

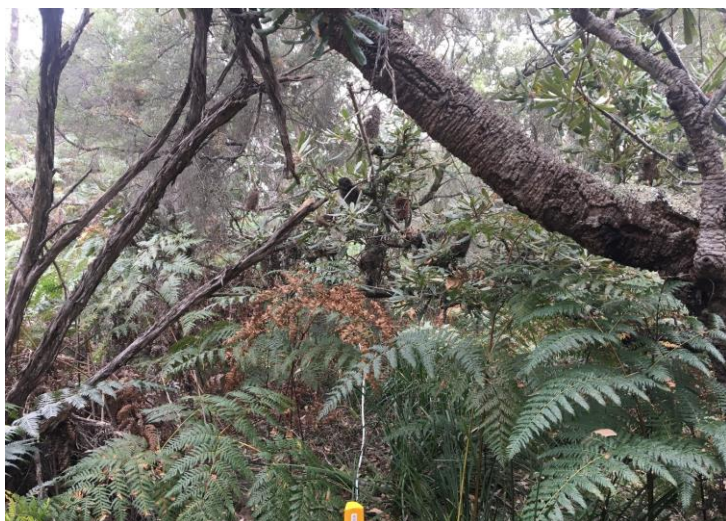


Biobanking Agreement Credit Assessment Report

North Tuncurry Biobank Site

Prepared for
Landcom (on behalf of Department of Primary Industries Crown Lands and Water Branch)

27 July 2020



DOCUMENT TRACKING

Item	Detail
Project Name	Biobanking Agreement Credit Assessment Report: North Tuncurry Biobank Site
Project Number	20SUT-15408
Project Manager	Robert Humphries 02 8536 8620 Level 3, Suite 2 668 Princes Highway Sutherland NSW 2232
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Approved by	Robert Humphries
Status	Final
Version Number	1
Last saved on	27 July 2020
Cover photo	Clockwise from top left: Biometric plot TC-22 start (<i>Coast Banksia-Coast Wattle dune scrub</i>); <i>Corunastylis littoralis</i> (syn <i>Genoplesium littorale</i> ; Tuncurry Midge Orchid); Biometric plot TC-05 start (<i>Smooth-barked Apple - Blackbutt - Old Man Banksia woodland</i>)

This report should be cited as 'Eco Logical Australia 2020. *Biobanking Agreement Credit Assessment Report: North Tuncurry Biobank Site*. Prepared for Landcom

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Michael Pring of Landcom

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Abbreviations

Abbreviation	Description
BACAR	Biobank Agreement Credit Assessment Report
BCAA	Biodiversity Certification Assessment Area
BCC	Biobanking Credit Calculator
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BBAM 2014	BioBanking Assessment Methodology 2014
BCAA	Biocertification Assessment Area
BVT	BioMetric Vegetation Type
CMA	Catchment Management Area
CLWB	Crown Lands and Water Branch of the Department of Primary Industries
DPE	Former NSW Department of Planning and Environment (now part of DPIE)
ELA	Eco Logical Australia Pty Ltd
EEC	Endangered Ecological Community
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
NPWS	National Parks and Wildlife Service
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Types
PFC	Projected Foliage Cover
TMO	Tuncurry Midge Orchid (<i>Genoplesium littorale</i>)
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

Executive summary

Eco Logical Australia Pty Ltd (ELA) has been engaged by Landcom, on behalf of the Crown Lands and Water Branch of the Department of Primary Industries (CLWB) to prepare a Biobank Agreement Credit Assessment Report and Management Plan for the establishment of a Biobank site within Lot 331 DP 1104340. The biobank site is located in Tuncurry on the NSW mid north coast within the former Great Lakes Local Government Area (LGA), now MidCoast LGA.

The registration of a biobank site comprising 312.70 ha of vegetation and threatened species habitat is a '100% conservation measure' commitment in the Biocertification Application for the North Tuncurry State Significant Site which was submitted to the Minister by the then Department of Planning and Environment (DPE) in July 2019 (ELA 2019). The biocertification application was accepted as duly made for the purposes of clause 37 of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* and will be assessed in accordance with the provisions of the now repealed *Threatened Species Conservation Act 1995*. The same regulation provides that an application to register a Biobank Agreement, consistent with a commitment in a biocertification application may be made so long as the application is submitted by 24 August 2020 and determined by the Minister by 24 August 2021. Further, the Minister may only enter into a biobanking agreement after the said application for biocertification has been conferred.

This document is the **Biobank Agreement Credit Assessment Report** (BACAR) for the North Tuncurry Biobank Site and has been prepared to meet the requirements of the BioBanking Assessment Methodology 2014 (BBAM 2014) (NSW Office of Environment and Heritage [OEH] 2014) and is consistent with the commitments outlined in the Biodiversity Certification Assessment (ELA 2019). This BACAR has been prepared and assessment by an accredited BioBanking assessor being Lily Gorrell (assessor number: 145). Version 4.0 of the calculator was used in the assessment.

It contains a detailed description of the Biobanking Assessment process, including a justification of the landscape score, and mapping of plant community types, vegetation zones, and management zones. The credits generated by the proposal, and their credit profiles, are also outlined.

Due to the relationship with the already prepared Biodiversity Certification Assessment, ELA have retained Plant Community Types (PCTs)/Biometric Vegetation Types (BVTs), Vegetation Zones, Threatened Species Habitat polygons and Strategic Locations (State/Regional linkages) consistent with the Biodiversity Certification Assessment where possible. Generally, changes were only made where differences between the BCAM and BBAM tool (e.g. BVTs), were required or the condition of the vegetation had significantly changed since the ELA vegetation stratification in 2015 (e.g. some vegetation zones delineated in 2015 as burnt/unburnt now merged as the effects of the 2007, 2013 & 2017 fires on structure and/or floristics were no longer noticeable). Thus, this assessment included merging of some vegetation zones and slight differences in areas due to refining the vegetation boundaries with more recent aerial photographs and data provided from on-ground validation of vegetation condition in 2020. Additional changes also included the removal of powerline maintenance corridors from the conservation area (as requested by the then Office of Environment and Heritage (OEH), now part of the Department of Planning, Industry and Environment (DPIE) and including provisions for beach access to the 'certified land' layer.

The total area of the resulting Biobank site is 317.63 ha of which 314.12 ha comprises mapped native vegetation and will generate both ecosystem and species credits. An additional 3.45 ha of existing management trails will be retained within the Biobank area and 0.05 ha cleared land around these tracks that will not generate credits. The Biobank site boundary does not include the existing powerline maintenance corridors (which are not registered as easements), which have been excluded from the area

to be registered as a Biobank site. The proposed Biobank site is shown in **Figure 1** and **Figure 2** which shows the excluded powerline maintenance corridor.

The proposed North Tuncurry Biobank Site is located entirely on Crown land and has been the subject of biodiversity investigations since 2005 as part of the State Significant Site study (ERM 2005 & 2010; RPS 2012) and Biodiversity Certification Assessment seeking '*biocertification of land*' for a proposed rezoning and mixed use development of part of the North Tuncurry site (**Figure 2**).

The Biobank Site comprises three vegetation types, none of which are listed as endangered ecological communities under the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

As discussed above, changes were necessary to two of the PCTs/BVTs assessed in the biocertification assessment as they were no longer available within the BBAM Calculator tool, and therefore, an updated vegetation community was chosen based on best fit (dominant species, landscape position, vegetation formation and class and benchmark values etc). These are outlined below and all further reference to PCTs throughout the report refer to the updated PCTs chosen.

The plant community types are mapped as:

- 1702 (HU916) Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast (Originally 'HU503 Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion')
- 1646 (HU 860): Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Originally 'HU530 Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion'); and
- 772 (HU530): Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion

The vegetation on site generates 3,011 ecosystem credits and 15,140 species credits for four species. All credits generated will be registered as 'committed' and retired in accordance with the credit calculations in the Biocertification Assessment. **Table 1** provides a summary of ecosystem credits generated, with details provided in **Section 3**.

Table 1: Summary of ecosystem credits generated

Plant community type	Condition and ancillary code	Area (ha)	Credits generated	Credits/ha
1702 (HU916) Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	Moderate-Good High	83.26	858	10.3
	Moderate-Good Moderate (Pine)	2.72	21	7.7
1646 (HU860): Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Moderate-Good High	64.66	691	10.7
	Moderate-Good Moderate (Pine)	4.34	41	9.4
772 (HU530): Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Moderate-Good High	127.57	1,102	8.6
	Moderate-Good Moderate (Dune)	31.57	298	9.4

Plant community type	Condition and ancillary code	Area (ha)	Credits generated	Credits/ha
Total		314.10	3,011	-

Table 2 provides a summary of species credits generated in the Biobank site.

A count of 1,511 individuals of the Tuncurry Midge Orchid (TMO) (*Genoplesium littorale*) listed as critically endangered under both the TSC Act and EPBC Act have been recorded during surveys within the proposed Biobank Site, generating 10,728 species credits (A further 181 TMO plants have been recorded in the powerline maintenance corridor and 678 in the Foster Local Aboriginal Land Council land. The Brush-tailed Phascogale (*Phascogale tapoatafa*) and Eastern Pygmy Possum (*Cercartetus nanus*), both vulnerable species under the TSC Act have also been recorded within the Biobank site (RPS 2012), with 278.6 ha of habitat present within the site generating 1,978 species credits respectively. Additionally, the Koala (*Phascolarctos cinereus*), listed as vulnerable under both the TSC Act and EPBC Act was 'assumed' to be present on site as part of the biocertification assessment on the basis of recent records (2013) north of the Biobank site and potential habitat within the biocertification assessment area (BCAA). Koala was not recorded during extensive surveys of the wider BCAA or Biobank site, however, it is assumed that Zone 5, comprising good condition *Smooth-barked Apple - Blackbutt - Old Man Banksia woodland* is suitable habitat for this species, and is contiguous with suitable habitat offsite, generating 456 species credits.

Table 2: Summary of species credits generated

Species credit species	Area (ha) or count	Credits generated
Brush-tailed Phascogale	278.6 ha	1,978
Eastern Pygmy Possum	278.6 ha	1,978
Koala	64.23 ha	456
Tuncurry Midge Orchid	1,511	10,728

Management of the North Tuncurry Biobank Site will involve the implementation of 'standard' management actions and will include:

- The active management and reduction of weeds;
- The erection and maintenance of new fencing/gates/signage to restrict access to the Biobank site other than on identified management trails for continued 4WD access to Nine Mile Beach;
- The erection and maintenance of bollards to clearly mark the boundaries of the powerline maintenance corridor to avoid any encroachment of maintenance to the biobank site
- Feral animal control;
- The application of fire, where appropriate;
- Active management of human disturbance; and
- The retention of regrowth/native vegetation, dead timber, and rocks.

There are no 'additional' management actions proposed (consistent with the biocertification assessment).

The management required on site, and the associated costs, are provided in the accompanying Management Plan (completed management actions template) and credit pricing spreadsheet, respectively.

1 Site Description

1.1 Location and history of commitments

The North Tuncurry Biobank Site encompasses an area of 317.63 ha on the eastern side of 'The Lakes Way', directly to the north of, and adjoining, the Tuncurry town centre and includes Part Lot 331 DP 1104340. The Biobank site is located within the former Great Lakes Local Government Area (LGA), now MidCoast LGA, approximately 320 km north of Sydney along the NSW coast (**Figure 1**)

The proposed Biobank site is an irregular shaped waterfront parcel of land situated on a peninsula that has been created by the Wallamba River to the west and surrounds the existing 18-hole Forster / Tuncurry Golf Club. The Biobank site is bounded by Nine Mile Beach to the east, educational facilities to the south, vacant land, Darawank Nature Reserve and the Tuncurry Waste Management Centre to the north (**Figure 1**).

A 66 kilovolt (kV) powerline runs along the western edge of the Biobank site (parallel to The Lakes Way). There is no registered easement associated with this powerline, however, the area beneath is maintained by Essential Energy by slashing the regrowth (this maintenance corridor has been excluded from the Biobank area and will be marked by bollards to ensure that current and future maintenance activities do not encroach the biobank site. A number of formal and informal access roads and tracks traverse the site and provide informal pedestrian and four-wheel drive beach access. As part of the Management Plan, these tracks will be rationalised and only designated tracks as shown the 'Property Management Actions' map will provide future access to the beach.

All credits generated will be registered as 'committed' and retired in accordance with the commitments in the biocertification assessment.

There are no covenants or conservation funding arrangements for the North Tuncurry Biobank Site, and the site is to be managed for ecosystem and species credits in its entirety.

1.2 Biophysical characteristics of the site

The site lies entirely within the Karuah-Manning subregion of the Hunter/Central Rivers IBRA region (Thackway and Creswell 1994), and the Manning - Macleay Barriers and Beaches Mitchell Landscape (**Figure 3**).

The landform and geology in the area is described as stable, gently undulating, Holocene quartz sand sheets, beach ridges and low dunes with slopes of 0 - 5%, local relief of 2 - 10 m and an elevation of 3 - 40 m. Low sandy dunes and swales are the dominant landform elements.

Soils are predominately within the Hawks Nest soil landscape. Hawks Nest soils are characterised very deep (150 - 500 cm), well-drained Aeric Podosols (Podzols); deep (100 - <150 cm), rapidly drained Rudosols (Siliceous Sands); and shallow (25 - <50 cm), very poorly drained Hydrosols and Organosols (Acid Peats and Peaty Sands) (OEH, 2018). The acid sulphate soil probability in the area is considered low (OEH, 2016).

The topography of the land is considered typical of a beachridge barrier, comprising an undulating dune field. The landform does not display significant variations in level but instead undulates in a series of crests and troughs formed through the coastal processes that have shaped the land. Topographic maps

for the site do not reveal the presence of any watercourses through the site which is normal given the foundation and porosity of the sand preventing runoff of water in storm events.

No streams are mapped on the North Tuncurry Biobank Site.

1.3 Land use zoning

The North Tuncurry Biobank Site is currently zoned a mix of RU2 (Rural landscape), R2 (Low density residential) and E2 (Environmental Protection) under Great Lakes LEP 2014 and as part of the Planning Proposal accompanying the biocertification application will be zoned E2 (Environmental Protection).

1.4 Site history and current uses of property

The North Tuncurry Biobank Site has been subjected to numerous historical disturbances including forestry activities, mineral extraction and recreational uses.

Parts of the North Tuncurry Biobank Site were previously known as Tuncurry State Forest No. 283 and subject to historic planting of various *Pinus species* since the 1890's with the earliest documented planting in 1911 (Bailey 1931). Bailey (1931) describes the methods of planting as either 'cleared and burnt', 'felled and burnt' or 'brushed, matted and planted' to make way for pine plantations. Remnants of these pine plantations are still evident as dense stands of pine or where pine is a co-dominant species.

The northern part of the North Tuncurry Biobank Site has been subject to mineral sands extraction and has had a number of wildfires burn part of the area, the most recent being an intensive wildfire in 2019/2020 which burnt the northern part of the site and other smaller, low intensity fires burning parts of the south-eastern section of the project site in 2013 and 2017.

With the exception of the dense network of tracks, vegetation within the North Tuncurry Biobank Site has recovered well from these past disturbances, with scattered occurrences of *Pinus elliotii* (Slash Pine) as one of the few relics of past disturbance. Along access tracks, particularly intersections, minor infestations of exotic grasses including *Eragrostis curvula* (African Lovegrass), *Andropogon virginicus* (Whiskey grass), *Chloris gayana* (Rhodes grass) were also present. Along the foredune and dune areas, *Senecio madagascariensis* (Fireweed), *Asparagus aethiopicus* (Asparagus fern), and *Chrysanthemoides monilifera* subsp. *rotundata* (Bitous Bush) were also present. Minor rubbish dumping (various household items) were also present along access tracks throughout the Biobank site.

Accordingly, the current vegetation on site is all regrowth of approximately 50-60 years of age.

1.5 Surrounding land uses

The Biobank Site is situated on a peninsula that has been created by the Wallamba River to the west and is bounded by Nine Mile Beach to the east, educational facilities to the south, vacant land, Darawank Nature Reserve and the Tuncurry Waste Management Centre to the north (**Figure 2**).

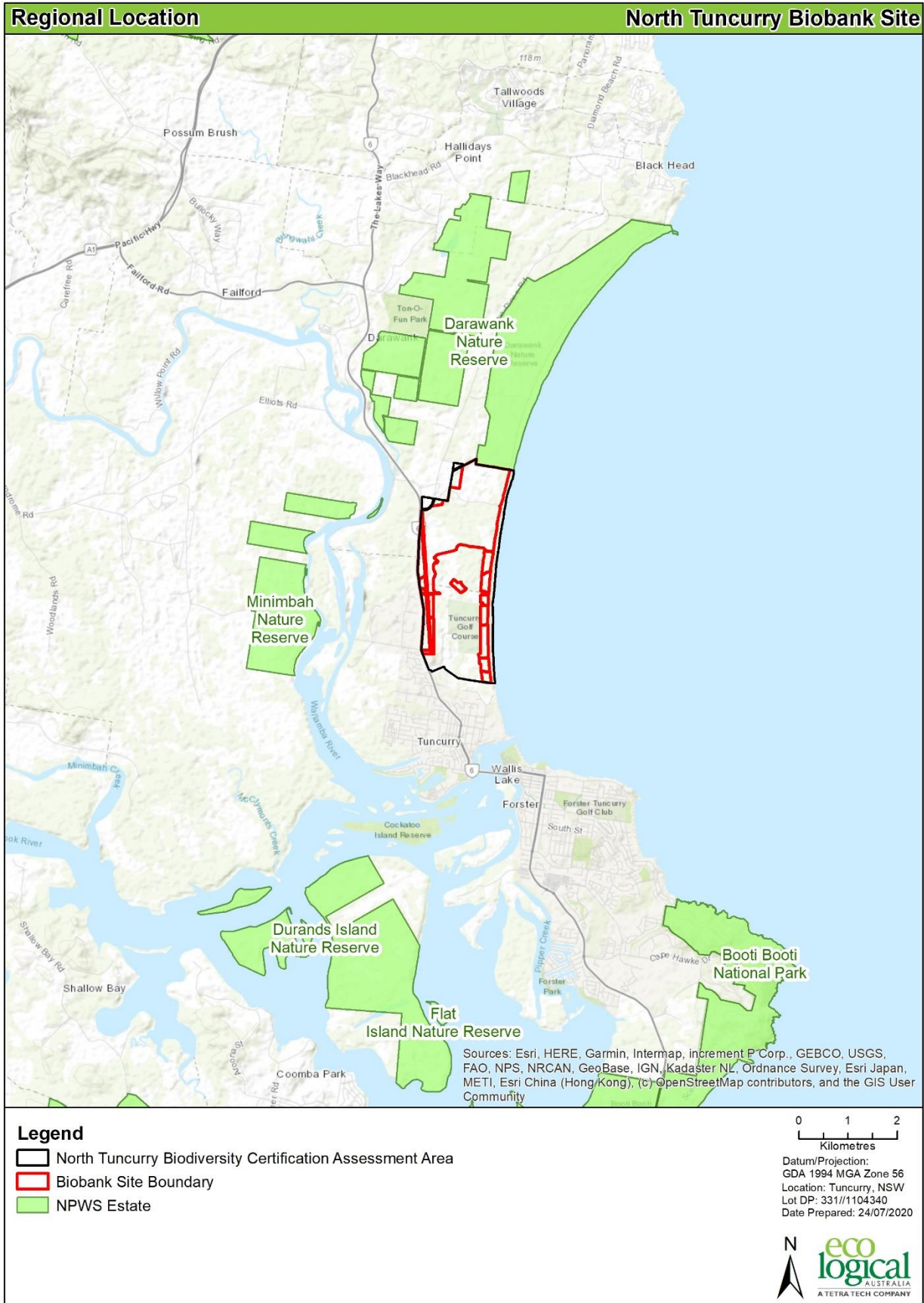


Figure 1: Regional location of the North Tuncurry Biobank Site

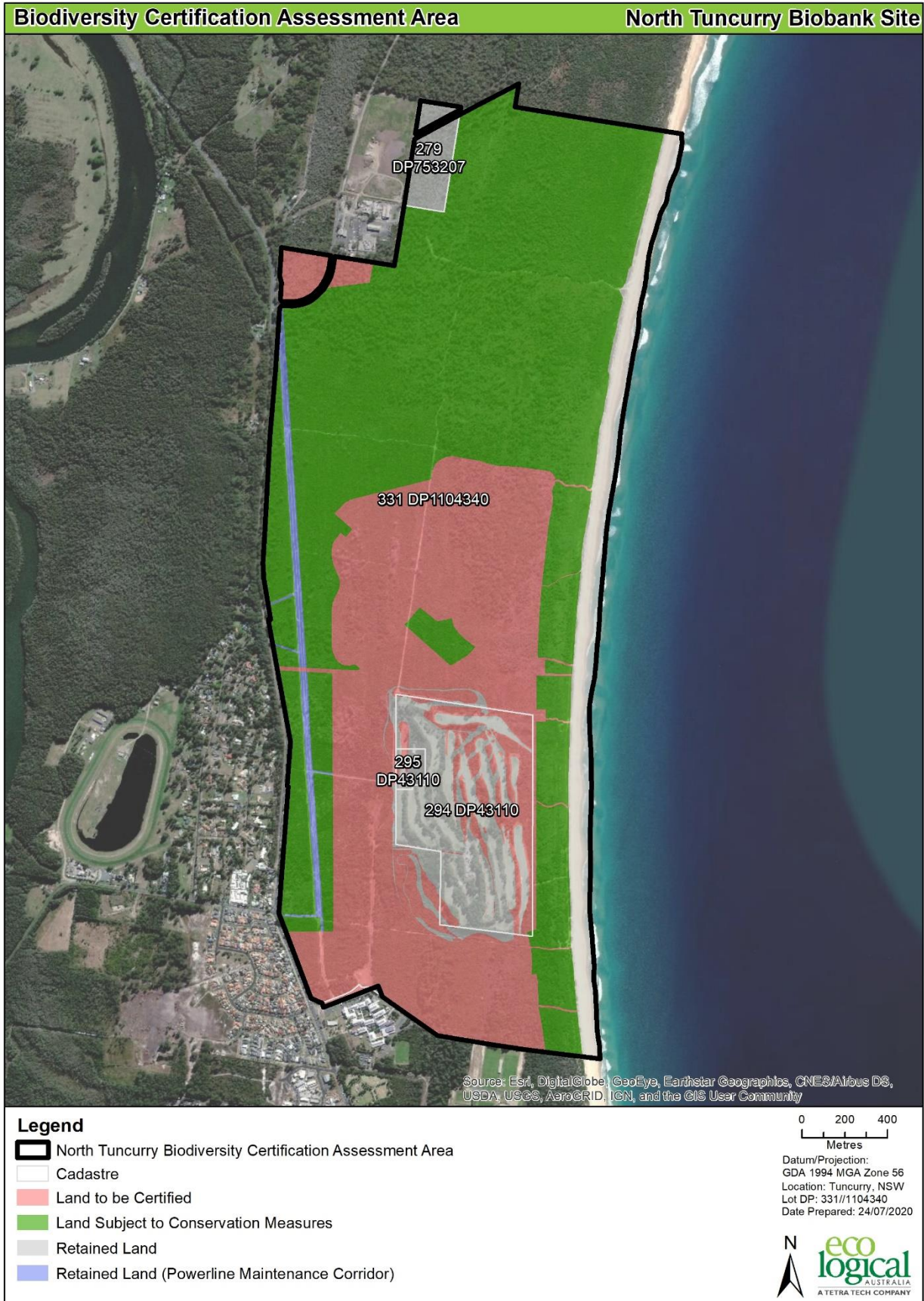


Figure 2: North Tuncurry Biocertification Assessment area



Figure 3: Location of the North Tuncurry Biobank Site relative to IBRA Regions/Subregions, Mitchell Landscapes, and Assessment circles (Location Map)

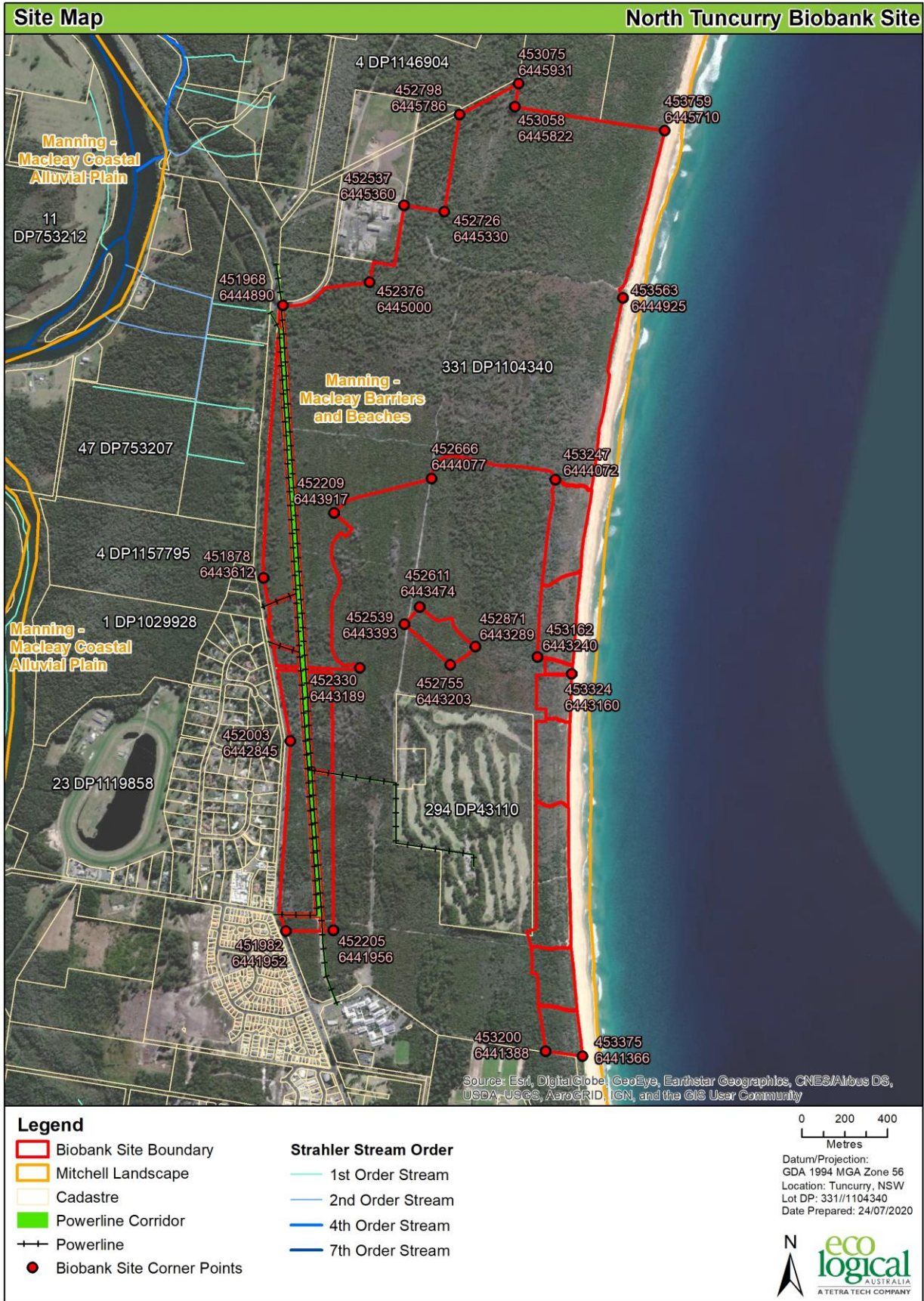


Figure 4: The North Tuncurry Biobank Site boundary (Site map)

2 Biobank Assessment

2.1 Biobank area

The North Tuncurry Biobank Site covers a total of 317.63 ha. There are no covenants or conservation funding arrangements for the property or any existing requirements to actively manage the site for biodiversity conservation. The entire Biobank site is to be managed for ecosystem and species credits.

2.2 Plant Community Types

2.2.1 History of PCT allocation

The Biobank site (and wider BCAA - **Figure 2**) has been the subject of several previous ecological and planning assessments. The Biocertification Credit Assessment Report (BCAR) (ELA 2019) prepared as part of this project has been informed by the '*Ecological Inventory Report – North Tuncurry*' (RPS 2012a) which incorporates the findings of ERM (2005 & 2010b).

RPS (2012a) presents a synthesis of previous ecological information which has been recorded for the BCAA, including ERM (2005; 2010a; 2010b), Paget (2008) and RPS (2011), in addition to the results of further investigations undertaken by RPS throughout 2010, 2011 and 2012.

Vegetation surveys conducted within the Biobank site (and wider BCAA) by RPS included vegetation mapping and condition assessment, 23 full floristic plots (conducted according to the BCAM (DECW 2011) and 48 rapid data points (methodology outlined in RPS 2012a).

RPS (2012a) previously identified and mapped four vegetation communities within the North Tuncurry Biobank site

- *Eucalyptus pilularis* Dry Sclerophyll Forest (Dunal) – Equivalent Biometric Vegetation Type: '*Blackbutt – Smooth-barked Apple Shrubby Open Forest on Coastal Sands of the Southern North Coast*';
- *Banksia aemula* Dry Heathland – Equivalent Biometric Vegetation Type: '*Banksia Dry Shrubland on Coastal Sands of the North Coast*'),
- *Leptospermum laevigatum* Dry Sclerophyll Shrubland – Equivalent Biometric Vegetation Type: '*Coast Banksia-Coast Wattle dune scrub, Sydney Basin and South East Corner*'; and
- Foredune Complex – Equivalent Biometric Vegetation Type: No Biometric equivalent.

None of these vegetation communities are listed as endangered ecological communities (EECs) under the TSC Act or Commonwealth EPBC Act or are considered to comprise a 'highly cleared' vegetation type.

Vegetation mapping and condition stratification within the Biobank site (and wider BCAA) was undertaken in accordance with the BCAM by RPS (2012a). This vegetation mapping and condition stratification was validated and refined by ELA in March 2014 with a further 13 biometric plots were collected in March 2014 and four in May 2015 by accredited assessors and former ELA staff members Brian Towle and Antony Von Chrismar (Accreditation Nos. 0229 and 0080 respectively).

The mapping of biometric vegetation types within the Biobank site (and wider BCAA) generally followed that of RPS (2012a). Minor changes were made with regard to the distribution of different 'vegetation zones', including refining areas in which the exotic *Pinus elliottii* was present. Additionally, some areas which were identified by RPS (2012a) as *Banksia Aemula* Dry Heathland with emergent *Eucalyptus pilularis* (Blackbutt) have been considered in this study as a shrubby form of the '*Blackbutt – Smooth-*

barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion due to the woodland/forest structure of these areas. RPS (2012) acknowledges the woodland structure of these areas in regard to habitat structure for fauna, however, considered this area more closely aligned to the *'Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion'*, based upon floristic analyses.

RPS (2012a) and the additional surveys by ELA in 2014 and 2015 identified three biometric vegetation types within the Biobank site (and wider BCAA):

- HU 509 - Blackbutt – Smooth-barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion;
- HU 503 - Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion; and
- HU 530 - Coast Banksia – Coast Wattle dune scrub, Sydney Basin and South East Corner.

The distribution of these vegetation communities appears to be related to soil depth and distance from the ocean. Generally, forest and woodland vegetation occurred in areas with increased soil depth, with shrublands occurring in areas with shallower soils across the remainder of the site.

2.2.2 Current PCT allocation

Due to the age since original field works were undertaken (2011-2015) and the recent fires that hit the north coast in 2019/2020, the Department of Planning, Industry and Environment requested that ELA update the plot data and review the vegetation mapping as part of this Biobank Assessment. As a result, ELA have collected updated data for 29 Biobanking plots within the Biobank Site. Plots were completed by ELA Senior Botanist Gordon Patrick (BAM Accredited) and Senior Ecologist and Accredited BBAM/BAM Assessor (BBAM number: 145) Lily Gorrell on the 2nd, 3rd and 4th June and 16th, 17th and 18th June 2020.

Based on the relationship with the already prepared Biodiversity Certification Assessment, for this Biobank site assessment, ELA have retained Plant Community Types (PCTs)/Biometric Vegetation Types (BVTs), Vegetation Zones, Threatened Species Habitat polygons and Strategic Locations (State/Regional linkages) consistent with the Biodiversity Certification Assessment where possible. Generally, changes were only made where differences between the BCAM and BBAM tool (e.g. BVTs), were required or the condition of the vegetation had significantly changed since the ELA vegetation stratification in 2015 (e.g. some vegetation zones delineated in 2015 as burnt/unburnt now merged as the effects of the 2007, 2013 & 2017 fires on structure and/or floristics were no longer noticeable). Thus, this assessment has included merging of some vegetation zones and slight differences in areas due to refining the vegetation boundaries with more recent aerial photographs and data provided from on-ground validation of vegetation condition and collection of plots in June 2020. The PCT mapping can be found in **Figure 5** below.

As discussed previously, changes were necessary to two of the original PCTs/BVTs as they were no longer available within the BBAM Calculator tool, and therefore, an updated vegetation community was chosen based on best fit (dominant species, landscape position, vegetation formation and class and benchmark values etc). These are outlined below and all further reference to PCTs throughout the report refer to the updated PCT chosen.

The plant community types are mapped as:

- 1702 (HU916) Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast (Originally 'HU503 Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion')

- 1646 (HU 860): Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast (Originally 'HU530 Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion'); and
- 772 (HU530): Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion

Vegetation in the Biobank site was mapped into 6 'vegetation zones' based on vegetation type and ancillary codes as per the BCAM and BBAM (DECCW 2011; OEH 2014) (**Table 2**). 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 Biobank site to identify and separate out zones where a canopy of regrowth Pines (*Pinus elliotii*) were present and areas where the vegetation structure (canopy or shrub stratum) was atypical and influenced by adjacent vegetation types. A description of each PCT and their associated vegetation zones is summarised in **Table 5** and location of the BioMetric plots are shown in **Figure 7**. The number of plots undertaken is consistent or exceeded the minimum number of plots required for each vegetation zone as defined by the BBAM 2014.

Due to the recent 2019/20 wildfire that effected large areas surrounding Tuncurry, portions of the Biobank Site, particularly the northern section, were considered 'severely burnt' in accordance with the DPIE 'Guidelines for applying the Biodiversity Assessment Method at severely burnt sites' (DPIE 2020). To date, this guideline has been prepared to provide guidance for Biodiversity Development Assessment Reports (BDARs) and Biodiversity Certification Assessment Reports (BCARs) under the Biodiversity Assessment Method (BAM), however, has been utilised in the absence of any specific guideline for the BBAM.

Based on the Table 2, Section 5.3 (option 1) of the DPIE guideline, all plots were located in unburnt areas of the vegetation zones for each PCT, however the number of plots is based on the requirements for the entire zone (i.e. burnt and unburnt sections combined). Due to the large size of each vegetation zone, plots were able to be placed in representative locations for that zone, outside of the 'severely burnt' areas (see Figure 7).

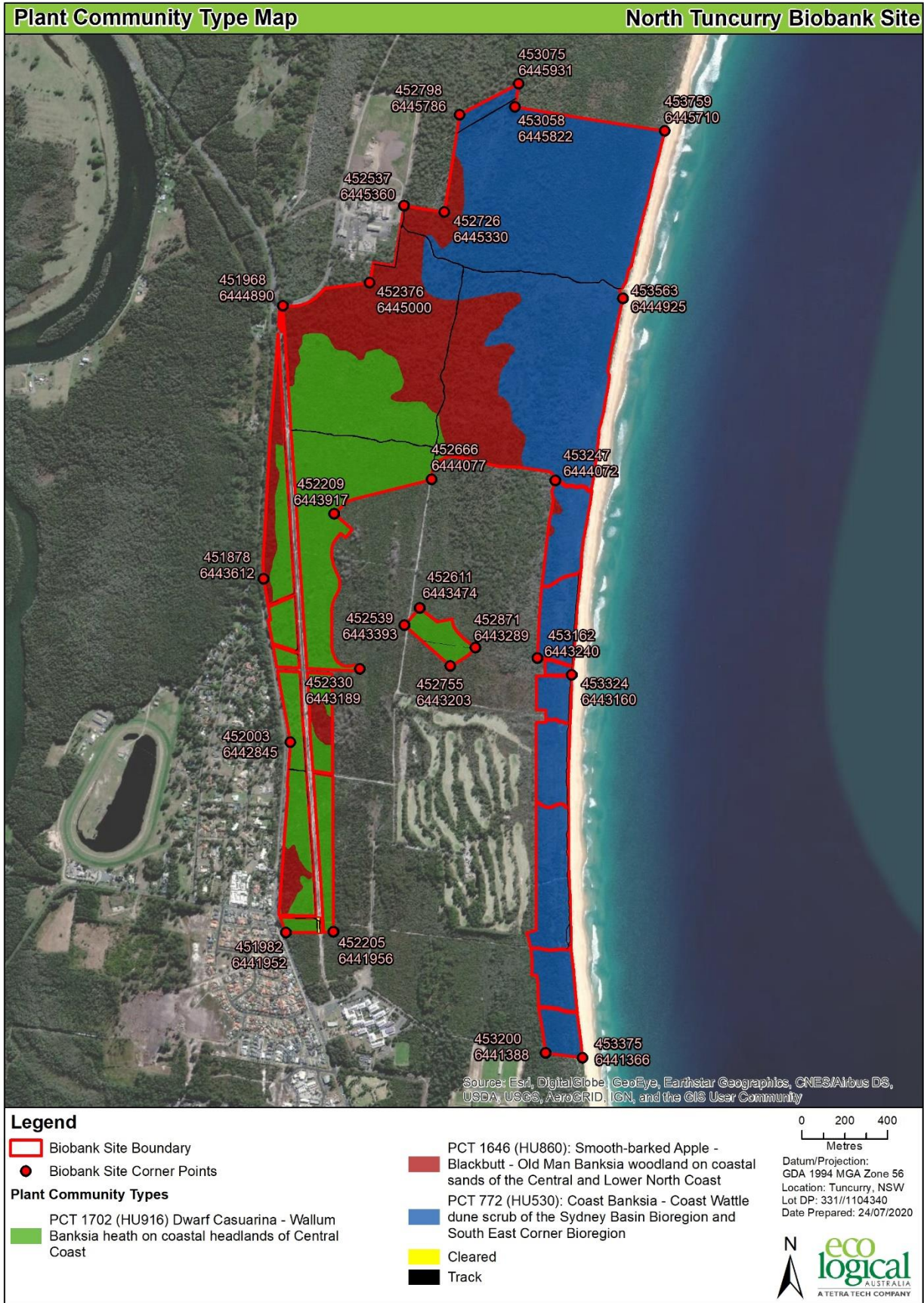


Figure 5: Plant Community Types in the North Tuncurry Biobank Site

2.3 Landscape value assessment

According to the BBAM 2014 (OEH 2014), the following steps are required in assessing the landscape value for biobank sites:

- a) Assess whether the site is in a strategic location;
- b) Assess change in connectivity value;
- c) Assess the increase in native vegetation cover; and
- d) Assess the patch size area.

A strategic location is defined in Section 4.2.6 of the BBAM 2014 as:

- part of a state or regional biodiversity link and in a plan approved by the Chief Executive of the OEH (and endorsed for use by the BCAM and/or BBAM); or
- a riparian buffer area of a third order stream or higher, or an important wetland or estuarine area.

If the biobank site is in a strategic location, there is no need to further assess connectivity value i.e. step 'b' is not required.

Whilst the proposed biobank site has been identified in a number of DPIE (and former agency reports) as a regional biodiversity link (e.g. a 'Key Habitat and Corridor' after Scotts 2003), these data layer has not been approved by the CEO of OEH for use in biobanking assessments, accordingly, the North Tuncurry Biobank Site does not meet any of the criteria for inclusion as a 'strategic location'. As such, the following landscape value assessment follows steps a, b, c and d of the BBAM 2014 for assessing landscape value.

The following sections outline the data that were entered to the BioBanking Credit Calculator (BCC).

2.3.1 Connectivity value

In accordance with the BBAM 2014, the following aspects were considered in determining the connectivity value:

- The width of the current and future connecting links; and
- The condition of woody and non-woody vegetation types before and after the biobank site is established.

Native vegetation was considered to be part of a connecting link if the patch size was >1 ha in size, in moderate to good condition, patches were separated by a distance of <100 m, and were not separated by a large water body, dual carriageway, wider highway or similar hostile link (see Appendix 6 of BBAM 2014).

The connectivity link identified for the purpose of the landscape value assessment is located within the Biobank site (**Figure 6**), however, the narrowest point of the current vegetated connection is identified outside the Biobank site. GIS analysis identified the minimum width of the current connection as approximately 102 m, placing it into the >100–500 m (moderate) connectivity width category. As the most limiting width occurs outside the Biobank Site, improvement of the Biobank Site will not increase the connectivity width. The connectivity width category after Biobank therefore remains >100–500 m. This vegetation had a projected foliage cover (PFC) >25% benchmark condition for overstorey cover before Biobank and a projected foliage cover (PFC) at Benchmark after Biobank. The mid-storey/ground cover had a projected foliage cover (PFC) at benchmark condition before and after Biobank. Given the overstorey is >25 % benchmark before Biobank and at benchmark after Biobank and the mid-storey/ground covers are already at benchmark, the average condition across the length of the connection

will increase by '1' in accordance with Appendix 6 of the BBAM. **Table 3** contains the results of the analysis.

The results of the width of current and future connecting links and the condition of vegetation types before and after the establishment of the biobank site combined to give a score of '1' for connectivity value (no linkage width classes were crossed and only one condition threshold was crossed). Thus, a score of '1' for connectivity value was entered into the BBCC.

Table 3: Condition classes before and after the establishment of the Biobank site

Strata	Condition Class (Before Biobank)	Condition Class (After Biobank)
Connectivity Value (Over-storey Condition)	>25% benchmark	Benchmark
Connectivity Value (Mid-storey/Ground Cover Condition)	Benchmark	Benchmark

2.3.2 Increase in native vegetation cover

The amount of vegetation currently within the 200 ha and 2,000 ha assessment circles (inner and outer assessment circles, respectively) was calculated using ArcGIS at a scale of 1:10,000 (see Figure 6 for circle placement). The amount of vegetation in the circles once the North Tuncurry Biobank Site is established, and managed into the future, was also estimated in ArcGIS. As part of the outer assessment circle covered part of the ocean, the area assessed only included the land area (land area assessed 1,241.25 ha).

It should be noted that vegetation proposed for removal as part of the North Tuncurry Biocertification Assessment is not included in the percent native vegetation cover.

The assessment for the inner circle recorded approximately 164.56 ha of overstorey vegetation before the establishment of the Biobank site, which represents 82.28% cover. After the establishment of the Biobank site, it has been assumed that the entire site will, at some stage, reach benchmark. The total amount of overstorey cover vegetation in the inner circle remains the same Pre and Post establishment of the Biobank site.

The assessment for the outer circle recorded approximately 695.59 ha of overstorey vegetation before the establishment of the Biobank site, which represents 56.04% cover. After the establishment of the Biobank site, it has been assumed that the entire site will, at some stage, reach benchmark. The total amount of overstorey cover vegetation in the outer circle remains the same Pre and Post establishment of the Biobank site.

Table 4 summarises the results of the assessment for each circle. The native vegetation cover class did not change for either the inner assessment circle or the outer assessment circle. As such, in accordance with Table 26 of the BBAM 2014 (OEH 2014), a score of 9.25 was entered into the BBCC for the inner assessment circle for both before and after the establishment of the Biobank site. A score of 12.6 was entered into the BBCC for the outer assessment circle for both before and after the establishment of the Biobank site.

Table 4: Area of over-storey cover in assessment circles before and after the establishment of the North Tuncurry Biobank Site

Assessment circle	Vegetated area before the	Native vegetation cover class (%)	Vegetated area after the establishment of the Biobank site (ha)	Native vegetation cover class (%)

	establishment of the Biobank site (ha)			
Inner	164.56	81-85%	164.56	81-85%
Outer	56.04	56-60%	56.04	56-60%

2.3.3 Patch size

The area surrounding the North Tuncurry Biobank Site consists of native canopy cover with a predominately native understorey and is shown in **Figure 6**. These areas are therefore predominantly in moderate to good condition. Large intact remnants are positioned to the north and north-west of the site. Tuncurry town centre occurs to the south and South-west and as a whole also retain patches of native over-storey vegetation. The maximum patch size assessable in the Manning – Macleay Barriers and Beaches Mitchell landscape (24% cleared) is 1000 ha according to the BBAM 2014. These linkages of moderate/good condition vegetation were measured at greater than 1000 ha and therefore 1001 hectares (a score of 12) was entered for patch size in the BBCC.

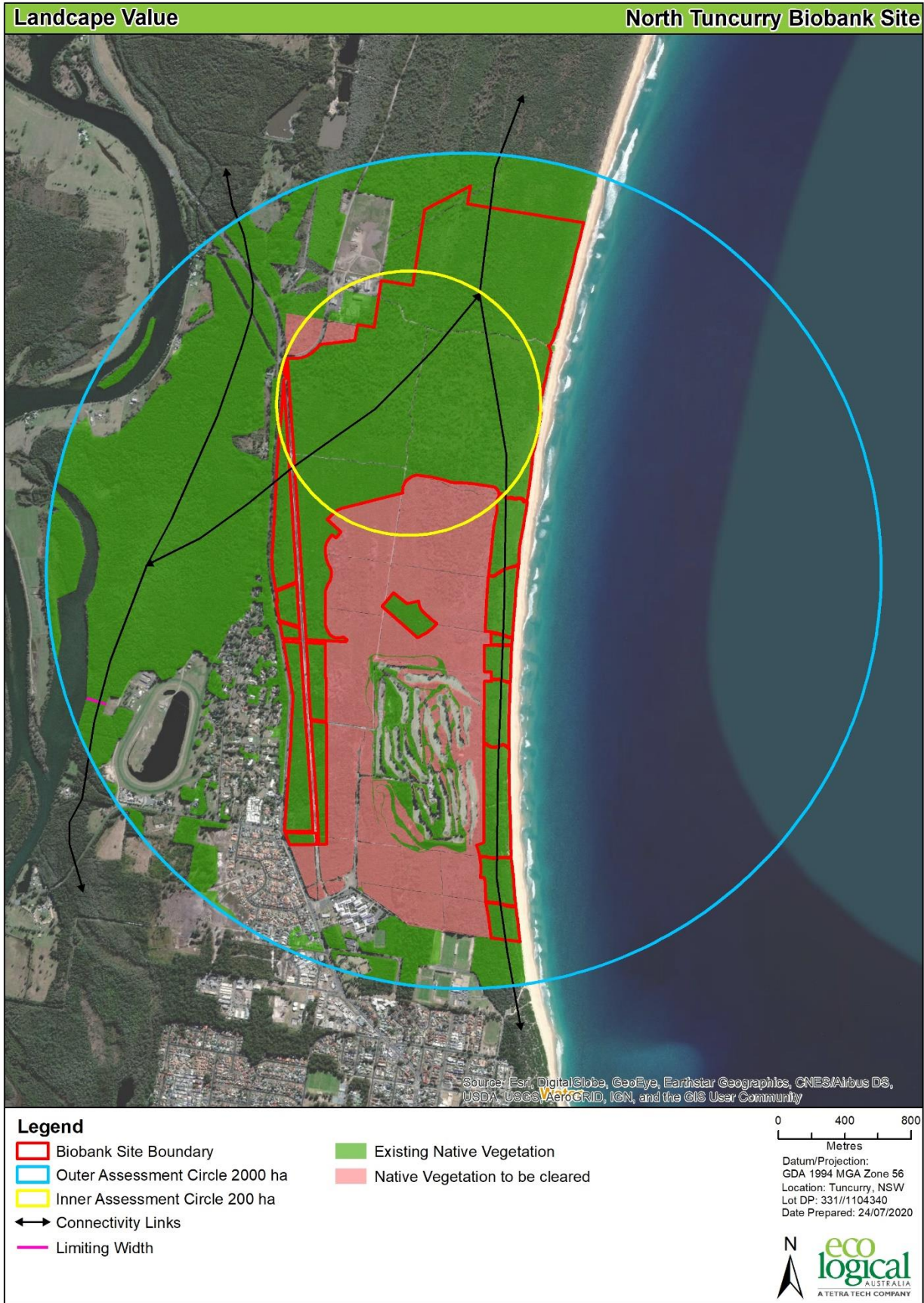


Figure 6: Landscape values

2.4 Native vegetation assessment

2.4.1 Vegetation zones

Vegetation zones are defined as areas of native vegetation that are the same PCT which have similar broad condition states (OEH 2014).

In total, there are six vegetation zones within the North Tuncurry Biobank Site. A description of each vegetation zone is provided in **Table 5** along with condition, area (ha), an outline of plots required and plots completed as per the BBAM. Additionally, respective photos of each zone are provided in Plate 1 through to Plate 6 and the spatial configuration of the vegetation zones is shown in **Figure 7**.



Plate 1: Intact Wallum Banksia heath in Vegetation Zone 1



Plate 2: Wallum Banksia heath with emergent Pine in Vegetation Zone 4



Plate 3: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland (good) in Vegetation Zone 5



Plate 4: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland (pine) in Vegetation Zone 8



Plate 5: Coast Banksia - Coast Wattle dune scrub (good) in Vegetation Zone 9



Plate 6: Coast Banksia - Coast Wattle dune scrub (Dune) in Vegetation Zone 13

2.4.2 Plot and transect surveys

The BBAM 2014 (OEH 2014) requires that Biometric plots/transects are undertaken to sample vegetation zones. The number of plots/transects undertaken for each vegetation zone is outlined in **Table 5**. Information was collected from the required number of plots/transects for all vegetation zones consistent with BBAM 2014. All plots were permanently marked with two star pickets to allow for the monitoring of vegetation condition in the future. A star-picket was placed at the beginning and end of the 50 m line transect. The locations of the star-pickets were recorded using handheld GPS units with co-ordinates in GDA94 datum. Two photographs were taken along each transect: one at the beginning of the transect and in the direction of the end of the transect, and one at the end of the transect in the direction of the start of the transect.

The location of plots/transects are shown in **Figure 7**. **Appendix A** contains the flora species recorded in each plot, while **Appendix B** contains the plot/transect data entered into the BBCC.

As discussed above, portions of the Biobank Site, particularly the northern section, were considered 'severely burnt' in accordance with the DPIE 'severely burnt sites' Guidelines (DPIE 2020). Section 5.3 of Table 2 within the guideline states '*If the assessment has been partially completed prior to the severe bushfire event, information from that work should be used to determine vegetation zones*'. Vegetation mapping and condition stratification within the Biobank site has been undertaken in accordance with the BCAM by RPS (2012a) and again validated and refined by ELA in March 2014 (Section 2.2.1). Based on these guidelines, and all the previous survey effort undertaken, plots were located in unburnt areas of the vegetation zones for each PCT, with plots placed in representative locations for that zone, outside of the 'severely burnt' areas.

Table 5: Vegetation zones and number of biometric plots/transects required and surveyed for in the North Tuncurry Biobank Site

Veg zone ID	Plant community type	Condition/ Ancillary code	Vegetation Class	Vegetation Formation	Characteristics of vegetation zone	Area (ha)**	Plots required	Plots completed
1	1702 (HU916) Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	Moderate-Good (High) (Plate 1)	Sydney Coastal Heathlands	Heathland	Restricted to coastal headlands with a mature native overstorey dominated by <i>Banksia aemula</i> (Wallum Banksia) and <i>Leptospermum trinervium</i> (Flaky-barked Tea-tree) with a midstorey dominated by <i>Leptospermum polygalifolium</i> (Tantoon) and to lesser extent <i>Ochrosperma lineare</i> (Straggly Baeckea) and <i>Ricinocarpos pinifolius</i> (Wedding Bush) The ground-layer is composed of a mixture of native sedges, herbs and scramblers.	83.26	5	9 TC-09, TC-10, TC-11, TC-12, TC-13, TC-16, TC-17, BB36*, BB37*
4		Moderate-Good (Pine) (Plate 2)			As discussed above, this vegetation zone is dominated by <i>B. aemula</i> and <i>L. trinervium</i> , however, also comprises <i>Pinus</i> species within the canopy and mid-layers, although seems that many of the mature trees are senescing and there is minimal juvenile recruitment occurring. A midstorey dominated by <i>L. polygalifolium</i> and <i>R. pinifolius</i> The ground-layer is composed of a mixture of native sedges, herbs and scramblers.			2.72
5	1646 (HU 860): Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Moderate-Good (High) (Plate 3)	Coastal Dune Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	Open Forests to Woodland confined to Quaternary dune sands at elevations up to 100m. This community is dominated in the canopy by <i>Eucalyptus pilularis</i> (Blackbutt). Occasional <i>Angophora costata</i> (Smooth-barked Apple) and <i>Eucalyptus robusta</i> (Swamp Mahogany) are also present. The mid-stratum is typically two layered the upper characterised by <i>Banksia serrata</i> (Old Man Banksia), <i>Leptospermum laevigatum</i> (Coast tea tree) and the lower layer comprising <i>L. polygalifolium</i> . The	64.66	5	5 TC-04, TC-05, TC-06, TC-07, TC-08

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Veg zone ID	Plant community type	Condition/ Ancillary code	Vegetation Class	Vegetation Formation	Characteristics of vegetation zone	Area (ha)**	Plots required	Plots completed
8		Moderate-Good (Pine) (Plate 4)			ground layer is characterised by grasses and ferns including <i>Pteridium esculentum</i> (Bracken), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Kennedia rubicunda</i> (Dusky coral pea). This community is known to extend along the coast from Gosford to Darawank Nature Reserve.	4.34	3	3 TC18 TC-19 TC-20
					As discussed above, this vegetation zone is dominated by <i>E. pilularis</i> however, also comprises <i>E. robusta</i> , <i>Allocasuarina littoralis</i> (Black sheoak) and Pinus species within the canopy and mid-layers. The mid-stratum is characterised by <i>Acacia longifolia</i> subsp. <i>sophorae</i> (Coast wattle), <i>B. aemula</i> , <i>L. polygalifolium</i> and <i>R. pinifolius</i> . The ground cover is characterised by grasses and ferns including <i>Caustis recurvata</i> var. <i>recurvata</i> (Curly sedge), <i>Hypolaena fastigiata</i> (Tassel rope-rush), <i>P. esculentum</i> and <i>L. longifolia</i> .			
9	772 (HU530): Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Moderate-Good (High) (Plate 5)	Sydney Coastal Heathlands	Heathland	This community commonly comprises of a low dense scrub found on coastal sand mass frontal dunes and beach ridges along the eastern coastline of New South Wales. This vegetation zone forms the component sitting just back from the frontal dunes and comprises a canopy dominated by both <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> (Coast Banksia), <i>B. serrata</i> and <i>L. laevigatum</i> . The shrub layer comprises <i>Monotoca elliptica</i> (Tree broom heath), The ground cover is characterised by <i>P. esculentum</i> , <i>Dianella caerulea</i> var. <i>producta</i> (Blue flax-lily), <i>L. longifolia</i> , <i>Pomax umbellata</i> and <i>Pandorea pandorana</i> subsp. <i>pandorana</i> (Wonga Vine).	127.57	6	6 TC-01, TC-03, TC-21, TC-22, TC-23, TC-24

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Veg zone ID	Plant community type	Condition/ Ancillary code	Vegetation Class	Vegetation Formation	Characteristics of vegetation zone	Area (ha)**	Plots required	Plots completed
13		Moderate-Good (Dune) (Plate 6)			As discussed above, this vegetation zone comprises of a low dense scrub found on coastal sand mass frontal dunes and beach ridges and is situated on the frontal dunes. This vegetation zone comprises a canopy dominated by <i>L. laevigatum</i> and to a lesser extent <i>Cupaniopsis anacardioides</i> (Tuckeroo). The shrub layer comprises <i>Myoporum acuminatum</i> (Pointed boobiella) and <i>A. longifolia</i> subsp. <i>sophorae</i> The characteristic groundlayer comprises salt-tolerant succulent herbs and grasses, several of which are unique to this environment including <i>Carpobrotus glaucescens</i> (Pigface), <i>Zoysia macrantha</i> (Prickly couch), <i>Imperata cylindrica</i> (Blady grass), <i>L. longifolia</i> and <i>Stephania japonica</i> var. <i>discolour</i> (Snake vine)	31.69	3	4 TC-02, TC-25, TC-26, TC-27
-	Cleared	-			-	0.05		
-	Tracks	-			-	3.46		
	Total Area of Biobank Site					317.63		30

*BB36 and BB37 have been re-surveyed in 2020 and original plot names kept. **BB28 has not been surveyed in 2020 as original data collected is considered 'fit for purpose' matching the vegetation type and condition currently present.

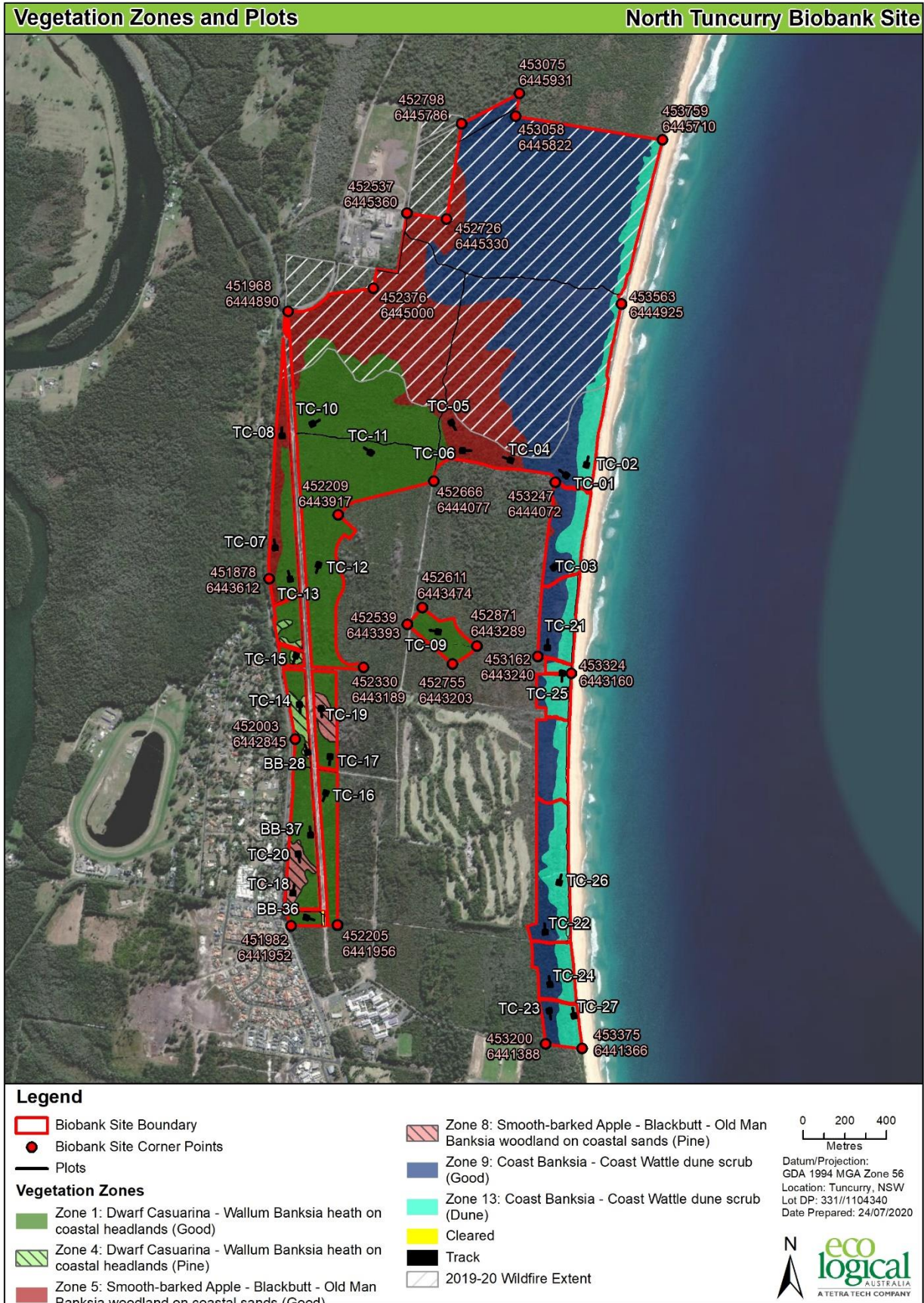


Figure 7: Vegetation zones and location of biometric plots/transects in the North Tuncurry Biobank Site

2.4.3 Management zones and site value scores

Management zones combine the mapping of vegetation zones with the final management outcome on the Biobank Site. They enable the assessor to increase, or decrease, the number of credits generated depending on the expected condition of the vegetation after management actions are undertaken.

The North Tuncurry Biobank Site contains six management zones (**Table 6** and **Figure 8**). Each management zone will be managed as an entire zone and grouped into Management Areas as per the preliminary management commitments in the biocertification application linked to the staged development. The boundaries of the six management zones match the six vegetation zones identified.

Table 6: Area of each management zone within the North Tuncurry Biobank Site

Management zone ID	Plant community type	Condition	Ancillary code	Area (ha)
MZ1	1702 (HU916) Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	Moderate to good	High	83.26
MZ4		Moderate to good (medium)	Pine	2.72
MZ5	1646 (HU 860): Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Moderate to good	High	64.66
MZ8		Moderate to good (medium)	Pine	4.34
MZ9	772 (HU530): Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Moderate to good	High	127.57
MZ13		Moderate to good (medium)	Dune	31.57
Total				314.12

The current site value scores for each management zone, as well as the future site value scores based on the BBCC's default site attribute scores after 'standard management' actions only are undertaken (consistent with the biocertification assessment), are shown in **Table 7**. The current site value scores ranged between 53.62 and 90.58 for the six management zones. The site values were predicted to increase from between 9.42 and 22.40 for the six management zones based on the application of standard management actions.

Table 7: Site value scores for each management zone

Management zone ID	Current site value	Future site value	Default increase in site value
MZ1	71.74	92.75	21.01
MZ4	90.58	100.00	9.42
MZ5	76.04	98.44	22.40
MZ8	63.54	82.29	18.75
MZ9	71.01	85.99	14.98
MZ13	53.62	74.64	21.02

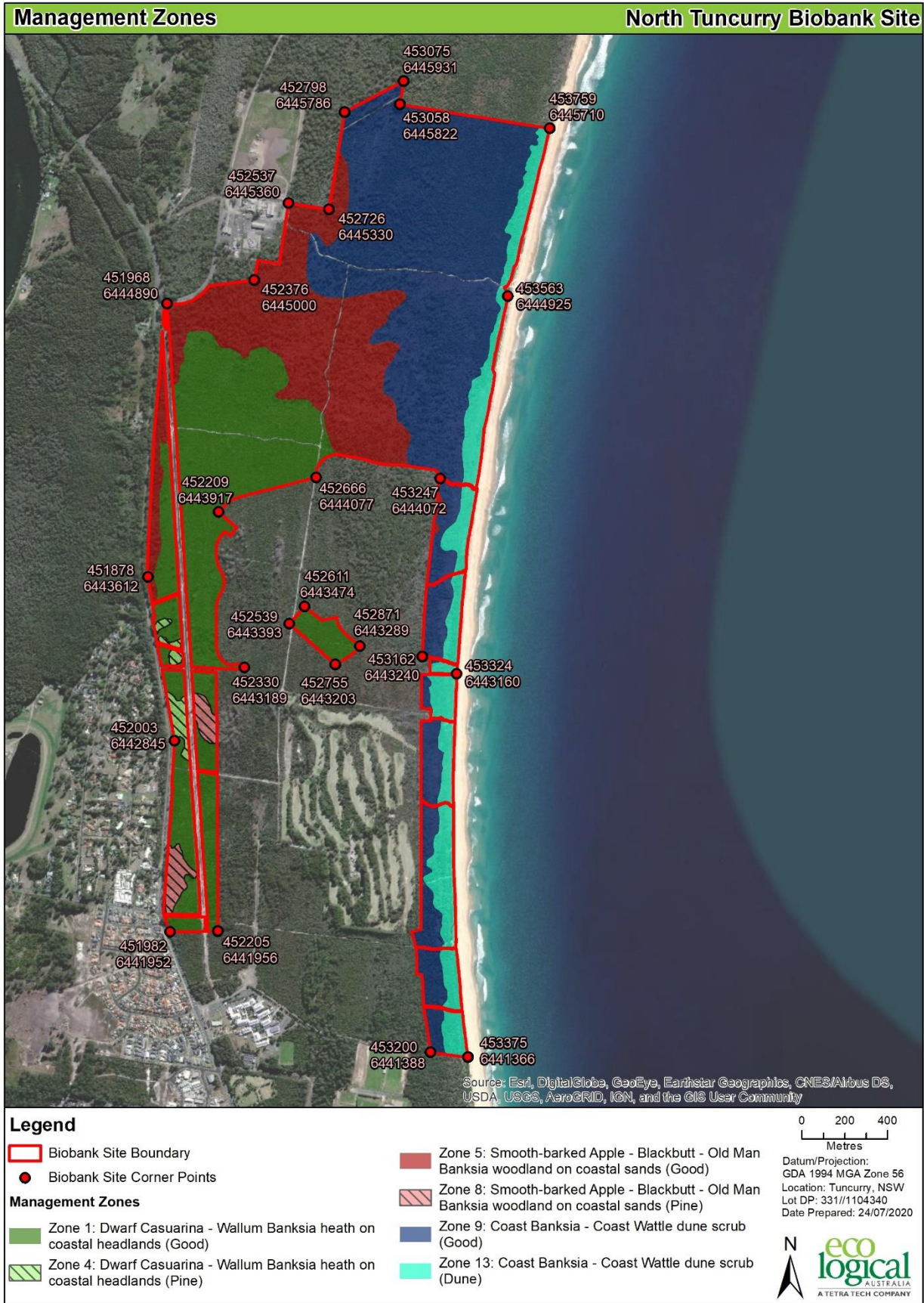


Figure 8: Management zones in the North Tuncurry Biobank Site

2.5 Threatened species and populations assessment

2.5.1 List of predicted threatened species

The list of threatened species (predicted to occur within ecosystem credits and those that require survey to generate species credits) is provided in **Appendix C**.

2.5.2 Geographic and habitat questions and answers

The responses in **Table 8** were provided to the geographic and habitat features questions (Step 2) in the Biobank calculator.

Table 8: Geographic and habitat questions and answers

Common name	Scientific name	Feature	Answer
Austral Toadflax	<i>Thesium australe</i>	coastal headlands, grassland, grassy open forest or woodland on fertile or moderately fertile soils	Yes
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	No
Wallum Froglet	<i>Crinia tinnula</i>	land within 40 m of swamps, wet or dry heaths or sedge grasslands	Yes
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber	No
Eastern Osprey	<i>Pandion cristatus</i>	land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters	Yes
Nabiac Casuarina	<i>Allocasuarina simulans</i>	coastal sands	Yes
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	land within 1 km of rock outcrops or cliff lines	No
Common Planigale	<i>Planigale maculata</i>	rainforest, eucalypt forest, heathland, marshland, grassland or rocky areas	Yes
Eucalyptus parramattensis subsp. decadens	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	deep, low-nutrient sands	Yes
Green and Golden Bell Frog	<i>Litoria aurea</i>	land within 100 m of emergent aquatic or riparian vegetation	No
Green-thighed Frog	<i>Litoria brevipalmata</i>	land within 100 m of semi-permanent or ephemeral ponds or depressions containing leaf litter	Yes
Red Helmet Orchid	<i>Corybas dowlingii</i>	Sheltered areas such as gullies and southerly slopes in tall open forest on well-drained gravelly soil at elevations of 10-200 m	No

Sand Spurge	<i>Chamaesyce psammogeton</i>	fore-dunes or exposed headlands	Yes
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2.5.3 Threatened flora and fauna survey for species credits

The Biobank site (and wider BCAA) has been the subject of considerable targeted flora and fauna surveys spanning over 15 years (2005 – 2020). An outline of the historical and current surveys is present below from the ELA 2019 report.

Flora species

Targeted surveys for threatened flora species considered likely to occur within the North Tuncurry Biobank site were undertaken by RPS and ERM with survey documented in RPS (2012). For the purpose of these surveys the site was divided into four stratification units (Heath, Dry Blackbutt Forest and Beach Complex). Random meanders / targeted surveys were conducted for a total of 20 hours across the four stratifications units (**Table 9**) exceeding the requirements outlined in DEC (2004), with the locations of these surveys shown in **Figure 9**.

Specifically, targeted surveys were undertaken for the threatened flora species *Genoplesium littorale* (syn. *Corunastylis littoralis*) (Tuncurry Midge Orchid; TMO) listed under the TSC Act and EPBC Act as Critically Endangered by Paget (2008), ERM (in 2009, reported in ERM 2010) and RPS (2010, 2011 & 2012).

The timing of these surveys coincided with surveys requirements for the targeted species as outlined in the BBCC (**Table 9**).

Table 9: Survey effort for targeted surveys for threatened flora, RPS (2012)

Date	Effort	Reference	Description	Results
Jan-April 2008	11 person days	Paget 2008	Targeted survey of study area during flowering season by Andrew Paget, John Riley and Barry Ralley (& Isaac Mamott)	510 plants recorded east and south-east of Tuncurry tip 72 plants recorded north and north-east of Tuncurry TAFE
Jan-April 2008	3.5 person days	Paget 2008	Targeted survey by Andrew Paget & Di Brown north of Tuncurry Study area (Darawank, Bonny Hills and Crowdy Bay)	No plants recorded
Jan-April 2008	2 person days	Paget 2008	Targeted survey by Andrew Paget & Barry Ralley south of Tuncurry Study area (Booti Booti and Mungo Brush)	No plants recorded
19-21 March 2009	3 days	ERM 2010		15 plants recorded during reference site confirmation 47 plants recorded in study area 31 plants recorded southeast of Tip (Outside of study area)
March 2010 (23, 24, 29, 30 and 31) April 2010 (19, 20, 21, 22, 23, 28) May 2010 (14, 17, 18, 19 and 20)		RPS 2011	Targeted flora survey for the Tuncurry Midge Orchid. Walking transects and random meanders within potential habitat on the subject site. Focused on disturbed areas, previously recorded areas and under surveyed heath area	1,293 plants recorded in study area
Feb 2011		RPS	Random meander and targeted flora survey for Tuncurry Midge Orchid, (RPS, 2012a)	

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13/4/2011			Targeted search	25 plants recorded, (11 considered duplicates of 2010 records)
April 2011 (11, 12 and 13)	6 person days	RPS 2012	Targeted flora survey for the Tuncurry Midge Orchid. Nine random plots (40 x 40 m) within heath vegetation. Within each plot two ecologists walked parallel transects 2 m apart (RPS, 2012a).	9 of the 25 plants recorded in 2011 were in one of the 9 plots
22, 26 & 27 March 2012	3 person days	RPS 2012	22 Transects	309 plants recorded (101 considered new records)
18-22 March 2013 23-24 April 2013	24 person days	RPS 2013	Targeted surveys by Isaac Mamott and Andrew Smith at Tuncurry, South Foster and Minimbah	6 plants recorded at Booti Booti National Park 3 plants recorded on Midcoast Water lands at Minimbah

Fauna species

Fauna surveys have been conducted across the Biobank site (and wider BCAA) as part of the SSS and Biocertification Assessment in accordance with DEC 2004 (ERM 2005 & 2010), RPS (2012) and ELA (2019). The following provides an outline of the survey techniques utilised for detection of the target species for the Biobank site, being Brush-tailed Phascogale (*Phascogale tapoatafa*) and Eastern Pygmy Possum (*Cercartetus nanus*), both vulnerable species under the TSC Act and Koala (*Phascolarctos cinereus*) vulnerable under the TSC Act and EPBC Act.

Survey techniques to identify the above species included: call playback; spotlighting; Elliott and cage traps; pit fall traps; hair tube surveys; baited remote cameras (ELA June-July 2020); habitat assessments and incidental observations. The details, including survey locations, stratification units, weather conditions during surveys and total survey effort, are outlined in RPS (2012a) and summarised in **Table 10** and **Figure 9**. Survey effort generally followed standards set in the DEC (2004) guidelines.

Table 10: Combined survey effort (ERM 2010a and RPS 2012a)

Target Species	Method	<i>Leptospermum laevigatum</i> Dry Sclerophyll Shrubland 166 ha		<i>Banksia aemula</i> Dry Heathland 237 ha	<i>Eucalyptus pilularis</i> Dry Sclerophyll Forest (dunal) 99 ha	Foredune Complex 32 ha	Site Total	
		Unburnt 132.43	Burnt 33.57ha					
Small mammals and reptiles	Pitfall Traps	RPS	36	24	72	72	24	216 trap nights
		ERM	03	02	06	05	02	0 trap nights
		Total Undertaken	36	24	72	60	24	216 trap nights
		Total Required	48 trap nights	24 trap nights	72 trap nights	48 trap nights	24 trap nights	216 trap nights
Small mammals	Terrestrial Elliott A	RPS	350		400	150	100	1000 trap nights
		ERM	24		48	48	0	120 trap nights
		Total Undertaken	374		436	198	100	1120 trap nights
		Total Required	200 trap nights		300 trap nights	200 trap nights	100 trap nights	800 trap nights
Medium sized mammals	Terrestrial Elliott B	RPS	366		388	150	100	1004 trap nights
		ERM	0		0	0	0	0 trap nights
		Total Undertaken	366		388	150	100	1004 trap nights
		Total Required	200 trap nights		300 trap nights	200 trap nights	100 trap nights	800 trap nights
Arboreal mammals	Arboreal Elliott B	RPS	52		84	84	0	220 trap nights
		ERM	15		0	5	0	60 trap nights
		Total Undertaken	67		84	129	0	280 trap nights
		Total Required	48 trap nights		72 trap nights	48 trap nights	24 trap nights	192 trap nights
Various sized mammals	Hair Tube Terrestrial	RPS	187		165	0	0	352 trap nights
		ERM	150		300	50	0	500 trap nights
		Total Undertaken	337		465	50	0	852 trap nights
		Total Required	160 trap nights		240 trap nights	160 trap nights	80 trap nights	640 trap nights
	Hair Tube Arboreal	RPS	307		405	114	0	826 trap nights
		ERM	0		0	0	0	0 trap nights

Biobanking Agreement Credit Assessment Report: North Tuncurry Biobank Site

Target Species	Method	<i>Leptospermum laevigatum</i> Dry Sclerophyll Shrubland 166 ha		<i>Banksia aemula</i> Dry Heathland 237 ha	<i>Eucalyptus pilularis</i> Dry Sclerophyll Forest (dunal) 99 ha	Foredune Complex 32 ha	Site Total	
		Unburnt 132.43	Burnt 33.57ha					
		Total Undertaken	307	405	114	0	826 trap nights	
		Total Required	240 trap nights	360 trap nights	120 trap nights	120 trap nights	840 trap nights	
Various nocturnal mammals	Spotlighting on foot	RPS	4	9	6	2	21 hours	
		ERM	6 hours across the site					6 hours
		Total Undertaken	11	9	6	2	27 hours	
		Total Required	4 hours	8 hours	4 hours	4 hours	20 hours	
	Spotlighting in car	RPS	10	3	6	Driving not recommended	19 hours	
		ERM	0	0	0		0 hours	
		Total Undertaken	10	3	6		19 hours	
		Total Required	5 hours	10 hours	5 hours		20 hours	
Flora Surveys*	Random Meander	RPS	22.6	23	11.6	7.7	64.9 hours	
		ERM	-	-	-	-	-	
		Total Undertaken	22.6	23	11.6	7.7	64.9 hours	
		Total Required	1.5 hours	2.5 hours	1.5 hours	1 hour	6.5 hours	
	Quadrat	RPS	6	10	4	3	23 quadrats	
		ERM	1	3	2	0	6 quadrats	
		Total Undertaken	7	13	6	3	29 quadrats	
		Total Required	3 quadrats	3 quadrats	3 quadrats	2 quadrats	11 quadrats	

Random meander undertaken by RPS is calculated on distance covered within each stratification unit with an estimated average speed being 1km per hour. It is believed that this is a conservative estimate and the actual time spend undertaking random meanders is likely to be greater than what is displayed.

2.5.4 ELA fauna survey effort

Due to the age since original targeted fauna surveys were undertaken (2010-2012) and the recent fires that hit the north coast in 2019/2020, the Department of Planning, Industry and Environment requested that ELA undertake additional targeted surveys for Brush-tailed Phascogale, Eastern Pygmy Possum and Koala to confirm their continued presence/occupation of the site.

These surveys were undertaken by ELA ecologists Daniel McKenzie and Dee Ryder on the 2nd, 3rd and 4th June and again on 14th and 15th July by ELA ecologists Daniel McKenzie and Liam Scanlan. An outline of survey effort is presented below in **Table 11: ELA fauna survey effort**

Table 11: ELA fauna survey effort

Target Species	Method	Total site effort undertaken
Nocturnal mammals Brush-tailed Phascogale and Eastern Pygmy Possum	<ul style="list-style-type: none"> • Spotlighting on foot • Hair funnels • Remote cameras 	<p>2hrs of spotlighting x 2 people x 2 nights walking at approximately 1 km per hour (8 person hours)</p> <p>48 hair funnels baited with universal bait for 41 nights (3 June -13 July) (1968 trap nights)</p> <p>24 remote cameras set for 41 nights (3 June -13 July) (984 camera nights). 12 baited with sardines targeting Brush-tailed Phascogale, 12 with universal bait and sprayed with honey water.</p>
Koala	<ul style="list-style-type: none"> • Habitat assessment • Spotlighting • Remote cameras 	<p>2hrs of spotlighting x 2 people x 2 nights walking at approximately 1 km per hour (8 person hours)</p> <p>24 remote cameras set for 41 nights (3 June -13 July) (984 camera nights)</p>

2.5.5 Threatened species and habitat

Three threatened species requiring species credits have been recorded within the North Tuncurry Biobank site to date, being Tuncurry Midge Orchid (*Genoplesium littorale*), Brush-tailed Phascogale (*Phascogale tapoatafa*) and Eastern Pygmy Possum (*Cercartetus nanus*). One threatened species has been assumed present being the Koala *Phascolarctos cinereus*.

Genoplesium littorale (Tuncurry Midge Orchid)

Genoplesium littorale (syn. *Corunastylis littoralis*) (TMO) is a recently described terrestrial orchid species (Jones 2001) which is listed as Critically Endangered under the TSC Act and EPBC Act (as *C. littoralis*). TMO is a renascent terrestrial herb, which occur as underground tubers throughout winter and spring. A single tubular leaf to 25 cm high (Jones 2006) emerges following good rainfall in late summer. The inflorescence stalk emerges from the leaf from March to May supporting 5 to 30 flowers (Jones 2006). Pollination is mediated by flies of the family Chloropidae which are hypothesised to be attracted via 'kleptomyiophily', whereby flowers emit chemicals resembling those released by dying insects which attract kleptoparasitic flies (Bower, Towle & Bickel 2015). Following flowering and seed pod development, where successful pollination has occurred, stems wither and only underground tuber remain.

1,511 separate individuals of Tuncurry Midge Orchid have been recorded throughout the Biobank site between 2008 and 2013 (with special attention taken to ensure that individuals recorded in different

seasons are not the same individuals). Individuals were predominantly found along disturbed areas associated with the powerline corridor and informal tracks which bisect this site, predominantly in PCT 1702 (Dwarf Casuarina-Wallum Banksia heath) and PCT 1646 (Smooth-barked Apple-Blackbutt – Old Man Banksia woodland) and occasional records in PCT 772 (Coastal Banksia Heath) adjacent to PCT 164). The distribution of TMO records (together with a 30m record buffer) within the Biobank site is shown in **Figure 10**.

Brush-tailed Phascogale (*Phascogale tapoatafa*)

The Brush-tailed Phascogale is a small marsupial carnivore feeding mainly on invertebrates (Strahan 1995). It is one of the most arboreal of the dasyurids, seldom feeding on the ground, preferring to feed on prey captured by tearing away bark from rough barked species and also feeding on nectar (Strahan 1995). Nesting occurs in tree hollows, rotten stumps and bird nests, with lactating females preferring large tree hollows with small secure entrances (Strahan 1995).

This species was recorded by RPS in 2011 from within the Biobank site (and wider BCAA) within the 'Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast' and 'Coast Banksia-Coast Wattle dune scrub, Sydney Basin and South East Corner' (RPS 2012a). This species is considered likely to utilise all areas of the Biobank site except vegetation zone 13, the 'Dune' areas of PCT 772, although the 'Smooth-barked Apple - Blackbutt - Old Man Banksia woodland' vegetation type is considered to represent the best quality habitat for the species due to the density of potential nest sites (including hollow bearing trees) and foraging habitat (**Figure 11**). Despite targeted survey for this species between June and July 2020, the species was not re-recorded, which is consistent with its cryptic nature and difficulty to detect. However, it is considered likely to still be present in the Biobank area given that there has been no major clearing or degradation of its preferred habitat since the original records in 2011, and the biobank site forms part of a very large, continuously connected areas of vegetation to Darawank Nature Reserve.

Whilst the numerous small tracks across the Biobank site do not represent a movement barrier to the Brush-tailed Phascogale, these areas have not been included in the habitat polygon for the species, as they are not mapped as a vegetation zone. Accordingly, a habitat polygon of 278.6 ha has been determined for this species, excluding the 3.95 ha TMO reserve (which will become isolated following future development). This habitat polygon is consistent with the habitat polygon in the Biocertification assessment (ELA 2019). The locations and habitat for the Brush-tailed Phascogale is shown in **Figure 11** and has been categorised into the categories as detailed in **Table 12**.

Eastern Pygmy-possum (*Cercartetus nanus*)

The Eastern Pygmy-possum is a small possum which occurs from rainforests through sclerophyll forest to heaths (Strahan 1995). Eastern Pygmy-possum feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, although soft fruits are eaten when flowers are unavailable. It is an important pollinator of heathland plants such as banksias. It also feeds on insects throughout the year and this feed source may be more important in habitats where flowers are less abundant such as wet forests (Strahan 1995). This species shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, *Pseudocheirus peregrinus* (Ringtail Possum) dreys or thickets of vegetation, (e.g. grass-tree skirts). It appears to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares (Strahan 1995).

This species was recorded by RPS in 2011 from close to the boundary of the 'Coast Banksia-Coast Wattle dune scrub, Sydney Basin and South East Corner' and 'Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast' vegetation types within the Biobank site. This species is considered likely to utilise all areas of the Biobank site except vegetation

zone 13, the 'Dune' areas of PCT 772, due to the supply of feed species and nesting opportunities). Despite targeted survey for this species between June and July 2020, the species was not re-recorded, which is consistent with its cryptic nature and difficulty to detect. However, it is considered likely to still be present in the Biobank area given that there has been no major clearing or degradation of its preferred habitat since the original records in 2011, and the biobank site forms part of a very large, continuously connected areas of vegetation to Darawank Nature Reserve.

Whilst the numerous small tracks across the study area do not represent a movement barrier to the Eastern Pygmy Possum, these areas have not been included in the habitat polygon for the species in Biobank site, as they are not mapped as a vegetation zone. Accordingly, a habitat polygon of 278.6 ha has been determined for this species, excluding the 3.95 ha TMO reserve. (which will become isolated following future development). This habitat polygon is consistent with the habitat polygon in the Biocertification assessment (ELA 2019). The locations and habitat for the Eastern Pygmy-possum is shown in **Figure 12** and has been categorised into the categories as detailed in **Table 12**.

Koala (*Phascolarctos cinereus*)

Koala occurs in eastern Australia, from north-eastern Queensland to south-eastern South Australia and to the west of the Great Dividing Range. However, Koala is also a highly cryptic species when occurring at low density, and recent research by Close et al. (in press) concluded that Koala can exist and utilise habitat at quite low densities (around 0.01 animals per ha), utilising larger home ranges than in higher density populations. The species is very difficult to detect at such low densities.

The most important factor influencing Koala occurrence is the suite of food tree species available. In any one area, Koala rely primarily on regionally specific primary and/or secondary food tree species. If primary food tree species are not present or occur in low density, Koala will rely on secondary food tree species, but the carrying capacity of the habitat (i.e. number of animals per hectare) is inevitably lower. Although primary and secondary food trees provide the bulk of a koala's diet, leaves from other species, including non-eucalypts, may provide a seasonal or supplementary dietary resource. The quality of habitat is also influenced by the presence of suitable shelter trees, particularly in harsh climates, such as cypress pine and brush box (DECCW 2008).

At Tuncurry, DEC (2003) recognises Swamp Mahogany (*Eucalyptus robusta*) and Tallowwood (*E. microcorys*) as of primary importance to Koala with other species utilised to a lesser extent including Broad-leaved Paperbark (*Melaleuca quinquenervia*), Blackbutt (*E. pilularis*), Red Bloodwood (*Corymbia gummifera*) and Smooth-barked Apple (*Angophora costata*). DECCW (2008) also recognises White Stringybark (*E. globoidea*) as a supplementary feed species in the North Coast Koala Management Area. The *Smooth-barked Apple - Blackbutt - Old Man Banksia* forest at Tuncurry includes Swamp Mahogany, Blackbutt and Smooth-barked Apple and is thus considered suitable Koala habitat, despite Koala not being recorded in previous assessments or following additional targeted survey in 2020.

However, consistent with the habitat polygon in the biocertification assessment (ELA 2019) a habitat polygon of 64.23 ha has been determined for this species within the Biobank site. Whilst the numerous small tracks across the Biobank site do not represent a movement barrier to the Koala, these areas have not been included in the habitat polygon for the species in Biobank site, as they are not mapped as a vegetation zone. The habitat for Koala is shown in **Figure 13** and has been categorised into the categories as detailed in **Table 12**.

Table 12: Fauna Species Credit habitat within the North Tuncurry Biobank Site

Species credit species	Habitat	Area (ha)
Brush-tailed Phascogale	Areas of existing heathland and forest that currently provides habitat for the Brush-tailed Phascogale. This included all vegetation zones (1, 4, 5, 6 and 9) except for zone 13. Additionally, 3.95 ha was also removed as habitat as this will be a set aside for a TMO reserve.	278.6 ha
Eastern Pygmy Possum	Areas of existing heathland and forest that currently provides habitat for the Brush-tailed Phascogale. This included all vegetation zones (1, 4, 5, 6 and 9) except for zone 13. Additionally, 3.95 ha was also removed as habitat as this will be a set aside for a TMO reserve.	278.6 ha
Koala	Areas of existing forest that currently provides habitat for the Koala. This includes vegetation zones 5	64.23 ha

2.6 Changes to benchmark data

No changes to benchmark data were made in this assessment

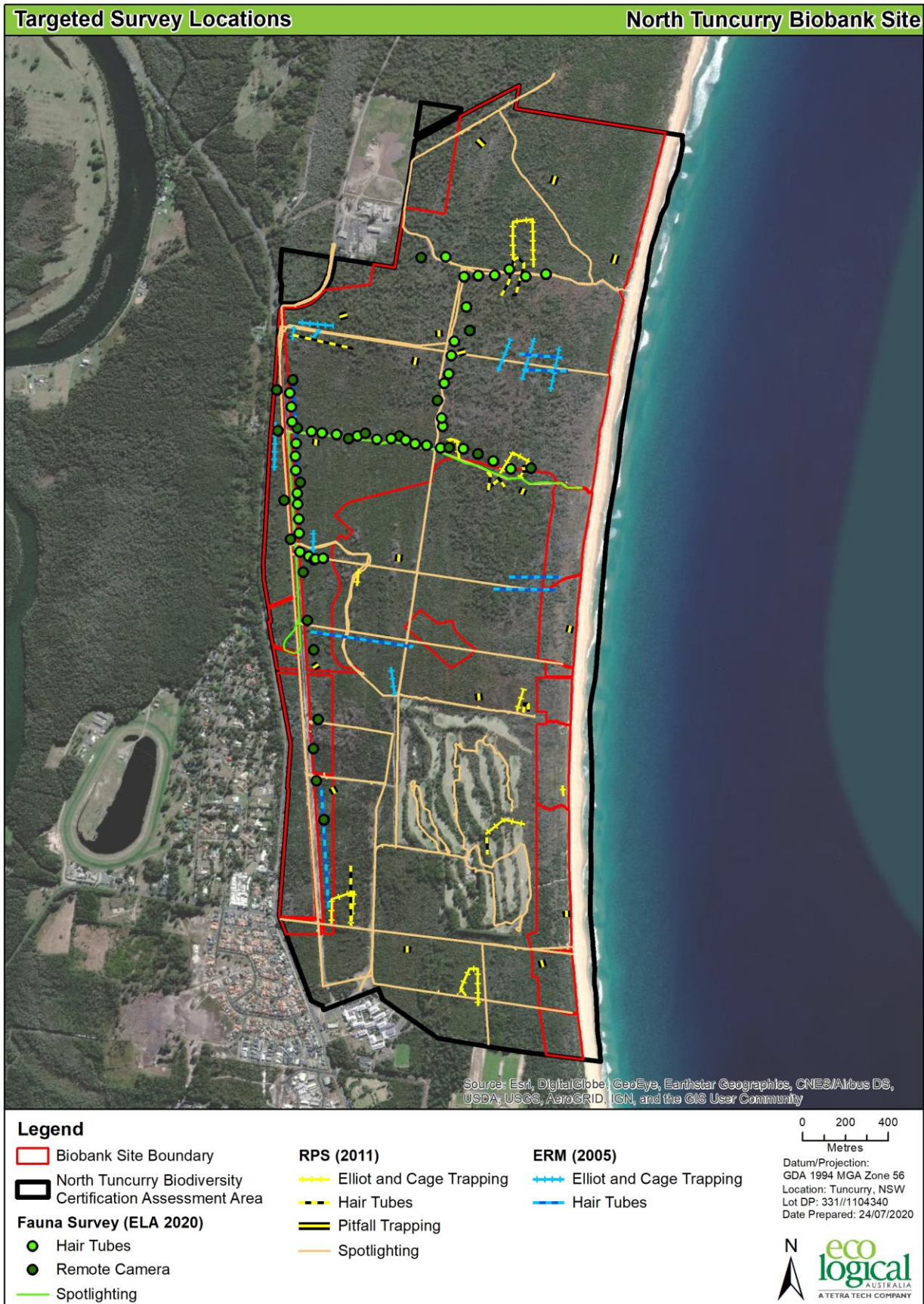


Figure 9: Targeted fauna survey locations

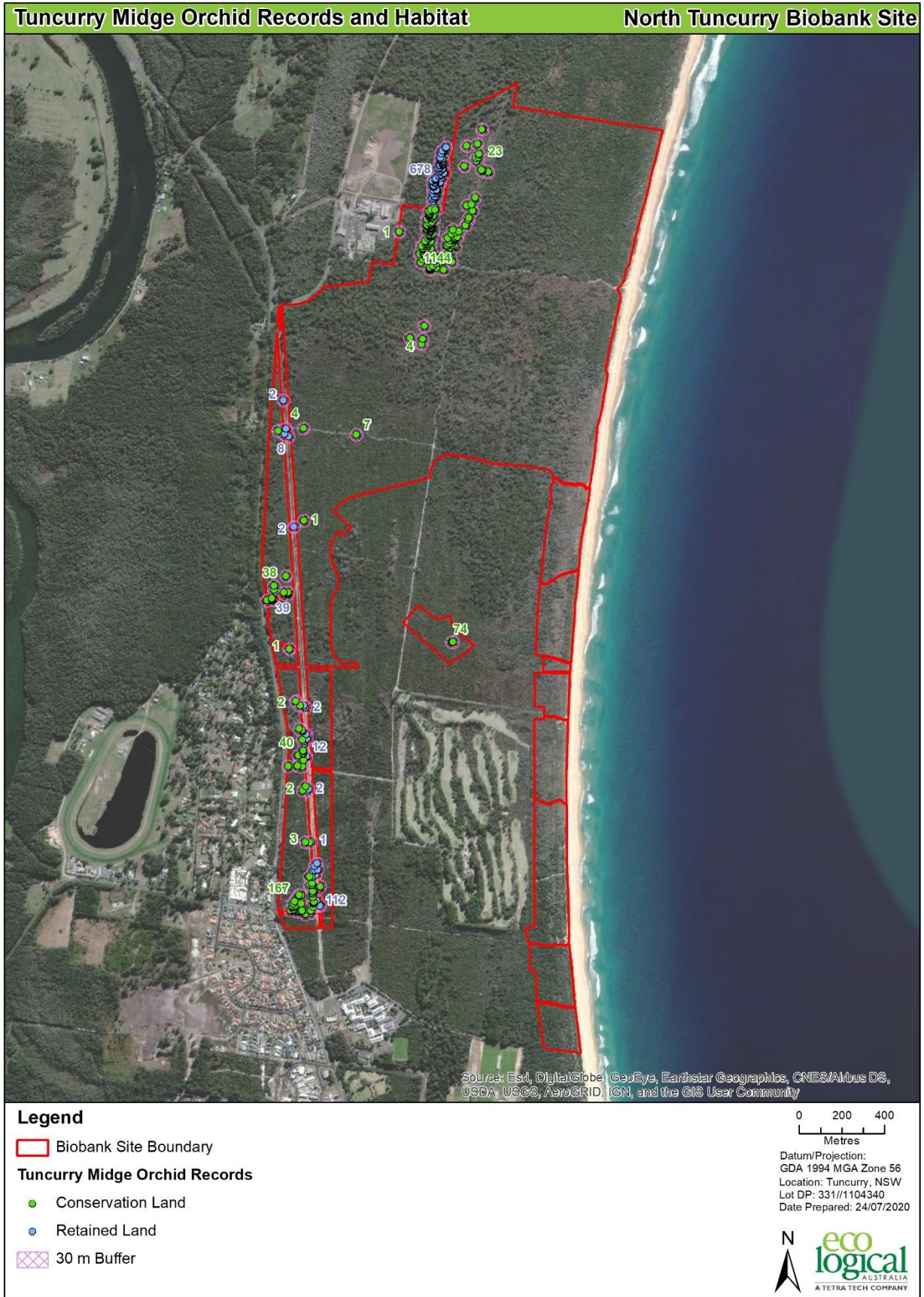


Figure 10: Tuncurry Midge Orchid locations and habitat polygons

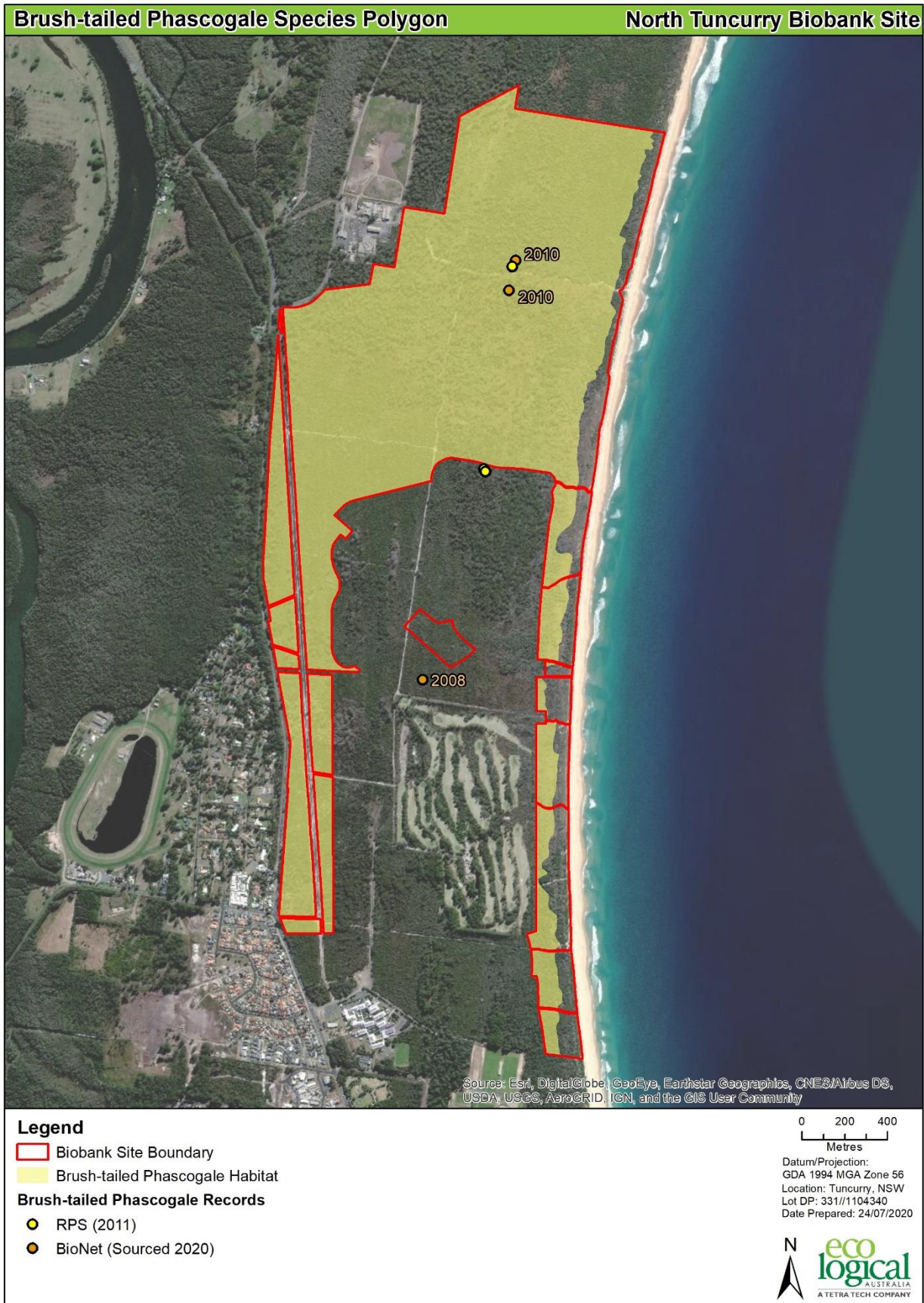


Figure 11: Brush-tailed Phascogale Records and Species Polygons



Figure 12: Eastern Pygmy Possum Records and Species Polygons

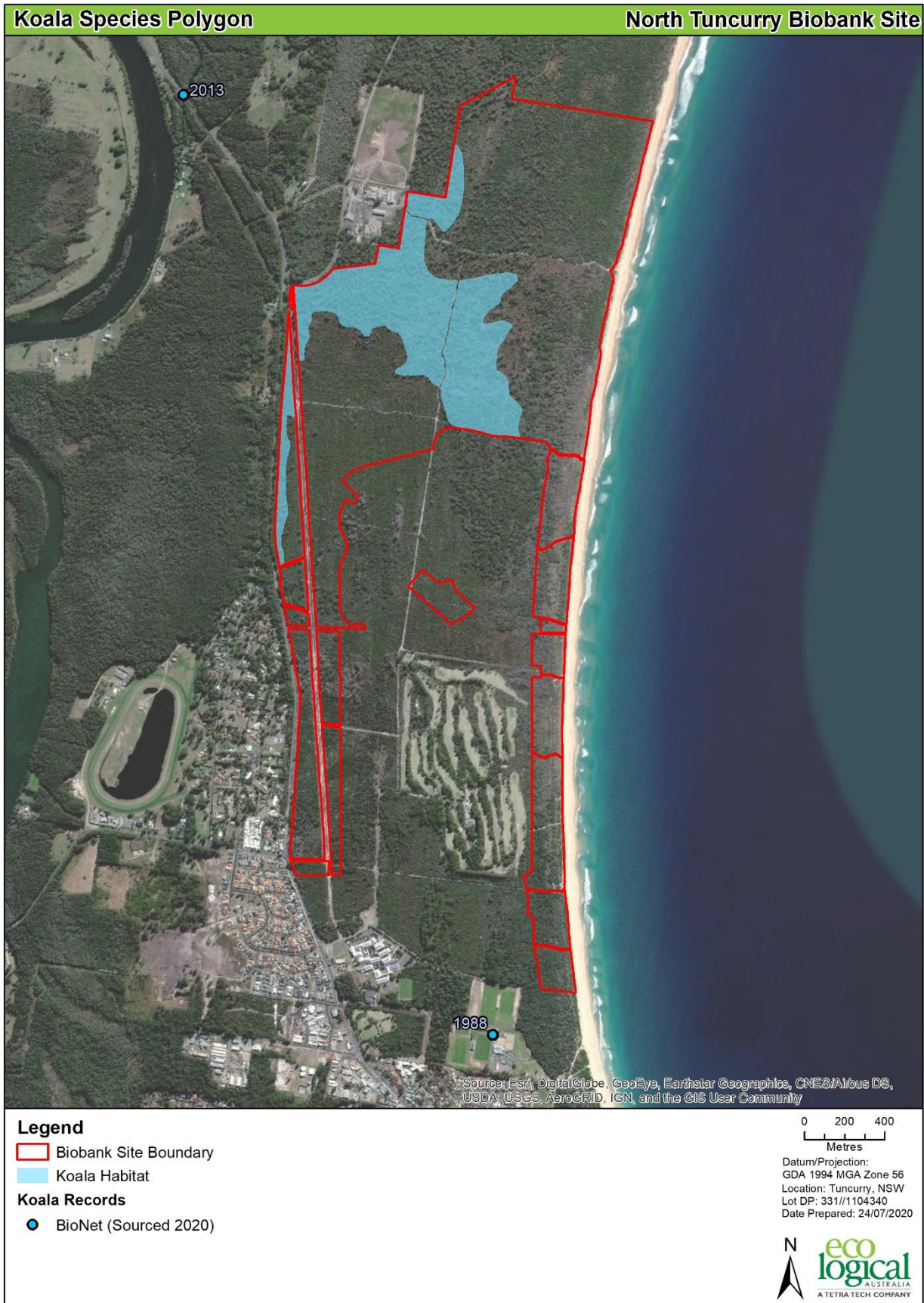


Figure 13: Koala (OEH records) and Species Polygons

3 Credits generated

3.1 Ecosystem credits

Table 13 shows the ecosystem credits generated for the North Tuncurry Biobank Site. A total of 3,011 ecosystem credits are generated by the Biobank Site. A copy of the credit report produced by the BBCC is provided in **Appendix D**.

All credits generated will be registered as 'committed' and retired in accordance with the Biocertification Agreement

Table 13: Ecosystem credits generated and credit profile

Veg zone ID	Plant community type	Condition	Area (ha)	Credits generated	Credits/ha
1	<i>1702 (HU916) Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast</i>	Moderate-Good (High)	83.26	858	10.3
4		Moderate-Good (Pine)	2.72	21	7.7
5	<i>1646 (HU 860): Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast</i>	Moderate-Good (High)	64.66	691	10.7
8		Moderate-Good (Pine)	4.34	41	9.4
9	<i>772 (HU530): Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion</i>	Moderate-Good (High)	127.57	1,102	8.6
13		Moderate-Good (Dune)	31.69	298	9.4
Total			314.12	3,011	-

3.2 Species credits

Table 14 shows the results of the species credit calculations. A copy of the credit report produced by the BBCC is provided in **Appendix D**. The North Tuncurry Biobank Site currently generates a total of 15,140 species credits for Brush-tailed Phascogale, Eastern Pygmy Possum, Koala and Tuncurry Midge Orchid.

Table 14: Species credits generated and credit profile

Species credit species	Area (ha) or count	Credits generated
Brush-tailed Phascogale	278.6 ha	1,978
Eastern Pygmy Possum	278.6 ha	1,978
Koala	64.23 ha	456
Tuncurry Midge Orchid	1,511	10,728
Total		15,140

4 Existing management obligations

There are no covenants or conservation funding arrangements for the North Tuncurry Biobank Site, and the entire Biobank Site is to be managed for ecosystem credits. The proposed Biobank site has no existing management obligations.

Based on the above, ELA is of the opinion that there is no requirement to 'discount' the number of credits generated.

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Appendix A Flora species recorded

Provided as a separate excel document due to size

Appendix B Biometric plot and transect data

Plot number	Native Plant Species	Native over-storey (%)	Native mid-storey cover (%)	Native ground cover – grasses (%)	Native ground cover – shrubs (%)	Native ground cover – other (%)	Exotic plant cover (%)	# Tree hollows	Over-storey regeneration	Fallen logs	Easting	Northing	Zone
<i>Zone 1: Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast – Moderate-Good (high)</i>													
TC-09	18	12	1	0	60	14	0	0	1	1	452695	6443358	56
TC-10	18	4.3	0	0	72	40	0	0	1	1	452075	6444347	56
TC-11	14	11.5	24.4	0	22	6	0	1	1	0	452371	6444209	56
TC-12	14	20.5	13.1	0	18	2	0	2	1	0	452117	6443689	56
TC-13	21	30.5	16	0	28	42	0	0	1	3	451980	6443601	56
TC-16	25	9.5	9	0	4	12	0	1	1	1	452152	6442598	56
TC-17	19	18	0.9	0	58	8	0	0	1	2	452171	6442772	56
BB36	24	8.5	16	0	20	12	0	0	1	0	452045	6441996	56
BB37	28	2.7	0.7	0	80	6	0	0	1	2	452077	6442377	56
<i>Zone 4: Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast – Moderate-Good (Pine)</i>													
TC-14	22	29	5.2	0	12	12	0	3	1	18	452022	6443021	56
TC-15	22	13	0.4	2	50	10	5	4	1	5	452010	6443255	56
BB28	34	37.5	0	0	16	52	0	0	1	1	452065	6442772	56
<i>Zone 5: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast– Moderate-Good (high)</i>													
TC-04	20	8	4.2	0	4	34	0	3	1	1	453042	6444176	56

Plot number	Native Plant Species	Native over-storey (%)	Native mid-storey cover (%)	Native ground cover – grasses (%)	Native ground cover – shrubs (%)	Native ground cover – other (%)	Exotic plant cover (%)	# Tree hollows	Over-storey regeneration	Fallen logs	Easting	Northing	Zone
TC-05	10	13	1	0	2	60	0	1	0	23	452744	6444368	56
TC-06	14	15	2.5	0	6	74	0	0	1	2	452792	6444225	56
TC-07	27	33	27	0	10	36	0	0	1	22	451908	6443750	56
TC-08	17	21.5	26.2	4	4	38	0	0	0	7	451940	6444285	56
<i>Zone 8: Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast– Moderate-Good (Pine)</i>													
TC18	39	2.7	2.7	4	2	20	0	0	1	117	451990	6442100	56
TC-19	20	14.9	0	12	2	78	0	1	1	28	452125	6443002	56
TC-20	26	26.7	10.7	0	54	24	0	0	1	8	452014	6442307	56
<i>Zone 9: Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion– Moderate-Good (high)</i>													
TC-01	18	17	0.5	6	0	78	0	0	1	7	453307	6444100	56
TC-03	23	16	13	10	0	62	0	0	1	32	453231	6443661	56
TC-21	16	17.5	0	30	0	58	0	0	1	35	453207	6443272	56
TC-22	17	27.5	7.2	6	2	74	3	0	1	13	453198	6441913	56
TC-23	18	37.5	2.7	0	0	56	4	1	1	11	453215	6441557	56
TC-24	27	41	0.2	0	0	62	2	0	1	16	453222	6441662	56
<i>Zone 13: Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion – Moderate-Good (Dune)</i>													
TC-02	15	0.7	0	62	0	16	0	0	1	4	453393	6444147	56
TC-25	20	0	1.5	58	4	2	2	1	1	18	453280	6443171	56

Plot number	Native Plant Species	Native over-storey (%)	Native mid-storey cover (%)	Native ground cover – grasses (%)	Native ground cover – shrubs (%)	Native ground cover – other (%)	Exotic plant cover (%)	# Tree hollows	Over-storey regeneration	Fallen logs	Easting	Northing	Zone
TC-26	21	12	3.5	20	6	6	22	0	1	22	453263	6442150	56
TC-27	17	37.5	0.3	16	12	2	12	0	1	1	453338	6441513	56

Appendix C Predicted threatened species and species requiring survey

Predicted species (ecosystem credits) – survey not required

Common name	Scientific name	TS multiplier	offset
Barking Owl	<i>Ninox connivens</i>	3.0	
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis</i> subsp. <i>gularis</i>	1.3	
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus</i> subsp. <i>victoriae</i>	2.0	
Bush Stone-curlew	<i>Burhinus grallarius</i>	2.6	
Common Blossom-bat	<i>Syconycteris australis</i>	1.2	
Diamond Firetail	<i>Stagonopleura guttata</i>	1.3	
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	2.2	
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	2.2	
Eastern Grass Owl	<i>Tyto longimembris</i>	1.3	
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	2.0	
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	1.8	
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	2.2	
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis</i> subsp. <i>temporalis</i>	1.3	
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata</i> subsp. <i>cucullata</i>	1.7	
Little Eagle	<i>Hieraaetus morphnoides</i>	1.4	
Little Lorikeet	<i>Glossopsitta pusilla</i>	1.8	
Masked Owl	<i>Tyto novaehollandiae</i>	3.0	
Powerful Owl	<i>Ninox strenua</i>	3.0	
Speckled Warbler	<i>Chthonicola sagittata</i>	2.6	
Spotted Harrier	<i>Circus assimilis</i>	1.4	

Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	2.6
Square-tailed Kite	<i>Lophoictinia isura</i>	1.4
Squirrel Glider	<i>Petaurus norfolcensis</i>	2.2
Swift Parrot	<i>Lathamus discolor</i>	1.3
Turquoise Parrot	<i>Neophema pulchella</i>	1.8
Varied Sittella	<i>Daphoenositta chrysoptera</i>	1.3
Yellow-bellied Glider	<i>Petaurus australis</i>	2.3
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	2.2

Species requiring survey (species credits)

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Austral Toadflax	<i>Thesium australe</i>	Yes	Yes							Yes	Yes	Yes	Yes
Black-eyed Susan	<i>Tetradlea juncea</i>							Yes	Yes	Yes	Yes	Yes	Yes
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Camfield's Stringybark	<i>Eucalyptus camfieldii</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Charmhaven Apple	<i>Angophora inopina</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Common Planigale	<i>Planigale maculata</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Australian Underground Orchid	<i>Rhizanthella slateri</i>									Yes	Yes	Yes	
Eastern Chestnut Mouse	<i>Pseudomys gracilicaudatus</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Osprey	<i>Pandion cristatus</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Pygmy-possum	<i>Cercartetus nanus</i>												
Emu population, NSW North Coast Bioregion and Port Stephens Local Government Area	<i>Dromaius novaehollandiae</i> - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eucalyptus parramattensis subsp. decadens	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Golden-tipped Bat	<i>Kerivoula papuensis</i>	Yes	Yes	Yes							Yes	Yes	Yes
Green and Golden Bell Frog	<i>Litoria aurea</i>	Yes	Yes	Yes					Yes	Yes	Yes	Yes	Yes
Green-thighed Frog	<i>Litoria brevipalmata</i>	Yes	Yes	Yes							Yes	Yes	Yes

Biobanking Agreement Credit Assessment Report: North Tuncurry Biobank Site

Grove's Paperbark	<i>Melaleuca groveana</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Koala	<i>Phascolarctos cinereus</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Koala population, Hawks Nest and Tea Gardens	<i>Phascolarctos cinereus</i> - endangered population Hawks Nest and Tea Gardens	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Leafless Tongue Orchid	<i>Cryptostylis hunteriana</i>	Yes	Yes									Yes	Yes
Nabiac Casuarina	<i>Allocasuarina simulans</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Netted Bottle Brush	<i>Callistemon linearifolius</i>	Yes	Yes	Yes						Yes	Yes	Yes	Yes
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Red Helmet Orchid	<i>Corybas dowlingii</i>						Yes	Yes	Yes				
Regent Honeyeater	<i>Anthochaera phrygia</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rough Doubletail	<i>Diuris praecox</i>							Yes	Yes				
Rufous Bettong	<i>Aepyprymnus rufescens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sand Doubletail	<i>Diuris arenaria</i>								Yes	Yes			
Sand Spurge	<i>Chamaesyce psammogeton</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Villous Mint-bush	<i>Prostanthera densa</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wallum Froglet	<i>Crinia tinnula</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix D Biobanking credit report

Provided as a separate Pdf report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 27/07/2020

Time: 11:26:16AM

Calculator version: v4.0

Biobank details

Proposal ID: 145/2020/5067B

Proposal name: North Tuncurry Biobank Site

Proposal address: The Lakes Way Darawank NSW 2560

Proponent name: Landcom

Proponent address: The Lakes Way Darawank NSW 2560

Proponent phone: 0412997409

Assessor name: Lily Gorrell

Assessor address: Level 7, Suites 28 & 29 19 Bolton St Newcastle NSW 2300

Assessor phone: (02) 49103401

Assessor accreditation: 145

Additional information required for approval:

- Use of local benchmark
- Expert report...
- Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	159.14	1,400.00
Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	85.98	879.00
Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	69.00	732.00
Total	314.12	3,011

Credit profiles

1. Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast, (HU860)

Number of ecosystem credits created	732
IBRA sub-region	Karuah Manning

2. Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion, (HU530)

Number of ecosystem credits created	1,400
IBRA sub-region	Karuah Manning

3. Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast, (HU916)

Number of ecosystem credits created	879
IBRA sub-region	Karuah Manning

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Brush-tailed Phascogale	Phascogale tapoatafa	278.60	1,978
Eastern Pygmy-possum	Cercartetus nanus	278.60	1,978
Koala	Phascolarctos cinereus	64.23	456
Tuncurry Midge Orchid	Genoplesium littorale	1,511.00	10,728

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Brush-tailed Phascogale	Exclude commercial apiaries
Brush-tailed Phascogale	Exclude miscellaneous feral species
Brush-tailed Phascogale	Fox control
Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Exclude commercial apiaries
Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species
Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Fox control
Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Slashing
Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	Control of feral pigs
Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	Feral and/or over-abundant native herbivore control
Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	Fox control
Dwarf Casuarina - Wallum Banksia heath on coastal headlands of Central Coast	Slashing
Eastern Pygmy-possum	Fox control
Koala	Exclude miscellaneous feral species
Koala	Slashing
Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Exclude commercial apiaries
Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Exclude miscellaneous feral species

Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Feral and/or over-abundant native herbivore control
Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Fox control
Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Slashing
Tuncurry Midge Orchid	Feral and/or over-abundant native herbivore control



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