Senior Team Leader Planning, North East Region  
Regional Operations

## Appendix D: Threatened species likelihood tables and assessment of candidate species

The table below lists the threatened species known or considered likely to occur within the BCAA based on previous surveys, Atlas, EPBC Act Protected Matters Search, Biodiversity certification credit calculator tool and/or expert opinion. Those species categorised as 'species credit' species (all threatened flora species and approximately half of all threatened fauna species) that were filtered into the BCAA by the biocertification credit calculator version 1.9 and validated as species credit species against the threatened species profile ecological data from the BioNet Atlas of NSW Wildlife (Step 1 of section 4.3 of the BCAM) are indicated. At this stage of the candidate species assessment, additional species are added to the list if they have been recently listed in the TSC Act, there are records on the Atlas or have been recorded in past ecological surveys/reports (Step 2 of section 4.3 of the BCAM). A Wildlife Atlas search was undertaken by ELA in September 2014 to identify any additional species to be added to the table.

The 'Likelihood' and 'Justification' columns justifies the culled list of candidate species for further assessment and the 'Additional survey required' indicates whether additional survey is required to complete a formal Biocertification assessment (Step 3 of section 4.3 of the BCAM).

Five categories for likelihood of occurrence of species are used in this report and are defined below. Assessment of likelihood was based on species locality records, presence or absence of suitable habitat features within the BCAA, results of previous studies, on site field surveys and professional judgement.

- **known/yes** - the species is known to occur within suitable habitat within the study area.
- **likely** - a medium to high probability that a species occupies or uses habitat within the study area.
- **potential** - suitable habitat for a species occurs within the study area, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur.
- **unlikely** - a very low to low probability that a species occupies or uses habitat within the study area.
- **no** - habitat within the study area and in the immediate vicinity is unsuitable for the species, or, in the case of plants, the species was not located during searches of the study area.

### TSC/EPBC Act Status

- CE = Critically Endangered species, population or ecological community.
- E = Endangered species, population (E2) or ecological community (E3).
- V = Vulnerable species, population or ecological community.

## Threatened flora

Scientific name	Common name	TSC Act	EPBC Act	Data source	Habitat association	Recorded on site	Likelihood	Justification	Additional survey required
<i>Acacia courtii</i>	North Brother Wattle	V	V	BCAM	Usually grows on steep, dry, rocky slopes and in mixed dry forest on shallow soils, often under a canopy of White Mahogany and Grey Gum (OEH 2014).	No	Unlikely	Not recorded in Port Macquarie, no suitable habitat present in the district.	No
<i>Acronychia littoralis</i>	Scented Acronychia	E	E	PMST	Grows in Wet Sclerophyll Forest and littoral rainforest on sand (OEH 2014).	No	Potential	Recorded in Port Macquarie, suitable habitat present on site.	Yes, in Wet Sclerophyll Forest communities.
<i>Allocasuarina defungens</i>	Dwarf Heath Casuarina	E	E	BCAM, Atlas, PMST	Grows mainly in tall heath on sand, but can also occur on clay soils and sandstone (OEH 2014).	Yes, but probably incorrectly recorded	Known, but since incorrectly recorded, Unlikely	Records of this species are likely to be erroneous	No
<i>Arthraxon hispidus</i>	Hairy-joint Grass	V	V	PMST	Found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps (OEH 2014).	No	Potential	Widespread species occurring in a variety of habitats	Yes, in Wet Sclerophyll Forest and swamp communities, and along creeklines.
<i>Asperula asthenes</i>	Trailing Woodruff	V	V	BCAM	Occurs in damp sites, often along river banks (OEH 2014).	No	Potential	Grows in wetlands, suitable habitat present on site	Yes, in damp areas and along creeklines
<i>Callistemon pungens</i>		-	V	PMST	Found along rocky watercourses, usually with sandy granite (or occasionally basalt) creek beds (TSSC 2008).	No	No	Not recorded in Port Macquarie area	No
<i>Chamaesyce psammogeton</i>	Sand Spurge	E	-	Biolink (App 1, 2011)	Grows on fore-dunes, pebbly strandlines and exposed headlands (OEH 2014).	No	No	Restricted to sand dunes, lack of suitable habitat present on site	No
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	BCAM, PMST	Known from a range of communities, including swamp-heath and woodland (OEH 2014).	No	Potential	Widespread species occurring in a variety of habitats	Yes, in swamp, heathland and woodland communities
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	BCAM, PMST	Occurs on the edge of dry rainforest vegetation (OEH 2014) and in a variety of habitats.	Yes	Known	Known from Port Macquarie area, suitable habitat present on site. Recorded by Parker 2014 as part of residential subdivision DA south of runway.	Yes, targeted survey in a variety of habitats
<i>Dendrobium melaleucaphilum</i>	Spider Orchid	E	-	BCAM	Grows frequently on <i>Melaleuca styphelioides</i> , less commonly on rainforest trees or on rocks in coastal districts (OEH 2014).	No	Potential	Widespread species occurring in paperbark swamps, suitable habitat present on site.	Yes, on Paperbarks ( <i>Melaleuca</i> ) spp.
<i>Diuris disposita</i>	Willawarrin Doubletail	E	-	BCAM	Known only from Willawarrin near Kempsey, where it is rare (OEH 2014).	No	No	No records from Port Macquarie area.	No
<i>Dracophyllum macranthum</i>		V	-	BCAM	Generally occurs on moderate to steep slopes with southerly aspects often associated with gaps in the forest canopy (OEH 2014).	No	No	No records from Port Macquarie area, no suitable habitat present on site.	No
<i>Euphrasia arguta</i>		CE	CE	PMST	Found in eucalypt forest with a mixed grass and shrub understorey, most dense in open disturbed areas and along roadsides (OEH 2014).	No	No	Not recorded in Port Macquarie area.	No
<i>Galium australe</i>	Tangled Bedstraw	E	-	Expert opinion	Recorded in Turpentine forest and coastal Acacia shrubland (OEH 2014).	No	Potential	Occurs in wet forest throughout broader region.	Yes, in Wet Sclerophyll Forest communities

Scientific name	Common name	TSC Act	EPBC Act	Data source	Habitat association	Recorded on site	Likelihood	Justification	Additional survey required
<i>Hibbertia hexandra</i>	Tree Guinea Flower	E	-	Biolink (App 1, 2011)	Grows in heath, open forest or rainforest (OEH 2014).	No	No	Not recorded in Port Macquarie area.	No
<i>Marsdenia longiloba</i>	Slender Marsdenia	E	V	BCAM	Sub-tropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops (OEH 2014).	No	Potential	Widespread species occurring in a variety of habitats.	Yes, in Wet Sclerophyll Forest communities
<i>Maundia triglochinos</i>		V	-	BCAM, Atlas	Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater on heavy, low nutrient clay (OEH 2014).	No	Potential	Grows in wetlands, suitable habitat present on site.	Yes, in swamp and sedgeland communities and along creeklines.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	BCAM, Atlas, PMST	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects (OEH 2014).	Yes	Potential	Recorded from Port Macquarie, suitable habitat present on site. Previous records by Biolink 2006 in Area 13.	Yes, in wetter vegetation types (e.g. creeklines, depressions) such as <i>Eucalyptus grandis</i> and/or <i>Melaleuca</i> -dominated vegetation.
<i>Melaleuca groveana</i>	Grove's Paperbark	V	-	BCAM	Often grows in exposed sites, on rocky outcrops and cliffs (OEH 2014).	No	Unlikely	Lack of suitable habitat in vicinity.	No
<i>Niemeyera whitei</i>	Rusty Plum	V	-	BCAM	Grows in rainforest and adjacent understorey of moist eucalypt forest (OEH 2014).	No	No	No plants recorded in Port Macquarie district.	No
<i>Oberonia titania</i>	Red-flowered King of the Fairies	V	-	BCAM	Occurs in littoral and sub-tropical rainforest and paperbark swamps (OEH 2014).	No	Potential	Recorded from Port Macquarie district, suitable habitat present on site.	Yes, in swamp and <i>Melaleuca</i> -dominated communities
<i>Parsonsia dorrigoensis</i>	Milky Silkpod	V	E	BCAM, PMST	Found in subtropical and warm-temperature rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils (OEH 2014).	No	Potential	Recorded from Port Macquarie district, suitable habitat present on site.	Yes, in Wet Sclerophyll Forest communities
<i>Phaius australis</i>	Lesser Swamp-orchid	E	E	BCAM, PMST	Found in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (OEH 2014).	No	Potential	Historic records from Port Macquarie, suitable habitat present on site.	Yes, in swamp and Wet Sclerophyll Forest communities
<i>Phaius tankervilleae</i>	Lady Tankerville's Swamp Orchid	E	E	BCAM	Found in swampy grassland or swampy forest, including rainforest, eucalypt and paperbark forest (OEH 2014).	No	No	Current taxonomic studies indicate that this species is not found in Australia.	No
<i>Persicaria elatior</i>	Tall Knotweed	V	V	Expert opinion	Grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance (OEH 2014).	No	Potential	Grows in wetlands, suitable habitat present on site.	Yes, in swamp communities and along creeklines.
<i>Pomaderris queenslandica</i>	Scant Pomaderris	E	-	BCAM	Grows in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks (OEH 2014).	No	No	This species has not been recorded in the Port Macquarie district.	No
<i>Psilotum complanatum</i>	Flat Fork Fern	E	-	Expert opinion	Grows in moist tropical or subtropical rainforest, or moist eucalypt forest (OEH 2014).	No	Potential	Known southern limit for this species is Port Macquarie.	Yes, in Wet Sclerophyll Forest communities
<i>Senna acclinis</i>	Rainforest Cassia	E	-	BCAM	Grows in or on the edges of subtropical and dry rainforest (OEH 2014).	No	Potential	Widespread species occurring in a variety of habitats.	Yes, in Wet Sclerophyll Forest communities
<i>Sophora tomentosa</i>	Silverbush	E	-	Biolink (App 1, 2011)	Occurs on coastal dunes (OEH 2014).	No	No	Restricted to sand dunes, lack of suitable habitat present on site.	No

Scientific name	Common name	TSC Act	EPBC Act	Data source	Habitat association	Recorded on site	Likelihood	Justification	Additional survey required
<i>Streblus pendulinus</i>	Siah's Backbone	-	E	PMST	Found in warmer rainforest, chiefly along watercourses (PlantNet 2014).	No	Potential	Widespread species, suitable habitat present on site.	Yes, in Wet Sclerophyll Forest along creeklines
<i>Thesium australe</i>	Austral Toadflax	V	V	PMST	Occurs in grassland or grassy woodland, often found in damp sites in association with Kangaroo Grass ( <i>Themeda australis</i> ) (OEH 2014).	No	Unlikely	Lack of suitable habitat present on site.	No
<i>Tinospora smilacina</i>	Tinospora Vine	E	-	BCAM	Grows in dry rainforest and along the boundaries of dry rainforest and dry eucalypt forest (OEH 2014).	No	No	Not recorded in the Port Macquarie district.	No
<i>Tylophora woollsii</i>	Cryptic Forest twiner	E	E	BCAM, Biolink (App 1, 2011)	Grows in moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins (OEH 2014).	No	Potential	Known from Port Macquarie area, suitable habitat present on site.	Yes, in moist sites within <i>Eucalyptus</i> -dominated vegetation.

Threatened fauna

Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
Amphibian	<i>Crinia tinnula</i>	Wallum Froglet	V		Atlas	Species	The Wallum Frog is restricted to the Wallum swamps and associated low land meandering watercourses on coastal plains. Occurs in elevations up to around 50m and is closely related to freshwater habitats in the coastal zone. Found most commonly in wallum wetlands characterised by low nutrients, highly acidic, tannin-stained waters that are typically dominated by paperbarks and tea-trees. Also found in sedgeland and wet heathland (OEH 2014).	Known	Recorded on site	Yes
Amphibian	<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Atlas	Species	Uses a variety of natural and man-made waterbodies. Fast flowing streams are not utilised for breeding purposes by this species. Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (OEH 2014). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes– <i>Typha</i> sp. and spikerushes– <i>Eleocharis</i> sp.) adjacent to open grassland areas for foraging are preferable. Ponds that are typically inhabited tend to be free from predatory fish such as <i>Gambusia holbrooki</i> (Mosquito Fish) (OEH 2014).	Potential	Records nearby and suitable habitat present	Yes
Amphibian	<i>Litoria brevipalmata</i>	Green-thighed Frog	V		BCAM	Species	Inhabits wet sclerophyll forest along the northern coast of NSW to Ourimbah (Anstis 2002). Also in a variety of habitats including dry to wet sclerophyll forest, rainforests and shrubland with a healthy understorey. Breeding aggregations occur in still water habitats such as grassy temporary to semi-permanent ponds and flooded ditches in late spring and summer (OEH 2014).	Potential	Suitable habitat present	Yes
Amphibian	<i>Mixophyes balbus</i>	Stuttering Frog	E	V	BCAM	Species	A variety of forest habitats from rainforest through wet and moist sclerophyll forest to riparian habitat in dry sclerophyll forest that are generally characterised by deep leaf litter or thick cover from understorey vegetation. Breeding habitats are streams and occasionally springs. Usually found fairly close to permanent running water. Not known from streams disturbed by humans or still water environments (OEH 2014).	No	Rainforest and tall wet forest habitat not present	No
Amphibian	<i>Mixophyes iteratus</i>	Giant Barred Frog	E	E	BCAM	Species	Found on forested slopes of the escarpment and adjacent ranges in riparian vegetation, subtropical and dry rainforest, wet sclerophyll forests and swamp sclerophyll forest. This species is associated with flowing streams with high water quality, though habitats may contain weed species. This species is not known from riparian vegetation disturbed by humans. During breeding eggs are kicked up onto an overhanging bank or the streams edge (OEH 2014).	No	Suitable freshwater riparian habitat not present	No
Amphibian	<i>Philoria sphagnicola</i>	Sphagnum Frog	V		BCAM	Species	Recorded between 640 to 1470 MASL in rainforest and wet sclerophyll forest with more than 1500mm annual rainfall. Preferred habitat is sphagnum moss bogs in or adjacent to wet forest. It occurs in the headwaters of small creeks and soaks associated with steep rocky cliffs or scree slopes (OEH 2014).	No	Higher elevation moss beds not present	No



Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
Birds	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	E, M	Atlas	Species	Regent Honeyeaters mostly occur in dry box-ironbark eucalypt woodland and dry sclerophyll forest associations, wherein they prefer the most fertile sites available, e.g. along creek flats, or in broad river valleys and foothills. In NSW, riparian forests containing <i>Casuarina cunninghamiana</i> (River Oak), and with <i>Amyema cambagei</i> (Needle-leaf Mistletoe), are also important for feeding and breeding. At times of food shortage (e.g. when flowering fails in preferred habitats), honeyeaters also use other woodland types. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes. As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar (OEH 2014).	Unlikely	Typical foraging habitat not present	No
Birds	<i>Atrichornis rufescens</i>	Rufous Scrubbird	V		BCAM	Species	Rainforest and adjacent eucalypt forest where undergrowth is particularly thick (OEH 2014).	No	Typical high altitude moist forest habitat not present	No
Birds	<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	BCAM	Species	Terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats. Found along the east coast and in the Murray-Darling Basin, notably in floodplain wetlands of the Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers. Reedbeds, swamps, streams, estuaries. Favours permanent shallow waters, edges of pools and waterways, with tall, dense vegetation such as sedges, rushes and reeds on muddy or peaty substrate. Also occurs in Lignum <i>Muehlenbeckia florulenta</i> and Canegrass <i>Eragrostis australasica</i> on inland wetlands (OEH 2014).	Potential	Vegetated wetlands present	Yes
Birds	<i>Burhinus grallarius</i>	Bush Stone-curlew	E		Atlas	Ecosystem	Associated with dry open woodland with grassy areas, dune scrubs, in savanna areas, the fringes of mangroves, golf courses and open forest / farmland. Forages in areas with fallen timber, leaf litter, little undergrowth and where the grass is short and patchy. Is thought to require large tracts of habitat to support breeding, in which there is a preference for relatively undisturbed in lightly disturbed (OEH 2014).	Unlikely	No nearby records and marginal habitat	No as ecosystem credit
Birds	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		Atlas	Ecosystem	Associated with a variety of forest types containing Allocasuarina species, usually reflecting the poor nutrient status of underlying soils. Intact drier forest types with less rugged landscapes are preferred. Nests in large trees with large hollows (OEH 2014).	Known	Recorded on site	No as ecosystem credit
Birds	<i>Carterornis leucotis</i>	White-eared Monarch	V		BCAM	Species*	Associated with lowland subtropical rainforest edges and remnants; littoral and floodplain rainforest, swamp sclerophyll with mesomorphic mid storey, coastal wet sclerophyll. It is thought to avoid moving into small remnants; preferring to move through areas of continuous forest cover (OEH 2014).	Potential	Suitable swamp sclerophyll habitat present	Yes
Birds	<i>Charadrius mongolus</i>	Lesser Sand-plover	V		Atlas	Species	Favours coastal areas including beaches, mudflats and mangroves where they forage. They may be seen roosting during high tide on sandy beaches or rocky shores (OEH 2014).	No	Habitat not present	No
Birds	<i>Circus assimilis</i>	Spotted Harrier	V		Atlas	Ecosystem	The Spotted Harrier is found in mainland Australia and Indonesia. It is widespread but sparsely distributed. The Spotted Harrier is found in open	Unlikely	Suitable grassy woodland or native grasslands not present	No as ecosystem credit

Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
							wooded country in tropical and temperate Australia, particularly in arid and semi-arid areas (OEH 2014).			
Birds	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		Atlas	Ecosystem	Distributed through central NSW on the western side of the Great Dividing Range and sparsely scattered to the east of the Divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys. The Brown Treecreeper occupies eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories (OEH 2014).	Known	Recorded on site	No as ecosystem credit
Birds	<i>Coracina lineata</i>	Barred Cuckoo-shrike	V		Atlas	Ecosystem	It is associated with subtropical, dry and littoral rainforests and is restricted to below 500m elevation (OEH 2014).	Unlikely	Most commonly associated with rainforests	No as ecosystem credit
Birds	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Atlas	Ecosystem	Varied Sittellas are endemic and widespread in mainland Australia. Varied Sittellas are found in eucalypt woodlands and forests throughout their range. They prefer rough-barked trees like stringybarks and ironbarks or mature trees with hollows or dead branches (OEH 2014).	Likely	Habitat present and nearby records	No as ecosystem credit
Birds	<i>Dromaius novaehollandiae</i>	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	EP		Atlas	Species	Occupies a range of mainly open habitats including plains, grasslands, woodlands, shrubs and occasionally forest. Not found in rainforest (OEH 2014).	Unlikely	Marginal habitat and distant from known distribution	No
Birds	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E		Atlas	Species	Associated with tropical and warm temperate terrestrial wetlands, estuarine and littoral habitats, and occasionally woodlands and grasslands floodplains. Forages in fresh or saline waters up to 0.5m deep, mainly in open fresh waters, extensive sheets of shallow water over grasslands or sedgeland, mangroves, mudflats, shallow swamps with short emergent vegetation and permanent billabongs and pools on floodplains (OEH 2014).	Potential	Habitat present and nearby records	Yes
Birds	<i>Esacus magnirostris</i>	Beach Stone-curlew	CE	M	Atlas	Species	Beaches, mudflats, reefs and especially islands. Open undisturbed beaches, islands, reefs, intertidal sand and mudflats, preferably with estuaries or mangroves nearby (OEH 2014).	No	Habitat not present	No
Birds	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		Atlas	Ecosystem	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. 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	Known	Recorded on site	No as ecosystem credit

Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
							patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box <i>Eucalyptus albens</i> and Yellow Box <i>E. melliodora</i> are particularly important food sources for pollen and nectar respectively.			
Birds	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		Atlas	Species	A coastal species that inhabits rock coastlines, coral cays, reefs and occasionally sandy beaches (OEH 2014).	No	Habitat not present	No
Birds	<i>Haematopus longirostris</i>	Pied Oystercatcher	E		Atlas	Species	Roosts and forages on sandy beaches, sand banks, mudflats and estuaries (OEH 2014).	No	Habitat not present	No
Birds	<i>Hieraaetus morphnoides</i>	Little Eagle	V		Atlas	Ecosystem	The Little Eagle is widespread in mainland Australia, central and eastern New Guinea. The Little Eagle is seen over woodland and forested The population of Little Eagle in NSW is considered to be a single population. This species was recently listed as vulnerable due to a moderate reduction in population size based on geographic distribution and habitat quality. It tends to avoid rainforest and heavy forest (OEH 2014).	Potential	Suitable open eucalypt forest present	No as ecosystem credit
Birds	<i>Ixobrychus flavicollis</i>	Black Bittern	V		Atlas	Species	Occurs in both terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation. In areas with permanent water it may occur in flooded grassland, forest, woodland, rainforest and mangroves (OEH 2014).	Known	Recorded on site	Yes
Birds	<i>Lathamus discolor</i>	Swift Parrot	E	E, M	Atlas	Ecosystem	Breeds in Tasmania between September and January. Feeds mostly on nectar, mainly from eucalypts, but also eats psyllid insects and lerps, seeds and fruit. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts. Favoured feed trees include winter flowering species such as Swamp Mahogany ( <i>Eucalyptus robusta</i> ), Spotted Gum ( <i>Corymbia maculata</i> ), Red Bloodwood ( <i>C. gummifera</i> ), Mugga Ironbark ( <i>E. sideroxylon</i> ), White Box ( <i>E. albens</i> ) and Forest Red Gum ( <i>E. tereticornis</i> ). Box-ironbark habitat in drainage lines, and coastal forest in NSW is thought to provide critical food resources during periods of drought or low food abundance elsewhere (OEH 2014).	Likely	Suitable foraging habitat present	No as ecosystem credit
Birds	<i>Lichenostomus fasciogularis</i>	Mangrove Honeyeater	V		BCAM	Species	Lives in mangroves, frequently visiting flowering shrubs in towns adjacent to mangroves. Spends some of its' time feeding close to the mud in mangroves (OEH 2014).	Unlikely	Only very small amount of mangrove habitat	No
Birds	<i>Lophoictinia isura</i>	Square-tailed Kite	V		Atlas	Ecosystem	In coastal areas associated tropical and temperate forests and woodlands on fertile soils with an abundance of passerine birds. May be recorded inland along timbered watercourses. In NSW it is commonly associated with ridge or gully forests dominated by Woollybutt ( <i>Eucalyptus logiflora</i> ), Spotted Gum ( <i>E. maculata</i> ), or Peppermint Gum ( <i>E. elata</i> , <i>E. smithii</i> ) (OEH 2014).	Known	Recorded on site	No
Birds	<i>Ninox strenua</i>	Powerful Owl	V		Atlas	Ecosystem	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds	Likely	Habitat present and nearby records	No as ecosystem credit

Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
							and flying foxes. Large trees with hollows at least 0.5m deep are required for shelter and breeding (OEH 2014).			
Birds	<i>Pandion cristatus</i>	Eastern Osprey	V	M	Atlas	Species	Associated with waterbodies including coastal waters, inlets, lakes, estuaries, beaches, offshore islands and sometimes along inland rivers. Osprey may nest on the ground, on sea cliffs or in trees. Osprey generally prefer emergent trees, often dead or partly dead with a broken off crown (OEH 2014).	Likely	Roosting habitat present and nearby records	Yes
Birds	<i>Pezoporus wallicus</i>	Ground Parrot	V		Expert opinion	Species	The Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgeland, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground (OEH 2014).	Potential	Suitable foraging and nesting habitat present	Yes
Birds	<i>Rostratula australis</i>	Australian Painted Snipe	V	V, M	PMST	Ecosystem	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (ibid.). Breeding is often in response to local conditions; generally occurs from September to December. Roosts during the day in dense vegetation. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter (OEH 2014).	Potential	Vegetated wetlands present	No as ecosystem credit
Birds	<i>Sternula albifrons</i>	Little Tern	E		Atlas	Species	Almost exclusively coastal, preferring sheltered areas, however may occur several kilometres inland in harbours, inlets and rivers. Australian birds breed on sandy beaches and sand spits (OEH 2014).	No	Habitat not present	No
Birds	<i>Turnix maculosus</i>	Red-backed Button-quail	V		BCAM	Species*	In Australia, the Red-backed Button-quail extends discontinuously from the Kimberley region of Western Australia, through the Top End of the Northern Territory and the southern Gulf of Carpentaria, to Cape York Peninsula and eastern Queensland and central-eastern and north-eastern NSW. It is mainly a species of coastal and subcoastal regions. Over their Australian range, Red-backed Button-quail inhabit grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas, typically only in regions subject to annual summer rainfall greater than 400 mm. In NSW, said to occur in grasslands, heath and crops. Said to prefer sites close to water, especially when breeding (OEH 2014).	Unlikely	Suitable grasslands and grassy woodlands not present	No
Birds	<i>Tyto longimembris</i>	Eastern Grass Owl	V		Atlas	Ecosystem	Reported habitats include tall grass, swampy, sometimes tidal areas, mangrove fringes, grassy plains, coastal heaths, grassy woodland, cane grass, lignum, sedges, cumbungi, cane fields and grain stubble. The Grass Owl nests on the ground within dense tall grass, sedges, reeds and even sugarcane plantations. The Grass Owl primarily feeds on rodents, hunting on the wing over heathland, grassland and sedgeland, as well as along the edge of sugar cane, crops and pastureland (OEH 2014).	Likely	Habitat present and nearby records	No as ecosystem credit

Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
Birds	<i>Tyto novaehollandiae</i>	Masked Owl	V		Atlas	Ecosystem	Associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland and especially the ecotone between wet and dry forest, and non forest habitat. Known to utilise forest margins and isolated stands of trees within agricultural land and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained (OEH 2014).	Known	Recorded on site	No as ecosystem credit
Birds	<i>Xenus cinereus</i>	Terek Sandpiper	V	M	Atlas	Species	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves on dead trees, often with related wader species (OEH 2014).	No	Habitat not present	No
Insect	<i>Argyreus hyperbius</i>	Laced Fritillary	E		BCAM	Species	Restricted to south-east Queensland and north-east NSW in open swampy coastal areas where the larval food plant Arrowhead Violet <i>Viola betonicifolia</i> occurs. Populations have declined dramatically and are now restricted to a few widely separated localities from Port Macquarie to Gympie. The most recent observations of the Australian Fritillary in NSW have been from the Port Macquarie area. The Australian Fritillary is found in open swampy coastal habitat.	Potential	Suitable habitat present and core of range	Yes
Insect	<i>Petalura gigantea</i>	Giant Dragonfly	E		BCAM	Species	The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. Live in permanent swamps and bogs with some free water and open vegetation.	Potential	Suitable habitat present	Yes
Mammal	<i>Aepyprymnus rufescens</i>	Rufous Bettong	V		BCAM	Species	The Rufous Bettong prefer forests with a grassy to sparse understorey including coastal forest, tall wet sclerophyll forest and dry forests west of GDR. It is most commonly found on sites derived from sedimentary rock and in north eastern NSW in forests characterised by Spotted Gum ( <i>Corymbia maculata</i> and <i>C. henryi</i> ). It has been known to feed on introduced pasture species (OEH 2014).	Unlikely	Suitable forest habitat not present	No
Mammal	<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		BCAM	Species	The Eastern Pygmy Possum occurs in wet and dry eucalypt forest, subalpine woodland, coastal banksia woodland and wet heath. Pygmy-Possums feed mostly on the pollen and nectar from banksias, eucalypts and understorey plants and will also eat insects, seeds and fruit. The presence of <i>Banksia</i> sp. and <i>Leptospermum</i> sp. are an important habitat feature. Small tree hollows are favoured as day nesting sites, but nests have also been found under bark, in old birds nests and in the branch forks of tea-trees (OEH 2014).	Potential	Heathland vegetation communities present	Yes

Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
Mammal	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Atlas	Ecosystem	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests, more frequently recorded near the ecotones of closed and open forest and in NSW within 200km of the coast. Preferred habitat is mature wet forest, especially in areas with rainfall 600 mm/year. Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in. Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (OEH 2014).	Potential	Suitable habitat present	No as ecosystem credit
Mammal	<i>Petaurus australis</i>	Yellow-bellied Glider	V		Atlas	Ecosystem	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter. Large hollows within mature trees are required for shelter, nesting and breeding (OEH 2014).	Known	Recorded on site	No as ecosystem credit
Mammal	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Atlas	Species	Associated with dry hardwood forest and woodlands. Habitats typically include gum barked and high nectar producing species, including winter flower species. The presence of hollow bearing eucalypts is a critical habitat value (OEH 2014).	Known	Recorded on site	Yes
Mammal	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V		Atlas	Species	The Brush-tailed Phascogale preferred habitat is Dry Open forest with a sparse open understorey, however, has been located in heath, swamps and rainforest and wet sclerophyll forest (OEH 2014).	Potential	Grassy open forests present on site	Yes
Mammal	<i>Phascolarctos cinereus</i>	Koala	V	V	Atlas	Species	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70%, with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: <i>Eucalyptus tereticornis</i> , <i>E. punctata</i> , <i>E. cypellocarpa</i> , <i>E. viminalis</i>	Known	Recorded on site	Yes
Mammal	<i>Planigale maculata</i>	Common Planigale	V		Atlas	Species	Subtropical to dry rainforest, dry sclerophyll forest, heathland and grassland up to 400m elevation. Habitat selection is dependant on surface cover (OEH 2014).	Potential	Dry sclerophyll forests and heathlands present	Yes
Mammal	<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	V		Atlas	Species	In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again (OEH 2014).	Known	Recorded on site	Yes
Mammal-bat	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V		Atlas	Ecosystem	The preferred habitat of this species appears to be variable, with dry open forest, woodland, vine thickets, coastal scrub, sand dunes, grasslands and floodplains recorded. This species often forages along watercourses, swampy areas and over farm dams. In NSW, this species has been recorded in Spotted Gum ( <i>Corymbia maculata</i> ), Grey Box ( <i>Eucalyptus moluccana</i> ) and Northern Ironbark ( <i>E. siderophloia</i> ) and woodland characterised by Scribbly Gums ( <i>E. signata</i> ) and Pink Bloodwood ( <i>C. intermedia</i> ) and sites dominated by the Blackbutt ( <i>E. pilularis</i> ). Roost	Unlikely	Outside of known distribution	No as ecosystem credit

Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
							sites have been identified as tree hollows, rock crevices and the roofs of buildings.			
Mammal-bat	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		Atlas	Ecosystem	Prefers moist habitats with trees taller than 20m. Roosts in tree hollows but has also been found roosting in buildings or under loose bark (OEH 2014).	Likely	Suitable foraging and roosting habitat	No as ecosystem credit
Mammal-bat	<i>Kerivoula papuensis</i>	Golden-tipped Bat	V		BCAM	Species*	The most favoured habitat for this species is moist closed forests often with a rainforest influence, however, some captures have been made in dry forests some distance from any rainforest. It has been suggested that the amount of vines and complex tree layers allows for increased numbers of spiders and webs and such areas are sought by the Golden-tipped Bat. Often caught over streams within rainforest. Known to frequently roost within the pendulous nests of Yellow-throated and Large-billed Scrub Wrens and Brown Gerygone in rainforest areas.	Unlikely	Suitable rainforests and creeklines not present	No
Mammal-bat	<i>Miniopterus australis</i>	Little Bentwing-bat	V		Atlas	Species**	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. This species shelter in a range of structures including culverts, drains, mines and caves. Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found. Breeding occurs in caves, usually in association with <i>M. schreibersii oceanensis</i> (OEH 2014).	Known	Recorded on site	No (no roosts)
Mammal-bat	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V		Atlas	Species**	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland. It forages above and below the tree canopy on small insects. Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (OEH 2014).	Known	Recorded on site	No (no roosts)
Mammal-bat	<i>Mormopterus norfolkensis</i>	Eastern Free-tail Bat	V		Atlas	Ecosystem	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range. Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges. Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut.	Known	Recorded on site	No as ecosystem credit
Mammal-bat	<i>Myotis macropus</i>	Southern Myotis	V		Atlas	Species**	Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water. While roosting is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains. However the species apparently has specific roost requirements, and only a small percentage of available caves, mines, tunnels and culverts are used.	Known	Recorded on site	Yes
Mammal-bat	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Atlas	Species**	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas.	Known	Recorded on site	Yes


Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
							Camps are often located in gullies, typically close to water, in vegetation with a dense canopy.			
Mammal-bat	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		Atlas	Ecosystem	Found in almost all habitats, from wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies. Roosts in tree hollows; may also use caves; has also been recorded in a tree hollow in a paddock and in abandoned sugar glider nests. The Yellow-bellied Sheath-tail-bat is dependent on suitable hollow-bearing trees to provide roost sites, which may be a limiting factor on populations in cleared or fragmented habitats.	Likely	The species uses a wide range of habitats	No as ecosystem credit
Mammal-bat	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Atlas	Ecosystem	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range, tending to be more frequently located in more productive forests. Within denser vegetation types use is made of natural and man made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey.	Known	Recorded on site	No as ecosystem credit
Mammal-bat	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		Atlas	Species**	Inhabit tropical mixed woodland and wet sclerophyll forest on the coast and the dividing range but extend into the drier forest of the western slopes and inland areas. Has been found roosting in sandstone overhand caves, boulder piles, mine tunnels and occasionally in buildings.	Potential	Forages widely although no roosting habitat present	No (no roosts)
Reptile	<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink	V	V	BCAM	Species	The Three-toed Snake-tooth Skink occurs in the coast and ranges from the Macleay valley in NSW to south-eastern Queensland. It is very uncommon south of Grafton. It occupies rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. The Three-toed Snake-tooth Skink lives in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs (OEH 2014).	Unlikely	Marginal habitat and distant from known distribution	No
Reptile	<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V		BCAM	Species	Wide range of habitats from rain or wet sclerophyll forest to drier eucalypt forests.	Unlikely	Marginal habitat and distant from known records	No
Reptile	<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V		BCAM	Species	Found in a variety of habitats from rainforest through wet and moist sclerophyll forests to dry sclerophyll forests. However it is most commonly found in wet to moist forests with rocky outcrops, cliffs or ridges and tends to favour ecotones between wet and dry forests. It most frequently uses gaps in the peeling bark of large senescent or dead trees for daytime shelter. However it can use hollow trunks, limbs, epiphytes, vine thickets, rock crevices or rock slabs.	Potential	Marginal habitat but little known about ecology	Yes
Migratory	<i>Apus pacificus</i>	Fork-tailed Swift		M	PMST	Ecosystem	Sometimes travels with Needletails. Varied habitat with a possible tendency to more arid areas but also over coasts and urban areas.	Potential	Species may use site on occasion	No as ecosystem credit
Migratory	<i>Ardea alba</i>	Great Egret		M	PMST	Ecosystem	The Great Egret is common and widespread in Australia. It forages in a wide range of wet and dry habitats including permanent and ephemeral freshwaters, wet pasture and estuarine mangroves and mudflats.	Potential	Suitable wetland areas present	No as ecosystem credit





Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
Migratory	<i>Ardea ibis</i>	Cattle Egret		M	PMST	Ecosystem	Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and croplands, but not usually in the open water of streams or lakes and they avoid marine environments. Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and return the next spring. Cattle Egrets are likely to spend the winter dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range.	Potential	Suitable wetland areas present	No as ecosystem credit
Migratory	<i>Gallinago hardwickii</i>	Latham's Snipe		M	PMST	Ecosystem	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover. Occupies a variety of vegetation around wetlands including wetland grasses and open wooded swamps.	Potential	Suitable wetland areas present	No as ecosystem credit
Migratory	<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle		M	PMST	Ecosystem	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas. Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away.	Potential	May overfly but main habitat not present and nest sites not known	No as ecosystem credit
Migratory	<i>Hirundapus caudacutus</i>	White throated Needletail		M	PMST	Ecosystem	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas. Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather.	Potential	Species may use site on occasion	No as ecosystem credit
Migratory	<i>Merops ornatus</i>	Rainbow Bee-eater		M	PMST	Ecosystem	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May. Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs. Nest is a chamber at the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy bank or cutting.	Potential	Suitable open and wetland habitats available	No as ecosystem credit
Migratory	<i>Monarcha melanopsis</i>	Black-faced Monarch		M	PMST	Ecosystem	Rainforest and eucalypt forests, feeding in tangled understorey.	Potential	Variety of forest habitats available	No as ecosystem credit
Migratory	<i>Monarcha trivirgatus</i>	Spectacled Monarch		M	PMST	Ecosystem	Wet forests, mangroves.	No	Typical rainforest habitat not present	No as ecosystem credit
Migratory	<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	PMST	Ecosystem	Associated with drier eucalypt forests, absent from rainforests, open forests, often at height.	Potential	Variety of forest habitats available	No as ecosystem credit
Migratory	<i>Numenius phaeopus</i>	Whimbrel		M	PMST	Ecosystem	Intertidal coastal mudflats, river deltas and mangroves, occasionally sandy beaches. Breeds Siberia and Alaska.	No	Habitat not present	No as ecosystem credit
Migratory	<i>Pluvialis fulva</i>	Pacific Golden Plover		M	PMST	Ecosystem	Breeds North Siberia, Alaska. Mainly coastal, beaches, mudflats and sandflats and other open areas such as recreational playing fields in Australia.	No	Habitat not present	No as ecosystem credit
Migratory	<i>Rhipidura rufifrons</i>	Rufous Fantail		M	PMST	Ecosystem	The Rufous Fantail is a summer breeding migrant to southeastern Australia. The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside	Unlikely	Prefers moist forests that are not present	No as ecosystem credit

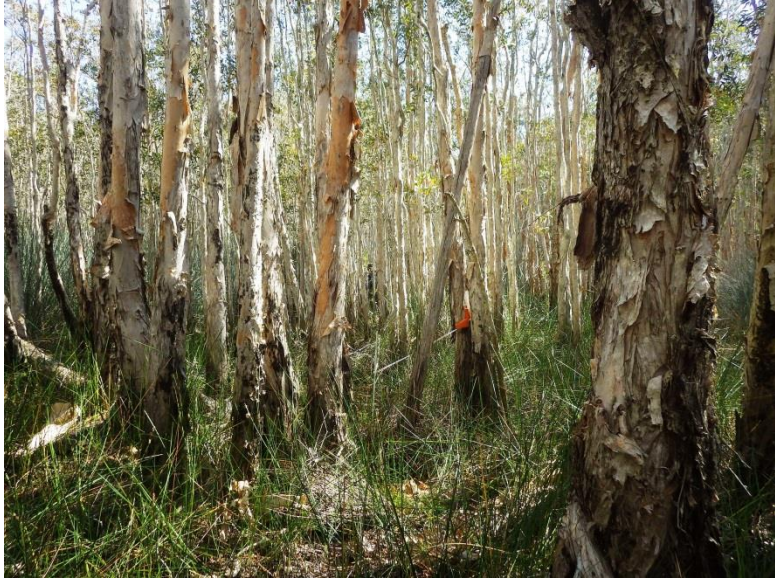
Group	Scientific name	Common name	TSC Act	EPBC Act	Data Source	BCAM credit	Habitat association	Likelihood	Justification	Additional survey required
							vegetation. Open country may be used by the Rufous Fantail during migration.			


# Appendix E: Vegetation type profiles

<b>Biometric Vegetation Type</b>	<b>Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast (NR114)</b>
	
<b>Description</b>	This community mostly had a forest structure (Specht and Specht 2002) although there was also a small area cleared that is regularly mowed/slashed and was therefore a derived grassland. The mid stratum in the uncleared patches was uniformly present within this vegetation type and was usually quite dense. The ground stratum included a combination of low shrubs, ferns, graminoids and grasses.
<b>Location and habitat</b>	Three patches of this forest community occurred to the west of the runway with a few small patches also on the south-eastern edge of the runway. All patches occurred on reasonably well-drained sandy loams in flat areas.
<b>Ancillary codes</b>	Three different ancillary codes were identified for this vegetation types as follows: <ul style="list-style-type: none"> <li>• Good – applied to the vast majority of vegetation type which was mostly in good condition apart from a lack of large trees following past logging.</li> <li>• Regrowth - applied to a single small area where this vegetation type has previously been cleared and/or selectively logged and is now dominated by Bloodwood trees with a very dense layer of Black She-oak.</li> <li>• Mowed Understorey – applied to a single small area where this vegetation type has previously been cleared and is now regularly mowed/slashed.</li> </ul>
<b>Sampling locations</b>	Good – 1-1, 1-2, 1-3 Regrowth – 2-1 Cleared (to regen) – 3-1
<b>Upper stratum</b>	The canopy of this vegetation type was dominated by <i>Eucalyptus pilularis</i> (Blackbutt) with occasional <i>Corymbia gummifera</i> (Red Bloodwood) and <i>C. intermedia</i> (Pink Bloodwood). The canopy was up to 30 m in height with an overall projected foliage cover of 10 to 30%.
<b>Midstorey</b>	A diverse midstorey was present within this vegetation type, commonly including <i>Leptospermum polygalifolium</i> subsp. <i>cismontanum</i> (Tantoon), <i>Leucopogon lanceolatus</i> var. <i>gracilis</i> , <i>Banksia aemula</i> (Wallum Banksia), <i>Oxylobium arborescens</i> (Tall Shaggy Pea), <i>Allocasuarina littoralis</i> (Black She-oak) and <i>Callistemon salignus</i> (Willow Bottlebrush).
<b>Groundcovers</b>	A ground layer ranging from 0.3-1.0 m in height occurred within this vegetation type and was usually dominated by <i>Pteridium esculentum</i> (Common Bracken), <i>Lomandra longifolia</i> (Spiny-headed mat-rush) and <i>Imperata cylindrica</i> (Blady Grass).
<b>Corresponding vegetation type (Biolink 2013)</b>	Blackbutt Coastal Dune Satinwood Forest


<b>Biometric Vegetation Type</b>	<b>Blackbutt - Tallowood dry grassy open forest of the central parts North Coast (NR119)</b>
	
<b>Description</b>	This community mostly had a forest structure (Specht and Specht 2002) although there were also cleared areas dominated by groundlayer species or regenerating midstorey species which are therefore derived grasslands. There were also regularly mowed/slashed areas south and north of the runway with no understorey and scattered canopy trees. Other areas south of the runway have been previously cropped. The mid stratum in the unmowed patches was uniformly present and often moderately dense. The ground stratum included a mix of grasses, forbs and ferns.
<b>Location and habitat</b>	Several patches of this forest community occurred to the west and south of the runway. All patches occurred on reasonably well-drained sandy loams in flat areas.
<b>Ancillary codes</b>	Four different ancillary codes were identified for this vegetation types as follows: <ul style="list-style-type: none"> <li>• Benchmark – applied to the majority of vegetation type which was mostly in good condition apart from a lack of large trees following past logging.</li> <li>• Cropped – applied to several patches south of the runway which had been previously cropped</li> <li>• Mowed Understorey – applied to four small areas north and south of the runway where the understorey within this vegetation type has previously been cleared and is now regularly mowed/slashed.</li> <li>• Cleared (to regen) - applied to a three areas where this vegetation type has previously been cleared and/or selectively logged.</li> </ul>
<b>Sampling locations</b>	Good – 4-1, 4-2, 4-3, 4-4 Cropped – 5-1, 5-2 Mowed Understorey – 6-1 Cleared (to regen) – 7-1, 7-2, 7-3
<b>Upper stratum</b>	The canopy of this vegetation type was mainly dominated by <i>Eucalyptus pilularis</i> (Blackbutt) and <i>E. microcorys</i> (Tallowood), with some patches supporting co-dominant <i>Corymbia gummifera</i> (Red Bloodwood), <i>C. intermedia</i> (Pink Bloodwood) and <i>E. carnea</i> (Thick-leaved Mahogany). The canopy was up to 35 m in height with an overall projected foliage cover of 10 to 30%.
<b>Midstorey</b>	A diverse midstorey was present within this vegetation type, commonly including <i>Allocasuarina torulosa</i> (Forest Oak), <i>A. littoralis</i> (Black She-oak), <i>Acacia floribunda</i> , <i>A. myrtifolia</i> (Myrtle Wattle) and <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark).
<b>Groundcovers</b>	A ground layer ranging from 0.3-0.7 m in height occurred within this vegetation type and was usually dominated by <i>Pteridium esculentum</i> (Common Bracken), <i>Imperata cylindrica</i> (Blady Grass), <i>Ottochloa gracillima</i> and <i>Entolasia stricta</i> (Wiry Panic).
<b>Corresponding vegetation type (Biolink 2013)</b>	Blackbutt Grassy Forest Blackbutt Shrubby Moist Forest White Stringybark - Tallowood - Grey Gum Dry Forest


<b>Biometric Vegetation Type</b>	<b>Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast (NR176)</b>
	
<b>Description</b>	<p>This community had a forest structure (Specht and Specht 2002). This vegetation type had not been previously cropped. The mid stratum in this patch was uniformly present and often moderately dense. The ground stratum included a mix of ferns, graminoids, climbers/vines and forbs.</p>
<b>Location and habitat</b>	<p>One patch of this forest community occurred to the south of the runway. This patch occurred on reasonably well-drained sandy loams in a predominantly flat area.</p>
<b>Ancillary codes</b>	<p>One ancillary code was identified for this vegetation type as follows:</p> <ul style="list-style-type: none"> <li>• Benchmark – applied to all this vegetation type which was in good condition with no history of cropping.</li> </ul>
<b>Sampling locations</b>	<p>Good – 8-1</p>
<b>Upper stratum</b>	<p>The canopy of this vegetation type was mainly dominated by <i>Eucalyptus siderophloia</i> (Grey Ironbark) and <i>Syncarpia glomulifera</i> (Turpentine), with occasional <i>E. propinqua</i> (Grey Gum) and <i>Corymbia gummifera</i> (Red Bloodwood). The canopy was up to 30 m in height with an overall projected foliage cover of 8 to 10%.</p>
<b>Midstorey</b>	<p>A diverse midstorey was present within this vegetation type, commonly including <i>Guioa semiglauc</i> (Guioa) and <i>Synoum glandulosum</i> (Scented Rosewood).</p>
<b>Groundcovers</b>	<p>A diverse ground layer ranging from 0.3-0.8 m in height occurred within this vegetation type and was mainly dominated by <i>Blechnum cartilagineum</i> (Soft Water Fern), <i>Lastreopsis decomposita</i> (Trim Shield Fern).</p>
<b>Corresponding vegetation types (Biolink 2013)</b>	<p>Grey Gum - Grey Ironbark Moist Forest</p>

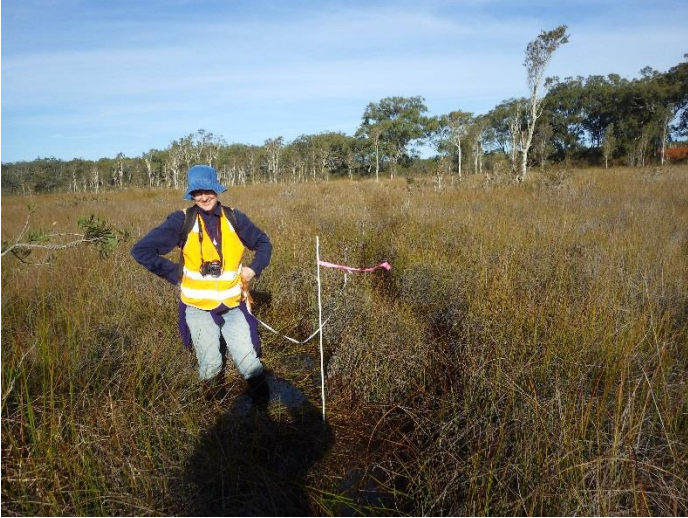
<b>Biometric Vegetation Type</b>	<b>Paperbark swamp forest of the coastal lowlands of the North Coast (NR217)</b>
	
<b>Description</b>	This community mostly had a forest structure (Specht and Specht 2002) although there were also two patches south of the runway which have been previously cropped. The mid stratum in most patches was generally sparse or absent. The ground stratum included a mix of graminoids, ferns, forbs and grasses.
<b>Location and habitat</b>	Many patches of this forest community occurred to the west, south and east of the runway. All patches occurred on waterlogged or periodically inundated sandy loams which are in flat areas.
<b>Ancillary codes</b>	Two different ancillary codes were identified for this vegetation types as follows: <ul style="list-style-type: none"> <li>• Benchmark – applied to the vast majority of this vegetation type which was mostly in good condition.</li> <li>• Cropped – applied to two patches south of the runway which had been previously cropped.</li> </ul>
<b>Sampling locations</b>	Good – 9-1, 9-2, 9-3, 9-4, 9-5 Cropped – 10-1
<b>Upper stratum</b>	The canopy of this vegetation type was mainly dominated by <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark), with occasional <i>Casuarina glauca</i> (Swamp Oak). The canopy was up to 20 m in height with an overall projected foliage cover of 10 to 25%.
<b>Midstorey</b>	The midstorey was mainly absent or sparse within this vegetation type, commonly including <i>Melaleuca linariifolia</i> (Flax-leaved Paperbark), <i>M. stypheliodes</i> (Prickly-leaved Tea Tree) and <i>Callistemon pachyphyllus</i> (Wallum Bottlebrush).
<b>Groundcovers</b>	A very dense ground layer ranging from 0.1-2.5 m in height occurred within this vegetation type and was usually dominated by <i>Baumea articulata</i> (Jointed Twig-rush), <i>B. rubiginosa</i> , <i>Schoenus brevifolius</i> (Zig-zag Bog-rush), <i>Carex</i> species, <i>Lepironia articulata</i> (Grey Rush) and <i>Viola banksii</i> (Wild Violet).
<b>Corresponding vegetation type (Biolink 2013)</b>	Broad-leaved Paperbark - Mixed Eucalypt Swamp Forest Complex Broad-leaved Paperbark Swamp Woodland/Forest Flax-leaved Paperbark - Mixed Eucalypt Coastal Floodplain Wetlands Forest Complex Flax-leaved Paperbark - Prickly-leaved Tea Tree Forests

<b>Biometric Vegetation Type</b>	<b>Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast (NR228)</b>
	
<b>Description</b>	<p>This community mostly had a forest structure (Specht and Specht 2002) although there was also one regularly mowed/slashed area north-east of the runway with no understorey and scattered canopy trees. The mid stratum in the unmowed patches was uniformly present and often dense. The ground stratum included a mix of grasses, graminoids, forbs and ferns.</p>
<b>Location and habitat</b>	<p>Two larger patches of this forest community occurred to the west of the runway and several smaller patches to the east of the runway. All patches occurred on reasonably well-drained sandy loams in flat areas.</p>
<b>Ancillary codes</b>	<p>Two different ancillary codes were identified for this vegetation types as follows:</p> <ul style="list-style-type: none"> <li>• Benchmark – applied to the vast majority of vegetation type which was mostly in excellent condition.</li> <li>• Mowed Understorey – applied to one small area north-east of the runway where the understorey within this vegetation type has previously been cleared and is now regularly mowed/slashed.</li> </ul>
<b>Sampling locations</b>	<p>Good – 11-1, 11-2, 11-3, 11-4 Mowed Understorey – 12-1</p>
<b>Upper stratum</b>	<p>The canopy of this vegetation type was mainly dominated by <i>Eucalyptus signata</i> (Scribbly Gum), with occasional co-dominant <i>Corymbia gummifera</i> (Red Bloodwood). The canopy was up to 25 m in height with an overall projected foliage cover of 10 to 25%.</p>
<b>Midstorey</b>	<p>A diverse midstorey was present within this vegetation type, commonly including <i>Leptospermum polygalifolium</i> subsp. <i>cismontanum</i> (Tantoon), <i>Allocasuarina littoralis</i> (Black She-oak), <i>Banksia aemula</i> (Wallum Banksia) and <i>Melaleuca nodosa</i> (Prickly-leaved Paperbark).</p>
<b>Groundcovers</b>	<p>A ground layer ranging from 0.1-1.0 m in height occurred within this vegetation type and was usually dominated by <i>Pteridium esculentum</i> (Common Bracken), <i>Lomandra longifolia</i> (Spiny-headed mat-rush), <i>Selaginella uliginosa</i> (Swamp Selaginella) <i>Leptocarpus tenax</i> and <i>Baloskion tetraphyllum</i>.</p>
<b>Corresponding vegetation types (Biolink 2013)</b>	<p>Scribbly Gum Dune Heathy Woodland</p>




<b>Biometric Vegetation Type</b>	<b>Swamp Mahogany swamp forest of the coastal lowlands of the North Coast (NR254)</b>
	
<b>Description</b>	<p>This community mostly had a forest structure (Specht and Specht 2002) although there were also small patches north-east of the runway which have been previously cleared and is revegetated with native canopy species. The mid stratum in the uncleared patches was uniformly present within this vegetation type and was usually somewhat dense. The ground stratum included a mix of graminoids, ferns, forbs and grasses.</p>
<b>Location and habitat</b>	<p>Several patches of this forest community occurred to the south and east of the runway, with one small patch to the west. All patches occurred on poorly-drained sandy loams which are in flat areas.</p>
<b>Ancillary codes</b>	<p>Two different ancillary codes were identified for this vegetation types as follows:</p> <ul style="list-style-type: none"> <li>• Benchmark – applied to the majority of this vegetation type which was mostly in good condition.</li> <li>• Regeneration – applied to small patches north-east of the runway where this vegetation type has previously been cleared and is revegetated with native canopy species.</li> </ul>
<b>Sampling locations</b>	<p>Good – 13-1, 13-2 Regeneration – 14-1</p>
<b>Upper stratum</b>	<p>The canopy of this vegetation type was mainly dominated by <i>Eucalyptus robusta</i> (Swamp Mahogany). The canopy was up to 25 m in height with an overall projected foliage cover of 10 to 25%.</p>
<b>Midstorey</b>	<p>The midstorey was present within this vegetation type, commonly including <i>Melaleuca sieberi</i>, <i>M. stypheliodes</i> (Prickly-leaved Tea Tree) and <i>M. quinquenervia</i> (Broad-leaved Paperbark).</p>
<b>Groundcovers</b>	<p>A dense ground layer ranging from 0.3-1.5 m in height occurred within this vegetation type and was usually dominated by <i>Imperata cylindrica</i> (Blady Grass), <i>Lomandra longifolia</i> (Spiny-headed mat-rush) and <i>Gahnia clarkei</i> (Tall Saw-sedge).</p>
<b>Corresponding vegetation types (Biolink 2013)</b>	<p>Broad-leaved Paperbark - Swamp Mahogany Swamp Forest Swamp Mahogany Forest</p>

<b>Biometric Vegetation Type</b>	<b>Swamp Oak swamp forest of the coastal lowlands of the North Coast (NR255)</b>
	
<b>Description</b>	<p>This community mostly had a forest structure (Specht and Specht 2002) although several patches west and north of the runway supported a weedy understorey and a weedy patch north of the runway had been previously cropped. The mid stratum in most patches was generally absent. The ground stratum included a mix of graminoids, ferns, forbs and grasses.</p>
<b>Location and habitat</b>	<p>Several patches of this forest community occurred to the west and north of the runway, with one small patch occurring south-east of the runway. All patches occurred on waterlogged or periodically inundated sandy loams which are in flat areas.</p>
<b>Ancillary codes</b>	<p>Four different ancillary codes were identified for this vegetation types as follows:</p> <ul style="list-style-type: none"> <li>• Benchmark – applied to the majority of vegetation type which was mostly in moderate condition.</li> <li>• Weedy understorey – applied to several patches west and south of the runway which supported high levels of invasive species.</li> <li>• Cropped with weedy understorey – applied to one area north of the runway which supported high levels of invasive species and where the canopy has previously been cropped</li> <li>• Cleared (to regen) - applied to an area where this vegetation type has previously been cleared and/or selectively logged.</li> </ul>
<b>Sampling locations</b>	<p>Good – 15-1, 15-2                  Weedy understorey – 16-1                  Cropped with Weedy Understorey – 17-1                  Cleared (to regen) – 18-1</p>
<b>Upper stratum</b>	<p>The canopy of this vegetation type was mainly dominated by <i>Casuarina glauca</i> (Swamp Oak), with occasional <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark). The canopy was up to 20 m in height with an overall projected foliage cover of 10 to 25%.</p>
<b>Midstorey</b>	<p>The midstorey was mainly absent within this vegetation type, with occasional <i>Gahnia clarkei</i> (Tall Saw-sedge).</p>
<b>Groundcovers</b>	<p>A dense ground layer ranging from 0.1-1.5 m in height occurred within this vegetation type and was usually dominated by <i>Gahnia clarkei</i> (Tall Saw-sedge), <i>Phragmites australis</i> (Common Reed), <i>Hypolepis muelleri</i> (Harsh Ground Fern), <i>Microlaena stipoides</i> (Weeping Grass), <i>Opismenus imbecillis</i> (Creeping Beard Grass) and <i>O. aemulus</i> (Australian Basket Grass).</p>
<b>Corresponding vegetation types (Biolink 2013)</b>	<p>Swamp Oak - Mixed Eucalypt Coastal Floodplain Wetland Forest Complex                  Swamp Oak Coastal Floodplain Wetland Forest</p>

<b>Biometric Vegetation Type</b>	<b>Wallum sedgeland and rushland of near coastal lowlands of the North Coast (NR276)</b>
	
<b>Description</b>	<p>This community had a sedgeland structure (Specht and Specht 2002). The mid stratum in most patches was generally absent or sparse. The ground stratum included a mix of graminoids, ferns, forbs and grasses.</p>
<b>Location and habitat</b>	<p>Large areas of this sedgeland community occurred to the east and south of the runway. All patches occurred on waterlogged or periodically inundated sandy loams which are in flat areas.</p>
<b>Ancillary codes</b>	<p>One ancillary code was identified for this vegetation type as follows:</p> <ul style="list-style-type: none"> <li>• Benchmark – applied to all this vegetation type which was all in good condition.</li> </ul>
<b>Sampling locations</b>	<p>Good – 19-1, 19-2</p>
<b>Upper stratum</b>	<p>The canopy of this vegetation type was mainly absent or very sparse, with low levels of <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) and <i>Callistemon pachyphyllus</i> (Wallum Bottlebrush) occurring. Where canopy species did occur they were up to seven metres in height with an overall projected foliage cover of 2-3%.</p>
<b>Mid-storey</b>	<p>The mid-storey was mainly absent or sparse within this vegetation type, including <i>Leptospermum juniperinum</i> (Prickly Tea-tree) and <i>Callistemon pachyphyllus</i> (Wallum Bottlebrush).</p>
<b>Groundcovers</b>	<p>A dense ground layer typically ranging from 0.1-2.0 m in height occurred within this vegetation type, also with areas of open water. The ground layer was usually dominated by <i>Baumea articulata</i> (Jointed Twig-rush), <i>Blechnum indicum</i> (Swamp Water Fern), <i>Carex polyantha</i>, <i>Persicaria strigosa</i> (Spotted Knotweed) and <i>Eleocharis</i> species.</p>
<b>Corresponding vegetation types (Biolink 2013)</b>	<p>Lepironia Coastal Lagoon Sedgeland  Lepironia Coastal Lagoon Sedgeland (Derived)  Twig-rush Coastal Lagoon Sedgeland</p>

<b>Biometric Vegetation Type</b>	<b>Coastal freshwater meadows and forblands of lagoons and wetlands (NR150)</b>
	
<b>Description</b>	<p>This community had a sedgeland structure (Specht and Specht 2002). The mid stratum in most patches was generally absent. The ground stratum included a mix of graminoids, ferns, forbs and grasses.</p>
<b>Location and habitat</b>	<p>Large areas of this sedgeland community occurred to the west of the runway in the Partridge Creek catchment area. All patches occurred on waterlogged or periodically inundated floodplain alluvial soils which are in flat areas.</p>
<b>Ancillary codes</b>	<p>One ancillary code was identified for this vegetation type as follows:</p> <ul style="list-style-type: none"> <li>• Benchmark – applied to all this vegetation type which was all in good condition.</li> </ul>
<b>Sampling locations</b>	<p>Good – 19-3, 19-4, 19-5</p>
<b>Upper stratum</b>	<p>The canopy of this vegetation type was mainly absent or very sparse, with low levels of <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) occurring. Where canopy species did occur they were up to seven metres in height with an overall projected foliage cover of 3%.</p>
<b>Mid-storey</b>	<p>The mid-storey was mainly absent within this vegetation type</p>
<b>Groundcovers</b>	<p>A dense ground layer typically ranging from 0.1-2.0 m in height occurred within this vegetation type, also with areas of open water. The ground layer was usually dominated by <i>Carex polyantha</i>, <i>Persicaria strigosa</i> (Spotted Knotweed), <i>Eleocharis</i> and <i>Juncus</i> species.</p>
<b>Corresponding vegetation types (Biolink 2013)</b>	<p>Partridge Creek Coastal Lagoon Sedgeland Complex</p>

<b>Biometric Vegetation Type</b>	<b>Wet heathland and shrubland of coastal lowlands of the North Coast (NR278)</b>
	
<b>Description</b>	<p>This community mostly had a heathland structure (Specht and Specht 2002) although there was also a small area cleared that is regularly mowed/slashed. The mid stratum in the unmowed patches was uniformly present within this vegetation type and was usually very dense. The ground stratum included a combination of low shrubs, ferns, graminoids, forbs and grasses.</p>
<b>Location and habitat</b>	<p>Large areas of this heathland community occurred to the west and east of the runway with another patch occurring south of the runway. All patches occurred on poorly-drained sandy loams which are in flat areas.</p>
<b>Ancillary codes</b>	<p>Two different ancillary codes were identified for this vegetation types as follows:</p> <ul style="list-style-type: none"> <li>• Benchmark – applied to the vast majority of vegetation type which was mostly in good condition.</li> <li>• Regeneration – applied to small patches north-west of the runway where this vegetation type has previously been cleared and is now regularly mowed/slashed.</li> </ul>
<b>Sampling locations</b>	<p>Good – 20-1, 20-2, 20-3, 20-4 Mowed – 21-1</p>
<b>Upper stratum</b>	<p>The canopy of this vegetation type was considered to be absent.</p>
<b>Midstorey</b>	<p>A diverse midstorey was present within this vegetation type, commonly including <i>Leptospermum liversidgei</i> (Olive Tea-tree), <i>Melaleuca sieberi</i>, <i>M. nodosa</i> (Prickly-leaved Paperbark), <i>Hakea teretifolia</i> (Needlebush) and <i>Banksia ericifolia</i> (Heath-leaved Banksia).</p>
<b>Groundcovers</b>	<p>A ground layer ranging from 0.1-1.5 m in height occurred within this vegetation type and was usually dominated by <i>Empodisma minus</i> (Wire Rush), <i>Lepidosperma laterale</i>, <i>Leptocarpus tenax</i>, <i>Ptilothrix deusta</i> and <i>Xanthorrhoea</i> species.</p>
<b>Corresponding vegetation types (Biolink 2013)</b>	<p>Heath-leaved Banksia Sandplain Shrublands Swamp Banksia Heathy Sandplain Shrubland Tea-tree Heathy Shrubland</p>

## Appendix F: Flora species recorded in BioMetric plots

## Vegetation Zones 1-8

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Acacia brownii</i>	Native											1					
<i>Acacia elongata</i>	Native																
<i>Acacia falcata</i>	Native														1	1	
<i>Acacia floribunda</i>	Native				1		2	2	3								
<i>Acacia longifolia</i>	Native																
<i>Acacia maidenii</i>	Native		2							1	1						
<i>Acacia myrtifolia</i>	Native														1	2	
<i>Acacia suaveolens</i>	Native	1															
<i>Acmena smithii</i>	Native																
<i>Ageratina adenophora</i>	Exotic																
<i>Ageratum houstonianum</i>	Exotic													1			
<i>Alectryon subcinereus</i>	Native																1
<i>Allocasuarina littoralis</i>	Native			2	4	1		2		2		3				3	
<i>Allocasuarina thalassoscopica</i>	Native																
<i>Allocasuarina torulosa</i>	Native							3	3	3	2						1
<i>Alphitonia excelsa</i>	Native				1				1								
<i>Amperea xiphoclada</i>	Native																
<i>Amyema congener</i> subsp. <i>congener</i>	Native																
<i>Andropogon virginicus</i>	Exotic				1	3									3	3	
<i>Aotus ericoides</i>	Native	2															
<i>Aristida vagans</i>	Native											2					
<i>Asparagus aethiopicus</i>	Exotic		1														
<i>Astrotricha latifolia</i>	Native																
<i>Austrostipa rudis</i>	Native					3											
<i>Avicennia marina</i> subsp. <i>australasica</i>	Native																
<i>Baloskion tetraphyllum</i>	Native	1															
<i>Baloskion</i> sp.	Native																
<i>Banksia aemula</i>	Native	2	3														

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Banksia ericifolia</i> subsp. <i>macrantha</i>	Native																
<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	Native											1					
<i>Banksia oblongifolia</i>	Native																
<i>Banksia robur</i>	Native																
<i>Banksia spinulosa</i>	Native											1					
<i>Bauera capitata</i>	Native																
<i>Baumea articulata</i>	Native																
<i>Baumea rubiginosa</i>	Native																
<i>Baumea</i> sp.	Native																
<i>Baumea</i> sp. (smaller)	Native																
<i>Bidens pilosa</i>	Exotic													1			
<i>Billardiera rubens</i>	Native							1				1					
<i>Billardiera scandens</i>	Native				1				1	1		1					
<i>Blandfordia grandiflora</i>	Native																
<i>Blechnum cartilagineum</i>	Native								1		1						
<i>Blechnum indicum</i>	Native																
<i>Boronia falcifolia</i>	Native																
<i>Boronia parviflora</i>	Native																
<i>Boronia polygalifolia</i>	Native						2					1					
<i>Boronia saffrolifera</i>	Native	1															
<i>Bossiaea</i> sp.	Native																
<i>Botrychium australe</i>	Native								1								
<i>Breynia oblongifolia</i>	Native		2	1		1	2	2	1	1	1	1					1
<i>Caesia parviflora</i> var. <i>parviflora</i>	Native					2											
<i>Caladenia carnea</i>	Native																
<i>Caleana major</i>	Native																
<i>Callistemon pachyphyllus</i>	Native																
<i>Callistemon</i> sp.	Native																
<i>Callistemon salignus</i>	Native				2	2											
<i>Calochilus campestris</i>	Native																
<i>Calochilus paludosus</i>	Native																
<i>Calochilus</i> sp.	Native																

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Calochlaena dubia</i>	Native			4		2	2	2	1								
<i>Carex appressa</i>	Native																
<i>Carex breviculmis</i>	Native							1									
<i>Carex polyantha</i>	Native																
<i>Carex</i> sp.	Native								2								
<i>Cassytha filiformis</i>	Native																
<i>Cassytha glabella</i>	Native							1									
<i>Cassytha pubescens</i>	Native																
<i>Cassytha</i> sp.	Native				2			2			1						
<i>Casuarina glauca</i>	Native															2	
<i>Caustis flexuosa</i>	Native																
<i>Caustis recurvata</i>	Native																
<i>Centaurium erythraea</i>	Exotic																1
<i>Centella asiatica</i>	Native					1						1		2	2		
<i>Centratherum riparium</i>	Native																
<i>Cheilanthes sieberi</i> ssp. <i>sieberi</i>	Native					1											
<i>Chiloglottis</i> sp.	Native																
<i>Chorizandra cymbaria</i>	Native																
<i>Chorizema parviflorum</i>	Native																
<i>Cinnamomum camphora</i>	Exotic								1			1					
<i>Cirsium vulgare</i>	Exotic																
<i>Cissus hypoglauca</i>	Native										1						1
<i>Clerodendrum floribundum</i>	Native		2		1												
<i>Comesperma ericinum</i>	Native																
<i>Commersonia dasyphylla</i>	Native																
<i>Conospermum taxifolium</i>	Native																
<i>Conyza bonariensis</i>	Exotic														2		
<i>Cordyline stricta</i>	Native										1						2
<i>Corymbia gummifera</i>	Native	2		2								2					1
<i>Corymbia intermedia</i>	Native				3		1		1			3					
<i>Corymbia</i> sp.	Native					2			1								
<i>Cryptandra propinqua</i>	Native																



Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Cryptocarya microneura</i>	Native							1									
<i>Cryptocarya rigida</i>	Native																
<i>Cryptostylis subulata</i>	Native																
<i>Cryptostylis erecta</i>	Native	2															
<i>Cryptostylis leptochila</i>	Native			1													
<i>Cyathea australis</i>	Native																
<i>Cyclosporum leptophyllum</i>	Exotic													1			
<i>Cymbopogon refractus</i>	Native						1		1	1	2	2				1	
<i>Cynodon dactylon</i>	Native																
<i>Cyperus</i> sp.	Native																
<i>Dampiera stricta</i>	Native																
<i>Daviesia ulicifolia</i>	Native															1	
<i>Daviesia umbellulata</i>	Native											1					
<i>Dendrobium linguiforme</i>	Native																
<i>Denhamia celastroides</i>	Native																
<i>Derris involuta</i>	Native																
<i>Desmodium varians</i>	Native																
<i>Desmodium gunnii</i>	Native							1	1	2							2
<i>Desmodium nemorosum</i>	Native																
<i>Desmodium rhytidophyllum</i>	Native		1								1						
<i>Dianella caerulea</i> var. <i>producata</i>	Native		2	1	2	2	1		2	2	2						
<i>Dianella longifolia</i>	Native											2					
<i>Dianella revoluta</i>	Native										1				1		
<i>Dianella</i> sp.	Native												1			1	
<i>Dichondra repens</i>	Native							1							2		
<i>Dichondra</i> sp.A (sens Fl.NSW)	Native						2										
<i>Dichondra</i> sp.	Native													1			
<i>Digitaria</i> sp.	Native											1					
<i>Dillwynia floribunda</i>	Native																
<i>Dillwynia retorta</i>	Native	1															
<i>Dioscorea transversa</i>	Native																2
<i>Doodia</i> sp.	Native																2

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Drosera spatulata</i>	Native																
<i>Drosera</i> sp.	Native					1											
<i>Duboisia myoporoides</i>	Native		1		1		1		1			1					
<i>Echinopogon caespitosus</i>	Native																
<i>Eclipta prostrata</i>	Native														1		
<i>Elaeocarpus obovatus</i>	Native																
<i>Elaeocarpus reticulatus</i>	Native	1	2		1												
<i>Eleocharis</i> sp. (medium size)	Native																
<i>Eleocharis sphacelata</i>	Native																
<i>Empodisma minus</i>	Native																
<i>Entolasia marginata</i>	Native							2	3	2							
<i>Entolasia stricta</i>	Native	1	2		2		2	3	3	2	2	2	2				
<i>Epacris brevifolia</i>	Native																
<i>Epacris pulchella</i>	Native	1															
<i>Eragrostis ? brownii</i>	Native														2		
<i>Eragrostis leptostachya</i>	Native					2							1				
<i>Eragrostis</i> sp.	Native															2	
<i>Eriocaulon australe</i>	Native																
<i>Erythrina</i> sp.	Exotic																
<i>Eucalyptus carnea</i>	Native							1			2	2					
<i>Eucalyptus globoidea</i>	Native										2						
<i>Eucalyptus grandis</i>	Native																
<i>Eucalyptus microcorys</i>	Native			2				3	3	4	3	3	3	2		1	
<i>Eucalyptus pilularis</i>	Native	4	4	3				4	3	2		2				1	
<i>Eucalyptus propinqua</i>	Native											1					2
<i>Eucalyptus resinifera</i>	Native																
<i>Eucalyptus robusta</i>	Native												1				
<i>Eucalyptus saligna</i>	Native																
<i>Eucalyptus siderophloia</i>	Native											1					3
<i>Eucalyptus signata</i>	Native			1													
<i>Eucalyptus</i> sp. (juvenile)	Native											2					
<i>Eucalyptus tereticornis</i>	Native														1		

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8	
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1	
<i>Euchiton</i> sp.	Native													1	1			
<i>Eupomatia laurina</i>	Native																2	
<i>Eurychorda complanata</i>	Native																	
<i>Euryomyrtus ramosissima</i> subsp. <i>ramosissima</i>	Native																	
<i>Eustrephus latifolius</i>	Native							1		1		1						
<i>Gahnia aspera</i>	Native							1										
<i>Gahnia clarkei</i>	Native									1								
<i>Gahnia sieberiana</i>	Native	1		1												1		
<i>Gahnia</i> sp.	Native																	
<i>Gamochaeta coarctata</i>	Exotic																	
<i>Geitonoplesium cymosum</i>	Native				1					1		1					1	
<i>Geranium</i> sp.	Native																	
<i>Gladiolus</i> sp.	Exotic																	
<i>Gleichenia dicarpa</i>	Native																	
<i>Glochidion ferdinandii</i>	Native	1	1		1			2	2	1	1		1					
<i>Glycine clandestina</i>	Native		1					1	1				1				1	
<i>Glycine microphylla</i>	Native																	
<i>Glycine tabacina</i>	Native												1					
<i>Gomphocarpus</i> sp.	Exotic																1	
<i>Gompholobium pinnatum</i>	Native																	
<i>Gonocarpus humilis</i>	Native			1	1					2							1	
<i>Gonocarpus micranthus</i> subsp. <i>ramosissimus</i>	Native	1					1											
<i>Gonocarpus oreophilus</i>	Native								1									
<i>Gonocarpus tetragynus</i>	Native						2										1	
<i>Goodenia fordiana</i>	Native																	
<i>Goodenia paniculata</i>	Native																	
<i>Goodenia</i> sp.	Native						2										1	
<i>Guioa semiglauca</i>	Native																	3
<i>Gymnostachys anceps</i>	Native																	2
<i>Haemodorum planifolium</i>	Native						1											
<i>Hakea teretifolia</i>	Native																	
<i>Hardenbergia violacea</i>	Native				1				1			2					1	1

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Hedychium gardnerianum</i>	Exotic																
<i>Hemarthria uncinata</i>	Native																
<i>Hibbertia aspera</i>	Native				1		1	1		1		1			1		
<i>Hibbertia dentata</i>	Native																
<i>Hibbertia fasciculata</i>	Native																
<i>Hibbertia linearis</i>	Native																
<i>Hibbertia obtusifolia</i>	Native																
<i>Hibbertia salicifolia</i>	Native																
<i>Hibbertia scandens</i>	Native				1		2	1		1	1						
<i>Hibbertia sp.</i>	Native	1															
<i>Hibbertia vestita</i>	Native																
<i>Histiopteris incisa</i>	Native																
<i>Hydrocotyle peduncularis</i>	Native		2				2	2	2					1	2		
<i>Hydrocotyle sp.</i>	Native																
<i>Hypericum gramineum</i>	Native					1										2	
<i>Hypericum japonicum</i>	Native																
<i>Hypochaeris radicata</i>	Exotic					1					1		2		2	2	
<i>Hypolepis muelleri</i>	Native								1								
<i>Hypoxis hygrometrica</i>	Native																
<i>Imperata cylindrica var. major</i>	Native		3				4	3	2	3	3	3	2	2	4	4	
<i>Indigofera australis</i>	Native																
<i>Isachne globosa</i>	Native																
<i>Isolepis sp. (very small)</i>	Native																
<i>Juncus cognatus</i>	Exotic																
<i>Juncus sp. (large, in swamps)</i>	Native																
<i>Juncus sp.</i>	Exotic												1				
<i>Juncus usitatus</i>	Native																
<i>Kennedia rubicunda</i>	Native		2	2						1	1		1			1	
<i>Kunzea capitata</i>	Native																
<i>Lachnagrostis filiformis</i>	Native																
<i>Lantana camara</i>	Exotic						1		3	2	1	2		1			2
<i>Lastreopsis decomposita</i>	Native																2

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Laxmannia gracilis</i>	Native																
<i>Lepidosperma laterale</i>	Native	1		2	1							2					
<i>Lepidosperma limicola</i>	Native																
<i>Lepidosperma</i> sp.	Native																
<i>Lepironia articulata</i>	Native																
<i>Leptocarpus tenax</i>	Native																
<i>Leptomeria acida</i>	Native																
<i>Leptospermum juniperinum</i>	Native								1								
<i>Leptospermum liversidgei</i>	Native																
<i>Leptospermum polygalifolium</i> subsp. <i>cismontanum</i>	Native	3		3													
<i>Leptospermum trinervium</i>	Native																
<i>Lepyrodia</i> sp.	Native																
<i>Leucopogon ericoides</i>	Native	1															
<i>Leucopogon juniperinus</i>	Native				1	1	1	1			1					1	
<i>Leucopogon margarodes</i>	Native																
<i>Leucopogon pimelioides</i>	Native	3	2	1	1			1	1								
<i>Leucopogon</i> sp. ( <i>deformis</i> maybe?)	Native	2															
<i>Linaria arvensis</i>	Exotic																
<i>Lindsaea linearis</i>	Native																
<i>Lindsaea microphylla</i>	Native																
<i>Livistona australis</i>	Native																
<i>Lomandra confertifolia</i>	Native																
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Native				1										1		
<i>Lomandra longifolia</i>	Native	3	2	3	2	2			2	2	2		2		2	2	2
<i>Lomatia silaifolia</i>	Native			1								1					
<i>Lophostemon confertus</i>	Native																
<i>Lycopodium deuterodensum</i>	Native																
<i>Lycopodium microphyllum</i>	Native																
<i>Maclura cochinchinensis</i>	Native																
<i>Marsdenia rostrata</i>	Native						1			1	1	1					
<i>Melaleuca linariifolia</i>	Native								1								
<i>Melaleuca nodosa</i>	Native				1	2											

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Melaleuca quinquenervia</i>	Native										1			2			
<i>Melaleuca sieberi</i>	Native																
<i>Melaleuca styphelioides</i>	Native						1										
<i>Melaleuca thymifolia</i>	Native																
<i>Microlaena stipoides</i>	Native						2	2			2						
<i>Microtis parviflora</i>	Native					1											
<i>Mirbelia rubiifolia</i>	Native																
? <i>Mischocarpus</i> sp.	Native		1														
<i>Monotoca elliptica</i>	Native		1	1													
<i>Morinda jasminoides</i>	Native																
<i>Muellerina eucalyptoides</i>	Native																
<i>Myrsine howittiana</i>	Native																
<i>Notelaea longifolia</i>	Native																
<i>Notelaea</i> sp.	Native			1				1			1						
<i>Nymphaea</i> sp.	Native																
<i>Ochna serrulata</i>	Exotic				1												
<i>Ochrosperma lineare</i>	Native																
<i>Opercularia diphylla</i>	Native				1	1		1									
<i>Oplismenus aemulus</i>	Native							2	2	2							
<i>Oplismenus imbecillis</i>	Native				1			2	2							2	
<i>Ottochloa gracillima</i>	Native								3								
<i>Oxylobium arborescens</i>	Native	2	3														
<i>Oxalis</i> sp.	Native							1							1		
<i>Ozothamnus diosmifolius</i>	Native							1	1		1		1		1		
<i>Pandorea pandorana</i>	Native								1							1	
<i>Panicum simile</i>	Native				1						1	2					
<i>Parsonsia straminea</i>	Native								1							1	
<i>Paspalum dilatatum</i>	Exotic											2		2			
<i>Paspalum</i> sp.	Exotic																
<i>Paspalum urvillei</i>	Exotic																
<i>Patersonia fragilis</i>	Native																
<i>Patersonia glabrata</i>	Native	2		1							1						

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Pennisetum clandestinum</i>	Exotic												3				
<i>Persicaria praetermissa</i>	Native																
<i>Persicaria strigosa</i>	Native																
<i>Persoonia levis</i>	Native																
<i>Persoonia stradbrogensis</i>	Native		1	2	1	1	2	2	1					1			
<i>Persoonia virgata</i>	Native																
<i>Philydrum lanuginosum</i>	Native																
<i>Phragmites australis</i>	Native																
<i>Phytolacca</i> sp.	Exotic																
<i>Pimelea linifolia</i>	Native											1			1	1	
<i>Pittosporum revolutum</i>	Native		1						1								1
<i>Pittosporum undulatum</i>	Native		1														
<i>Plantago lanceolata</i>	Exotic												1				
<i>Platycerium bifurcatum</i>	Native																
<i>Platylobium formosum</i> subsp. <i>formosum</i>	Native			2								2					
<i>Plectorrhiza tridentata</i>	Native																
<i>Polymeria calycina</i>	Native					2	1	1	2						1		
<i>Polyscias sambucifolia</i> subsp. <i>sambucifolia</i>	Native				1		1	2	2	1	1	2					
<i>Pomaderris</i> sp.	Native				1											1	
<i>Pomax umbellata</i>	Native	2	2	2							1						
<i>Pratia purpurascens</i>	Native					1	1	2	2		2	2	1		2		
<i>Pseuderanthemum variabile</i>	Native						2	2	2	2	2	1					2
<i>Pteridium esculentum</i>	Native	2	3	3		2	2		2	3	3	3		2	2	3	
<i>Pterostylis erecta</i>	Native																
<i>Ptilothrix deusta</i>	Native																
<i>Pultenaea retusa</i>	Native														1	1	
<i>Pultenaea villosa</i>	Native																
<i>Pyrosia rupestris</i>	Native																
<i>Ranunculus inundatus</i>	Native																
<i>Ranunculus lappaceus</i>	Native																
<i>Rhodamnia rubescens</i>	Native																1
<i>Ricinocarpus pinifolius</i>	Native																

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Ricinus communis</i>	Exotic																
<i>Rubus fruticosus</i> sp. agg.	Exotic																
<i>Rubus moluccanus</i>	Native				1		1			1	1			1			
<i>Rubus parvifolius</i>	Native							2	1								
<i>Rubus rosifolius</i>	Native																1
<i>Rulingia darphylla</i>	Native				2												
<i>Sarcopetalum harveyanum</i>	Native																1
<i>Schizaea bifida</i>	Native																
<i>Schizaea dichotoma</i>	Native																
<i>Schizomeria ovata</i>	Native																
<i>Schoenoplectus validus</i>	Native																
<i>Schoenus apogon</i>	Native																
<i>Schoenus brevifolius</i>	Native																
<i>Schoenus melanostachys</i>	Native																
<i>Selaginella uliginosa</i>	Native																
<i>Senecio madagascariensis</i>	Exotic												1	2		1	
<i>Senna floribunda</i>	Exotic																
<i>Senna pendula</i>	Exotic																
<i>Setaria sphacelata</i>	Exotic														6		
<i>Smilax australis</i>	Native																2
<i>Smilax glyciphylla</i>	Native	1		2	1			1	1								
<i>Solanum mauritianum</i>	Exotic															1	
<i>Solanum nigrum</i>	Exotic																
<i>Solanum stelligerum</i>	Native											1					
<i>Sonchus oleraceus</i>	Exotic																
<i>Sowerbaea juncea</i>	Native																
<i>Sphaerolobium vimineum</i>	Native																
<i>Sporobolus</i> sp.	Native														1		
<i>Sprengelia spregelioides</i>	Native																
<i>Stenotaphrum secundatum</i>	Exotic												5				
<i>Stephanica japonica</i> var. <i>discolor</i>	Native																
<i>Syncarpia glomulifera</i>	Native																3



Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
<i>Synoum glandulosum</i>	Native																2
<i>Taraxacum officinale</i>	Exotic																
<i>Tephrosia grandiflora</i>	Exotic																
<i>Tetradlea thymifolia</i>	Native																
<i>Thelymitra malvina</i>	Native																
<i>Thelymitra pauciflora s.l.</i>	Native															1	
<i>Thelymitra purpurata</i>	Native																
<i>Thelymitra sp.</i>	Native																
<i>Themeda australis</i>	Native		1			2	2				2	2			2	2	
<i>Trachymene incisa</i>	Native																
<i>Tricoryne elatior</i>	Native					2											
<i>Trifolium repens</i>	Exotic											1					
<i>Triglochin multifructa</i>	Native																
<i>Tripladenia cunninghamii</i>	Native																1
<i>Tylophora paniculata</i>	Native																
<i>Verbena rigida</i>	Exotic							1						2	2		
<i>Verbena sp.</i>	Exotic																
<i>Vernonia cinerea</i>	Native								1	1	1	1					
<i>Villarsia exaltata</i>	Native																
<i>Viola banksii</i>	Native								2								2
<i>Viola betonicifolia</i>	Native									1							
<i>Wahlenbergia gracilis</i>	Native																
<i>Wikstroemia indica</i>	Native								1								
<i>Wilkiea huegeliana</i>	Native																1
<i>Wurmbea biglandulosa</i>	Native																
<i>Xanthorrhoea macronema</i>	Native	2		1													
<i>Xanthorrhoea sp. (good stem, in swamps)</i>	Native																
<i>Xanthosia pilosa</i>	Native																
<i>Xyris sp.</i>	Native																
<i>Zieria laxiflora</i>	Native																
<i>Zieria smithii</i>	Native																2
Unknown grass from Swamp Mahog 1	Native																

Scientific name	Native/ Exotic	Veg Zone 1			Veg Zone 2	Veg Zone 3	Veg Zone 4				Veg Zone 5		Veg Zone 6	Veg Zone 7			Veg Zone 8
		1-1	1-2	1-3	2-1	3-1	4-1	4-2	4-3	4-4	5-1	5-2	6-1	7-1	7-2	7-3	8-1
Unknown grass from Swamp Oak 2	Native																
Unknown grass from Wallum Sedgeland 4	Native																
Unknown Sapindaceae from Bbutt-Tallow 2	Native						1										
Unknown herb from Swamp Mahog 2	Native																
Unknown herb from Bbutt-Tallow (crop) 1	Native									1							
Unknown sedge from Swamp Mahog 2	Native																
Unknown sedge from Wet Heathland (mow) 1	Native																
<b>TALLY</b>		<b>28</b>	<b>27</b>	<b>26</b>	<b>35</b>	<b>31</b>	<b>41</b>	<b>38</b>	<b>44</b>	<b>31</b>	<b>37</b>	<b>41</b>	<b>22</b>	<b>14</b>	<b>38</b>	<b>27</b>	<b>33</b>

Veg Zone 1 = Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast, Moderate to Good condition, Ancillary Condition Code: Good

Veg Zone 2 = Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast, Moderate to Good condition, Ancillary Condition Code: Regrowth

Veg Zone 3 = Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast, Low condition, Ancillary Condition Code: Cleared

Veg Zone 4 = Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast, Moderate to Good condition, Ancillary Condition Code: Good

Veg Zone 5 = Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast, Moderate to Good condition, Ancillary Condition Code: Cropped

Veg Zone 6 = Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast, Low condition, Ancillary Condition Code: Mowed Understorey

Veg Zone 7 = Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast, Low condition, Ancillary Condition Code: Cleared (to regenerate)

Veg Zone 8 = Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast, Moderate to Good condition, Ancillary Condition Code: Good

## Vegetation Zones 9-15

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Acacia brownii</i>	Native											1					
<i>Acacia elongata</i>	Native																
<i>Acacia falcata</i>	Native																
<i>Acacia floribunda</i>	Native																
<i>Acacia longifolia</i>	Native																
<i>Acacia maidenii</i>	Native					1							1				
<i>Acacia myrtifolia</i>	Native																
<i>Acacia suaveolens</i>	Native									2	1						
<i>Acmena smithii</i>	Native																
<i>Ageratina adenophora</i>	Exotic																
<i>Ageratum houstonianum</i>	Exotic																
<i>Alectryon subcinereus</i>	Native																
<i>Allocasuarina littoralis</i>	Native									3							
<i>Allocasuarina thalassoscopica</i>	Native																
<i>Allocasuarina torulosa</i>	Native																
<i>Alphitonia excelsa</i>	Native																
<i>Amperea xiphoclada</i>	Native											1					
<i>Amyema congener</i> subsp. <i>congener</i>	Native																
<i>Andropogon virginicus</i>	Exotic		3							1		3			4		
<i>Aotus ericoides</i>	Native							1			1				1		
<i>Aristida vagans</i>	Native																
<i>Asparagus aethiopicus</i>	Exotic																
<i>Astrotricha latifolia</i>	Native																
<i>Austrostipa rudis</i>	Native																
<i>Avicennia marina</i> subsp. <i>australasica</i>	Native																
<i>Baloskion tetraphyllum</i>	Native								2			3		3		2	
<i>Baloskion</i> sp.	Native								3			1					
<i>Banksia aemula</i>	Native										3	3	1				
<i>Banksia ericifolia</i> subsp. <i>macrantha</i>	Native								2						2		
<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	Native																
<i>Banksia oblongifolia</i>	Native									2							

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Banksia robur</i>	Native																
<i>Banksia spinulosa</i>	Native																
<i>Bauera capitata</i>	Native																
<i>Baumea articulata</i>	Native	4			4		4										
<i>Baumea rubiginosa</i>	Native	3					3										
<i>Baumea</i> sp.	Native		3	3	3								3				1
<i>Baumea</i> sp. (smaller)	Native		2														
<i>Bidens pilosa</i>	Exotic																
<i>Billardiera rubens</i>	Native																
<i>Billardiera scandens</i>	Native																
<i>Blandfordia grandiflora</i>	Native																
<i>Blechnum cartilagineum</i>	Native																
<i>Blechnum indicum</i>	Native	2	2				3						1				1
<i>Boronia falcifolia</i>	Native																
<i>Boronia parviflora</i>	Native																
<i>Boronia polygalifolia</i>	Native																
<i>Boronia safrolifera</i>	Native							1		2	2						
<i>Bossiaea</i> sp.	Native																
<i>Botrychium australe</i>	Native																
<i>Breynia oblongifolia</i>	Native			1									1				
<i>Caesia parviflora</i> var. <i>parviflora</i>	Native																
<i>Caladenia carnea</i>	Native																
<i>Caleana major</i>	Native																
<i>Callistemon pachyphyllus</i>	Native				2					1							
<i>Callistemon</i> sp.	Native		3													1	
<i>Callistemon salignus</i>	Native																
<i>Calochilus campestris</i>	Native																
<i>Calochilus paludosus</i>	Native																
<i>Calochilus</i> sp.	Native																
<i>Calochlaena dubia</i>	Native																
<i>Carex appressa</i>	Native					1										3	
<i>Carex breviculmis</i>	Native																

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Carex polyantha</i>	Native																
<i>Carex</i> sp.	Native			2		1							2				
<i>Cassytha filiformis</i>	Native							1			1						
<i>Cassytha glabella</i>	Native								2								
<i>Cassytha pubescens</i>	Native																
<i>Cassytha</i> sp.	Native																
<i>Casuarina glauca</i>	Native		1	2		2							1		3	4	
<i>Caustis flexuosa</i>	Native							2		1							
<i>Caustis recurvata</i>	Native									2	1						
<i>Centaurium erythraea</i>	Exotic																
<i>Centella asiatica</i>	Native		2	2													
<i>Centratherum riparium</i>	Native																
<i>Cheilanthes sieberi</i> ssp. <i>sieberi</i>	Native																
<i>Chiloglottis</i> sp.	Native																
<i>Chorizandra cymbaria</i>	Native					1											
<i>Chorizema parviflorum</i>	Native																
<i>Cinnamomum camphora</i>	Exotic		1														
<i>Cirsium vulgare</i>	Exotic																
<i>Cissus hypoglauca</i>	Native																
<i>Clerodendrum floribundum</i>	Native																
<i>Comesperma ericinum</i>	Native																
<i>Commersonia dasyphylla</i>	Native																
<i>Conospermum taxifolium</i>	Native																
<i>Conyza bonariensis</i>	Exotic																
<i>Cordyline stricta</i>	Native																
<i>Corymbia gummifera</i>	Native								1	3	3						
<i>Corymbia intermedia</i>	Native																
<i>Corymbia</i> sp.	Native		1														
<i>Cryptandra propinqua</i>	Native																
<i>Cryptocarya microneura</i>	Native																
<i>Cryptocarya rigida</i>	Native																
<i>Cryptostylis subulata</i>	Native																

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Cryptostylis erecta</i>	Native																
<i>Cryptostylis leptochila</i>	Native																
<i>Cyathea australis</i>	Native																
<i>Cyclospermum leptophyllum</i>	Exotic																
<i>Cymbopogon refractus</i>	Native																
<i>Cynodon dactylon</i>	Native																
<i>Cyperus</i> sp.	Native					1											
<i>Dampiera stricta</i>	Native											1					
<i>Daviesia ulicifolia</i>	Native																
<i>Daviesia umbellulata</i>	Native																
<i>Dendrobium linguiforme</i>	Native												1				
<i>Denhamia celastroides</i>	Native																
<i>Derris involuta</i>	Native																
<i>Desmodium varians</i>	Native																
<i>Desmodium gunnii</i>	Native																
<i>Desmodium nemorosum</i>	Native												2				
<i>Desmodium rhytidophyllum</i>	Native																
<i>Dianella caerulea</i> var. <i>producata</i>	Native		1	2					1		1	2	2				
<i>Dianella longifolia</i>	Native																
<i>Dianella revoluta</i>	Native								1								
<i>Dianella</i> sp.	Native														1		
<i>Dichondra repens</i>	Native			2										1			
<i>Dichondra</i> sp.A (sens Fl.NSW)	Native																
<i>Dichondra</i> sp.	Native																
<i>Digitaria</i> sp.	Native																
<i>Dillwynia floribunda</i>	Native																
<i>Dillwynia retorta</i>	Native								1		2	1	1		1		
<i>Dioscorea transversa</i>	Native																
<i>Doodia</i> sp.	Native																
<i>Drosera spatulata</i>	Native																
<i>Drosera</i> sp.	Native																
<i>Duboisia myoporoides</i>	Native																

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11					Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2	
<i>Echinopogon caespitosus</i>	Native																	
<i>Eclipta prostrata</i>	Native																	
<i>Elaeocarpus obovatus</i>	Native																	
<i>Elaeocarpus reticulatus</i>	Native							1										
<i>Eleocharis</i> sp. (medium size)	Native																	
<i>Eleocharis sphacelata</i>	Native																	
<i>Empodisma minus</i>	Native								2									
<i>Entolasia marginata</i>	Native			2		2												
<i>Entolasia stricta</i>	Native		2						2	2	2		2	2				
<i>Epacris brevifolia</i>	Native																	
<i>Epacris pulchella</i>	Native							2	1						1			
<i>Eragrostis ? brownii</i>	Native																	
<i>Eragrostis leptostachya</i>	Native											1						
<i>Eragrostis</i> sp.	Native																	
<i>Eriocaulon australe</i>	Native				2													
<i>Erythrina</i> sp.	Exotic																	
<i>Eucalyptus carnea</i>	Native																	
<i>Eucalyptus globoidea</i>	Native																	
<i>Eucalyptus grandis</i>	Native																	
<i>Eucalyptus microcorys</i>	Native																	
<i>Eucalyptus pilularis</i>	Native																	
<i>Eucalyptus propinqua</i>	Native																	
<i>Eucalyptus resinifera</i>	Native																	
<i>Eucalyptus robusta</i>	Native						1						4	3	3			
<i>Eucalyptus saligna</i>	Native																	
<i>Eucalyptus siderophloia</i>	Native																	
<i>Eucalyptus signata</i>	Native								3	3	3	3	4					
<i>Eucalyptus</i> sp. (juvenile)	Native																	
<i>Eucalyptus tereticornis</i>	Native																	
<i>Euchiton</i> sp.	Native																	
<i>Eupomatia laurina</i>	Native																	
<i>Eurychorda complanata</i>	Native				1													

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Euryomyrtus ramosissima</i> subsp. <i>ramosissima</i>	Native											1					
<i>Eustrephus latifolius</i>	Native																
<i>Gahnia aspera</i>	Native																
<i>Gahnia clarkei</i>	Native		2	2		3							4	3	2		3
<i>Gahnia sieberiana</i>	Native								2		2					1	
<i>Gahnia</i> sp.	Native							1									
<i>Gamochaeta coarctata</i>	Exotic																
<i>Geitonoplesium cymosum</i>	Native			1										1			
<i>Geranium</i> sp.	Native																
<i>Gladiolus</i> sp.	Exotic																
<i>Gleichenia dicarpa</i>	Native	1	1														
<i>Glochidion ferdinandii</i>	Native			1		1		1					1	1		1	
<i>Glycine clandestina</i>	Native																
<i>Glycine microphylla</i>	Native																
<i>Glycine tabacina</i>	Native																
<i>Gomphocarpus</i> sp.	Exotic																
<i>Gompholobium pinnatum</i>	Native																
<i>Gonocarpus humilis</i>	Native																
<i>Gonocarpus micranthus</i> subsp. <i>ramosissimus</i>	Native		2							2		1	1		2		
<i>Gonocarpus oreophilus</i>	Native																
<i>Gonocarpus tetragynus</i>	Native																
<i>Goodenia fordiana</i>	Native																
<i>Goodenia paniculata</i>	Native																
<i>Goodenia</i> sp.	Native																
<i>Guioa semiglauca</i>	Native																
<i>Gymnostachys anceps</i>	Native																
<i>Haemodorum planifolium</i>	Native																
<i>Hakea teretifolia</i>	Native								1								
<i>Hardenbergia violacea</i>	Native																
<i>Hedychium gardnerianum</i>	Exotic												1				
<i>Hemarthria uncinata</i>	Native																
<i>Hibbertia aspera</i>	Native																



Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11					Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2	
<i>Hibbertia dentata</i>	Native																	
<i>Hibbertia fasciculata</i>	Native																	
<i>Hibbertia linearis</i>	Native										1	1						
<i>Hibbertia obtusifolia</i>	Native																	
<i>Hibbertia salicifolia</i>	Native																	
<i>Hibbertia scandens</i>	Native			1														
<i>Hibbertia</i> sp.	Native																	
<i>Hibbertia vestita</i>	Native									2								
<i>Histiopteris incisa</i>	Native					1												
<i>Hydrocotyle peduncularis</i>	Native			2														
<i>Hydrocotyle</i> sp.	Native																	
<i>Hypericum gramineum</i>	Native																	
<i>Hypericum japonicum</i>	Native																	
<i>Hypochaeris radicata</i>	Exotic											2			1			
<i>Hypolepis muelleri</i>	Native					2							3		2	4		
<i>Hypoxis hygrometrica</i>	Native																	
<i>Imperata cylindrica</i> var. <i>major</i>	Native		2									2	4					
<i>Indigofera australis</i>	Native																	
<i>Isachne globosa</i>	Native						2											
<i>Isolepis</i> sp. (very small)	Native					2										1	1	
<i>Juncus cognatus</i>	Exotic																	
<i>Juncus</i> sp. (large, in swamps)	Native					1									2			
<i>Juncus</i> sp.	Exotic																	
<i>Juncus usitatus</i>	Native														1			
<i>Kennedia rubicunda</i>	Native																	
<i>Kunzea capitata</i>	Native														1			
<i>Lachnagrostis filiformis</i>	Native																	
<i>Lantana camara</i>	Exotic												2					
<i>Lastreopsis decomposita</i>	Native																	
<i>Laxmannia gracilis</i>	Native											1						
<i>Lepidosperma laterale</i>	Native																	
<i>Lepidosperma limicola</i>	Native																	

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11					Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2	
<i>Lepidosperma</i> sp.	Native							1										
<i>Lepironia articulata</i>	Native	3			3												1	
<i>Leptocarpus tenax</i>	Native							1	4	1		2						
<i>Leptomeria acida</i>	Native									2								
<i>Leptospermum juniperinum</i>	Native																	
<i>Leptospermum liversidgei</i>	Native																	
<i>Leptospermum polygalifolium</i> subsp. <i>cismontanum</i>	Native			1				4	3	2	3	1			2			
<i>Leptospermum trinervium</i>	Native										2							
<i>Lepyrodia</i> sp.	Native								2	1								
<i>Leucopogon ericoides</i>	Native														1			
<i>Leucopogon juniperinus</i>	Native												1					
<i>Leucopogon margarodes</i>	Native																	
<i>Leucopogon pimelioides</i>	Native							3	2	3	2	1			1			
<i>Leucopogon</i> sp. ( <i>deformis</i> maybe?)	Native							1		2	1	1						
<i>Linaria arvensis</i>	Exotic																	
<i>Lindsaea linearis</i>	Native																	
<i>Lindsaea microphylla</i>	Native																	
<i>Livistona australis</i>	Native																	
<i>Lomandra confertifolia</i>	Native																	
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Native								1	2		1						
<i>Lomandra longifolia</i>	Native							2	2	3	3	2		2	3			
<i>Lomatia silaifolia</i>	Native																	
<i>Lophostemon confertus</i>	Native																	
<i>Lycopodium deuterodensum</i>	Native																	
<i>Lycopodium microphyllum</i>	Native																	
<i>Maclura cochinchinensis</i>	Native																	
<i>Marsdenia rostrata</i>	Native																	
<i>Melaleuca linariifolia</i>	Native			2			2							1				
<i>Melaleuca nodosa</i>	Native							3	1		1	1						
<i>Melaleuca quinquenervia</i>	Native	4	4	4	3	4	3							2	2		2	
<i>Melaleuca sieberi</i>	Native								2					1				
<i>Melaleuca styphelioides</i>	Native			1										4				

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Melaleuca thymifolia</i>	Native									1							
<i>Microlaena stipoides</i>	Native												2				
<i>Microtis parviflora</i>	Native																
<i>Mirbelia rubiifolia</i>	Native																
? <i>Mischocarpus</i> sp.	Native																
<i>Monotoca elliptica</i>	Native									2							
<i>Morinda jasminoides</i>	Native			1									2				
<i>Muellerina eucalyptoides</i>	Native																
<i>Myrsine howittiana</i>	Native												1				
<i>Notelaea longifolia</i>	Native																
<i>Notelaea</i> sp.	Native																
<i>Nymphaea</i> sp.	Native																
<i>Ochna serrulata</i>	Exotic			1													
<i>Ochrosperma lineare</i>	Native										2						
<i>Opercularia diphylla</i>	Native																
<i>Oplismenus aemulus</i>	Native													1			
<i>Oplismenus imbecillis</i>	Native			2										2			
<i>Ottochloa gracillima</i>	Native																
<i>Oxylobium arborescens</i>	Native																
<i>Oxalis</i> sp.	Native																
<i>Ozothamnus diosmifolius</i>	Native																
<i>Pandorea pandorana</i>	Native										1						
<i>Panicum simile</i>	Native																
<i>Parsonsia straminea</i>	Native		1	2		2				1			1	2			1
<i>Paspalum dilatatum</i>	Exotic					2											
<i>Paspalum</i> sp.	Exotic																
<i>Paspalum urvillei</i>	Exotic			2													
<i>Patersonia fragilis</i>	Native																
<i>Patersonia glabrata</i>	Native							1		2		2					
<i>Pennisetum clandestinum</i>	Exotic											2					
<i>Persicaria praetermissa</i>	Native																
<i>Persicaria strigosa</i>	Native					2	2										

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Persoonia levis</i>	Native								1								
<i>Persoonia stradbrogensis</i>	Native								2								
<i>Persoonia virgata</i>	Native									1				1			
<i>Philydrum lanuginosum</i>	Native				2												
<i>Phragmites australis</i>	Native	1					2										3
<i>Phytolacca</i> sp.	Exotic																
<i>Pimelea linifolia</i>	Native								2			2					
<i>Pittosporum revolutum</i>	Native																
<i>Pittosporum undulatum</i>	Native																
<i>Plantago lanceolata</i>	Exotic																
<i>Platycerium bifurcatum</i>	Native					1										1	
<i>Platylobium formosum</i> subsp. <i>formosum</i>	Native																
<i>Plectorrhiza tridentata</i>	Native													1		1	
<i>Polymeria calycina</i>	Native													1			
<i>Polyscias sambucifolia</i> subsp. <i>sambucifolia</i>	Native								1								
<i>Pomaderris</i> sp.	Native																
<i>Pomax umbellata</i>	Native							2		2		1			1		
<i>Pratia purpurascens</i>	Native												2				
<i>Pseuderanthemum variabile</i>	Native													2			
<i>Pteridium esculentum</i>	Native							2	3	2	2	1			2		
<i>Pterostylis erecta</i>	Native																
<i>Ptilothrix deusta</i>	Native								2								
<i>Pultenaea retusa</i>	Native																
<i>Pultenaea villosa</i>	Native																
<i>Pyrosia rupestris</i>	Native					1											
<i>Ranunculus inundatus</i>	Native																
<i>Ranunculus lappaceus</i>	Native																
<i>Rhodamnia rubescens</i>	Native																
<i>Ricinocarpos pinifolius</i>	Native									1	1						
<i>Ricinus communis</i>	Exotic																
<i>Rubus fruticosus</i> sp. agg.	Exotic																
<i>Rubus moluccanus</i>	Native			1										1			

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11					Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2	
<i>Rubus parvifolius</i>	Native																	
<i>Rubus rosifolius</i>	Native																	
<i>Rulingia darphylla</i>	Native																	
<i>Sarcopetalum harveyanum</i>	Native																	
<i>Schizaea bifida</i>	Native																	
<i>Schizaea dichotoma</i>	Native								1									
<i>Schizomeria ovata</i>	Native																	
<i>Schoenoplectus validus</i>	Native																	
<i>Schoenus apogon</i>	Native																	
<i>Schoenus brevifolius</i>	Native				4				3									
<i>Schoenus melanostachys</i>	Native											1						
<i>Selaginella uliginosa</i>	Native		1					3				2						
<i>Senecio madagascariensis</i>	Exotic																	
<i>Senna floribunda</i>	Exotic																	
<i>Senna pendula</i>	Exotic												1					
<i>Setaria sphacelata</i>	Exotic															4		
<i>Smilax australis</i>	Native																	
<i>Smilax glycyphylla</i>	Native			1						1			1					
<i>Solanum mauritianum</i>	Exotic																	
<i>Solanum nigrum</i>	Exotic																	
<i>Solanum stelligerum</i>	Native																	
<i>Sonchus oleraceus</i>	Exotic																	
<i>Sowerbaea juncea</i>	Native											1						
<i>Sphaerolobium vimineum</i>	Native																	
<i>Sporobolus sp.</i>	Native																	
<i>Sprengelia spregelioides</i>	Native																	
<i>Stenotaphrum secundatum</i>	Exotic														2			
<i>Stephanica japonica var. discolor</i>	Native												1					
<i>Syncarpia glomulifera</i>	Native																	
<i>Synoum glandulosum</i>	Native																	
<i>Taraxacum officinale</i>	Exotic																	
<i>Tephrosia grandiflora</i>	Exotic																	

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
<i>Tetradlea thymifolia</i>	Native									2							
<i>Thelymitra malvina</i>	Native																
<i>Thelymitra pauciflora s.l.</i>	Native																
<i>Thelymitra purpurata</i>	Native																
<i>Thelymitra sp.</i>	Native																
<i>Themeda australis</i>	Native								2					1			
<i>Trachymene incisa</i>	Native										2			1			
<i>Tricoryne elatior</i>	Native																
<i>Trifolium repens</i>	Exotic																
<i>Triglochin multifructa</i>	Native																
<i>Tripladenia cunninghamii</i>	Native																
<i>Tylophora paniculata</i>	Native																
<i>Verbena rigida</i>	Exotic																
<i>Verbena sp.</i>	Exotic																
<i>Vernonia cinerea</i>	Native																
<i>Villarsia exaltata</i>	Native				1												1
<i>Viola banksii</i>	Native					2							2			2	
<i>Viola betonicifolia</i>	Native																
<i>Wahlenbergia gracilis</i>	Native																
<i>Wikstroemia indica</i>	Native			1													
<i>Wilkiea huegeliana</i>	Native																
<i>Wurmbea biglandulosa</i>	Native																
<i>Xanthorrhoea macronema</i>	Native									1							
<i>Xanthorrhoea sp. (good stem, in swamps)</i>	Native										1		1				
<i>Xanthosia pilosa</i>	Native																
<i>Xyris sp.</i>	Native																
<i>Zieria laxiflora</i>	Native																
<i>Zieria smithii</i>	Native																
Unknown grass from Swamp Mahog 1	Native												1				
Unknown grass from Swamp Oak 2	Native																2
Unknown grass from Wallum Sedgeland 4	Native																
Unknown Sapindaceae from Bbutt-Tallow 2	Native																

Scientific name	Native/ Exotic	Veg Zone 9					Veg Zone 10	Veg Zone 11				Veg Zone 12	Veg Zone 13		Veg Zone 14	Veg Zone 15	
		9-1	9-2	9-3	9-4	9-5	10-1	11-1	11-2	11-3	11-4	12-1	13-1	13-2	14-1	15-1	15-2
Unknown herb from Swamp Mahog 2	Native												1				
Unknown herb from Bbutt-Tallow (crop) 1	Native																
Unknown sedge from Swamp Mahog 2	Native												3				
Unknown sedge from Wet Heathland (mow) 1	Native																
<b>TALLY</b>		<b>7</b>	<b>18</b>	<b>25</b>	<b>10</b>	<b>20</b>	<b>9</b>	<b>23</b>	<b>35</b>	<b>25</b>	<b>26</b>	<b>32</b>	<b>24</b>	<b>29</b>	<b>25</b>	<b>11</b>	<b>11</b>

Veg Zone 9 = Paperbark swamp forest of the coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Good

Veg Zone 10- = Paperbark swamp forest of the coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Cropped

Veg Zone 11 = Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Good

Veg Zone 12 = Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast, Low condition, Ancillary Condition Code: Mowed Understorey

Veg Zone 13 = Swamp Mahogany swamp forest of the coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Good

Veg Zone 14 = Swamp Mahogany swamp forest of the coastal lowlands of the North Coast, Low condition, Ancillary Condition Code: Regeneration

Veg Zone 15 = Swamp Oak swamp forest of the coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Good

## Vegetation Zones 16-22

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Acacia brownii</i>	Native													
<i>Acacia elongata</i>	Native							1						
<i>Acacia falcata</i>	Native													
<i>Acacia floribunda</i>	Native													
<i>Acacia longifolia</i>	Native							1						
<i>Acacia maidenii</i>	Native													
<i>Acacia myrtifolia</i>	Native													
<i>Acacia suaveolens</i>	Native													
<i>Acmena smithii</i>	Native													
<i>Ageratina adenophora</i>	Exotic	1												
<i>Ageratum houstonianum</i>	Exotic													
<i>Alectryon subcinereus</i>	Native													
<i>Allocasuarina littoralis</i>	Native													
<i>Allocasuarina thalassoscopica</i>	Native							3						
<i>Allocasuarina torulosa</i>	Native													
<i>Alphitonia excelsa</i>	Native	1		1										
<i>Amperea xiphoclada</i>	Native													
<i>Amyema congener</i> subsp. <i>congener</i>	Native													
<i>Andropogon virginicus</i>	Exotic			3										
<i>Aotus ericoides</i>	Native													
<i>Aristida vagans</i>	Native													
<i>Asparagus aethiopicus</i>	Exotic													
<i>Astrotricha latifolia</i>	Native													
<i>Austrostipa rudis</i>	Native													
<i>Avicennia marina</i> subsp. <i>australasica</i>	Native													
<i>Baloskion tetraphyllum</i>	Native					1					2			
<i>Baloskion</i> sp.	Native													
<i>Banksia aemula</i>	Native													
<i>Banksia ericifolia</i> subsp. <i>macrantha</i>	Native						3	3	2	2	1			
<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	Native													
<i>Banksia oblongifolia</i>	Native							3	2	2				



Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Banksia robur</i>	Native													
<i>Banksia spinulosa</i>	Native													
<i>Bauera capitata</i>	Native								1	1				
<i>Baumea articulata</i>	Native				3	5	2					2		3
<i>Baumea rubiginosa</i>	Native					2								
<i>Baumea</i> sp.	Native				4				3				2	2
<i>Baumea</i> sp. (smaller)	Native													
<i>Bidens pilosa</i>	Exotic													
<i>Billardiera rubens</i>	Native													
<i>Billardiera scandens</i>	Native													
<i>Blandfordia grandiflora</i>	Native						1							
<i>Blechnum cartilagineum</i>	Native													
<i>Blechnum indicum</i>	Native	1				3								
<i>Boronia falcifolia</i>	Native						1							
<i>Boronia parviflora</i>	Native						1							
<i>Boronia polygalifolia</i>	Native													
<i>Boronia safrolifera</i>	Native													
<i>Bossiaea</i> sp.	Native													
<i>Botrychium australe</i>	Native													
<i>Breynia oblongifolia</i>	Native													
<i>Caesia parviflora</i> var. <i>parviflora</i>	Native													
<i>Caladenia carnea</i>	Native													
<i>Caleana major</i>	Native													
<i>Callistemon pachyphyllus</i>	Native				1	2	1	3	2					
<i>Callistemon</i> sp.	Native													
<i>Callistemon salignus</i>	Native													
<i>Calochilus campestris</i>	Native													
<i>Calochilus paludosus</i>	Native													
<i>Calochilus</i> sp.	Native													
<i>Calochlaena dubia</i>	Native	1												
<i>Carex appressa</i>	Native													
<i>Carex breviculmis</i>	Native													

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Carex polyantha</i>	Native			2								5	6	
<i>Carex</i> sp.	Native													
<i>Cassytha filiformis</i>	Native						2	2	1	1				
<i>Cassytha glabella</i>	Native													
<i>Cassytha pubescens</i>	Native								2					
<i>Cassytha</i> sp.	Native													
<i>Casuarina glauca</i>	Native	3	3	3										
<i>Caustis flexuosa</i>	Native													
<i>Caustis recurvata</i>	Native													
<i>Centaurium erythraea</i>	Exotic													
<i>Centella asiatica</i>	Native			2										
<i>Centratherum riparium</i>	Native													
<i>Cheilanthes sieberi</i> ssp. <i>sieberi</i>	Native													
<i>Chiloglottis</i> sp.	Native													
<i>Chorizandra cymbaria</i>	Native													
<i>Chorizema parviflorum</i>	Native													
<i>Cinnamomum camphora</i>	Exotic	1	1											
<i>Cirsium vulgare</i>	Exotic													
<i>Cissus hypoglauca</i>	Native													
<i>Clerodendrum floribundum</i>	Native													
<i>Comesperma ericinum</i>	Native							1						
<i>Commersonia dasyphylla</i>	Native													
<i>Conospermum taxifolium</i>	Native													
<i>Conyza bonariensis</i>	Exotic		2	1										
<i>Cordyline stricta</i>	Native													
<i>Corymbia gummifera</i>	Native													
<i>Corymbia intermedia</i>	Native													
<i>Corymbia</i> sp.	Native													
<i>Cryptandra propinqua</i>	Native							2						
<i>Cryptocarya microneura</i>	Native													
<i>Cryptocarya rigida</i>	Native													
<i>Cryptostylis subulata</i>	Native													

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Cryptostylis erecta</i>	Native													
<i>Cryptostylis leptochila</i>	Native													
<i>Cyathea australis</i>	Native	1												
<i>Cyclospermum leptophyllum</i>	Exotic													
<i>Cymbopogon refractus</i>	Native													
<i>Cynodon dactylon</i>	Native													
<i>Cyperus</i> sp.	Native				1									
<i>Dampiera stricta</i>	Native									2				
<i>Daviesia ulicifolia</i>	Native													
<i>Daviesia umbellulata</i>	Native													
<i>Dendrobium linguiforme</i>	Native													
<i>Denhamia celastroides</i>	Native													
<i>Derris involuta</i>	Native													
<i>Desmodium varians</i>	Native													
<i>Desmodium gunnii</i>	Native													
<i>Desmodium nemorosum</i>	Native													
<i>Desmodium rhytidophyllum</i>	Native													
<i>Dianella caerulea</i> var. <i>producata</i>	Native													
<i>Dianella longifolia</i>	Native								1					
<i>Dianella revoluta</i>	Native													
<i>Dianella</i> sp.	Native													
<i>Dichondra repens</i>	Native		2											
<i>Dichondra</i> sp.A (sens FI.NSW)	Native													
<i>Dichondra</i> sp.	Native													
<i>Digitaria</i> sp.	Native	1												
<i>Dillwynia floribunda</i>	Native						1	1		1				
<i>Dillwynia retorta</i>	Native													
<i>Dioscorea transversa</i>	Native													
<i>Doodia</i> sp.	Native													
<i>Drosera spatulata</i>	Native													
<i>Drosera</i> sp.	Native						1				1			
<i>Duboisia myoporoides</i>	Native	1												

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Echinopogon caespitosus</i>	Native													
<i>Eclipta prostrata</i>	Native													
<i>Elaeocarpus obovatus</i>	Native													
<i>Elaeocarpus reticulatus</i>	Native	1												
<i>Eleocharis</i> sp. (medium size)	Native													4
<i>Eleocharis sphacelata</i>	Native													
<i>Empodisma minus</i>	Native						4			3	3			
<i>Entolasia marginata</i>	Native							2			2			
<i>Entolasia stricta</i>	Native	2							2					
<i>Epacris brevifolia</i>	Native						2			3				
<i>Epacris pulchella</i>	Native										2			
<i>Eragrostis ? brownii</i>	Native													
<i>Eragrostis leptostachya</i>	Native													
<i>Eragrostis</i> sp.	Native													
<i>Eriocaulon australe</i>	Native				2									
<i>Erythrina</i> sp.	Exotic													
<i>Eucalyptus carnea</i>	Native													
<i>Eucalyptus globoidea</i>	Native													
<i>Eucalyptus grandis</i>	Native													
<i>Eucalyptus microcorys</i>	Native													
<i>Eucalyptus pilularis</i>	Native													
<i>Eucalyptus propinqua</i>	Native													
<i>Eucalyptus resinifera</i>	Native													
<i>Eucalyptus robusta</i>	Native													
<i>Eucalyptus saligna</i>	Native													
<i>Eucalyptus siderophloia</i>	Native													
<i>Eucalyptus signata</i>	Native													
<i>Eucalyptus</i> sp. (juvenile)	Native													
<i>Eucalyptus tereticornis</i>	Native													
<i>Euchiton</i> sp.	Native													
<i>Eupomatia laurina</i>	Native													
<i>Eurychorda complanata</i>	Native													

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Euryomyrtus ramosissima</i> subsp. <i>ramosissima</i>	Native													
<i>Eustrephus latifolius</i>	Native													
<i>Gahnia aspera</i>	Native													
<i>Gahnia clarkei</i>	Native	3		1			2							
<i>Gahnia sieberiana</i>	Native													
<i>Gahnia</i> sp.	Native													
<i>Gamochaeta coarctata</i>	Exotic		1											
<i>Geitonoplesium cymosum</i>	Native													
<i>Geranium</i> sp.	Native			1										
<i>Gladiolus</i> sp.	Exotic		1											
<i>Gleichenia dicarpa</i>	Native									2				
<i>Glochidion ferdinandii</i>	Native	1												
<i>Glycine clandestina</i>	Native													
<i>Glycine microphylla</i>	Native													
<i>Glycine tabacina</i>	Native													
<i>Gomphocarpus</i> sp.	Exotic													
<i>Gompholobium pinnatum</i>	Native													
<i>Gonocarpus humilis</i>	Native													
<i>Gonocarpus micranthus</i> subsp. <i>ramosissimus</i>	Native													
<i>Gonocarpus oreophilus</i>	Native													
<i>Gonocarpus tetragynus</i>	Native			2										
<i>Goodenia fordiana</i>	Native													
<i>Goodenia paniculata</i>	Native													
<i>Goodenia</i> sp.	Native													
<i>Guioa semiglauca</i>	Native	1												
<i>Gymnostachys anceps</i>	Native													
<i>Haemodorum planifolium</i>	Native													
<i>Hakea teretifolia</i>	Native						2	3	1	2				
<i>Hardenbergia violacea</i>	Native													
<i>Hedychium gardnerianum</i>	Exotic													
<i>Hemarthria uncinata</i>	Native			2								3		
<i>Hibbertia aspera</i>	Native													

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Hibbertia dentata</i>	Native													
<i>Hibbertia fasciculata</i>	Native										2			
<i>Hibbertia linearis</i>	Native													
<i>Hibbertia obtusifolia</i>	Native	1												
<i>Hibbertia salicifolia</i>	Native						1							
<i>Hibbertia scandens</i>	Native													
<i>Hibbertia</i> sp.	Native													
<i>Hibbertia vestita</i>	Native													
<i>Histiopteris incisa</i>	Native													
<i>Hydrocotyle peduncularis</i>	Native			2										
<i>Hydrocotyle</i> sp.	Native		2											
<i>Hypericum gramineum</i>	Native			2										
<i>Hypericum japonicum</i>	Native			1										
<i>Hypochaeris radicata</i>	Exotic													
<i>Hypolepis muelleri</i>	Native	2		2										
<i>Hypoxis hygrometrica</i>	Native													
<i>Imperata cylindrica</i> var. <i>major</i>	Native													
<i>Indigofera australis</i>	Native													
<i>Isachne globosa</i>	Native												2	
<i>Isolepis</i> sp. (very small)	Native													
<i>Juncus cognatus</i>	Exotic													
<i>Juncus</i> sp. (large, in swamps)	Native			2								3	2	
<i>Juncus</i> sp.	Exotic													
<i>Juncus usitatus</i>	Native													
<i>Kennedia rubicunda</i>	Native													
<i>Kunzea capitata</i>	Native									2				
<i>Lachnagrostis filiformis</i>	Native													
<i>Lantana camara</i>	Exotic	3												
<i>Lastreopsis decomposita</i>	Native													
<i>Laxmannia gracilis</i>	Native													
<i>Lepidosperma laterale</i>	Native													
<i>Lepidosperma limicola</i>	Native						3							

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Lepidosperma</i> sp.	Native													
<i>Lepironia articulata</i>	Native													3
<i>Leptocarpus tenax</i>	Native						3	4	3	4				
<i>Leptomeria acida</i>	Native													
<i>Leptospermum juniperinum</i>	Native					3							1	1
<i>Leptospermum liversidgei</i>	Native						3							
<i>Leptospermum polygalifolium</i> subsp. <i>cismontanum</i>	Native										3			
<i>Leptospermum trinervium</i>	Native													
<i>Lepyrodia</i> sp.	Native							2	3	2				
<i>Leucopogon ericoides</i>	Native													
<i>Leucopogon juniperinus</i>	Native													
<i>Leucopogon margarodes</i>	Native													
<i>Leucopogon pimelioides</i>	Native													
<i>Leucopogon</i> sp. ( <i>deformis</i> maybe?)	Native										1			
<i>Linaria arvensis</i>	Exotic													
<i>Lindsaea linearis</i>	Native													
<i>Lindsaea microphylla</i>	Native													
<i>Livistona australis</i>	Native	1												
<i>Lomandra confertifolia</i>	Native										1			
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Native													
<i>Lomandra longifolia</i>	Native										1			
<i>Lomatia silaifolia</i>	Native													
<i>Lophostemon confertus</i>	Native													
<i>Lycopodium deuterodensum</i>	Native													
<i>Lycopodium microphyllum</i>	Native													
<i>Maclura cochinchinensis</i>	Native													
<i>Marsdenia rostrata</i>	Native	2												
<i>Melaleuca linariifolia</i>	Native					1								
<i>Melaleuca nodosa</i>	Native								3		2			
<i>Melaleuca quinquenervia</i>	Native	1				1	1							2
<i>Melaleuca sieberi</i>	Native							3	1	1	3			
<i>Melaleuca styphelioides</i>	Native													

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Melaleuca thymifolia</i>	Native							1	2	1				
<i>Microlaena stipoides</i>	Native		3											
<i>Microtis parviflora</i>	Native													
<i>Mirbelia rubiifolia</i>	Native									1				
? <i>Mischocarpus</i> sp.	Native													
<i>Monotoca elliptica</i>	Native										1			
<i>Morinda jasminoides</i>	Native	1												
<i>Muellerina eucalyptoides</i>	Native													
<i>Myrsine howittiana</i>	Native													
<i>Notelaea longifolia</i>	Native													
<i>Notelaea</i> sp.	Native													
<i>Nymphaea</i> sp.	Native													
<i>Ochna serrulata</i>	Exotic													
<i>Ochrosperma lineare</i>	Native										2			
<i>Opercularia diphylla</i>	Native													
<i>Oplismenus aemulus</i>	Native	2	2											
<i>Oplismenus imbecillis</i>	Native	2												
<i>Ottochloa gracillima</i>	Native	2												
<i>Oxylobium arborescens</i>	Native													
<i>Oxalis</i> sp.	Native													
<i>Ozothamnus diosmifolius</i>	Native													
<i>Pandorea pandorana</i>	Native													
<i>Panicum simile</i>	Native													
<i>Parsonsia straminea</i>	Native			1										
<i>Paspalum dilatatum</i>	Exotic		2											
<i>Paspalum</i> sp.	Exotic			3										
<i>Paspalum urvillei</i>	Exotic													
<i>Patersonia fragilis</i>	Native										1			
<i>Patersonia glabrata</i>	Native										2			
<i>Pennisetum clandestinum</i>	Exotic													
<i>Persicaria praetermissa</i>	Native			1										
<i>Persicaria strigosa</i>	Native											3	2	3



Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Persoonia levis</i>	Native													
<i>Persoonia stradbrogensis</i>	Native			2										
<i>Persoonia virgata</i>	Native													
<i>Philydrum lanuginosum</i>	Native													2
<i>Phragmites australis</i>	Native													2
<i>Phytolacca</i> sp.	Exotic													
<i>Pimelea linifolia</i>	Native							1		1				
<i>Pittosporum revolutum</i>	Native													
<i>Pittosporum undulatum</i>	Native													
<i>Plantago lanceolata</i>	Exotic													
<i>Platycerium bifurcatum</i>	Native													
<i>Platylobium formosum</i> subsp. <i>formosum</i>	Native													
<i>Plectorrhiza tridentata</i>	Native													
<i>Polymeria calycina</i>	Native													
<i>Polyscias sambucifolia</i> subsp. <i>sambucifolia</i>	Native													
<i>Pomaderris</i> sp.	Native													
<i>Pomax umbellata</i>	Native										1			
<i>Pratia purpurascens</i>	Native		2											
<i>Pseuderanthemum variabile</i>	Native													
<i>Pteridium esculentum</i>	Native	1									2			
<i>Pterostylis erecta</i>	Native													
<i>Ptilothrix deusta</i>	Native								3	3	3	2		
<i>Pultenaea retusa</i>	Native													
<i>Pultenaea villosa</i>	Native													
<i>Pyrosia rupestris</i>	Native													
<i>Ranunculus inundatus</i>	Native													
<i>Ranunculus lappaceus</i>	Native													
<i>Rhodamnia rubescens</i>	Native													
<i>Ricinocarpos pinifolius</i>	Native													
<i>Ricinus communis</i>	Exotic													
<i>Rubus fruticosus</i> sp. agg.	Exotic			1										
<i>Rubus moluccanus</i>	Native	1												

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Rubus parvifolius</i>	Native													
<i>Rubus rosifolius</i>	Native													
<i>Rulingia darphylla</i>	Native													
<i>Sarcopetalum harveyanum</i>	Native													
<i>Schizaea bifida</i>	Native													
<i>Schizaea dichotoma</i>	Native													
<i>Schizomeria ovata</i>	Native													
<i>Schoenoplectus validus</i>	Native													
<i>Schoenus apogon</i>	Native													
<i>Schoenus brevifolius</i>	Native													
<i>Schoenus melanostachys</i>	Native				1									
<i>Selaginella uliginosa</i>	Native									3				
<i>Senecio madagascariensis</i>	Exotic		2	1										
<i>Senna floribunda</i>	Exotic	1												
<i>Senna pendula</i>	Exotic													
<i>Setaria sphacelata</i>	Exotic			4										
<i>Smilax australis</i>	Native													
<i>Smilax glycyphylla</i>	Native	1												
<i>Solanum mauritianum</i>	Exotic	1												
<i>Solanum nigrum</i>	Exotic													
<i>Solanum stelligerum</i>	Native													
<i>Sonchus oleraceus</i>	Exotic		1											
<i>Sowerbaea juncea</i>	Native													
<i>Sphaerolobium vimineum</i>	Native								1					
<i>Sporobolus sp.</i>	Native													
<i>Sprengelia spregelioides</i>	Native						2		2					
<i>Stenotaphrum secundatum</i>	Exotic		5	3										
<i>Stephanica japonica var. discolor</i>	Native													
<i>Syncarpia glomulifera</i>	Native													
<i>Synoum glandulosum</i>	Native													
<i>Taraxacum officinale</i>	Exotic		1											
<i>Tephrosia grandiflora</i>	Exotic													

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
<i>Tetradlea thymifolia</i>	Native													
<i>Thelymitra malvina</i>	Native										1			
<i>Thelymitra pauciflora s.l.</i>	Native													
<i>Thelymitra purpurata</i>	Native													
<i>Thelymitra sp.</i>	Native													
<i>Themeda australis</i>	Native			2										
<i>Trachymene incisa</i>	Native													
<i>Tricoryne elatior</i>	Native													
<i>Trifolium repens</i>	Exotic													
<i>Triglochin multifructa</i>	Native													
<i>Tripladenia cunninghamii</i>	Native													
<i>Tylophora paniculata</i>	Native	1												
<i>Verbena rigida</i>	Exotic			2										
<i>Verbena sp.</i>	Exotic			1										
<i>Vernonia cinerea</i>	Native													
<i>Villarsia exaltata</i>	Native					1								1
<i>Viola banksii</i>	Native	2	3											
<i>Viola betonicifolia</i>	Native			1										
<i>Wahlenbergia gracilis</i>	Native													
<i>Wikstroemia indica</i>	Native													
<i>Wilkiea huegeliana</i>	Native													
<i>Wurmbea biglandulosa</i>	Native													
<i>Xanthorrhoea macronema</i>	Native													
<i>Xanthorrhoea sp. (good stem, in swamps)</i>	Native					-	1	2	3	3				
<i>Xanthosia pilosa</i>	Native													
<i>Xyris sp.</i>	Native						1							
<i>Zieria laxiflora</i>	Native													
<i>Zieria smithii</i>	Native													
Unknown grass from Swamp Mahog 1	Native													
Unknown grass from Swamp Oak 2	Native													
Unknown grass from Wallum Sedgeland 4	Native												2	
Unknown Sapindaceae from Bbutt-Tallow 2	Native													

Scientific name	Native / Exotic	Veg Zone 16	Veg Zone 17	Veg Zone 18	Veg Zone 19		Veg Zone 20				Veg Zone 21	Veg Zone 22		
		16-1	17-1	18-1	19-1	19-2	20-1	20-2	20-3	20-4	21-1	19-3	19-4	19-5
Unknown herb from Swamp Mahog 2	Native													
Unknown herb from Bbutt-Tallow (crop) 1	Native													
Unknown sedge from Swamp Mahog 2	Native													
Unknown sedge from Wet Heathland (mow) 1	Native									1				
<b>TALLY</b>		<b>31</b>	<b>16</b>	<b>27</b>	<b>8</b>	<b>8</b>	<b>21</b>	<b>19</b>	<b>16</b>	<b>20</b>	<b>24</b>	<b>5</b>	<b>7</b>	<b>10</b>

Veg Zone 16 = Swamp Oak swamp forest of the coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Weedy Understorey

Veg Zone 17 = Swamp Oak swamp forest of the coastal lowlands of the North Coast, Low condition, Ancillary Condition Code: Cropped with Weedy Understorey

Veg Zone 18 = Swamp Oak swamp forest of the coastal lowlands of the North Coast, Low condition, Ancillary Condition Code: Cleared (to regenerate)

Veg Zone 19 = Wallum sedgeland and rushland of near coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Good

Veg Zone 20 = Wet heathland and shrubland of coastal lowlands of the North Coast, Moderate to Good condition, Ancillary Condition Code: Good

Veg Zone 21 = Wet heathland and shrubland of coastal lowlands of the North Coast, Low condition, Ancillary Condition Code: Mowed

Veg Zone 22 = Coastal Freshwater meadows and forblands of lagoons and wetlands of the North Coast, Moderate-Good condition, Ancillary Condition Code: Good

## Appendix G: Fauna species recorded in BCAA by ELA

Fauna group	Scientific name	Common name
Frogs	<i>Crinia signifera</i>	Clicking Froglet
Frogs	<i>Crinia tinnula</i> ^	Wallum Froglet
Frogs	<i>Limnodynastes peronii</i>	Striped Marsh Frog
Frogs	<i>Litoria caerulea</i>	Green Tree Frog
Frogs	<i>Litoria dentata</i>	Bleating Tree Frog
Frogs	<i>Litoria fallax</i>	Eastern Sedge Frog
Frogs	<i>Litoria peronii</i>	Emerald-spotted Tree Frog
Frogs	<i>Litoria</i> sp.	
Frogs	<i>Pseudophryne coriacea</i>	Red-backed Toadlet
Reptiles	<i>Varanus varius</i>	Lace Monitor
Birds	<i>Acanthiza nana</i>	Yellow Thornbill
Birds	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill
Birds	<i>Accipiter fasciatus</i>	Brown Goshawk
Birds	<i>Accipiter novaehollandiae</i>	Grey Goshawk
Birds	<i>Acrocephalus australis</i>	Australian Reed-Warbler
Birds	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar
Birds	<i>Anas castanea</i>	Chestnut Teal
Birds	<i>Anthochaera carunculata</i>	Red Wattlebird
Birds	<i>Anthus novaeseelandiae</i>	Australasian Pipit
Birds	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo
Birds	<i>Cacomantis pallidus</i>	Pallid Cuckoo
Birds	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black Cockatoo
Birds	<i>Centropus phasianinus</i>	Pheasant coucal
Birds	<i>Chrysococcyx lucidus</i>	Shining Bronze-cuckoo
Birds	<i>Circus approximans</i>	Swamp Harrier?
Birds	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
Birds	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Birds	<i>Cormobates leucophaeus</i>	White-throated Treecreeper
Birds	<i>Corvus bennetti</i>	Little Crow

Fauna group	Scientific name	Common name
Birds	<i>Corvus coronoides</i>	Australian Raven
Birds	<i>Cracticus nigrogularis</i>	Pied Butcherbird
Birds	<i>Cracticus tibicen</i>	Australian Magpie
Birds	<i>Cracticus torquatus</i>	Grey Butcherbird
Birds	<i>Cygnus atratus</i>	Black swan
Birds	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
Birds	<i>Dicrurus bracteatus</i>	Sprangled Drongo
Birds	<i>Gallinula tenebrosa</i>	Dusky Moorhen
Birds	<i>Eopsaltria australis</i>	Eastern Yellow Robin
Birds	<i>Eudnamys orientalis</i>	Eastern Koel
Birds	<i>Eurystomus orientalis</i>	Dollarbird
Birds	<i>Gallirallus philippensis</i>	Buff-banded Rail
Birds	<i>Geopelia humeralis</i>	Bar-shouldered Dove
Birds	<i>Gerygone albogularis</i>	White-throated Gerygone
Birds	<i>Glossopsitta concinna</i>	Musk Lorikeet
Birds	<i>Grallina cyanoleuca</i>	Magpielark
Birds	<i>Haliastur sphenurus</i>	Whistling Kite
Birds	<i>Malurus cyaneus</i>	Superb Fairy-wren
Birds	<i>Malurus lamberti</i>	Variiegated Fairy-wren
Birds	<i>Manorina melanocephala</i>	Noisy Miner
Birds	<i>Merops ornatus</i> ^	Rainbow Bee-eater
Birds	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant
Birds	<i>Myiagra cyanoleuca</i>	Satin Flycatcher
Birds	<i>Neochima temporalis</i>	Red-browed Finch
Birds	<i>Oriolus sagittatus</i>	Olive-backed Oriole
Birds	<i>Pachycephala rufiventris</i>	Rufous Whistler
Birds	<i>Petroica rosea</i>	Rose Robin
Birds	<i>Petrochelidon ariel</i>	Fairy Martin
Birds	<i>Phaps chalcoptera</i>	Common Bronzewing
Birds	<i>Phylidonyris niger</i>	White-cheeked Honeyeater
Birds	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater
Birds	<i>Platalea regia</i>	Royal Spoonbill
Birds	<i>Platycercus eximius</i>	Eastern Rosella

Fauna group	Scientific name	Common name
Birds	<i>Podargus strigoides</i>	Tawny Frogmouth
Birds	<i>Porphyrio porphyrio</i>	Purple Swamphen
Birds	<i>Psophodes olivaceus</i>	Eastern Whipbird
Birds	<i>Rhipidura albiscapa</i>	Grey Fantail
Birds	<i>Rhipidura leucophrys</i>	Willie Wagtail
Birds	<i>Sericornis frontalis</i>	White-browed Scrubwren
Birds	<i>Threskiornis molucca</i>	Australian White Ibis
Birds	<i>Todiramphus sanctus</i>	Sacred Kingfisher
Birds	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
Birds	<i>Tyto tenebricosa</i> ^	Sooty Owl
Mammals (excluding bats)	<i>Antechinus flaviceps</i>	Yellow-footed Antechinus
Mammals (excluding bats)	<i>Antechinus</i> sp.	Antechinus sp.
Mammals (excluding bats)	<i>Antechinus stuartii</i>	Brown Antechinus
Mammals (excluding bats)	<i>Dama dama</i> *	Fallow Deer
Mammals (excluding bats)	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
Mammals (excluding bats)	<i>Macropus rufogriseus</i>	Red-necked Wallaby
Mammals (excluding bats)	<i>Perameles nasuta</i>	Long-nosed Bandicoot
Mammals (excluding bats)	<i>Perameles / Isoodon</i> sp.	Bandicoot sp.
Mammals (excluding bats)	<i>Petaurus breviceps</i>	Sugar Glider
Mammals (excluding bats)	<i>Petaurus norfolcensis</i> ^	Squirrel Glider
Mammals (excluding bats)	<i>Phascolarctos cinereus</i> ^	Koala
Mammals (excluding bats)	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum
Mammals (excluding bats)	<i>Pseudomys gracilicaudatus</i> ^3	Eastern Chestnut Mouse
Mammals (excluding bats)	<i>Rattus fuscipes</i>	Bush Rat
Mammals (excluding bats)	<i>Rattus lutreolus</i>	Swamp Rat
Mammals (excluding bats)	<i>Rattus rattus</i>	Black Rat
Mammals (excluding bats)	<i>Rattus</i> sp.	Rat sp.
Mammals (excluding bats)	<i>Rusa timorensis</i> *	Rusa deer
Mammals (excluding bats)	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
Mammals (excluding bats)	<i>Trichosurus vulpecula</i>	Common Brushtail Possum
Mammals (excluding bats)	<i>Wallabia bicolor</i>	Swamp Wallaby
Mammals - bats	<i>Austronomus australis</i>	White-striped Free-tailed Bat
Mammals - bats	<i>Chalinolobus gouldii</i> <sup>1</sup>	Gould's Wattled Bat

Fauna group	Scientific name	Common name
Mammals - bats	<i>Chalinolobus morio</i> <sup>3</sup>	Chocolate Wattled Bat
Mammals - bats	<i>Miniopterus australis</i> <sup>^1</sup>	Little Bentwing Bat
Mammals - bats	<i>Miniopterus schreibersii oceanensis</i> <sup>^3</sup>	Eastern Bentwing Bat
Mammals - bats	<i>Mormopterus norfolkensis</i> <sup>^3</sup>	East-coast Free-tail Bat
Mammals - bats	<i>Mormopterus (Ozimops) ridei (species 2)</i> <sup>1</sup>	Eastern Freetail Bat
Mammals - bats	<i>Myotis macropus</i> <sup>^1</sup>	Southern Myotis
Mammals - bats	<i>Pteropus poliocephalus</i> <sup>^</sup>	Grey-headed Flying Fox
Mammals - bats	<i>Tadarida australis</i> <sup>1</sup>	White-striped Freetail Bat
Mammals - bats	<i>Vespadelus pumilus</i> <sup>1</sup>	Eastern Forest Bat
Mammals - bats	<i>Vespadelus vulturnus</i> <sup>3</sup>	Little Forest Bat

<sup>^</sup> Denotes threatened/migratory species, \* Denotes introduced species. <sup>1</sup>Definite record, <sup>2</sup>Probable record, <sup>3</sup>Possible record.



## Appendix H: Anabat results

### Anabat Results – Port Macquarie Airport Biocertification, 13-15 October 2014.

Total of four Anabat nights

Bat calls were analysed using the program AnalookW (Version 3.8 25 October 2012, written by Chris Corben, [www.hoarybat.com](http://www.hoarybat.com)). Call identifications were made by Alicia Scanlon who has over six years of experience in the identification of ultrasonic call recordings. Regional based guides to the echolocation calls of microbats in New South Wales (Pennay et al. 2004) and south-east Queensland and north-east New South Wales (Reinhold et al. 2001) and the accompanying reference library of over 200 calls from north-eastern NSW were used for guidance and reference calls (Available: <http://www.forest.nsw.gov.au/research/bats/default.asp>).

Bat calls are analysed using species-specific parameters of the call profile such as call shape, characteristic frequency, initial slope and time between calls (Rinehold et al. 2001). To ensure reliable and accurate results, the following protocols (adapted from Lloyd et al. 2006) were followed:

- Search phase calls were used in the analysis, rather than cruise phase calls or feeding buzzes (McKenzie et al. 2002)
- Recordings containing less than three pulses were not analysed and these sequences were labeled as short (Law et al. 1999)
- Four categories of confidence in species identification were used (Mills et al. 1996), including:
  - definite – identity not in doubt
  - probable – low probability of confusion with species of similar calls
  - possible – medium to high probability of confusion with species with similar calls
  - unidentifiable – calls made by bats which cannot be identified to even a species group.
- *Nyctophilus* spp. are difficult to identify confidently from their calls and no attempt was made to identify this genus to species level (Pennay et al. 2004)
- Sequences not attributed to microbat echolocation calls do not represent microbat activity at the site and were not included in the analysis.
- Sequences labelled as short or low were of poor quality and therefore not able to be identified to any microbat species, they can however be used as an indicator of microbat activity at the site.

A total of 159 call sequences were recorded from three sites during AnaBat surveys conducted within the Port Macquarie Airport Biocertification footprint during October 2014. Two static AnaBat sites recorded microbat activity along creeks running from the far northern end of the study area to the Hastings River. The third site was a 2 h spotlight transect through Paperbark/Bloodwood forest adjacent to the north western runway. Approximately 67% of call sequences were able to be identified to species, with the remainder being too short or of low quality, preventing positive identification of species.

A minimum of ten microbat species were identified across all sites, including potentially four species listed as Vulnerable under the NSW TSC Act (**Tables 1- 3, Figures 1-10**). The vulnerable species were ***Miniopterus australis*** (**Little Bentwing Bat**), ***Myotis macropus*** (**Large-footed Myotis**) and potentially ***Miniopterus schreibersii oceanensis*** (**Eastern Bentwing Bat**) and ***Mormopterus (Micronomus) norfolkensis*** (**East-coast Freetail Bat**).

The most common species across all sites were the **Little Bentwing Bat**, Goulds Wattled Bat (*Chalinolobus gouldii*), **Large-footed Myotis** and Little Forest Bat (*Vespadelus vulturnus*). The **Little Bentwing Bat** and Little Forest Bat were recorded at all three sites and **Large-footed Myotis** recorded along both creek lines. The site along the creek on Tuffins Lane recorded the highest species diversity, with all ten microbat species recorded, six of those not recorded at any other site. The site along the creek behind the stadium on Boundary Street recorded moderate levels of microbat activity, with calls recorded more often than every 10 minutes, but less often than every two minutes throughout the evening. Tuffins Lane and the spotlight transect through Paperbark/Bloodwood recorded low levels of microbat activity, with calls recorded less often than every ten minutes throughout the evening.

Feeding buzzes were occasionally recorded at all sites indicating that bats were actively foraging.

Calls of the **Eastern Bentwing Bat** overlap in frequency with those of *Vespadelus darlingtoni* (Large Forest Bat) and *V. regulus* (Southern Forest Bat). Calls can only be identified as **Eastern Bentwing Bat** when there is a down-sweeping tail, drop of more than 2 kHz in the pre-characteristic section, and the pulse shape and time between calls is variable.

The calls of **Large-footed Myotis** are very similar to all *Nyctophilus* species, and it is often difficult to separate these species. Calls were identified as *Nyctophilus* spp. when the time between calls (TBC) was higher than 95 ms and the initial slope (OPS) was lower than 300. Calls were identified as **Large-footed Myotis** when the TBC was lower than 75 ms and the OPS was greater than 400.

**Table 1: Anabat results from creek off Boundary St, Port Macquarie, 14 October 2014.**

SCIENTIFIC NAME	COMMON NAME	NUMBER OF CALLS	DEFINITE	PROBABLE	POSSIBLE
<i>Miniopterus australis</i> *	Little Bentwing Bat	30			
<i>Myotis macropus</i> *	Large-footed Myotis	8		6	2
<i>Myotis macropus</i> * / <i>Nyctophilus</i> spp.	Large-footed Myotis / a long-eared bat	1			
<i>Vespadelus pumilus</i>	Eastern Forest Bat	2	1		1
<i>Vespadelus pumilus</i> / <i>Vespadelus vulturnus</i>	Eastern Forest Bat / Little Forest Bat	1			
<i>Vespadelus vulturnus</i>	Little Forest Bat	17	15		2
Low		12			
Short		9			
Total sequences		80			

Table 2: Anabat results from creek on Tuffins Lane, Port Macquarie, 13-14 October 2014.

SCIENTIFIC NAME	COMMON NAME	NUMBER OF CALLS	DEFINITE	PROBABLE	POSSIBLE
<i>Chalinolobus gouldii</i>	Goulds Wattled Bat	17	17		
<i>Chalinolobus gouldii</i> / <i>Mormopterus (Ozimops) ridei</i> (species 2)	Goulds Wattled Bat / Eastern Freetail Bat	2			
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	2			2
<b><i>Miniopterus australis</i>*</b>	<b>Little Bentwing Bat</b>	3	2	1	
<b><i>Miniopterus schreibersii oceanensis</i>*</b>	<b>Eastern Bentwing Bat</b>	1			1
<b><i>Miniopterus schreibersii oceanensis</i>*</b> / <i>Vespadelus darlingtoni</i>	<b>Eastern Bentwing Bat / Large Forest Bat</b>	1			
<b><i>Mormopterus norfolkensis</i>*</b>	<b>East-coast Freetail Bat</b>	3			3
<i>Mormopterus (Ozimops) ridei</i> (species 2)	Eastern Freetail Bat	2	2		
<b><i>Myotis macropus</i>*</b>	<b>Large-footed Myotis</b>	8	3	5	
<b><i>Myotis macropus</i>*</b> / <i>Nyctophilus spp.</i>	<b>Large-footed Myotis / a long-eared bat</b>	1			
<i>Vespadelus pumilus</i>	Eastern Forest Bat	3	3		
<i>Vespadelus vulturnus</i>	Little Forest Bat	1			1
<i>Tadarida australis</i>	White-striped Freetail Bat	1	1		
Low		9			
Short		22			
Total sequences		76			

\*Threatened species

Table 3: Anabat results from spotlight transect, Port Macquarie Airport Lands, north-western section, 13 October 2014.

SCIENTIFIC NAME	COMMON NAME	NUMBER OF CALLS	DEFINITE	PROBABLE	POSSIBLE
<b><i>Miniopterus australis</i>*</b>	<b>Little Bentwing Bat</b>	1			1
<i>Vespadelus vulturnus</i>	Little Forest Bat	2			2
Total sequences		3			

\*Threatened species

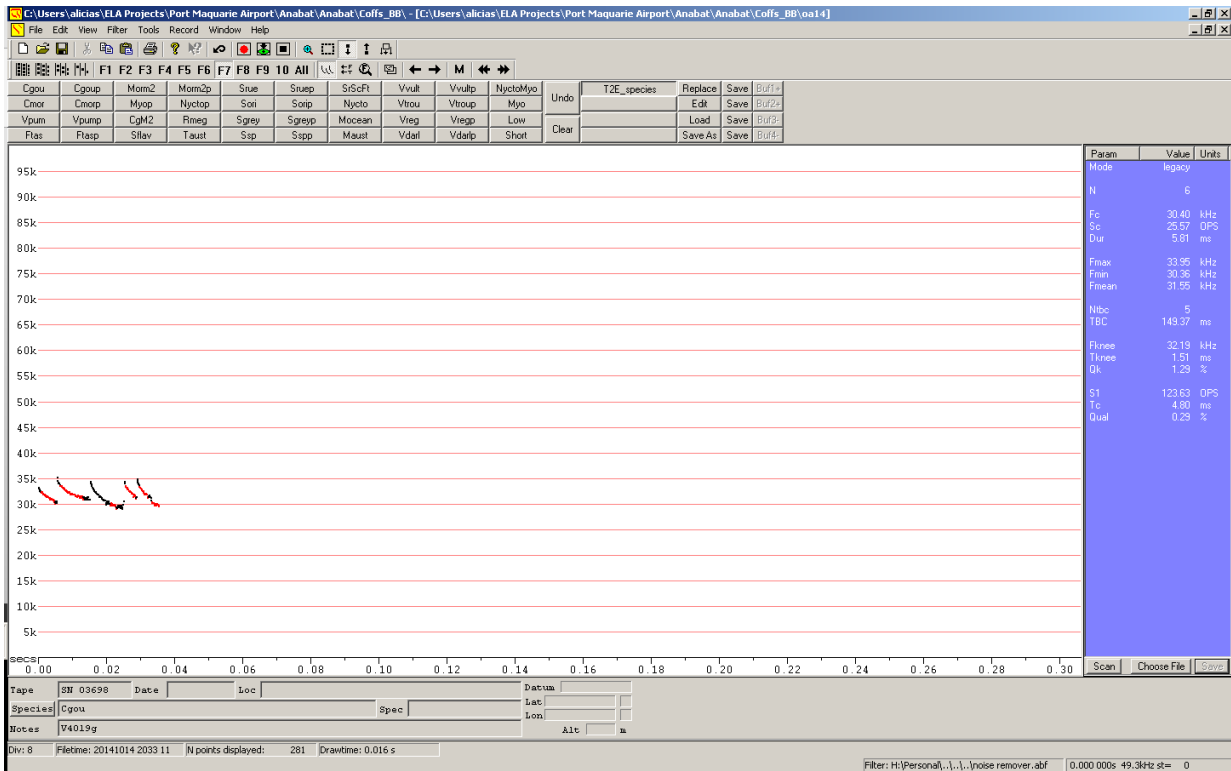


Figure 1: Call profile for *Chalinolobus gouldii* recorded along the creek on Tuffins Lane, Port Macquarie at 20:33 on 14 October 2014.

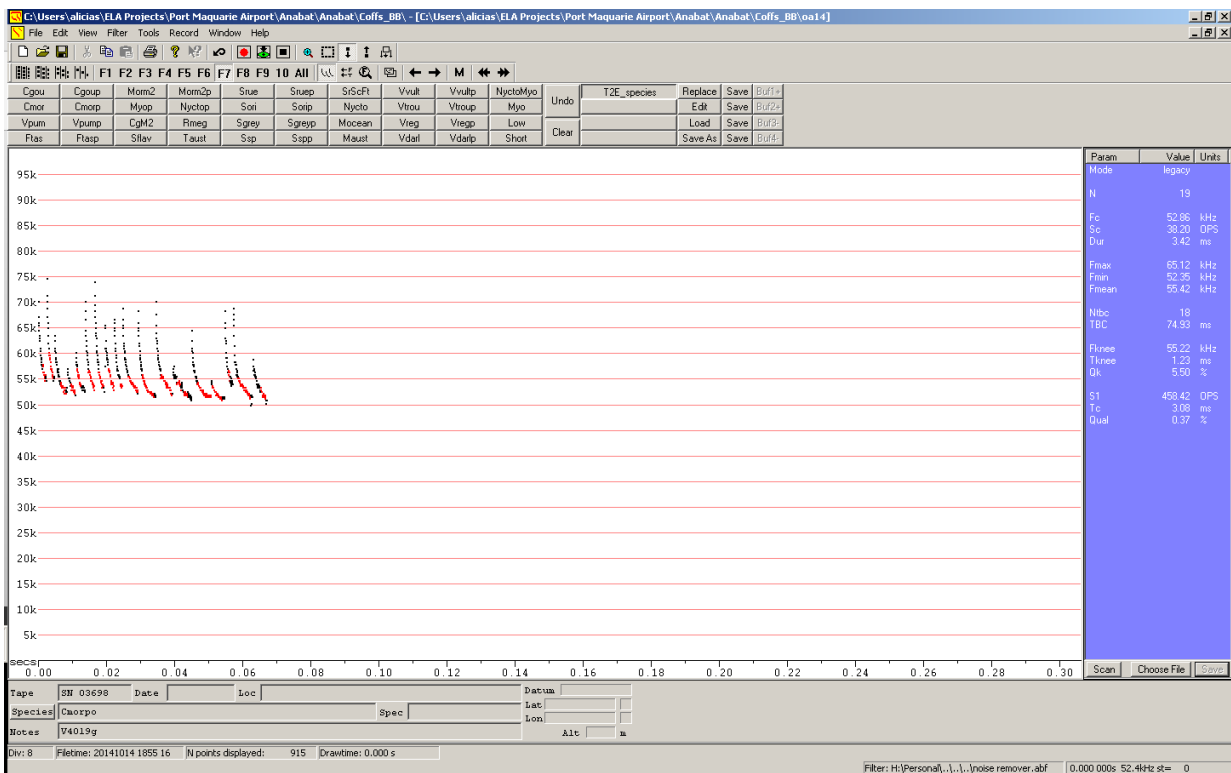


Figure 2: Call profile for *Chalinolobus morio* recorded along the creek on Tuffins Lane, Port Macquarie at 18:55 on 14 October 2014.

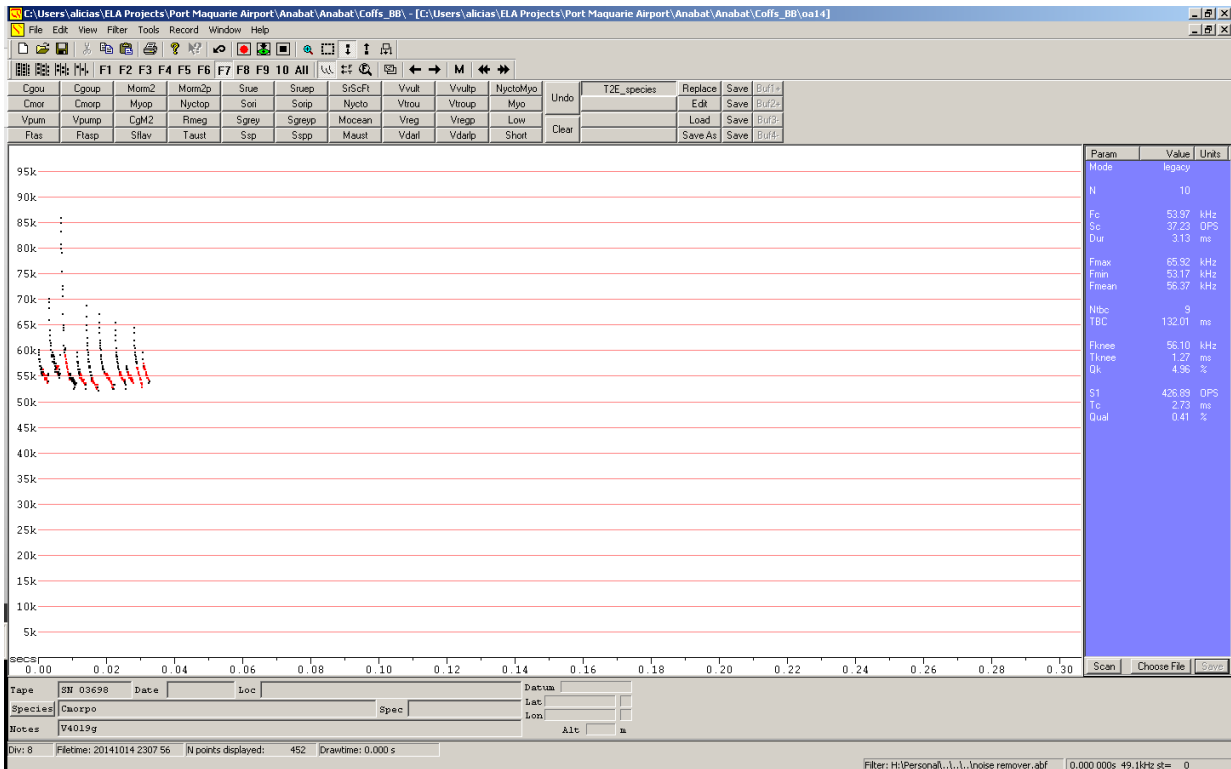


Figure 3: Call profile for *Miniotermis australis* recorded along the creek on Tuffins Lane, Port Macquarie at 23:07 on 14 October 2014.

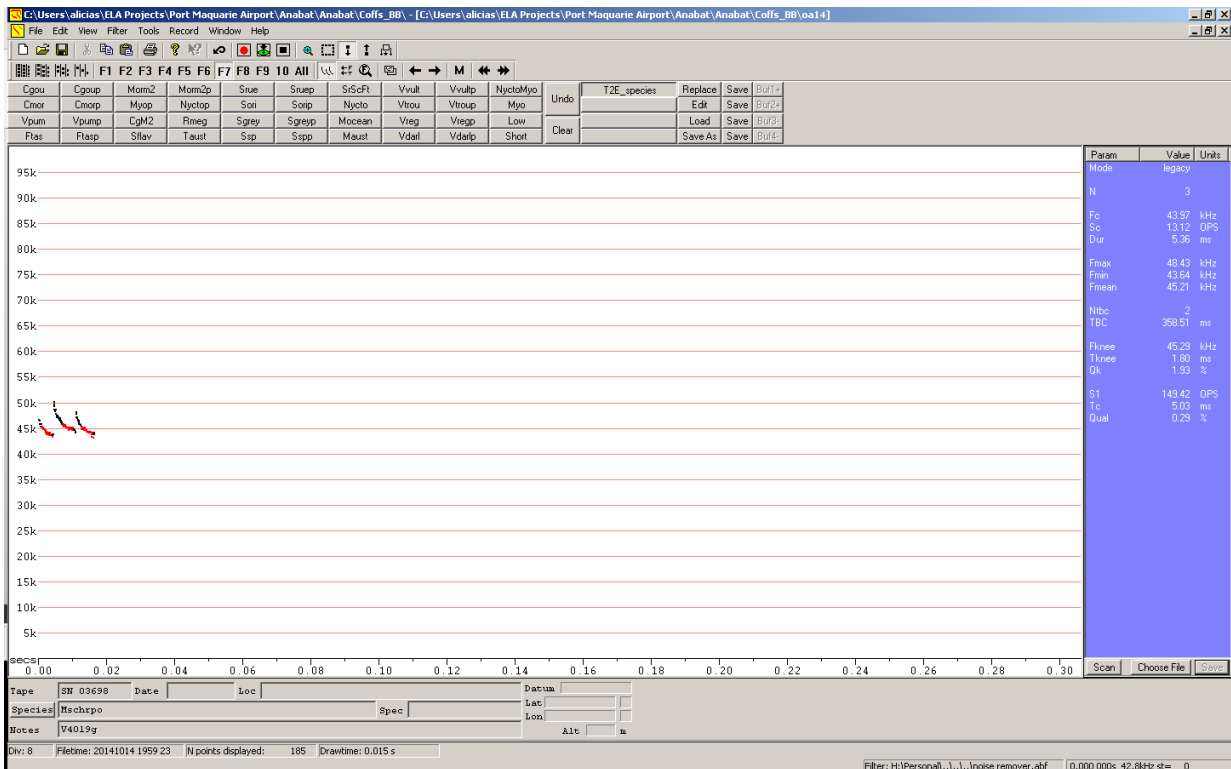


Figure 4: Possible call profile for *Miniotermis schreibersii oceanensis* recorded along the creek on Tuffins Lane, Port Macquarie at 19:59 on 14 October 2014.

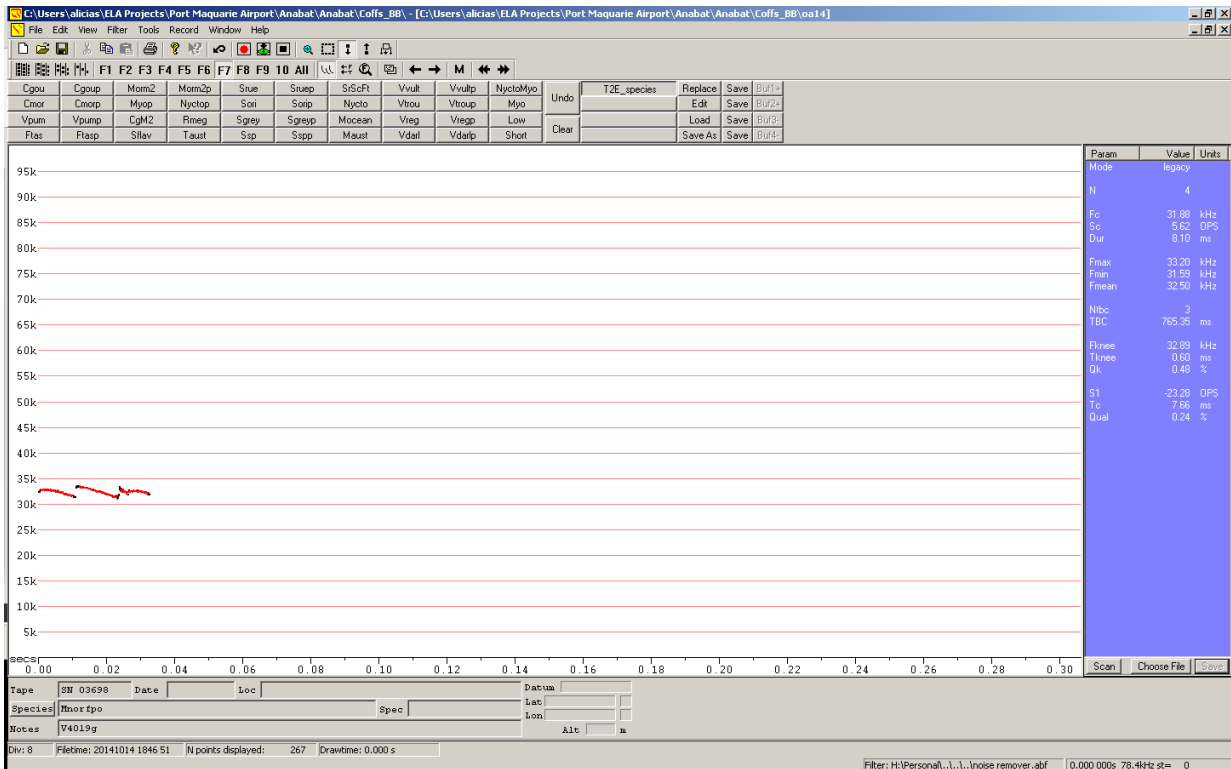


Figure 5: Possible call profile for *Mormopterus (Micronomus) norfolkensis* recorded along the creek on Tuffins Lane, Port Macquarie at 18:46 on 14 October 2014.

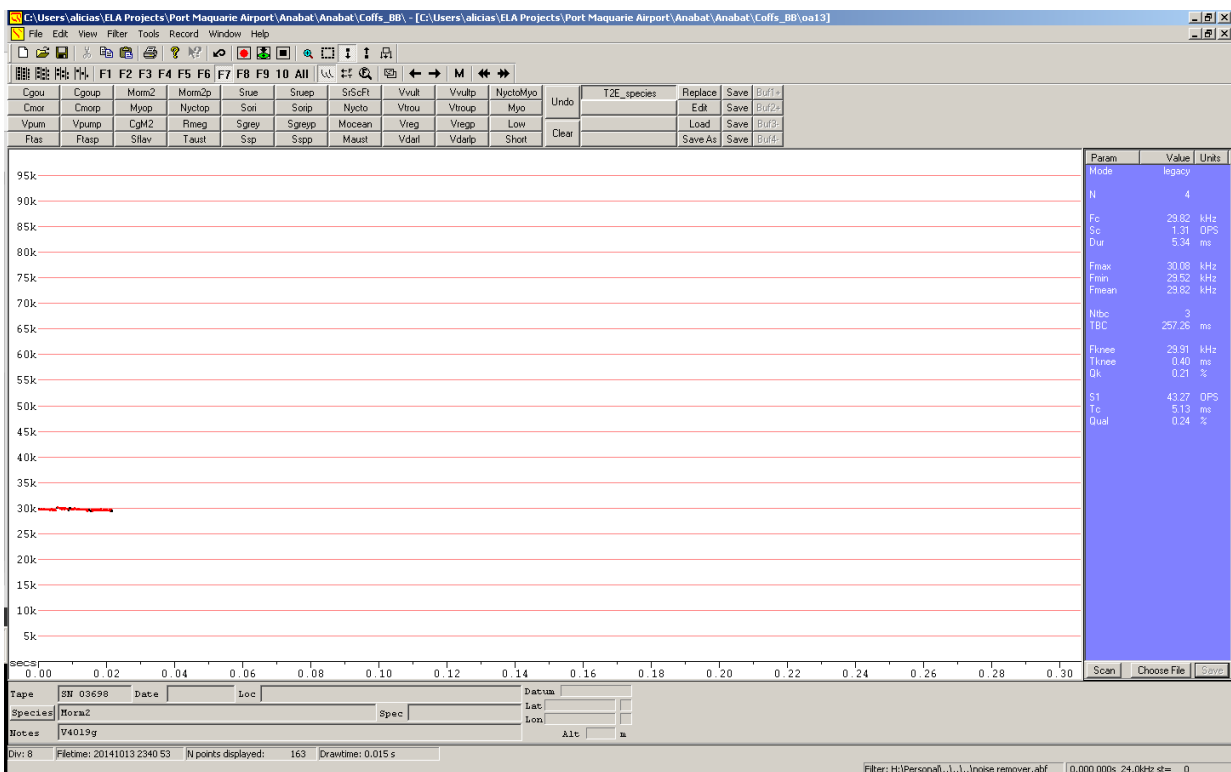


Figure 6: Call profile for *Mormopterus (Ozimpos) ridei (species 2)* recorded along the creek on Tuffins Lane, Port Macquarie at 03:14 on 31 August 2014.

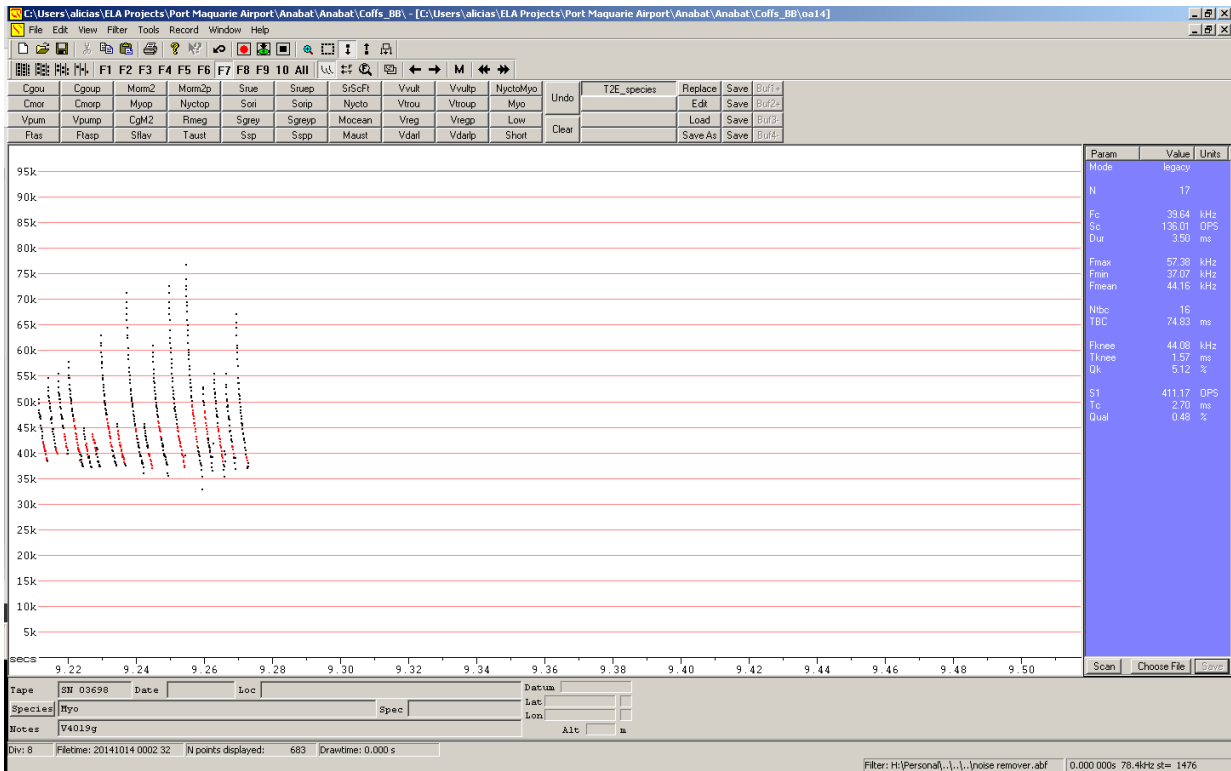


Figure 7: Call profile for *Myotis macropus* recorded at the creek on Tuffins Lane, Port Macquarie at 00:02 on 13 October 2014.

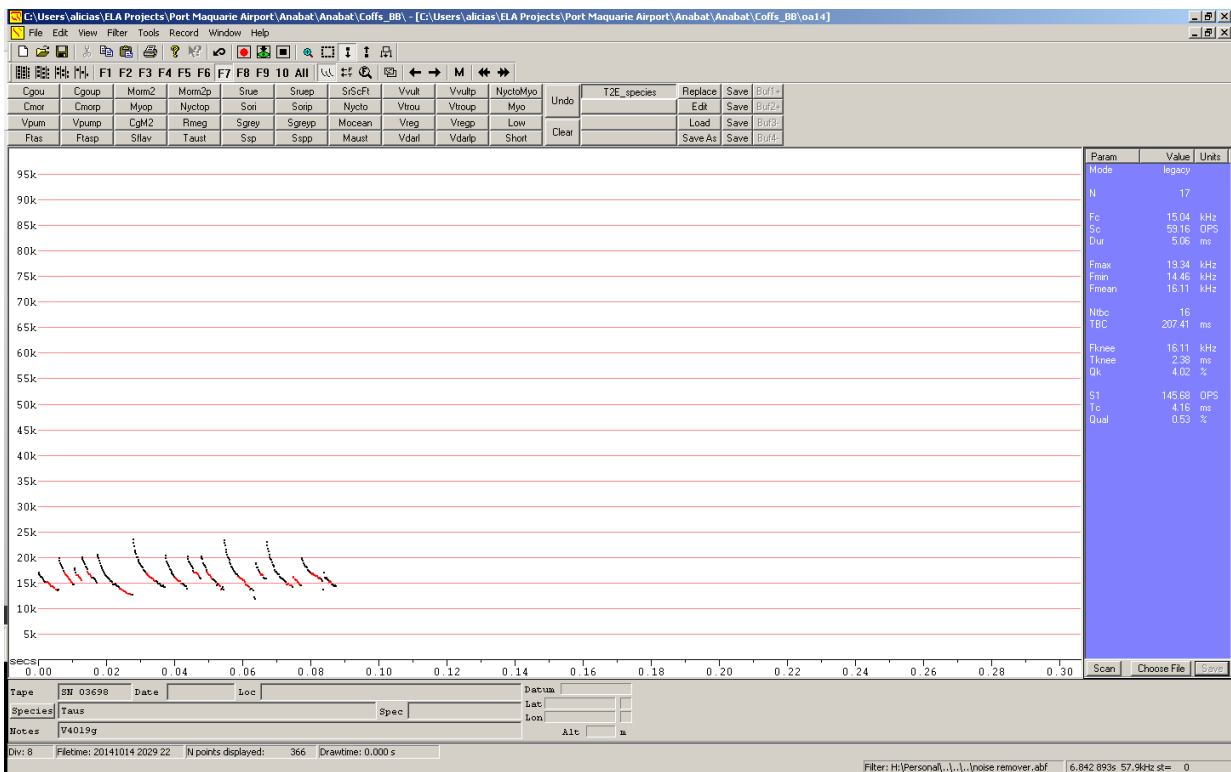


Figure 8: Call profile for *Tadarida australis* recorded at the creek on Tuffins Lane, Port Macquarie at 20:29 on 14 October 2014.

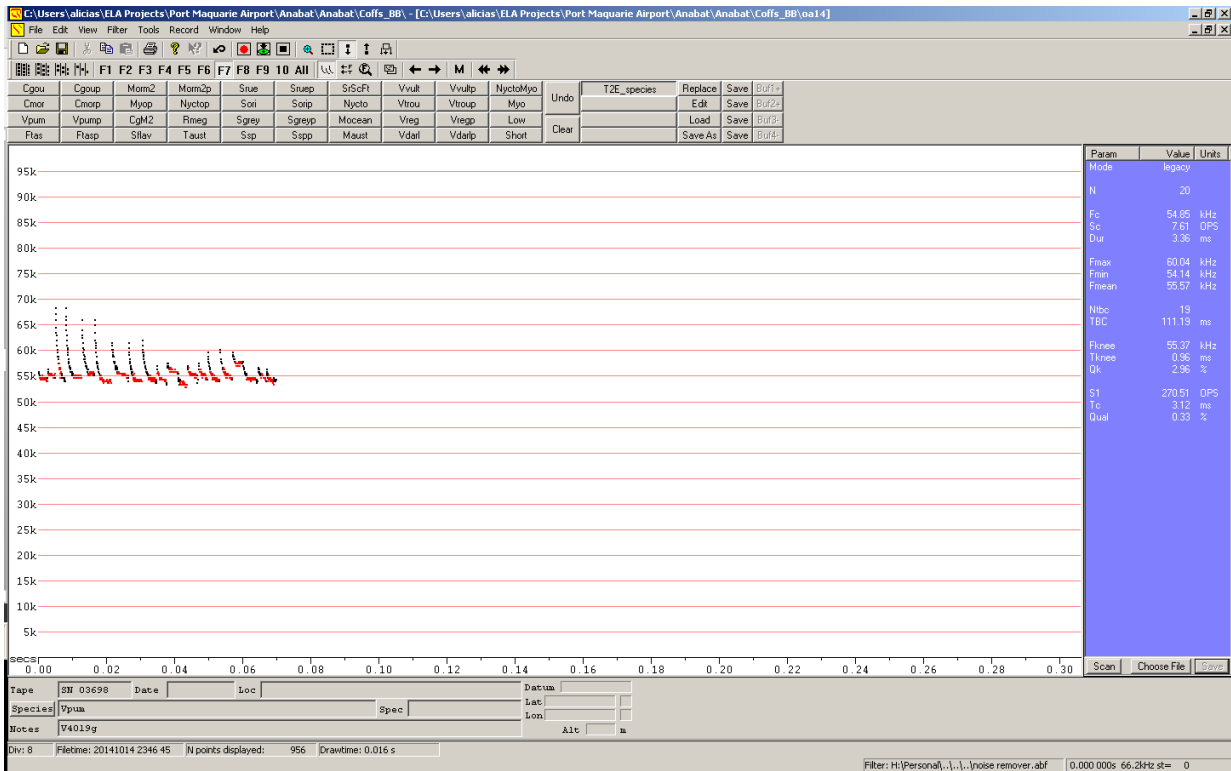


Figure 9: Call profile for *Vespadelus pumulus* recorded at the creek on Tuffins Lane, Port Macquarie at 23:46 on 14 October 2014.

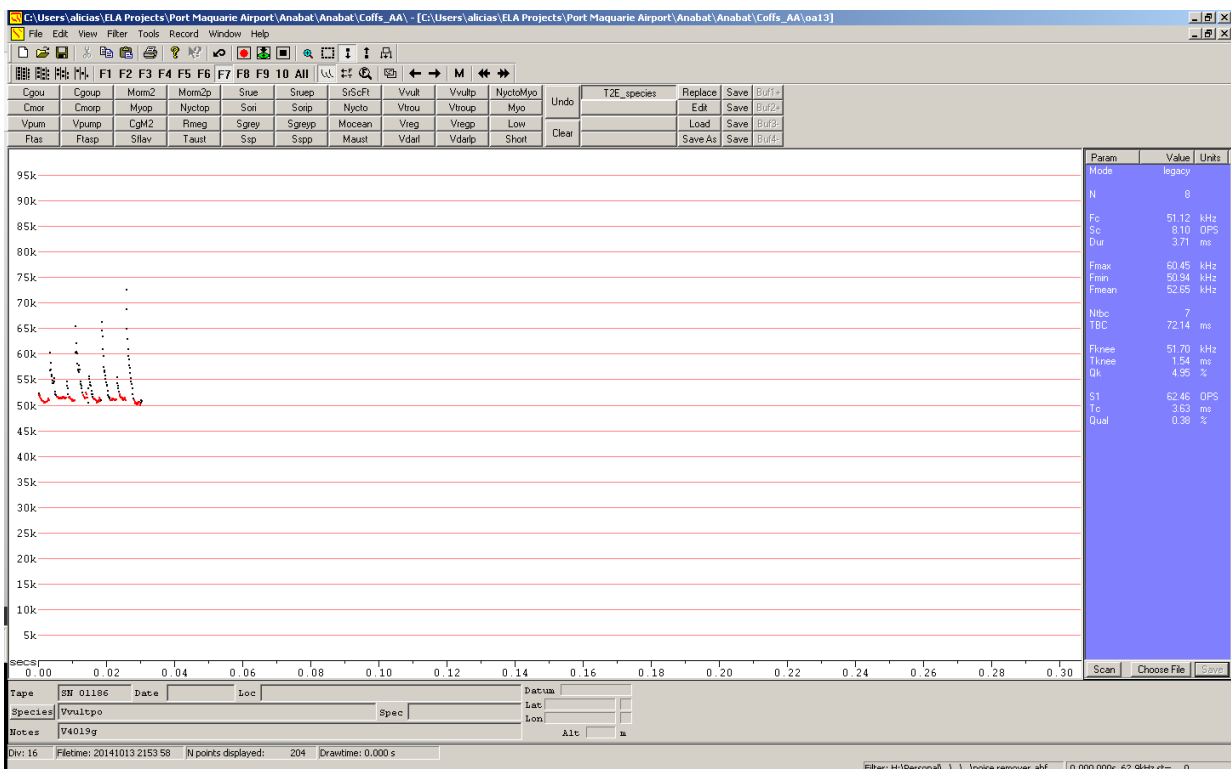


Figure 10: Call profile for *Vespadelus vulturnus* recorded in Bloodwood forest adjacent to the north western end of the runway, Port Macquarie Airport at 21:53 on 13 October 2014.



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## Appendix I: Transect/plot data

### Vegetation Zone 1: Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast - Moderate to Good (Good)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
1-1	28	20.5	8.5	0	8	40	0	0	1	6	486049	6522440	56
1-2	26	14.4	7	4	4	32	0	0	1	12	486643	6522888	56
1-3	26	28.5	2.8	10	4	60	0	1	1	9	486059	6521685	56

### Vegetation Zone 2: Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast - Moderate to Good (Regrowth)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
2-1	33	4.5	24	6	0	4	0	0	1	0	486777	6521431	56

### Vegetation Zone 3: Blackbutt - bloodwood dry heathy open forest on Quaternary sands of the northern North Coast - Low (Cleared)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
3-1	29	0	0	12	8	6	14	0	1	0	486754	6521393	56

### Vegetation Zone 4: Blackbutt - Tallowood dry grassy open forest of the central parts North Coast – Moderate to Good (Good)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
4-1	40	36.5	1.9	32	6	10	0	0	1	35	485278	6521586	56
4-2	37	30.5	15.5	36	2	6	0	0	1	32	485905	6521871	56
4-3	43	18.5	8.9	34	2	14	1.9	0	1	18	485019	6522078	56
4-4	29	22	14.7	20	0	10	0	0	1	44	485420	6520582	56

**Vegetation Zone 5: Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast – Moderate to Good (Cropped)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
5-1	35	16.5	1.9	10	0	14	0	0	1	135	485107	6519265	56
5-2	40	2.3	2.3	32	8	10	0	0	1	210	485769	6520337	56

**Vegetation Zone 6: Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast – Low (Mowed understorey)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
6-1	13	13.5	0.4	8	2	0	44	1	0	0	487332	6523311	56

**Vegetation Zone 7: Blackbutt - Tallowwood dry grassy open forest of the central parts North Coast – Low (Cleared, to regenerate)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
7-1	8	0	0	10	2	2	90	0	0	0	485107	6522145	56
7-2	30	0	0.6	14	0	22	54	0	0	0	485709	6520893	56
7-3	23	0	3.2	54	8	16	18	0	0	0	485312	6520283	56

**Vegetation Zone 8: Grey Ironbark - Grey Gum open forest of the northern escarpment ranges of the North Coast – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
8-1	32	35	13.2	6	8	20	1.5	0	1	90	484770	6519335	56

**Vegetation Zone 9: Paperbark swamp forest of the coastal lowlands of the North Coast – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
9-1	7	20	4.5	0	0	30	0	0	1	15	485866	6520909	56
9-2	16	15.5	7.7	0	4	42	4	0	1	0	486366	6520580	56

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
9-3	23	13	9.7	14	0	26	0	0	1	35	485614	6520017	56
9-4	10	2.5	4.9	0	0	84	0	0	1	0	487954	6521769	56
9-5	19	14.7	10.2	2	0	26	0	0	1	0	485178	6521824	56

**Vegetation Zone 10: Paperbark swamp forest of the coastal lowlands of the North Coast – Moderate to Good (Cropped)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
10-1	9	3.5	0	2	0	88	0	0	1	20	486237	6521134	56

**Vegetation Zone 11: Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
11-1	23	13.5	22.5	0	0	72	0	0	1	33	488487	6522189	56
11-2	34	41	7.7	26	10	64	0	0	1	92	486414	6521702	56
11-3	25	14	17	0	20	22	0	1	1	21	486594	6522529	56
11-4	26	11.5	11.5	0	38	20	0	1	1	36	486592	6521261	56

**Vegetation Zone 12: Scribbly Gum - Red Bloodwood heathy open forest of the coastal lowlands of the North Coast – Low (Mowed understorey)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
12-1	29	13.5	0	6	0	2	10	0	0	0	487625	6522610	56

**Vegetation Zone 13: Swamp Mahogany swamp forest of the coastal lowlands of the North Coast – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
13-1	21	26.5	1.2	66	8	76	15	0	1	21	488383	6522331	56
13-2	29	8.5	26.5	0	0	60	0	0	1	14	485227	6520189	56

**Vegetation Zone 14: Swamp Mahogany swamp forest of the coastal lowlands of the North Coast – Low (Regeneration)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
14-1	22	0	2.3	6	8	16	28	0	1	0	488206	6522170	56

**Vegetation Zone 15: Swamp Oak swamp forest of the coastal lowlands of the North Coast – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
15-1	10	23	0	0	0	56	32	0	1	0	485465	6522118	56
15-2	11	31	7.6	6	0	32	0	0	1	0	486160	6523020	56

**Vegetation Zone 16: Swamp Oak swamp forest of the coastal lowlands of the North Coast – Moderate to Good (Weedy understorey)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
16-1	26	22	13.8	24	2	20	13.8	0	1	5	486371	6522904	56

**Vegetation Zone 17: Swamp Oak swamp forest of the coastal lowlands of the North Coast – Low (Cropped with weedy understorey)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
17-1	7	4.6	0	16	0	10	80	0	1	0	487405	6523404	56

**Vegetation Zone 18: Swamp Oak swamp forest of the coastal lowlands of the North Coast – Low (Cleared, to regenerate)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
18-1	18	0	3.1	12	0	12	76	0	0	0	486068	6522803	56

**Vegetation Zone 19: Wallum sedgeland and rushland of near coastal lowlands of the North Coast – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
19-1	8	0	0.6	0	0	60	0	0	1	0	487421	6521639	56
19-2	8	1.5	8.8	2	2	86	0	0	1	0	486073	6520419	56

**Vegetation Zone 20: Wet heathland and shrubland of coastal lowlands of the North Coast – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
20-1	21	0	13.2	0	24	90	0	0	1	0	488195	6522421	56
20-2	19	0	6.5	0	52	78	0	0	1	0	487036	6521914	56
20-3	16	0	7.8	0	18	80	0	0	1	0	486561	6521996	56
20-4	20	0	0.9	0	8	80	0	0	1	15	487747	6521944	56

**Vegetation Zone 21: Wet heathland and shrubland of coastal lowlands of the North Coast – Low (Mowed)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
21-1	24	0	0	4	16	18	0	0	0	0	486632	6522742	56

**Vegetation Zone 22: Coastal freshwater meadows and forblands of lagoons and wetlands – Moderate to Good (Good)**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
19-3	5	0	0	0	0	46	0	0	1	0	485695	6523442	56
19-4	7	0	0	2	0	70	0	0	1	0	485827	6522522	56
19-5	10	0	0.9	0	0	56	0	0	1	0	485509	6521607	56

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