BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Ilmenite Stockpile Rehabilitation Project

Point Plomer Road, Crescent Head NSW

Prepared for

Greencoast Environmental Rehabilitation

by

Greenloaning Biostudies Pty Ltd

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Report No. *2002001RP1*

The preparation of this report has been in accordance with the brief provided by the Client and in compliance with the requirements of the *Biodiversity Assessment Method Order* 2017. Assessments provided therein have relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances, including the outcomes from the Biodiversity Assessment Method process. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted.

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Glossary of Terms

BAM Biodiversity Assessment Method Order 2017 (NSW)

BC Act Biodiversity Conservation Act 2016 (NSW)

BDAR Biodiversity Development Assessment Report

BOS Biodiversity Offsets Scheme

BV Biodiversity Value

Cth Commonwealth

DA Development Application

Dbh Diameter breast height

[the] Impact Area/Footprint Proposed area for resource recovery

EPBC Act *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

HTE High Threat Exotic

LGA Local Government Area

NSW New South Wales

OEH Office of Environment and Heritage

[the] Subject property The entire Lot 2281, DP 1153793 encompassing the proposed resource recovery area

SEARs Secretary's Environmental Assessment Requirements

Executive Summary

S.1 BACKGROUND AND PURPOSE

Greenloaning was commissioned to prepare a Biodiversity Development Assessment Report for the proposed removal and subsequent rehabilitation of an ilmenite stockpile at Lot 2281 on DP 1153793, Plomer Road, Crescent Head, New South Wales. The stockpile/resource recovery site is a former mineral separation plant or 'dry mill' that ceased operation in 1985. The subject property is located within Crown land approximately 1km south of the township of Crescent Head and 0.5 km west of the Pacific Ocean. The purposes of the Crown reserve are: Environmental Protection and Public Recreation.

As part of the assessment process relating to biodiversity, Greenloaning have determined that a Biodiversity Development Assessment Report is required for the proposed resource recovery operations on the basis of part of the subject property and proposed resource recovery area being mapped as of 'High Biodiversity Value' as shown on the Biodiversity Value Map under the *Biodiversity Assessment Method Order 2016 (NSW).* Since being abandoned around 30 years ago, the site has been left to regenerate naturally which has resulted in both native species and weed infestations, in particular Lantana (*Lantana camara*).

Greencoast Environmental Rehabilitation is seeking approval under the *Mining Act 1992* (NSW) to remove the Ilmenite stockpile down to natural ground level and subsequently rehabilitate the stockpile footprint, which covers an area of approximately two hectares. The resource recovery operation would entail clearing of the following:

- the regenerating vegetation occurring on/within the stockpile, including a small number of isolated trees;
- a very small patch of remnant and regenerating trees and understorey representing a form of Swamp Mahogany Swamp Forest on Coastal Lowlands, albeit lacking in swampy attributes;
- a small patch of regenerating (young mature) Swamp Oak (*Casuarina glauca*), representing a regenerating form of Swamp Oak swamp forest;

The total area of clearing comprises 1.37ha, encompassing .08ha of Swamp Oak swamp forest (non-Threatened Ecological Community) and 1.29ha of Swamp Mahogany swamp forest (non-Threatened Ecological Community). The small patches of remnant forest/woodland occurring in the north and south of the stockpile will be retained and no other disturbance to the surrounding vegetation will occur.

The primary purpose of this report is to provide an assessment of the biodiversity values of the proposed resource recovery area that is in compliance with the requirements of the Biodiversity Conservation Act and the Biodiversity Assessment Method. The report also will provide details on any credit requirements for the proposed resource recovery, as per the

NSW Biodiversity Offset Scheme and address any additional requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

S.2 KEY SITE ATTRIBUTES

The site is located within the Kempsey Local Government Area. The shire falls within the NSW North Coast Interim Biodiversity Regionalisation for Australia Region and Macleay-Hastings Subregion. The Impact Area footprint is located on an Alluvial Plain System of Quaternary alluvial and colluvial fan comprising fluvial sand, silt, gravel and clay, which extends to the south of the site. The soils immediately south of the stockpile have a high probability of occurrence of Acid Sulfate Soils, while the soils under the stockpile itself have not been assessed.

The topography of the subject property surrounding the stockpile is flat with a gradual south east slope towards the beach. The elevation of the stockpile varies from 6m to 13m. Removal of the stockpile is expected to result in a ground profile similar to the surrounding gently undulating topography. The drainage of the stockpile and underlying ground surface (quartz sand) reflects the low runoff and high infiltration capacity of black and quartz sand. A shallow drainage trench on the eastern boundary of the stockpile is likely to be a relic from sand mining operations and tends to contain standing water at the southern end. Two first order streams occur in close proximity but outside the proposed resource recovery footprint. There are no Important Wetlands within close proximity to the site as defined in "A Directory of Important Wetlands in Australia"

At a broad scale, the subject property falls entirely within the North East NSW Fauna Corridor and the North East NSW Climate Change Corridor, is surrounded by NPWS Estate and is adjacent to Fauna Key Habitats. At a local scale, the subject property is primarily vegetated, supporting a mixture of remnant and regenerating native vegetation communities and exotic species. The total extent of native vegetation within a 1500m buffer area extending from, and including the subject property, has been calculated as 62%.

The total area of native vegetation inside the buffer area is contiguous and extends for considerable distances outside the buffer area and forms one patch which exceeds the maximum patch class size of >100ha under the Biodiversity Assessment Method process.

S.3 ASSESSMENT METHODS

The primary aims of the assessment procedures were to obtain appropriate data for the impact assessment process, and to comply with the Biodiversity Assessment Method requirements. Integral to the assessment process has been the due consideration of relevant procedures as required under the BAM, whilst also taking into account the limited nature of the proposed resource recovery and specific site attributes. Thus there has been a robust desktop assessment process, in conjunction with site-specific surveys, the latter focusing primarily on vegetation community attributes via plot sampling, general and threatened plant species surveys and target threatened fauna species surveys. Specific procedures included small mammal Elliott trapping, spotlighting, harp trapping, microbat call detection, hair tube trapping and Koala SAT Plot sampling.

S.4 KEY SURVEY RESULTS

S.4.1 Flora

Five Plant Community Types have been identified as occurring on the subject property, viz;

1. PCT 686 - Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion
2. PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
3. PCT 1230 - Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion and
4. PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion; and
5. PCT 1536 - Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest.

The remnant and regenerating vegetation with the Impact Area have been assigned to PCT 1230 and PCT 1235 on the basis of species occurrence. However, these community identifications are considered as 'best fit' only and should be viewed in the context of recognising that the vegetation occurring on an ilmenite stockpile would not be representative of a natural system. Neither Plant Community Type on the stockpile represents a swampy system.

The surveys yielded 66 native plant species overall, as well as 10 weed species of which seven were High Threat Exotics as listed under the *Biodiversity Conservation Act 2016.*

S.4.2 Fauna

Fauna surveys yielded 20 bird species, 10 mammal species and three reptile species occurring within the subject property, the majority of which also were recorded within habitats occurring on the stockpile. Additional species would be expected to be recorded over time but the majority of species would be expected to frequent the forest/woodland habitats outside the proposed Impact Area.

S.4.3 Threatened Species

No threatened flora species were recorded during the site surveys, although there is always some potential for threatened species to occur. This would be most likely within the more extensive and higher condition habitats adjoining the stockpile area.

Two threatened mammal species were recorded during field surveys. The Koala (*Phascolarctos cinereus)*, was recorded from one pellet sample within the northern forest woodland remnant to be retained within the stockpile footprint. The results indicate the stockpile habitats to be 'low use' habitat for the species. Microbat detection surveys also yielded one record of the Little Bent-winged Bat (*Miniopterus australis*). One threatened bird species, the Little Lorikeet, was tentatively identified flying through the subject property. None of these three species would have any reliance on the habitats occurring within the resource recovery /Impact Area, although they may pass through/over the area. The lorikeet and microbat also could use the habitat for very limited foraging purposes.

S.5 IMPACT ASSESSMENT

Clearing of a total of approximately 1.37 ha of previously cleared and regenerating land, much of which has substantial HTE infestations, is unavoidable if the proposed resource recovery project is to proceed. The extent of clearing has been minimised however, by ensuring the resource recovery operations are to be located within the existing previously cleared area and not impinge on the remnant forest/woodland areas supporting Koala Food Trees and old growth/large mature trees, nor on the adjoining forested areas representing Threatened Ecological Communities. The clearing operations trigger the requirement for a total of 3 ecosystem credits to be retired under the Biodiversity Offset Scheme.

There will be some minor increases in habitat fragmentation within the ilmenite stockpile footprint for the duration of the resource recovery process and subsequent early stages of regeneration/rehabilitation of the Impact Area. There also will be some short term (approximately 36 weeks) increase in diurnal noise levels during weekdays. However, no threatened flora or fauna species is considered likely to be significantly adversely affected by the clearing activities and subsequent works within the resource recovery area. A range of mitigation measures are proposed to minimise any risks of physical damage to Koala Food Trees and habitat to be retained, and injury to fauna species from clearing operations.

The proposed management measures, encompassing preparation and implementation of a site-specific Revegetation/Rehabilitation Plan, are expected to improve the habitat value of the Impact Area and stockpile per se over time. The overall outcome will be protection of existing, albeit low use, Koala habitat within the subject property, a relatively short term loss of the current limited biodiversity values within the Impact Area, and in the longer term, a net gain in biodiversity stockpile area.

S.6 CONCLUSIONS

The following conclusions have been made on the basis of the Biodiversity Assessment Method process for the project:

- The subject property forms part of a patch of remnant and regenerating bushland, well connected with other coastal vegetation in the area and represents part of a defined wildlife corridor and key fauna habitat area;
- The total extent of native vegetation within the 1500 m buffer for the subject property has been estimated to be 62%;
- The resource recovery /Impact Area and subject property, have been subject to substantial past disturbances associated with sand mining operations in the 1950s to 1980s. The ilmenite stockpile was formed during the course of the sand mining activities;
- The majority of the resource recovery /Impact Area has been cleared previously, these areas supporting varying stages and forms of natural regeneration, including areas of dense ground cover, scattered regenerating native and exotic trees, a small patch of regenerating Swamp Oak and some dense Lantana infestations. Only two small patches of remnant forest/woodland remnant and regenerating vegetation have been retained within the general stockpile area;

- Five Plant Community Types have been identified as occurring on the subject property, with the identification of Plant Community Types occurring on the stockpile considered as 'best fit' only. Vegetation occurring on the ilmenite stockpile would not be representative of a natural system;;
- Both Plant Community Types identified within the resource recovery /Impact Area can represent Threatened Ecological Communities but the occurrence of these communities on an elevated ilmenite stockpile renders both communities as not conforming to the definition of the associated Threatened Ecological Communities align with Threatened Ecological Communities listed under the *Biodiversity Conservation Act 2016*,
- No threatened flora species has been detected on the subject property, or within the resource recovery /Impact Area, although there remains minor potential for such species to occur in the main body of vegetation to be retained,;
- One threatened fauna species, the Koala, was detected from one Koala pellet in one of the remnant forest/woodland patches to be retained. The results indicate that the stockpile habitat represents 'low use' Koala habitat;
- There was a tentative record of another threatened fauna species, the Little Lorikeet, flying through the subject property and microbat detection surveys yielded one record of the Little Bent-winged Bat. None of these three species would have any reliance on the habitats occurring within the resource recovery /Impact Area, although they may pass through/over the area. Development of the site will require the clearing of a total of 1.37 ha of regenerating vegetation, comprising 1.29 ha of low condition PCT 1230, and 0.08 ha of moderate condition PCT 1235. No old growth or large mature trees will be removed and the majority of young trees to be removed are less than 20 cm diameter breast height;
- There are no Serious and Irreversible Impacts associated with the project;
- The two patches of remnant and regenerating forest/woodland supporting Koala Food Trees will be retained and protected;
- All vegetation beyond the resource recovery /Impact Area, which encompasses some areas of Threatened Ecological Communities, will be retained and protected from disturbance during the course of the resource recovery operations;
- No credits are required to be retired for threatened fauna species, but the proposed clearing activities trigger the requirements for 3 ecosystem credits to be retired;
- The detailed measures required to protect vegetation to be retained, and to rehabilitate and revegetate the ilmenite stockpile post resource recovery operations will be provided in a site specific Revegetation/Rehabilitation Management Plan prior to the commencement of works on the subject property;
- The project will result in a short term loss in existing, but limited biodiversity values within the resource recovery /Impact Area, and short term (approximately 36 months) increases in local noise levels. The overall outcome in the long term however, is expected to be an improvement in biodiversity on the subject property.

S.7 RECOMMENDATIONS

The following broad measures are recommended to minimise short term risks of damage to habitat to be protected or injury to fauna during clearing operations, and to maximise the potential for long term positive biodiversity outcomes from the resource recovery project as a whole:

- All clearing and construction works follow best practice procedure, incorporating the measures provided in **Chapter 6** of this BDAR; and

- Habitat regeneration, enhancement processes and weed control measures be detailed in a site-specific Revegetation/Rehabilitation Management Plan for the property.

1 Introduction

1.1 INTRODUCTION AND BACKGROUND

Greenloaning was commissioned to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed removal and subsequent rehabilitation of an ilmenite stockpile at Lot 2281 on DP 1153793, Plomer Road, Crescent Head, NSW. The location of the proposed resource recovery area and associated subject property as a whole is indicated on **Figure 1** and **Figure 2**. The ilmenite will be transported offshore for reprocessing via a depot in South Kempsey and the Port of Newcastle (PS, 2019). A mineral separation plant previously operated on the site until 1985 in association with coastal sand mining activities (DoI, 2017). As the ilmenite stockpile is material from former sand mining activities (DoPE, 2017), it is likely to be classified as waste by the Environmental Protection Authority (EPA, 2017). The stockpile is located within (Mining) Exploration Licence 8085, held under Crown Reserve No. 1003 268 and comprises approximately 47,500m³ covering an area of 19,623m² (EPA, 2017).

In November 2017, Pandanus Solutions was appointed by the client, Greencoast Environmental Rehabilitation (GER), to prepare an Environmental Impact Statement (EIS), which is a requirement of the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (Resources and Geosciences) (PS, 2019). The EIS requirements include addressing the Biodiversity Assessment Method provisions of the revised Biodiversity Conservation Act 2016 (NSW) (BC Act) for a Development Application with Kempsey Shire Council (KSC).

Greenloaning have determined that a BDAR is required for the resource recovery as part of the subject property is mapped as being of 'High Biodiversity Value,' as shown on the Biodiversity Value Map (BV Map) (DPIE, 2020a) (refer to **Figure 3**). The BV Map forms part of the Biodiversity Offsets Scheme Threshold and is one of the triggers for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal (s7.3, *Biodiversity Conservation Regulation 2017* (NSW) [BC Reg]). The BDAR is required to be prepared according to the *Biodiversity Assessment Method Order 2017 (NSW)* (the BAM). A site-based assessment is required and the 1500m buffer zone for the subject property is required to be used to assess native vegetation cover under s4.2 and 4.3 of the BAM, as shown on **Figure 3**. Further details on the legislative and planning context for the proposed resource recovery, in the context of biodiversity, are provided in **Chapter 2** of this report.

GER is seeking approval under the *Mining Act 1992* (NSW) to remove the Ilmenite stockpile down to natural ground level and subsequently rehabilitate the stockpile footprint, which covers an area of approximately two hectares (ha) (PS, 2018). The boundary of the stockpile (the resource recovery/impact area) and vegetation occurring within is shown on **Figure 4** in

the context of the subject property. The area proposed for resource recovery comprises the stockpile and access track, the majority of which appears to have been abandoned and left to revegetate naturally, although there are some larger/old growth trees which must have been present prior to stockpile placement. The occurrence of these trees is discussed in detail in **Section 4.2.1** of the BDAR and general site attributes are discussed in **Section 1.4.4**.

The resource recovery would entail clearing of the following:

- the regenerating vegetation occurring on/within the stockpile, including a small number of isolated trees;
- a very small patch of remnant and regenerating trees and understorey representing a form of Swamp Mahogany Swamp Forest on Coastal Lowlands, albeit lacking in swampy attributes;
- a small patch of regenerating (young mature) Swamp Oak (*Casuarina glauca*), representing a regenerating form of Swamp Oak swamp forest; and

These areas all conform to the definition of 'native vegetation' under the Biodiversity Conservation Act 2016 (NSW) (BC Act). Although the forest communities can represent Threatened Ecological Communities, the occurrence of these communities on the stockpile render their status as not conforming to the respective TEC definitions (REFS).

The total area of clearing comprises 1.37ha, encompassing .08ha of Swamp Oak swamp forest and 1.29ha of Swamp Mahogany swamp forest (refer to **Sections 4.2 and 6.2**). The small patches of remnant forest/woodland occurring in the north and south of the stockpile will be retained and no other disturbance will occur in the surrounding vegetation (PS, 2019).

The resource recovery and subject property area have been the subject of previous studies, which have been drawn upon as background for this BDAR. These studies are included in the full reference list and bibliography provided at the end of the body of this report, but also are listed below as key sources of information for the BDAR:

- Greencoast Environmental. 'Stockpile Rehabilitation Crescent Head'. Site Survey report prepared by Pandanus Solutions for Greencoast Environmental Rehabilitation, Feb 2018. (PS, 2018);
- Pandanus Solutions. 'Crescent Head Ilmenite Stockpile Economic Rehabilitation Project - Environmental Impact Statement'. Prepared by Pandanus Solutions, December 2019 for Greencoast Environmental Rehabilitation as part of an application for Development Consent over Lot 2281/DP 115793, for Extractive Industries, section 1.5, Part 4 – Designated Development under the Environmental Planning and Assessment Act (1979). Submitted to Kempsey Shire Council. (PS ,2019);
- JB Enviro, 2018 'PRELIMINARY BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT For Rezoning of Lot 703 and 704 DP749885 and part Lot 707 DP1032859, Crescent Head Rd, Crescent Head'. Submitted to Kempsey Shire Council September 2018 (JBE, 2018);
- Biodiversity Value Map (Department of Planning, Industry and Environment 2020);
- Kempsey Shire Council website https://www.https://www.kempsey.nsw.gov.au/);
- SEED data Portal (DPIE, 2020d);
- BioNet Vegetation Classification Data Collection (DPIE, 2020e);
- BioNet Atlas (DPIE, 2020f);

- Threatened Species Profiles DPIE, 2020g);
- Atlas of Living Australia (ALA, 2020)

1.2 PURPOSE OF REPORT

The primary purpose of this BDAR is to provide an assessment of the biodiversity values of the proposed resource recovery area that is in compliance with the requirements of the BC Act and the BAM. The report will also provide details on any credit requirements for the proposed resource recovery, as per the NSW BOS and address any additional requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). The assessment process however, is subject to an approved bilateral agreement between the Commonwealth and NSW such that the Commonwealth Minister for the Environment, when assessing actions under the EPBC Act, can rely on the NSW specified environmental impact assessment processes (DoE, 2015).

The report also is to comply with all other relevant legislation, as detailed in **Chapter 2** of the BDAR.

1.3 SCOPE OF WORKS

The scope of works has been determined primarily according to the specific requirements of the BAM, with reference to the summary of requirements provided in **Table 25** and **Table 26**, **Appendix 10** of the BAM. Slightly summarised versions of these tables are presented in **Appendix A** of this BDAR, together with details on the relevant sections/items within the BDAR that address the various requirements. In brief, the scope of works was determined to entail the following key tasks:

1. Preliminary desktop assessments to identify existing information and mapping relevant to the subject property and impact area;
2. An initial inspection of the proposed impact area and the immediate surroundings, and preliminary site surveys, to confirm generally the site features, representation of vegetation communities and vegetation condition;
3. Follow-up comprehensive desktop assessments to determine the likely extent and distribution of vegetation zones and extent of additional surveys required and preparation of relevant background GIS maps;
4. Plot-based sampling and field surveys as determined to be required by the desktop assessments and any additional information obtained during the initial vegetation sampling process;
5. Data entry into the BAM Calculator to determine the vegetation integrity score, particularly for the proposed impact area and whether any ecosystem or species credits would be required to be retired;
6. Preparation of the BDAR report;
7. Submission of the Biodiversity Credit Report from the BAM Calculator to the Office of Environment and Heritage (OEH); and
8. Review of feedback on the BDAR and Biodiversity Credit Report and updating of relevant components of these documents as may be required.

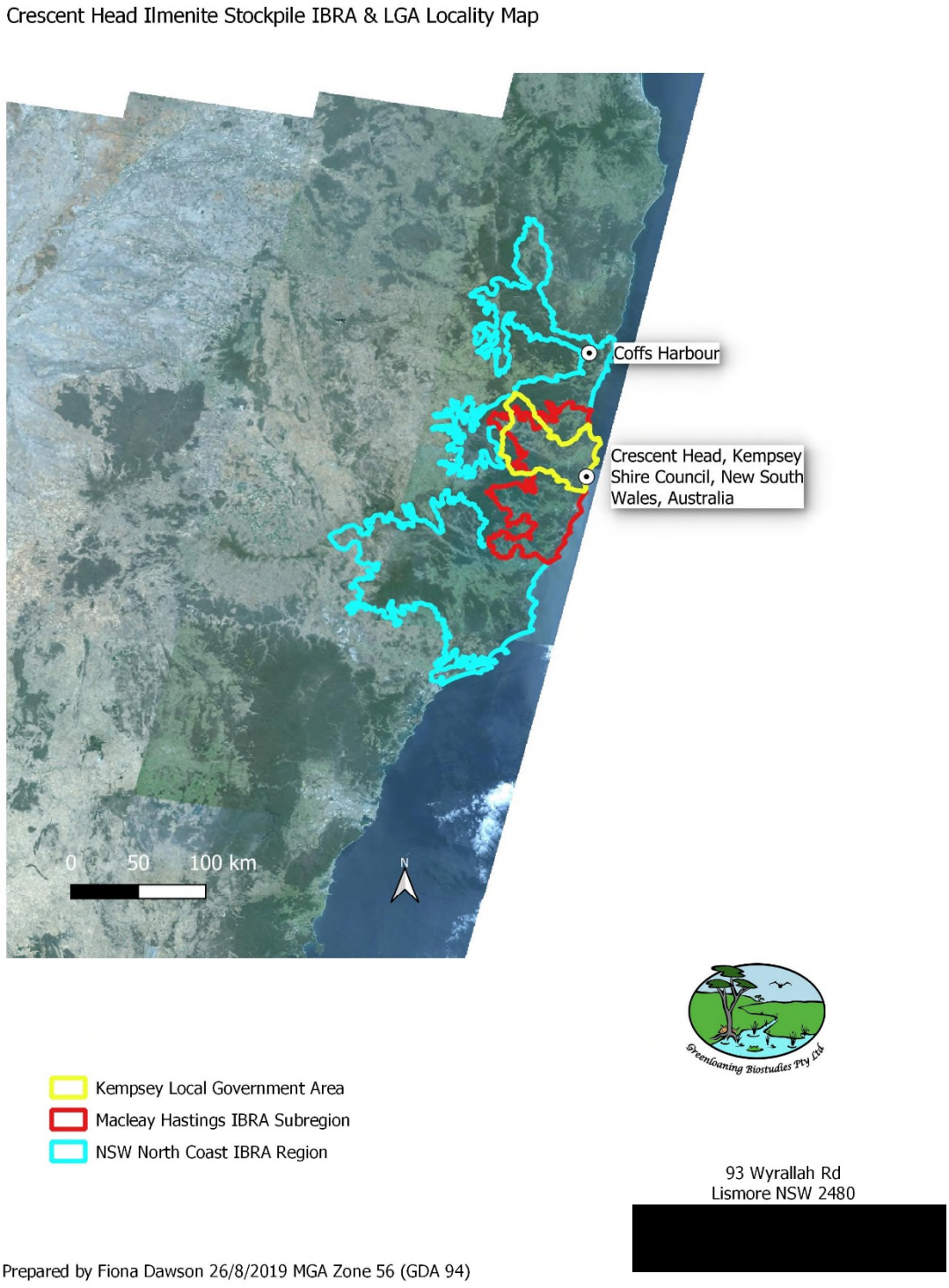


Figure 1 Location of subject property within the Local Government Authority and Interim Biogeographic Regionalisation for Australia (IBRA) indicating the Region and Subregion.

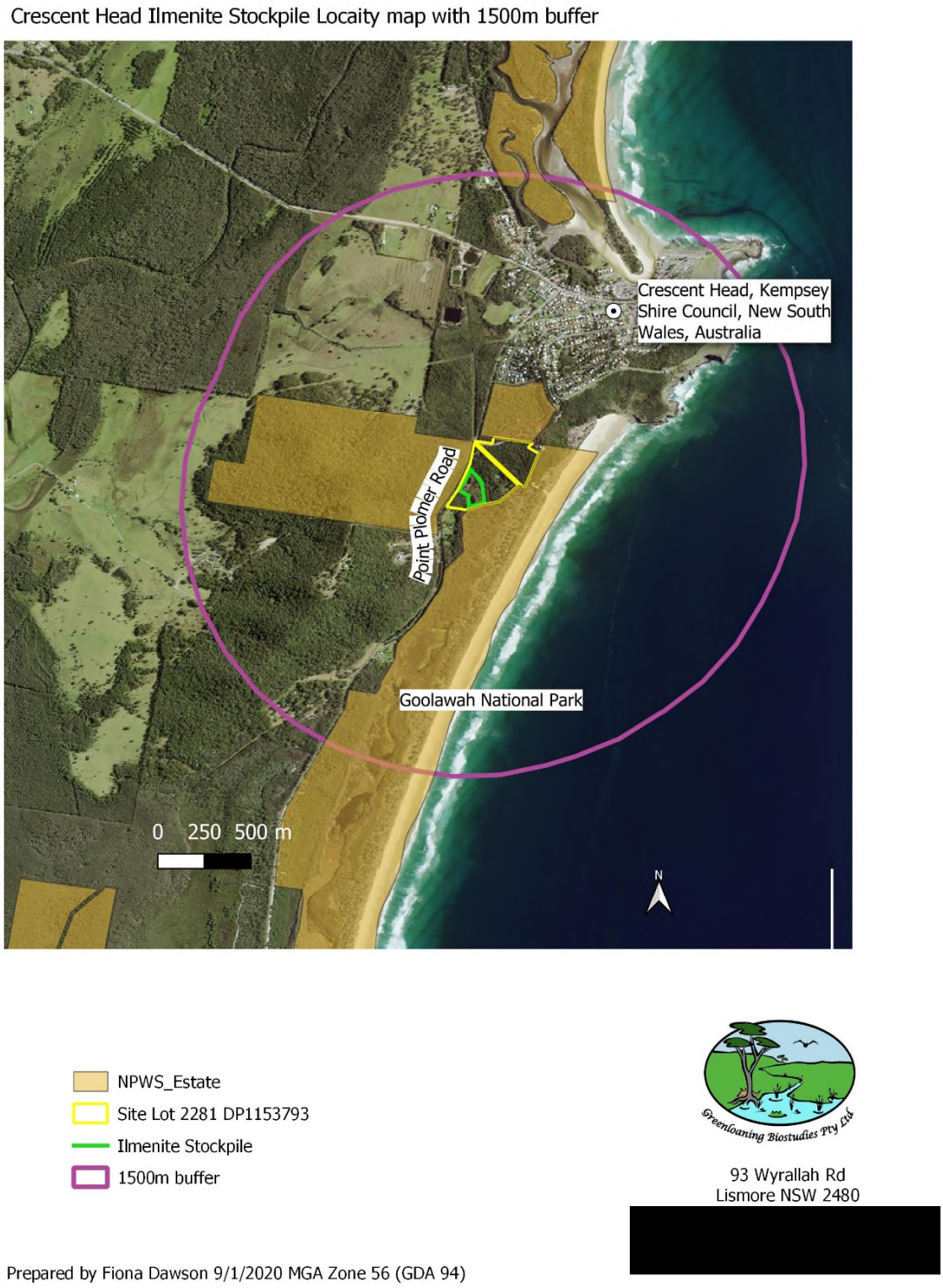


Figure 2 Location Map of subject property with key landscape features and 1500m buffer

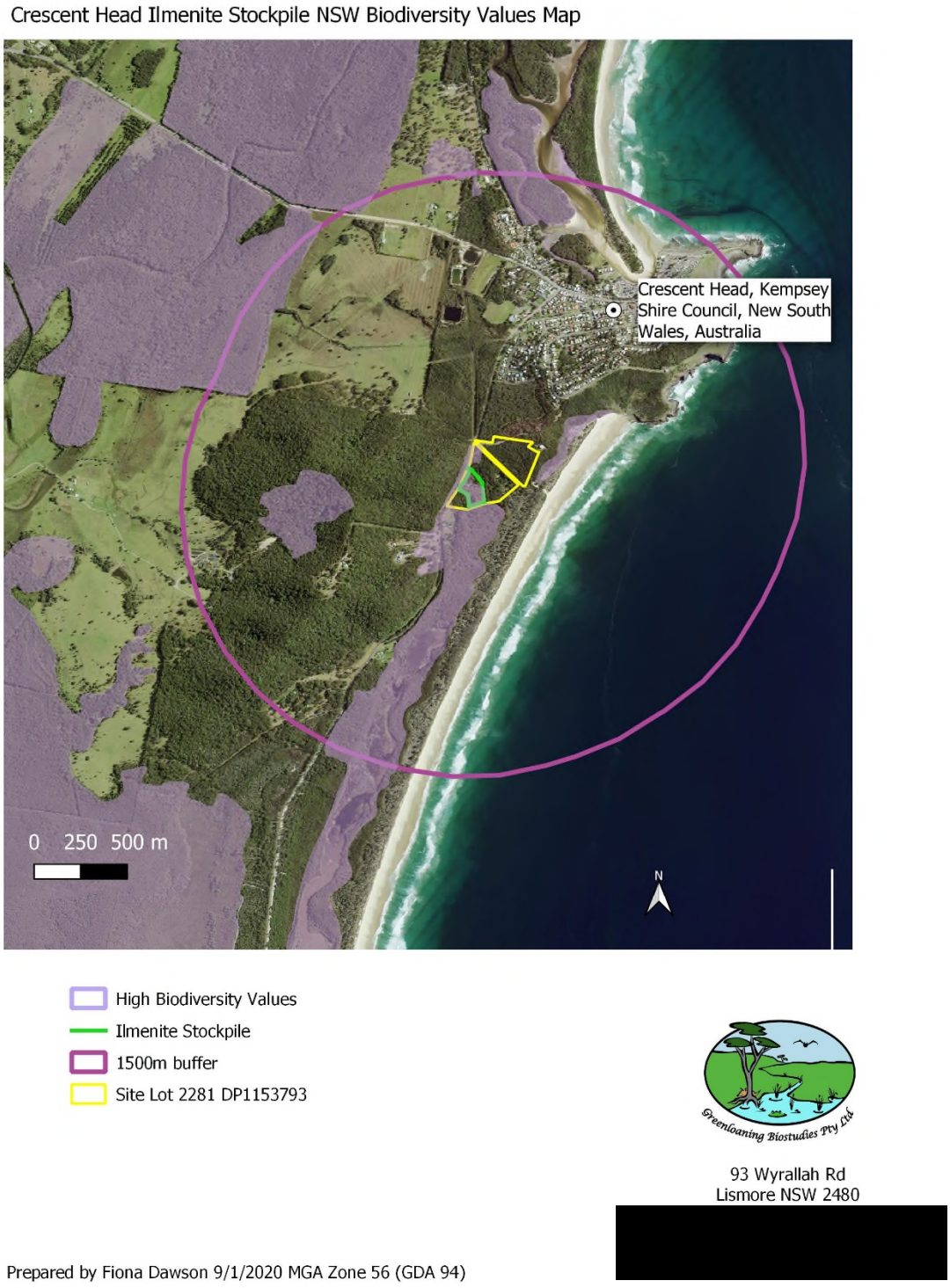


Figure 3 Map of High Biodiversity Values prepared by the Office of Environment and Heritage under Part 7 of the Biodiversity Conservation Act 2016). No change was applicable to the subject property following an update 26/2/2020.

Figure 4 Resource recovery footprint and potential extent of vegetation clearing (final impact area)

1.4 GENERAL SITE CONTEXT/LANDSCAPE FEATURES

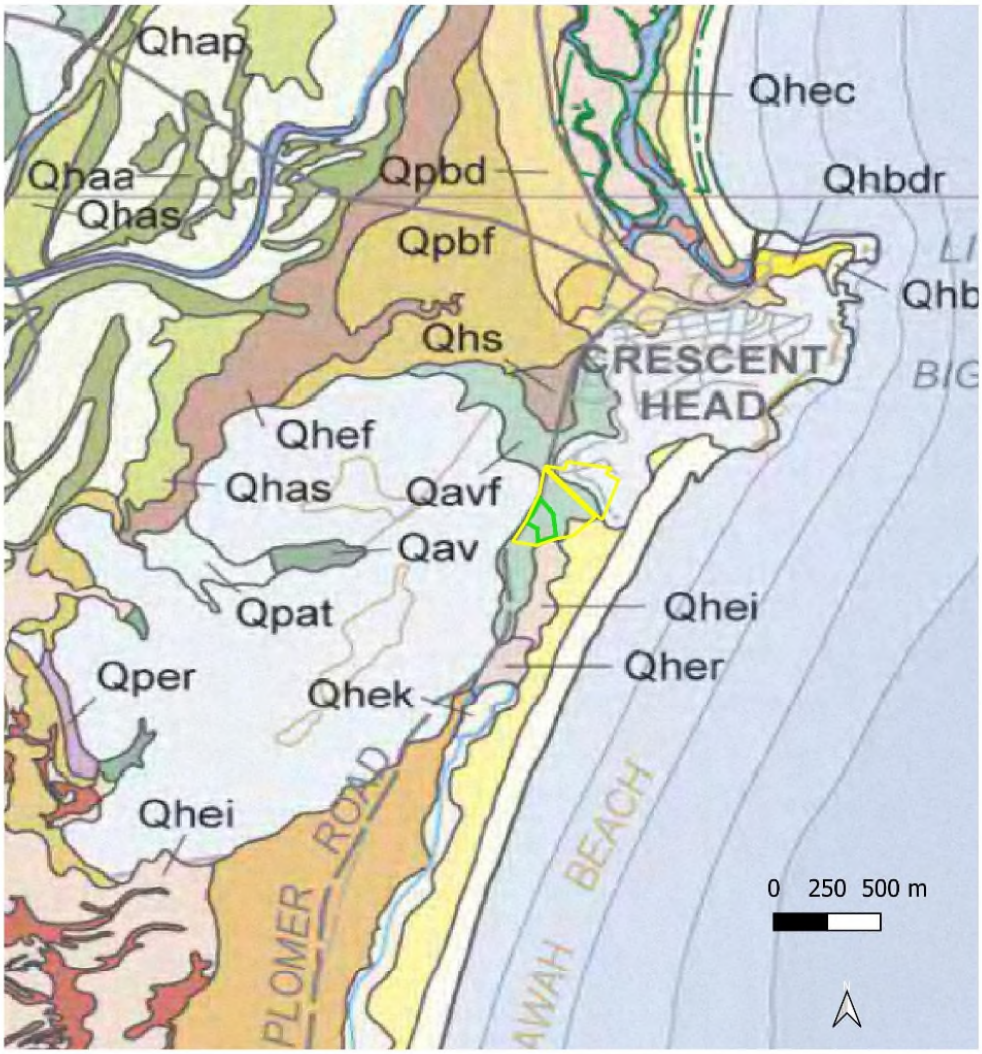
1.4.1 *Regional Context and Geology*

The site is located within the Kempsey Local Government Area (LGA) which covers an area of 3,381 km^2, extending along the coastline from Point Plomer in the south to Scotts Head in the north and westwards to elevated areas of the Great Dividing Range (Phillips & Hopkins, 2008). The shire falls within the NSW North Coast IBRA Region and Macleay-Hastings Subregion (refer to **Figure 1**). The climate of this Region from east to west is that of a sub-tropical climate on the coast, with hot summers, through sub-humid climate on the slopes, to a temperate climate in the western uplands (DPIE, 2016).

The geology of the Manning-Macleay subregion is a complex faulted terrain where the New England Fold belt over-thrusts the Sydney Basin. The main rocks are Silurian and Devonian slates, quartzites and acid volcanics, Carboniferous mudstones, lithic sandstones and Permian shales and sandstones. In addition, Quaternary coastal sands are a feature (DPIE, 2016).

According to the Kempsey Area Coastal Quaternary Geological Map (2008), the impact area footprint is located on an Alluvial Plain System of Quaternary alluvial and colluvial fan comprising fluvial sand, silt, gravel and clay, which extends to the south of the site. The south east of the site is mapped as an Estuarine Plain System comprising Holocene interbarrier creek deposits of marine sand, silt, clay, organic mud, peat, gravel and shell. To the east, a strip of Holocene dune marine sand borders the beach (**Figure 5**).

Crescent Head Ilmenite Stockpile NSW Geology Map



Site Lot 2281 DP1153793

Ilmenite Stockpile

Qhei Eustuarine Plain System (Holocene interbarrier creek deposits)
Qhbd Coastal Barrier System (Holocene dune)
Qavf Alluvial Plain System (Quaternary alluvial and colluvial fan)

Prepared by Fiona Dawson 16/1/2020 MGA Zone 56 (GDA 94)

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[redacted]

Figure 5 Kempsey Area Coastal Quaternary Geological Map (2008) M 258 sourced from NSW Resources & Geoscience

1.4.2 *Land systems and Soils, Topography and Drainage, Wetlands and Streams*

i. *Land Systems and Soils*

As identified on the Sharing and Enabling Environment Data in NSW (SEED) Web map the relevant NSW Mitchell Landscapes comprise the following: the southern half of the subject property including the impact area and ilmentite stockpile as a whole is mapped as Manning – Macleay Barriers and Beaches while the northern half falls within the Brooms Head - Kempsey Coastal Ramp area (Mitchell, 2002).

Macleay Barriers and Beaches include dunes, swamps and lagoons on Quaternary coastal sands, with inner and outer barrier dune sequences. General elevation is 0 to 25m and local relief is 10 to 20m. Yellow or white single grain quartz sand occur on destabilised dunes above well-developed iron and humic podsols with depth to pan varying with position in the dune sequence, topography and depth to groundwater (Michell, 2002).

Brooms Head - Kempsey Coastal Ramp includes hills and low ranges of the coastal fall on lower Devonian greywacke, slate phyllite, quartzite, Permian Phyllite and schistose sandstone. The general elevation ranges from 50 to 450m, with local relief up to 300m. Thin, stony gradational loam and sandy loam occurs on the slopes, grading to yellow brown texture-contrast soils on lower slopes and in valleys (Mitchell, 2002).

The stockpile itself comprises ilmenite, (FeTiO3), a dense, black, weakly magnetic mineral with a high resistance to weathering. Ilmenite is a common accessory mineral present in the beach sands of eastern Australia, believed to be ultimately derived from the erosion of Tertiary Volcanic rocks from the New England Fold Belt. Australia's east coast beaches formerly contained substantial deposits of ilmenite that were concentrated in strandlines by wave action. Economic concentrations of mineral sands were extensively mined from beaches and dunes from the Central Coast of NSW north to Fraser Island in Queensland, mainly from the mid to late 1900s (PS, 2019).

ii. *Topography and Drainage Patterns*

The topography of the subject property surrounding the stockpile is flat with a gradual south east slope towards the beach. Based on hand auger drilling completed by GER (14 holes), it is predicted that the removal of the stockpile will result in a ground profile similar to the surrounding gently undulating topography (PS, 2019) (refer to **Figure 6** and **Figure 7)**. The elevation of the stockpile varies from 6m to 13m, as indicated in **Figure 7**, while the surrounding subject property varies from 2m to 6m in the south - south west and eastern drainage line to 4m to 8m to the immediate east and 8m to 30m in the far eastern portion.

The drainage of the stockpile and underlying ground surface (quartz sand) reflects the low runoff and high infiltration capacity of black and quartz sand, as evidenced by the absence of surface water features, ponding or drainage lines (PS, 2019). A shallow drainage trench (230m in length) on the eastern boundary of the stockpile is likely to be a relic from sand mining operations and tends to contain standing water at the southern end (PS, 2019).

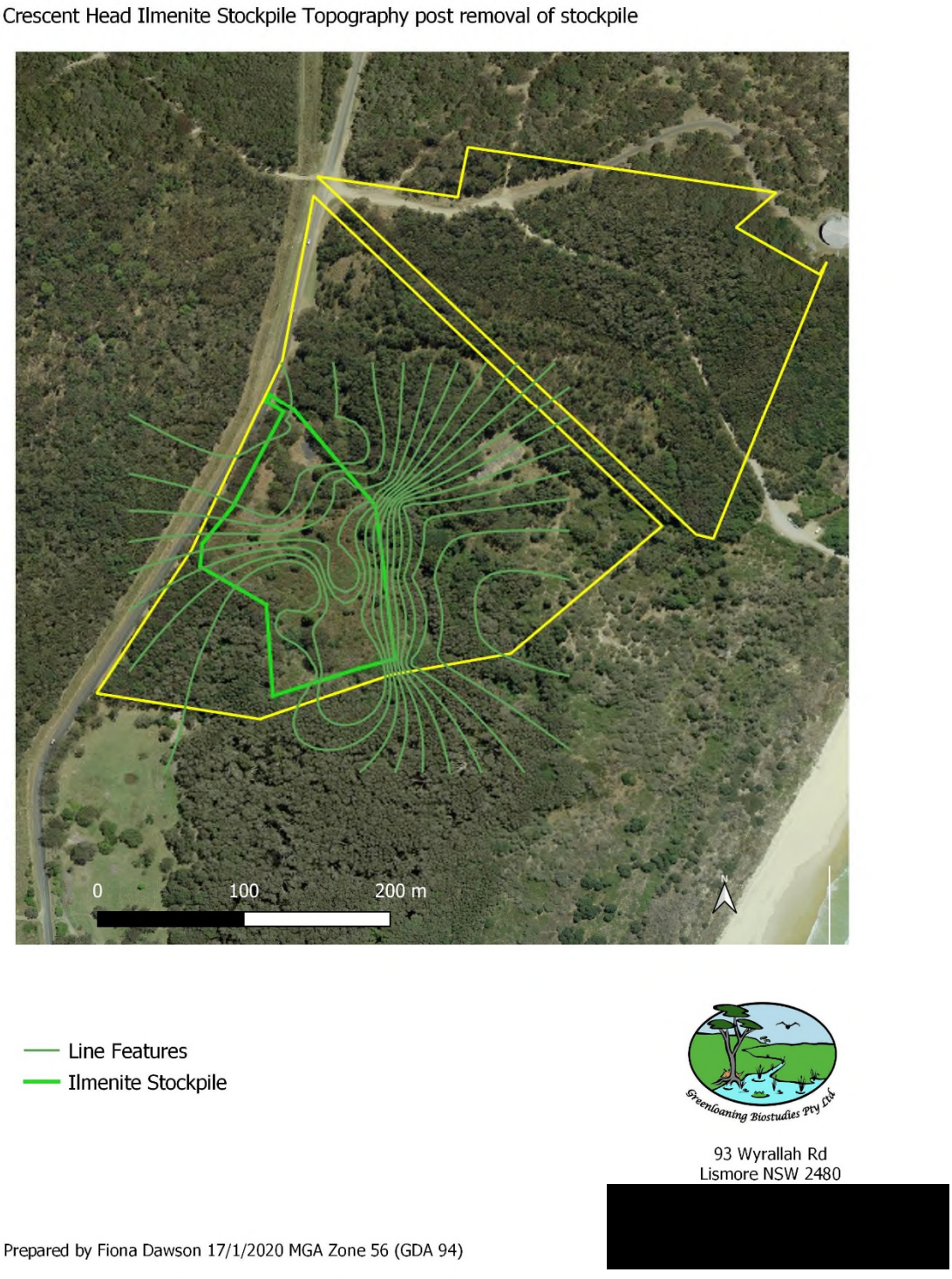


Figure 6 Topography post stockpile removal (natural ground contours) (PS, 2019).

Figure 7 Topography of subject property (Source ELVIS).

The presence and risk of Acid Sulfate Soils is mapped in **Figure 8,** which indicates that the soils immediately south of the stockpile have a high probability of occurrence, while the soils under the stockpile itself have not been assessed.

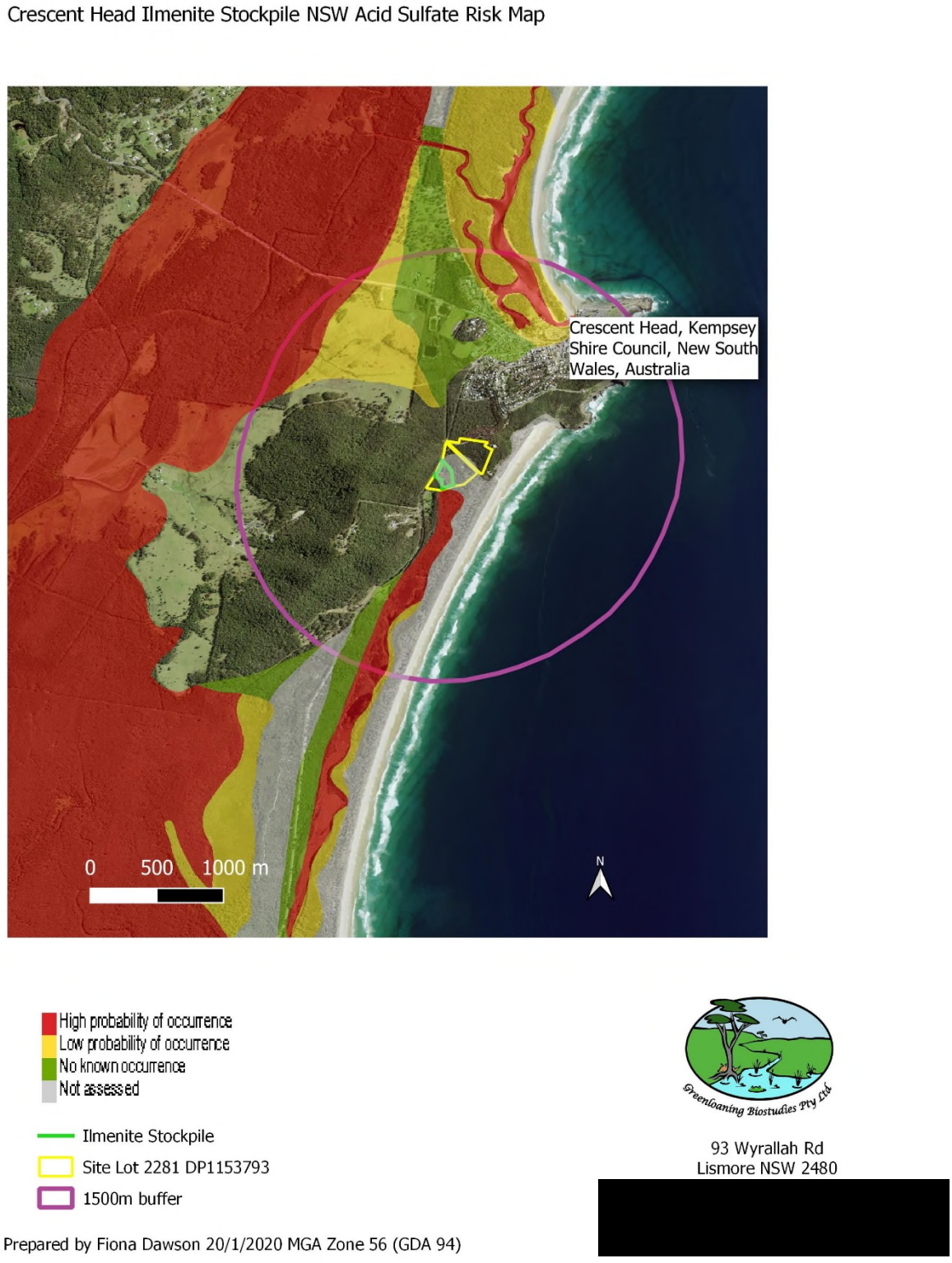


Figure 8 Occurrence of Acid Sulfate Soils along the coast of NSW

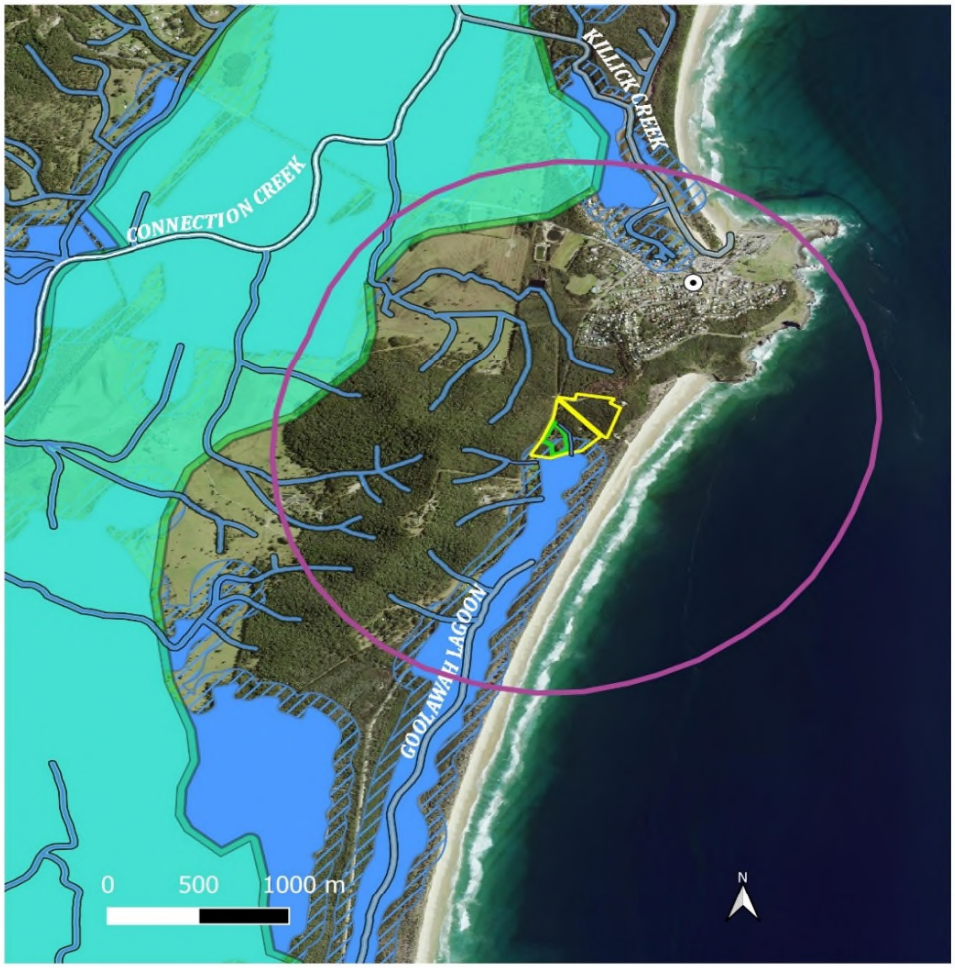
iii. *Streams, Rivers and Wetlands*

In order to comply with section 4.2.1.3 and Appendix 3 of the BAM, spatial data representing surface water in NSW was used to determine the Strahler stream order and map the associated buffers (**Figure 9**). Two first order streams occur in close proximity but outside of the proposed resource recovery footprint, including the shallow trench referred to in **Section 1.4.2.ii** and these have been mapped with a buffer of 10m on each side. All other streams within the 1500m buffer are first or second order streams, but have been buffered for prudence and expediency as second order streams with a buffer of 20m on each side.

State Environmental Planning Policy (SEPP) Coastal Management 2018 updates and consolidates into one integrated policy SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection) by specifying how development proposals are to be assessed if they fall within the coastal zone. As indicated in **Figure 9**, the stockpile is adjacent to and partly overlies the 100m Proximity Area for Coastal Wetlands which are described as plant communities dominated by any of six vegetation types; mangroves, salt marshes, melaleuca forests, casuarina forests, sedgelands, brackish swamps, freshwater swamps and wet meadows (DPE, 2018). Although development within the mapped proximity area is not designated development, any development requiring consent cannot be approved by a consent authority unless they are satisfied that the development will not significantly impact on the biophysical, hydrological or ecological integrity of (including the quantity and quality of surface and ground water flows to and from) the adjacent coastal wetland or littoral rainforest (DPE, 2018).

There are no Important Wetlands within close proximity to the site as defined in "A Directory of Important Wetlands in Australia" Third Edition (EA, 2001), however the extreme western perimeter of the 1500m buffer is adjacent to the Limeburners Creek Nature Reserve wetland to which a 50m buffer has been applied (**Figure 9**).

Crescent Head Ilmenite Stockpile NSW Wetlands, Rivers & Streams



Site Lot 2281 DP1153793
Ilmenite Stockpile
1500m buffer
Important Wetlands (DIWA) & 50m buffer
Coastal Wetlands & 100m proximity area per Coastal Mgt SEPP 2018
Streams First & Second order & buffer (see 1.4.2.ii)

Prepared by Fiona Dawson 22/1/2020 MGA Zone 56 (GDA 94)

Greenloaning Biostudies Pty Ltd
93 Wyrallah Rd
Lismore NSW 2480
[redacted]

Figure 9 Rivers, streams and wetlands with buffers as per BAM Appendix 3.

1.4.3 *Land use and History of Disturbance*

The subject property is located within Crown land approximately 1km south of the township of Crescent Head and 0.5 km west of the Pacific Ocean. At a local scale, it is bounded by Goolawah National Park to the east, Crown Land to the north, freehold land with a residence to the south and Point Plomer Road to the west (PS, 2019), while at a landscape scale it is largely surrounded by NPWS estate (**Figure 2**). The purposes of the Crown reserve are: Environmental Protection and Public Recreation. The land is managed by the Goolawah Reserve Trust [being a Corporation under the Minister Administering the National Parks & Wildlife Act 1974] – gazetted 16 April 2010 (DoI, 2017). The adjoining residence to the south is situated within cleared bushland and scattered native vegetation.

The subject property is zoned Rural Landscape (RU2) under the Kempsey Local Environmental Plan (2013) (refer to **Figure 10**), the objectives of which are to "encourage sustainable primary industry production by maintaining and enhancing the natural resource base, to maintain the rural landscape character of the land and to provide for a range of compatible land uses, including extensive agriculture" (PS, 2019).

The stockpile/resource recovery site is a former mineral separation plant or 'dry mill' that ceased operation in 1985. Sand mining around the township of Crescent Head commenced in 1957 by Mineral Deposits Ltd (MDL), with the operation comprised of three simple dredges in ponds and a separating plant, using land based spiral units and magnetic separators (PS, 2019) (refer to **Figure 11)**. The concentrates were treated at a dry mill, the concrete foundations of which are still present on the eastern side of the stockpile. Mineral sand from MDL's mining leases on the east coast is believed to have been processed at the Crescent Head dry mill until 1985 and the plant removed in 1987 (PS, 2019).

Since being abandoned around 30 years ago, the site has been left to regenerate naturally which has resulted in both native species and weed infestations, in particular Lantana (*Lantana camara*). Illegal rubbish dumping has taken place in recent years, including dumping of domestic waste and burnt out cars (refer photograph in **Appendix B**). The illegal removal of ilmenite from the northern end of the stockpile has been reported to Crown Lands (PS, 2019).

An exploration Licence (No 8505) and issued on 16 May 2013, expired on the 16th of May 2015, with China Australia Mining Pty Ltd's exploration work being completed in this time (DoI, 2017).

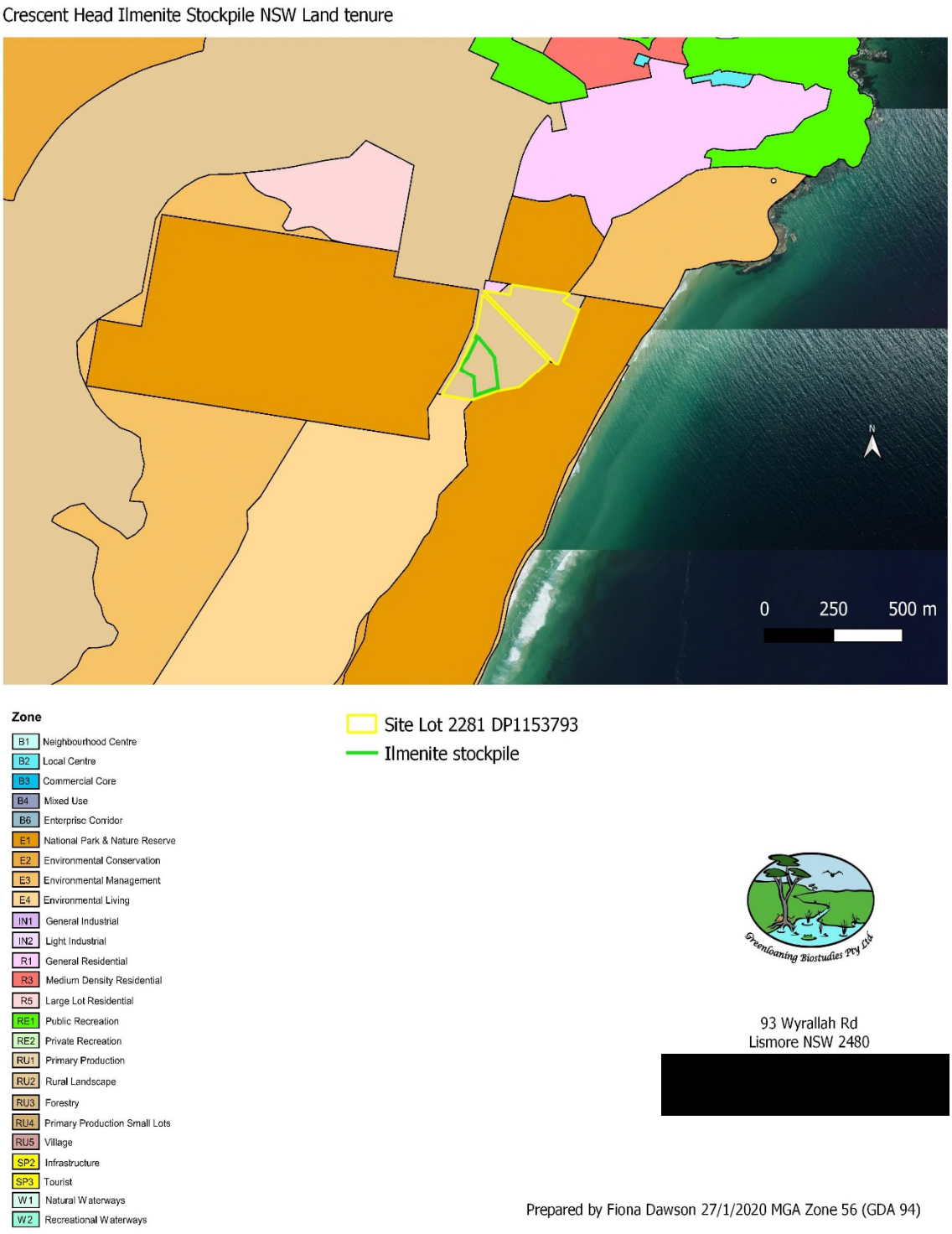


Figure 10 Zoning and legend sourced from the Kempsey LGA LEP (2013) Land Zoning Sheet LZN_012B

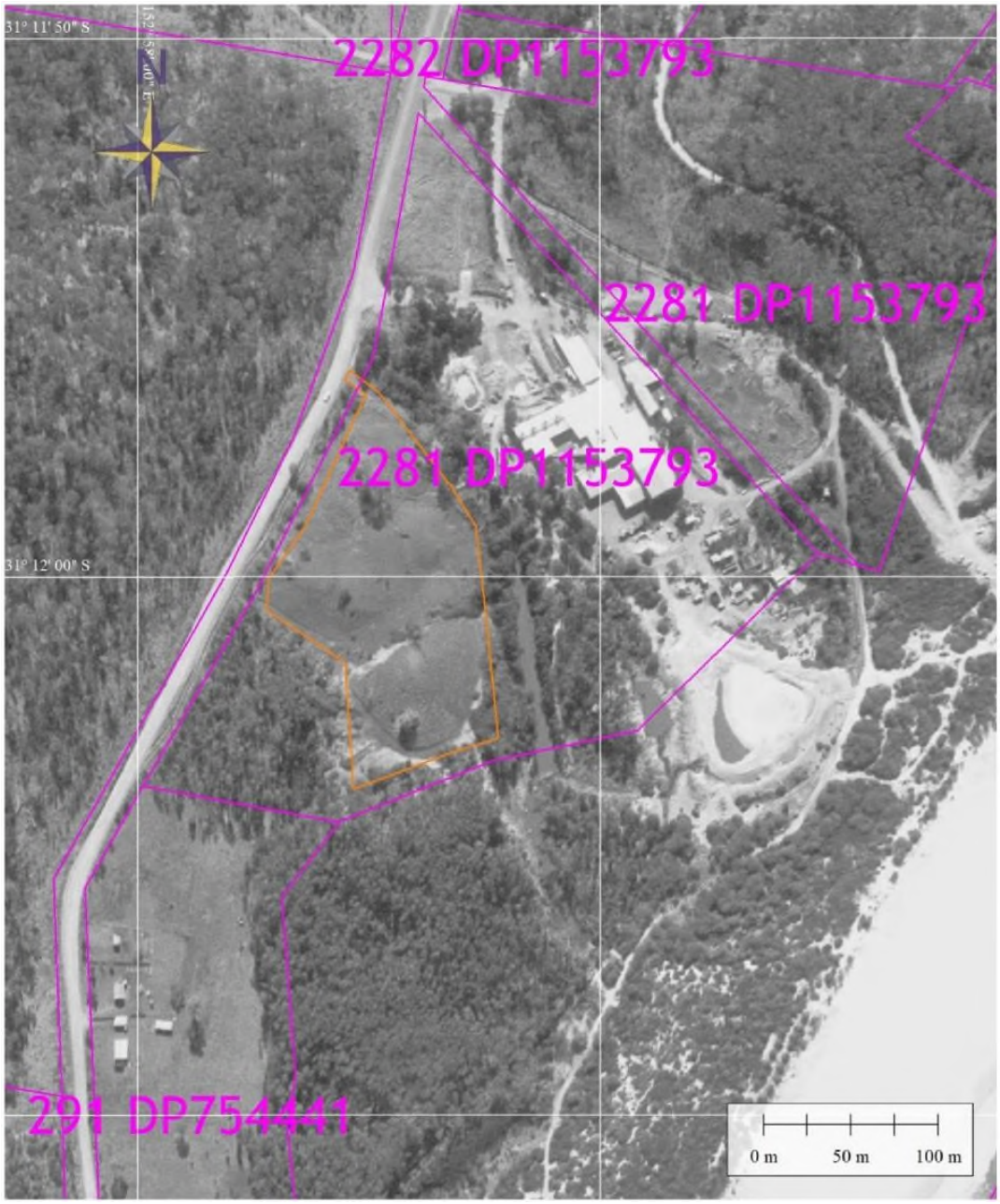


Figure 11 Historical Mineral Processing on existing site in 1981 (PS, 2019).

1.4.4 *Connectivity, Native Vegetation Extent (% Cover) and Patch Size*

At a broad scale, the subject property falls entirely within the North East NSW Fauna Corridor and the North East NSW Climate Change Corridor (DPIE, 2020b), is surrounded by NPWS Estate and is adjacent to Fauna Key Habitats (**Figure 12**). Wildlife corridors comprise connecting areas and habitat for such processes as migration, colonisation, dispersal and breeding exchanges while key fauna habitats comprise areas predicted to be of high value to forest fauna, both in reserve systems and other land tenures (DPIE, 2011). The spatial data for **Figure 12** was sourced from a recently created GIS program "NPWS CORRIDORS" which was used to derive regional scale habitat corridors based on the predicted distributions of priority fauna species assemblages (DPIE, 2020b).

At a local scale, the subject property as a whole is primarily vegetated, supporting a mixture of remnant and regenerating native vegetation communities and exotic species. The vegetation of the stockpile itself although of a lower quality, nevertheless provides some habitat and connectivity to other local corridors such as adjacent Goolawah National Park (**Figure 12**).

The total extent of native vegetation within a 1500m buffer area extending from, and including the subject property, has been calculated as 62% (**Figure 13**) and allocated to the 30 - 70% class (refer to **Section 3.2** for details of the methods).

The total area of native vegetation inside the buffer area is contiguous and extends for considerable distances outside the buffer as can be seen on **Figure 3**. The area within the buffer is approximately 380ha (**Figure 13**) and forms one patch which exceeds the maximum patch class size of >100ha, thus each PCT and vegetation zone was allocated to the maximum patch size class (refer to **Section 3.2** for details of the methods undertaken).

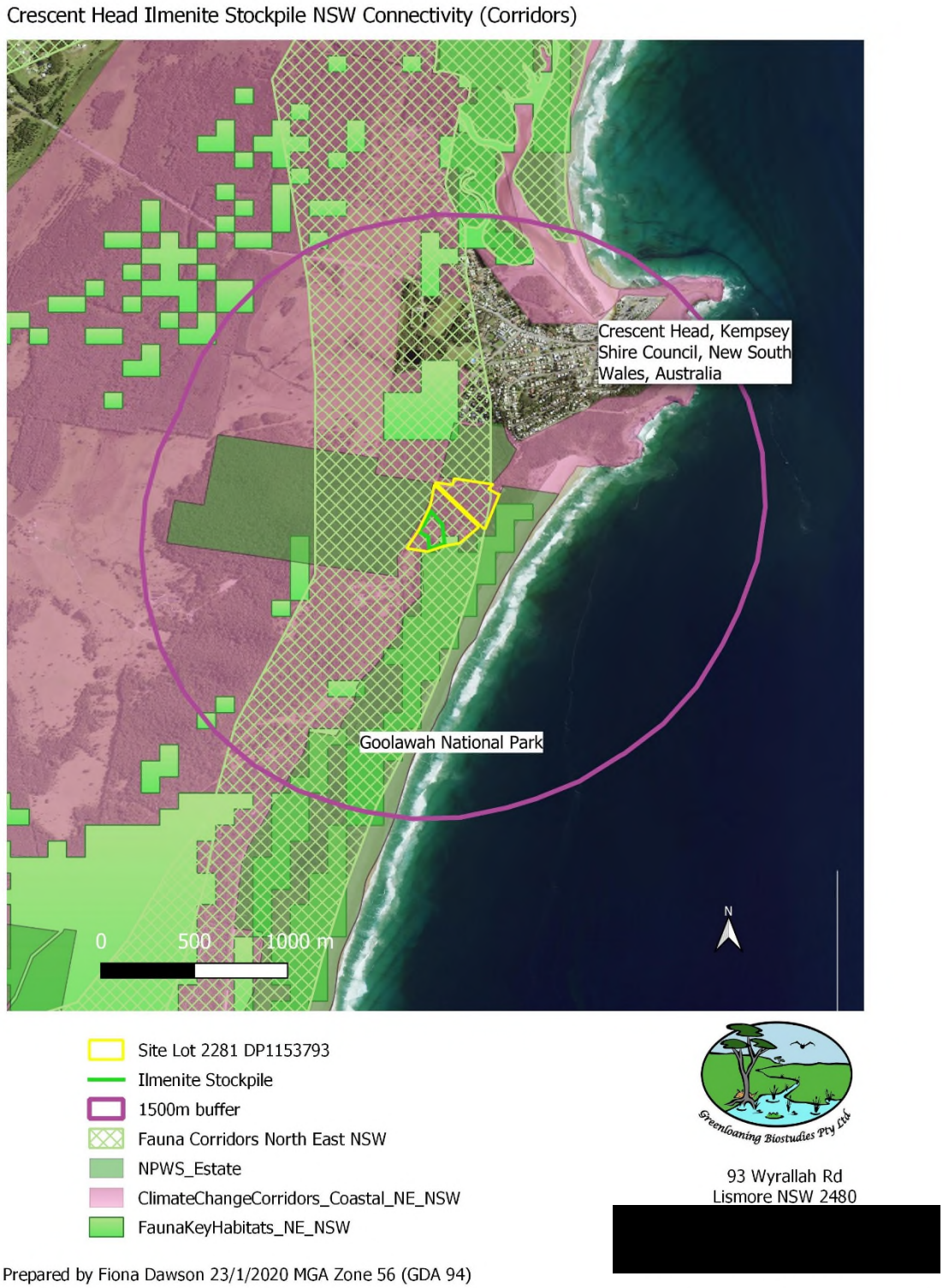


Figure 12 Location of subject property within North East NSW regional corridors

Figure 13 Native vegetation extent within the 1500m buffer was calculated as 62% (refer to 3.2 and Table 3.1). The total area of vegetation polygons is approximately 380ha which forms one contiguous patch.

1.5 DESCRIPTION OF DEVELOPMENT AREA AND ENVIRONS

The resource recovery /impact area comprises the ilmenite stockpile and access track from Point Plomer Rd. The stockpile comprises a mound of black sand 2m to 5m high (**Figure 7**), which has regenerated naturally since being abandoned in the late 1980's. The stockpile is dominated by the native plant species Blady Grass (*Imperata cylindrica*) and Bracken Fern (*Pteridium esculentum*), with thickets of the exotic species Lantana (*Lantana camara*) and Bitou Bush (*Chrysanthemoides monilifera*). Scattered small trees also are regenerating. The north eastern side is dominated by a patch of regenerating Swamp Oak (*Casuarina glauca*) and some Lantana thickets, whilst the northern part of the stockpile supports a cluster of old-growth trees including Forest Red Gum (*Eucalyptus tereticornis*). There are clusters of Figs (*Ficus spp.*), Swamp Mahogany (*E. robusta)* and Forest Red Gum in the centre and south but in general the stockpile is dominated by Blady Grass, Bracken Fern and Lantana, the latter occurring particularly around the perimeter and in the southern portion.

The roadside vegetation on the north western side of the stockpile supports planted Koala food trees (Forest Red Gums). A drainage trench borders the eastern edge of the stockpile and is dominated by Paperbark (*Melaleuca quinquenervia)*. To the southwest of the stockpile, the vegetation is also dominated by Paperbark with Red-fruit Saw-Sedge (*Gahnia sieberiana*) dominating the understorey. The area adjacent to the stockpile to the north and east supports communities dominated by Blackbutt (*Eucalyptus pilularis*) or Swamp Oak (*Casuarina glauca*), whilst the far eastern portion of the subject property supports Paperbark and Forest Red Gum with rainforest elements.

In general, the site environs can be described as complying with the Manning-Macleay subregion description as this description includes a coastal complex of Banksia, Paperbark, Smooth-barked apple and Blackbutt with numerous shrubs, areas of heath, swamp on dunes and mangroves in estuaries (DPIE, 2016). The southern half of the subject property is mapped as Manning-Macleay Barriers and Beaches which comprises foredunes with coast Spinifex coast wattle (*Acacia sophorae*), hind dunes with Blackbutt, Pink Bloodwood (*Corymbia intermedia*), Banksia (*Banksia spp.*) and rainforest elements such as Blue Lilly Pilly (*Syzygium oleosum*), Tuckeroo (*Cupaniopsis anacardioides*) and vines. Swampy lagoon zones of wet heath and swamp forest comprise dense Paperbark, Swamp Oak and Swamp Mahogany, rushes and sedges (Michell, 2002). The northern half of the subject property is mapped as Brooms Head - Kempsey Coastal Ramp and comprises dry hardwood forest of Blackbutt, Sydney Blue Gum (*E. saligna*), and Large-fruited Blackbutt (*E. pyrocarpa*) (Mitchell, 2002).

The characteristics of the resource recovery area and surrounding property are illustrated in the photographs provided in **Appendix B.**

2 Legislative Context

2.1 INTRODUCTION

An outline of the legislation, planning instruments and management plans/strategies relevant to the ecological attributes of the proposed resource recovery area is provided in the following sections.

2.2 COMMONWEALTH STATUTORY CONSIDERATIONS

2.2.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act provides protection for Matters of National Environmental Significance (MNES), the MNES relevant to the Development Area and subject property including:

- Nationally listed threatened species and ecological communities; and
- Listed migratory species;

Environmental approvals under the EPBC Act may be required for an 'action' that is considered likely to have a significant impact on MNES or the environment on Commonwealth land, i.e. species and/or vegetation communities listed as threatened under the Act. Further consideration of MNES is provided in **Section 3.1** and **Section 4.1** of this report.

2.3 NEW SOUTH WALES STATUTORY AND PLANNING CONSIDERATIONS

2.3.1 Relevant legislation

i. Biodiversity Conservation Act 2016

The BC Act has replaced the *Threatened Species Conservation Act 1995* (NSW) (TSC Act). The purpose of the BC Act 'is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development…'(s1.3). The Biodiversity Offset Scheme (BOS) has been established under Pt 6 of the BC Act, with thresholds for mandatory entry into the scheme prescribed by the regulations under this Act. For development required to be assessed under the BC Act, an assessment report must be prepared by an accredited person, with the impacts from the proposed development, and any offset requirements duly considered. The establishment of a biodiversity assessment method, in connection with the biodiversity offsets scheme, is prescribed under s6.7 of the BC Act.

Threatened species and communities are those now listed under the BC Act under Schedules 1 and 2 of the Act. Key Threatening Processes that need to be considered as part of the assessment of impact process also are listed under Schedule 4 of the BC Act.

ii. Biodiversity Conservation Regulation 2017 (BC Reg)

The BC Reg provides, inter alia, rules for offsetting and thresholds for triggering entry into the BOS. Under cl 7.1 of the BC Reg, 'the clearing of native vegetation…on land included on the *Biodiversity Values Map* published under clause 7.3' triggers entry into the (BOS). Under cl 7.3, the Biodiversity Values Map is to be prepared and published by the Environment Agency

Head, from time to time, on an appropriate Government website. As indicated in **Section 1.1** of this BDAR, and on **Figure 3**, a portion of the resource recovery area lies within an area shown on the BV Map and some clearing of native vegetation is proposed.

iii. *Biosecurity Act 2015*

The *Biosecurity Act 2015* has replaced the *Noxious Weeds Act 1993*. The main objective of the *Biosecurity Act is '*to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers' *(*s3 [1])

The Act provides for a shared responsibility for biosecurity matters that includes community and industry, as well as government authorities (s3 [2] [a]) and aims, inter-alia, 'to provide a framework for the timely and effective management of … threats to terrestrial and aquatic environments arising from pests, diseases, contaminants and other biosecurity matter' (s3 [2] [b] [ii]). This has relevance to the project in assigning some community responsibility for biosecurity matters such as invasive weed species management. Under s15 (2)A of the act, a 'pest' is defined as including 'anything declared by the regulations to be a pest for the purposes of this Act.'

These objectives, together with consideration of the provisions of the *Biosecurity Regulations 2017* (refer to **Section 2.3.1.iv)** have been taken into account in relation to the development of weed management strategies and associated site rehabilitation recommendations (refer to **Section 6.5.2** and **7.2**).

iv. *Biosecurity Regulations 2017*

Weed species declared as pest species under the *Biosecurity Regulation 2017* are listed under Schedule 3 (cl 33), and include Asparagus weed species (*Asparagus* spp.), Lantana (*Lantana camara*) and Bitou Bush (*Chrysanthemoides monilifera*), all of which occur within the subject property. Such species are not to be imported into the state or sold.

v. *Coastal Management Act 2016*

The *Coastal Management Act 2016* replaces the *Coastal Protection Act 1979*. The Act defines the coastal zone as four coast management areas, the first of which has potential relevance to the resource recovery area and subject property, viz:

1. Coastal wetlands and littoral rainforests area; areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26

The relevance of the Act to the current resource recovery is discussed in **Section 4.1.** The potential direct and indirect impacts of the proposed resource recovery on coast management areas will be discussed in **Section 6.1**

vi. *Water Management Act 2000*

The objects of the *Water Management Act 2000* are to provide for the sustainable and integrated management of the water sources of the state for the benefit of both present and

future generations. The key regulation made under this Act is the *Water Management (General) Regulation 2018* which requires the use of the Strahler stream order method to identify whether an approval is required. Controlled activities carried out within a Vegetated Riparian Zone (VRZ) must be carried out under a 'controlled activity approval'. The VRZ includes a pre-determined buffer viz:

1. 10m each side of 1st order watercourse
2. 20m each side of 2nd order watercourses
3. 30m each side of 3rd order watercourses
4. 40m each side of 4th and greater order watercourse

As discussed in **Section 1.4.2.iii**, the streams on the subject property are first order streams and more than 10m away from the impact area, there is therefore no requirement for VRZ management.

***2.3.2** Relevant Planning Instruments*

***i.** State Environment Planning Policy 44 – Koala Habitat Protection SEPP 44*

On 1 March 2020, NSW *State Environmental Planning Policy No 44 – Koala Habitat Protection* which has been in place since 1995, was repealed and replaced by a new *State Environmental Planning Policy (Koala Habitat Protection) 2019*. However, as per Section 16 of the new SEPP, a plan of management approved under SEPP 44 in relation to the whole or part of a local government area continues to apply to that area (DPIE, 2019b).

The purpose of SEPP 44 is to encourage the conservation and management of Koala habitat so as to ensure permanent free-living populations over the species' present range and reverse a State-wide trend of population decline. The Kempsey Shire Local Government Area (LGA) is identified under Schedule 1 of the Policy as one of the areas to which the Policy applies.

Under SEPP 44, Council is required to determine whether a development site constitutes 'potential koala habitat', and if such habitat is identified, Council requires a further determination as to whether the site may constitute 'core koala habitat'. Clause 4 of the SEPP defines '*potential koala habitat*' as areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. This matter is addressed further in **Section 5**.

***ii.** State Environmental Planning Policy (Coastal Management) 2018*

The *State Environmental Planning Policy (Coastal Management) 2018* (CM SEPP) identifies and maps the coastal zone according to definitions in the Coastal Management Act. The CM SEPP streamlines coastal development assessment requirements, identifies development controls for consent authorities to apply to each coastal management area and establishes the approval pathway for coastal protection works.

Statewide mapping is available for coastal wetlands and littoral rainforest area, coastal environment area and coastal use area. This mapping is addressed in **Section 1.4.4**

(Wetlands) but is not relevant for the subject property in terms of Littoral Rainforest mapping (DPIE, 2019a).

***2.3.3** Local Environmental Plans, Policies and Strategies*

***i.** Kempsey Shire Comprehensive Koala Plan of Management (CKPoM) (2011)*

The Kempsey Shire Council CKPoM is consistent with the State Recovery Plan for the Koala (2008) and has been prepared in accordance with *State Environmental Planning Policy No 44 (Koala Habitat Protection)* and therefore aims to contribute to" ...the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline". The KPoM focuses its efforts on reducing the impact of development in areas of preferred and core koala habitat through the protection of preferred koala food trees (PKFTs) where possible, or by the imposition of requirements to replace PKFTs, and in some instances the requirement to provide Habitat Compensation where removal of PKFTs exceeds certain thresholds (Phillips & Hopkins, 2009).

The key provisions of the KPoM relevant to the project are:

1. Development Applications (DA's) for land mapped as Preferred Koala Habitat (PKH) must undertake a Koala Habitat Assessment in accordance with the methodology outlined in Box 1 (i.e. SAT method);
2. A stadia survey of PKH food trees that may be impacted by the proposed DA must be undertaken and submitted with the DA;
3. If retention of Preferred Koala Food Trees (PKFT) greater than or equal to 250mm at dbhob is proposed, the nominated Performance Criteria in Section 4.10 of this plan are to be applied and consent may be granted with or without conditions where said criteria are met viz:
    - maximise retention and minimise degradation of native vegetation across the subject land;
    - minimise the removal of any identified PKFT where they occur across the subject land;
    - ensure such trees will not be negatively impacted by subsequent development works including the construction of buildings/infrastructure/public utilities;
    - maintain key linkages across the landscape, where they occur, to reduce the effects of habitat fragmentation;
    - where koala habitat and associated linkages are proposed to be retained to mitigate impacts, measures to ensure the protection of those areas in the long term;
    - measures (i.e. erection of exclusion fencing) to be in place to ensure koalas are protected during site construction works. Should koalas be found on site during clearing or site works, Section 4.11 (i) and (j) apply (koala specialist to inspect, clearing to be suspended within 25m of a tree occupied by koala, until koala has moved of its own accord.

***ii.** Kempsey Local Environmental Plan (LEP) 2013*

Kempsey LEP 2013 provides the statutory framework for land use management in the Kempsey Shire local government area, subject to overriding planning controls in State Environmental Planning Policies and other State legislation (KSC, 2017). The *Kempsey LEP 2013* details land uses permitted with and without development consent within zones identified by the LEP, and states the requirement for developments within the CKPoM

application area to address the development control provisions in the CKPoM (Phillips & Hopkins, 2009). As mentioned in **Section 1.4.3,** the subject property is zoned Rural Landscape (RU2), the objectives of which include "sustainable primary industry production by maintaining and enhancing the natural resource base, maintain the rural landscape character and provide for compatible land uses Activities permitted without consent include environmental protection works, extensive agriculture and forestry" (PS, 2019).

iii. *Kempsey Development Control Plan (DCP) 2013*

The *Kempsey DCP 2013 s*upports and expands upon the aims, objectives and other provisions of the LEP (KSC, 2017), inter alia:

1. To maintain the natural setting of the Kempsey Shire local government area.
2. To ensure that development protects and maintains high value vegetation, natural bushland and native habitats.

Tree preservation controls do not apply within Zone RU2.

3 Assessment Methods

3.1 GENERAL APPROACH TO THE SITE ASSESSMENT PROCESS

The aim of this section is to provide relevant details on the procedures undertaken for the BDAR, with the aim of such procedures being both to obtain appropriate data for the impact assessment process, and to comply with the BAM requirements (refer to **Appendix A** for compliance details). Integral to the assessment process has been the due consideration of relevant procedures as required under the BAM, whilst also taking into account the limited nature of the proposed resource recovery and specific site attributes. Thus there has been a robust desktop assessment process, in conjunction with site-specific surveys, the latter focusing primarily on vegetation community attributes via plot sampling, general and threatened plant species surveys and target threatened fauna species surveys. Further details on the specific procedures employed are provided in **Section 3.1, Section 3.2** and **Section 3.3**.

3.2 DESKTOP ASSESSMENTS AND METHODOLOGIES

***3.2.1** Desktop review*

Desktop reviews were undertaken for the purpose of identifying the potential occurrence of threatened flora and fauna species, populations and/or ecological communities in the vicinity of the subject property and proposed resource recovery area. The desktop review process incorporated the following:

- A search of the NSW OEH Bionet data, including the Bionet Atlas and Vegetation Information System Datasets, the BV Map and threatened species and ecological communities distribution maps;
- A search using the EPBC Act Protected Matters Search Tool for any threatened species, ecological communities, RAMSAR sites and/or migratory species listed under the Act that have been detected, and/or considered to have likely habitat, within the subregion and particularly within the locality;
- Searches on the **S**haring and **E**nabling **E**nvironmental **D**ata (SEED) Portal for relevant background mapping;
- Reviews of available background information on individual threatened species and communities;
- Review of available aerial images of the subject property and environs;
- Searches of Council's website for relevant documents and mapping, plus direct liaison with Council regarding vegetation mapping;
- Direct liaison with Council to obtain spatial data representing the Koala Plan of Management Preferred Koala Habitat mapping
- Reviews of relevant legislation and planning documents as documented in **Chapter 2;**
- Detailed reviews of Plant Community Types (PCTs), threatened species profiles and relevant background information; and
- Reviews of any reports prepared in relation to ecological attributes of the general locality of the project (refer to **Section 1.1**)

***3.2.2** Methods*

***i.** Native vegetation % cover*

Relevant desktop information and QGIS 3.8.1 were used to determine the percentage cover of native vegetation within the 1500m buffer area for the subject property. Vegetation cover was determined as defined in the s 4.3.2 of the BAM and page 13 of the BAM Operational Manual and the methodology applied was as follows:

- QGIS 3.8.1 was used to assess the vegetation cover based on imagery sourced from ArcGIS REST Services Directory WMS server provided by Spatial Services, NSW Department of Finance and Services (public/NSW Imagery) and to apply a 1500m buffer using the Offset Curve tool. The resulting layer was inclusive of the study site. The buffer area was calculated within QGIS using $area geometry (986ha).
- The ocean and estuarine (Killock Creek) areas were subtracted from the buffer area (986 less 374.59ha) to produce a net buffer area of 611.41ha.
- Ten polygons were created in QGIS to represent the native vegetation as determined by the assessor, based on aerial imagery and field assessments. The area of each polygon was calculated within QGIS using $area geometry.
- The gross area of four of the polygons was reduced by a percentage as determined appropriate by the assessor. This was to reflect the sparseness of the vegetation in these polygons (refer to **Table 3.1**) compared with other polygons, and was considered a conservative approach.
- Urban areas and infrastructure, estuarine and ocean areas and grassy patches were excluded. Grassy patches were conservatively considered to be dominated by exotic pasture species.
- Percentage cover was calculated by dividing the sum of the vegetation polygons net area by the net buffer area (refer to **Table 3.1**).

Native vegetation cover was calculated at 62% and is assigned to the 30 - 70% class.

Table 3-1 Summary of vegetation polygons created in QGIS to calculate Native Vegetation Extent

% native veg cover within 1500m buffer			
Polygon	gross area (ha)	%	net area (ha)
veg 1	197.90	100%	197.90
veg 2	15.57	100%	15.57
veg 3	10.91	70%	7.64
veg 4	5.92	80%	4.74
veg 5	46.66	100%	46.66
veg 6	67.40	100%	67.40
veg 7	12.74	100%	12.74
veg 8	0.93	100%	0.93
veg 9	3.35	30%	1.01
veg 10	31.85	80%	25.48
total	393.23		380.06
Gross buffer area			986.00

less ocean & creek			- 374.59
Net buffer area			611.41
Vegetation cover			62%

ii. *Patch size*

The calculation of the patch size was determined using QGIS 3.8.1 according to the definition described on p 21 of the 'manual' (BAM Operational Manual) and Section 5.3.2 of the BAM and the method applied was as follows:

- The patch is an area of intact native vegetation occurring on the subject land and beyond and includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or less than 30m for non-woody ecosystems).
- The boundary of the patch was determined to be equivalent to that of the polygons used to calculate native vegetation extent using the method outlined above.
- The contiguous nature of the vegetation resulted in one patch of approximately 380ha within the buffer (refer to **Figure 13, Section 3.2** and **Table 3.1**). All vegetation zones on the site are included in the same patch.
- As the one patch exceeds the maximum patch class size of >100ha, there is no requirement for the calculation of patch size to include areas outside the buffer in order to allocate each PCT and vegetation zone to the maximum patch size class.

The one patch of approximately 380ha was assigned to the maximum patch size class size of > 100ha.

iii. *GIS methods and spatial data sources*

QGIS 3.8.1 (Zanzibar) was used to prepare all mapping presented within the BDAR.

Resource recovery site (stockpile) boundary and stockpile topography spatial data supplied by Pandanus Solutions.

Koala mapping (CKPoM Preferred Koala Habitat) shapefile supplied by GIS Department, Kempsey Shire Council 12/2/2020.

Base imagery and cadastral data sourced from the Web Map Service (WMS) Directory provided by NSW Spatial Services, a division of the Department of Finance, Service and Innovation (DFSI). Accessed from https://mapprod3.environment.nsw.gov.au/arcgis/services/Planning/EPI_PrimaryPlanningLayers/MapServer/WMSServer?request=GetCapabilities&service=WMS

The following spatial datasets were used to prepare maps in this BDAR and/or identify relevant information used in this BDAR:

- Mitchell landscapes Version V3.1 obtained 15/1/2020 from https://datasets.seed.nsw.gov.au/dataset/7a1658be-a632-4d4c-8e94-5f9b3be31055 .

No requirement to include map in BDAR (an additional requirement for BSAR only as per 4.2.1.3 (h) of BAM)

- Biodiversity Values Map accessed 16/1/20 (and 26/2/20 post BV Map update) from (https://www.environment.nsw.gov.au/biodiversity/biodiversity-values-map.htm)
- Interim Biogeographic Regionalisation (IBRA) Regions and Subregions zip files obtained from Department of Agriculture, Water & Environment May/ August 2019: https://www.environment.gov.au/fed/catalog/search/resource/downloadData.page?uuid=%7B8B9E3F42-9856-4487-AE9E-C76A322809A1%7D and https://www.environment.gov.au/fed/catalog/search/resource/downloadData.page?uuid=%7B4A2321F0-DD57-454E-BE34-6FD4BDE64703%7D
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- BAM - Important Areas for a small number of species of threatened fauna: NSW Department of Planning, Industry & Environment Map viewer accessed 27/3/20 at https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas

3.3 FIELD SURVEYS

3.3.1 *Timing of surveys*

Following preliminary desktop assessments, an initial site inspection was undertaken on the 1st of September 2019 in order to gain a background understanding of the resource recovery area, subject property and the nature of the proposed resource recovery per se. Subsequent to follow-up comprehensive desktop assessments encompassing preliminary identification of potential PCTs and vegetation zones, field surveys were undertaken on the 1st to the 3rd of September 2019. These surveys were focused on vegetation plot sampling and plant species identification, both these tasks contributing to the compilation of a flora species list for the resource recovery area and subject property. Subsequent site inspections were undertaken on the 2nd to the 5th of December 2019 primarily to conduct fauna surveys but also to complete BAM flora plots. In order to address the requirements of the CKPoM, a SAT survey was undertaken on the 7th February 2020, in addition to vegetation zone boundary waypoint descriptions.

3.3.2 *Native Vegetation Communities and Target Threatened Plant Species*

i. *Determination of Vegetation Zones and Extent of Vegetation Plot Sampling*

The results from desktop assessments and the initial site inspection were used to determine the likely vegetation zones for the subject property. The key criteria for determining zones were native vegetation cover, the extent of existing clearing and observed/previously recorded tree species. The results from the plot sampling data subsequently were used to confirm and amend as appropriate, the boundaries of vegetation zones.

The extent of vegetation plot sampling required was determined according to the determination of the vegetation zones as described above and the size of these zones, with the number of plots required in accordance with the criteria provided in Table 4 of the BAM.

ii. *Plot Sampling and Target Threatened Plant Species Surveys*

Six sample plots, comprising a 20 x 20 m quadrat within a 20 x 50 m plot, initially were established as per the procedures prescribed by the BAM. These plots included two plots beyond the stockpile and/or impact area, surveyed in part for the purpose of comparing the respective vegetation types with the vegetation within the impact area and/or stockpile area. An additional purpose was to allow for the potential for indirect impacts on these vegetation communities/habitats. Descriptions of each vegetation zone are provided in **Section 4.2.2**.

The full criteria considered in the placement of the sample plots comprised the following:

- In general, the areas surrounding the stockpile were proposed for retention;
- In general, the proposed resource recovery /impact area was limited to the stockpile;
- The stockpile contained patches in the north and a small patch in the south of vegetation supporting preferred Koala Food Trees and old growth/large mature trees;
- Potential TEC's existed in the areas beyond the stockpile; and
- The area of the access track could require very limited impacts comprising primarily clearing of Lantana and possibly lopping of overhanging branches, within three very small patches. Given the size and disjunct nature of these patches, establishing a plot within this zone was considered impractical.

Based on the above factors, Plots 1, and 3 were placed within the main stockpile regrowth area of low condition, but varying in the regenerating vegetation present (refer to **Section 4.2.2** for further details). Plot 2 was placed in close proximity to Plot 1, but within the larger patch of remnant vegetation supporting preferred Koala Food Trees and old growth trees in the north of the stockpile, whilst Plot 4 was located to sample a patch of regenerating Swamp Oak (*Casuarina glauca*) occurring on the stockpile. Plot 5 and 6 were placed outside the impact area to survey more naturally occurring communities within the subject property. The locations of Plots 1 to 6 in relation to the impact area, are indicated on **Figure 14.**

In conjunction with the vegetation plot sampling procedures, general walking transects and fauna surveys (refer to **Section 3.3.3**), target searches were undertaken for threatened plant species potentially occurring on the subject property, and particularly within the impact area. These searches followed grid transect lines (as per the NSW Guide to Surveying Threatened Plants, Office of Environment and Heritage 2016), although both within and outside the impact area, minor deviations from transect alignments were necessary at times, owing to physical constraints from dense weed infestations. The identified candidate threatened species, as determined by the initial desktop assessment process, plus subsequent data entry to the BAM Calculator, are discussed further in **Section 4.1.1**. The general locations of survey transects for threatened flora are indicated on **Figure 14**, but the actual extent of surveying over the impact area and subject property is greater than could be clearly shown, given the extent of intersecting/criss-crossing movements undertaken.

Additional procedures for vegetation surveys including the following:

- Documentation of all plant species observed, both within plots, within the impact area and within the subject property as a whole;
- Collection of a small number of plant specimens for subsequent taxonomic confirmation; and
- Photographing of representative areas of the vegetation zones and of the vegetation plots.

3.3.3 *Native Fauna*

i. *General Approach to Surveys*

On the basis of the desktop review process, encompassing consideration of the habitats present, threatened species records for the IBRA Subregion, and the potential for threatened species to utilise the stockpile habitats, fauna surveys were undertaken based on the following factors:

- The stockpile area per se had been both cleared and substantially altered in landform structure some decades previously;
- There has been varying degrees of natural regeneration of native plant species on the stockpile, in combination with varying extents of exotic weed infestation; and
- The stockpile is bounded to the south/south-east by relatively natural vegetation communities, and to the north/north-east/east by relatively advanced regeneration of post-mining native vegetation communities (refer to **Figure 11**), albeit supporting varying extents of exotic weed infestation. These communities represent suitable habitat for a range of fauna species.

For some species to be considered as candidate species for assessment according to BAM requirements, potentially suitable habitat was either absent or too highly degraded or marginal to render it likely to support the threatened species in question. Consideration of this aspect also took into account amendments made to the extent of the proposed impact area, based on the identification of higher habitat values for some sectors. This applied particularly to areas supporting both KFTs and old growth and/or large mature trees. The reasons for removing candidate species from the list of species requiring further assessment/surveys are provided for each species in **Section 5.2.4**.

Details on specific fauna survey procedures undertaken in 2019/2020 are provided below and the locations of surveys are indicated on **Figure 14**. The majority of specific surveys were undertaken in December 2019, but additional Koala surveys were undertaken in February 2020 and general observations and some opportunistic bird surveys were undertaken during all survey sessions.

ii. *Habitat Assessments*

Site habitats were assessed generally to determine their value for native fauna species, the assessment process being undertaken on an ongoing basis through the study period in conjunction with both flora and target fauna surveys. Key habitat features, for both threatened species and other native fauna groups, considered for the assessment process included:

- The presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places;
- Presence of old growth trees/large mature trees;
- The presence of KFTs;
- The presence of preferred Glossy Black Cockatoo feed trees (Forest oak and/or Black she-oak);
- Areas of dense vegetation;
- Presence of hollow logs/debris and areas of dense leaf litter;
- Presence of drainage lines/swampy areas;
- Presence of fruiting flora species;
- Presence of blossoming flora species, particularly winter-flowering species;
- Vegetation connectivity and proximity to neighbouring areas of intact vegetation; and
- Presence of any man-made structures suitable as microchiropteran bat roost sites.

The locations of a number of specific habitat features, such as native figs representing a food resource, were recorded previously (Pandanus Solutions, 2018), using a hand held GPS unit and subsequently mapped.

iii. *Small Mammal Trapping*

Trapping surveys, using Elliott Type A traps, were undertaken in order to target any small mammals utilising the stockpile and adjoining habitats, and particularly the threatened species, the Common Planigale (*Planigale maculata*) and Eastern Pygmy Possum (*Cercartetus nanus*), both of which have been trapped previously in Elliott traps (A. Martin, 1995, 1996 unpubl. data). Although pitfall traps ideally would be used in addition to Elliott traps, the very

dense, soft nature of the ilmenite substrate severely hindered the installation of effective pitfall traps. The traps for this survey also were set on a very fine trigger level to maximise the chances of capture of small fauna species.

A total of 450 trap nights was sampled along two trap lines, with the location of each trap lines designed to sample habitats both on and off the stockpile. Traps were set with a standard bait mixture of peanut butter, rolled oats, honey and vanilla, checked each morning and rebaited if the bait had been eaten or soiled by a captured animal. All trap locations were marked with labelled flagging tape in the field.

iv. *Hair Tube Trapping*

Hair tube trapping was conducted in conjunction with Elliott trapping, with hair tube traps set along portions of each Elliott trap line. This trapping procedure was aimed at both small mammals, which have been effectively sampled using this method during long term monitoring programmes (Greenloaning Biostudies 2003), and medium weight range species (e.g bandicoots, Rufous Bettong [*Aepyprymnus reufescens*). A total of 120 hair tube trap nights was sampled. Hair specimen analysis was conducted Dr David Read.

v. *Camera Trapping*

Three Browning 'no-glow' infrared Trail Cameras (BTC 6HDE) were set at strategic locations within the subject property, one each near the start of each trap line and one to the north of the stockpile directed along a drainage line and potential movement corridor. A total of 27 camera trap nights was sampled, with all images checked once by an ecologist and re-checked by the principal ecologist for any signs of fauna activity. The locations of the camera traps are indicated on **Figure 14**.

vi. *Koala SAT Plot Surveys*

Although it was determined during the course of the project studies that the areas supporting KFTs were potentially to be retained, in the absence of complete certainty, initial checks of such areas were undertaken in December 2019 for signs of Koalas in the form of pellets at the base of trees. Spotlighting surveys also were undertaken over two nights in December 2019 (see **Section 3.3.3.iv**). A formal SAT Plot survey according to the procedures detailed in Phillips and Callaghan (2011) subsequently was undertaken in February 2020, focusing on the northern remnant forest/woodland vegetation supporting the majority of KFTs within the stockpile area.[1] The location of the central tree for the SAT Plot and spotlighting transects are indicated on **Figure 14**.

[1] Although this remnant occurs within the mapped boundaries of the stockpile, the age of some trees also exhibiting tree hollows suggests the stockpile material was built up around the old growth trees present. Younger trees within this forest/woodland patch would have grown since the establishment of the stockpile.

vii. *Spotlighting Surveys*

Spotlighting surveys were undertaken by two personnel on two nights in December 2019, with two spotlighting transects sampled each night. The conditions on each night were fine and mild to warm. The primary aim of these surveys was to target nocturnal arboreal species, including the Koala, as well as any other nocturnal ground fauna or bird species. A total of approximately eight person hours was spent spotlighting. Opportunistic spotlighting also was undertaken within the stockpile area during the course of checking harp nets after dusk (refer to **Section 3.3.3.viii** below).

viii. *Microbat Surveys*

Microbats were surveyed using two harp nets, located at two suitable flyways within the stockpile area, as shown on **Figure 14**. One species credit species requiring surveys under the BAM is the Southern Myotis (*Myotis macropus*). Harp nets were set at each location over three nights, total trap nights equalling nine. Two bat detectors also were set at the same locations, with sampling continued over nine consecutive nights. Call analysis was carried out by specialist Greg Ford from Balance Environmental.

ix. *Opportunistic Sightings*

All observations of fauna species observed during the course of flora surveys and other fauna survey procedures were recorded. Any locations of threatened or migratory species were documented separately and the GPS coordinates recorded.

x. *Active Searching*

Active searches for reptiles were undertaken whilst traversing the site, with logs, or any potential shelter site overturned as part of the search process. Any diggings, scats and bones observed during these searches also were recorded. Theses searches generally were opportunistic as logs and suitable shelter habitat were poorly represented over most of the stockpile habitats.

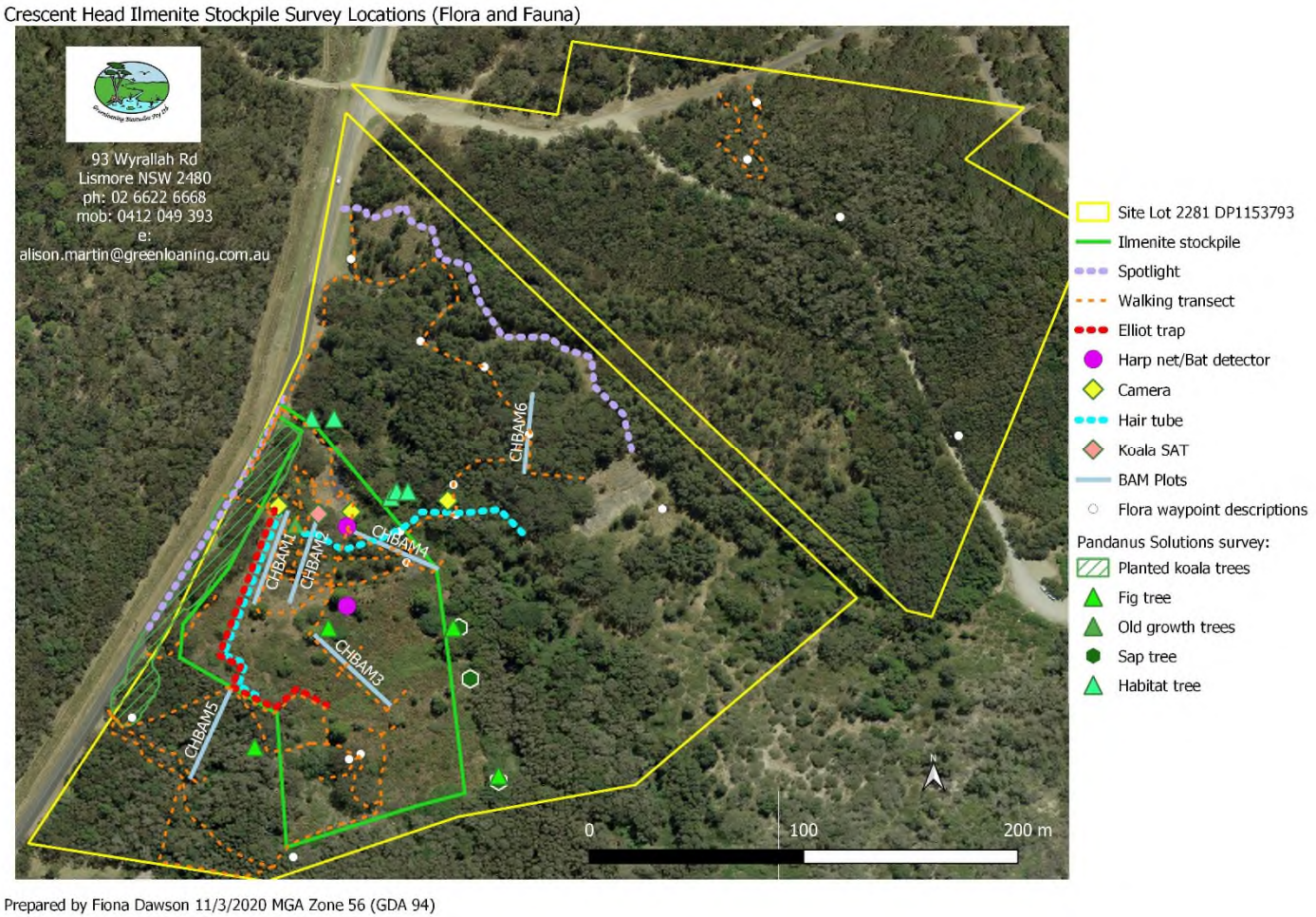


Figure 14 Flora and fauna surveys conducted at the subject property by Greenloaning Biostudies and Pandanus Solutions, 2019-2020

3.4 LIMITATIONS TO THE SURVEY PROCEDURES AND ASSESSMENT PROCESS

It is recognised that, as with all surveys, the survey process for the project had some limitations, viz:

- The identification of the PCTs occurring on the stockpile was not straightforward, this situation exacerbated by the highly disturbed nature of the stockpile per se and the regenerating vegetation not necessarily representing completely natural systems. This subsequently affected the listing of potential candidate species (refer to **Section 4.2.5** and **5.2.4** for further details).
- Field surveys in September were curtailed by severe weather conditions, with gale force winds prevailing on the third planned survey day;
- The timing of site inspections and surveys coincided primarily with severe drought conditions in many areas and severe bush fires to the west during, or immediately prior to survey periods. Blackened leaves were commonly observed for instance during the December surveys. Conditions for nomadic/seasonal/migratory species therefore were not optimal;
- The main target surveys for fauna species were limited to one seasonal session, although the intent of the timing was to maximise the number of species that could be sampled in accordance with required survey periods under the BAM; and
- Although stratification of survey sites is generally undertaken and recommended under survey guidelines (NSW Government n.d), the small size of the impact area and low topographical relief precluded the practicality of survey site stratification.

Nonetheless, the field data obtained, together with the comprehensive desktop assessment process and the extensive experience of the author of this report, provide a meaningful ecological basis for the subsequent assessment process for the preparation of this BDAR. This is particularly the case in the context of the highly modified nature of the impact area and the very small extent of proposed disturbance.

4 Results – Flora

4.1 RESULTS FROM DESKTOP ASSESSMENTS

***4.1.1** Threatened Species, Populations and /or Ecological Communities with Potential to Occur on the subject property*

The initial desktop assessment process yielded a total of 38 threatened species and nine threatened ecological communities (TECs) listed under the BC Act and occurring within the subregion. Of the total threatened flora species listed, 18 also are listed as threatened under the EPBC Act. Refinement of the list of potential threatened species and communities subsequently was undertaken, following a preliminary site inspection and detailed consideration of the ecological data on threatened species provided in BioNet 2019/2020. This process reduced the list of candidate 'species credit species' to a total of 8 threatened flora species. However, species such as those associated with estuarine or wetland habitats, which could not be expected to occur on the stockpile/impact area habitats, were excluded from the final candidate species list.

Four TECs also were considered likely or potentially to occur, these being:

1) Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions;
2) Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;
3) Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion;
4) Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions;

Community 1 and 2) above are also listed under the EPBC Act as Critically Endangered Ecological Communities (CEECs), viz:

1) Littoral Rainforest and Coastal Vine Thickets of Eastern Australia; and
2) Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community

It is noted that desktop studies indicated that the Goolawah National Parks contains a number of communities with potential relevance to the project site and stockpile environs. These communities include:

- Coastal swamp forests (including three different Broad-Leaved Paperbark (*Melaleuca quinquenervia*) communities;
- Wallum sand heaths, dominated by coastal wattle (*Acacia longifolia* ssp. *sophorae*);
- Coastal dune dry sclerophyll forests dominated by Pink Bloodwood (*Corymbia intermedia*) and Coast Banksia (*Banksia integrifolia* ssp. *integrifolia*), found on sandy dunes and coastal plains;
- Two distinct littoral rainforest communities, one is dominated by Coast Banksia and Tuckeroo (*Cupaniopsis anacardioides*), found in the more protected fore dune areas, and another, more diverse community occurring on Racecourse Headland (DPIE, 2014).

Two threatened plant species also have been recorded from the national park: Austral Toadflax (*Thesium australe*) and White-flowered Wax Plant (*Cynanchum elegans*). An additional three have been recorded in the locality, these being:

- Scented Acronychia (*Acronychia littoralis*),
- Dwarf Heath Casuarina (*Allocasuarina defungens*) and
- Milky Silkpod (*Parsonsia dorrigoensis*) (DPIE, 2014).

The park contains three endangered ecological communities:

- Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions;
- Themeda Grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions; and
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (DPIE, 2014).

The full lists of threatened species and communities generated from the database searches are provided in **Appendix C** and **Appendix D**. Preliminary comments on the likelihood of occurrence of species within the Impact Area also are provided in **Appendix C**. Candidate species determined to require surveys are provided in **Table 4.1**. Reasons for removing a species from the final candidate species list are detailed in **Section 4.2.5**.

Table 4-1 Candidate Threatened Flora Species for which Survey was Required, Extent of Potential Habitat and Biodiversity Risk Weighting

Species			**Habitat Features Suitable for the Species and Present on the subject property***	**Feature Present in Impact Area**	**Extent of Potential Habitat within Impact Area (ha)**	**Biodiversity Weighting Risk**
Scientific Name	**Common Name**					
Acronychia littoralis	Scented Acronychia		Regenerating Littoral Rainforest	Some elements	0	3
Alexfloydia repens	Floyd's Grass		Moist understorey of Swamp Oak Forest	Regenerating patch of Swamp Oak	0.08	3
Allocasuarina defungens	Dwarf Heath Casuarina		Tall heath on sands – also on clay soils and sandstone, coastal hills/headlands	Regenerating dry woodland areas with some heath elements	1.28	2
Dendrobium melaleucaphilum	Spider Orchid		Grows commonly on *Melaleuca styphelioides* and sometimes on rainforest trees	Very scattered rainforest Trees	Scattered Trees only within Zone 3c (Total zone - 1.14 ha)	2

Melaleuca biconvexa	Biconvex Paperbark		Damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Minimal – one small ditch within PCT 1235	Approx. 150 sq. m	2
Peristeranthus hillii	Brown Fairy-chain Orchid		Rainforest trees and occasional vines in Littoral Rainforest and t Lowland Rainforest on Floodplain	Only very scattered Littoral Rainforest trees	Scattered Trees only within Zone 3c (Total zone - 1.14 ha)	3
Eucalyptus seeana – endangered population	Eucalyptus seeana population in the Greater Taree local government area		Occurs as scattered individuals in woodlands and open forests on low, often swampy, sandy soils.	Slight possibility of an isolated specimen	If any mature specimens are present in forest/woodland habitats, an young seedling/sapling could occur in regenerating areas, mainly zone 2c (0.14 ha)	2

*Office of Environment and Heritage 2017a, 2017b, 2017c, 2018a, 2018b, 2019a, 2019b

4.1.2 *Vegetation Cover and Communities*

As stated in 1.4.4 and described in 3.2.2.1, desktop assessments determined that the percentage cover of native vegetation within the 1500m buffer zone was 62%, whilst the patch size was 380 ha. The extent of the native vegetation within the buffer zone and the size and extent of the defined 'patch' are shown on **Figure 13**.

The extent and broad type of existing vegetation mapping depicted in **Figure 15** is based on Kempsey LGA (Eastern Portion) Vegetation VIS_243, a polygon shapefile 1:25,000 vegetation mapping dataset combining 1999 CRAFTI and Forest Ecosystem mapping undertaken by Kendall and Kendall Ecological Consultants and GECO Environmental for Kempsey Shire Council and encompassing the resource recovery area and subject property. The existing mapping as shown on **Figure 15** is very broad scale and as confirmed by the report authors, was not subject to further ground truthing. "Limited ground truthing was conducted along roads providing access to the study area and no systematic flora survey was undertaken" (Telfer & Kendall, 2006). Therefore, vegetation communities within the resource recovery /impact area and subject property were subsequently refined for the purposes of this BDAR (refer to **Section 4.2**).

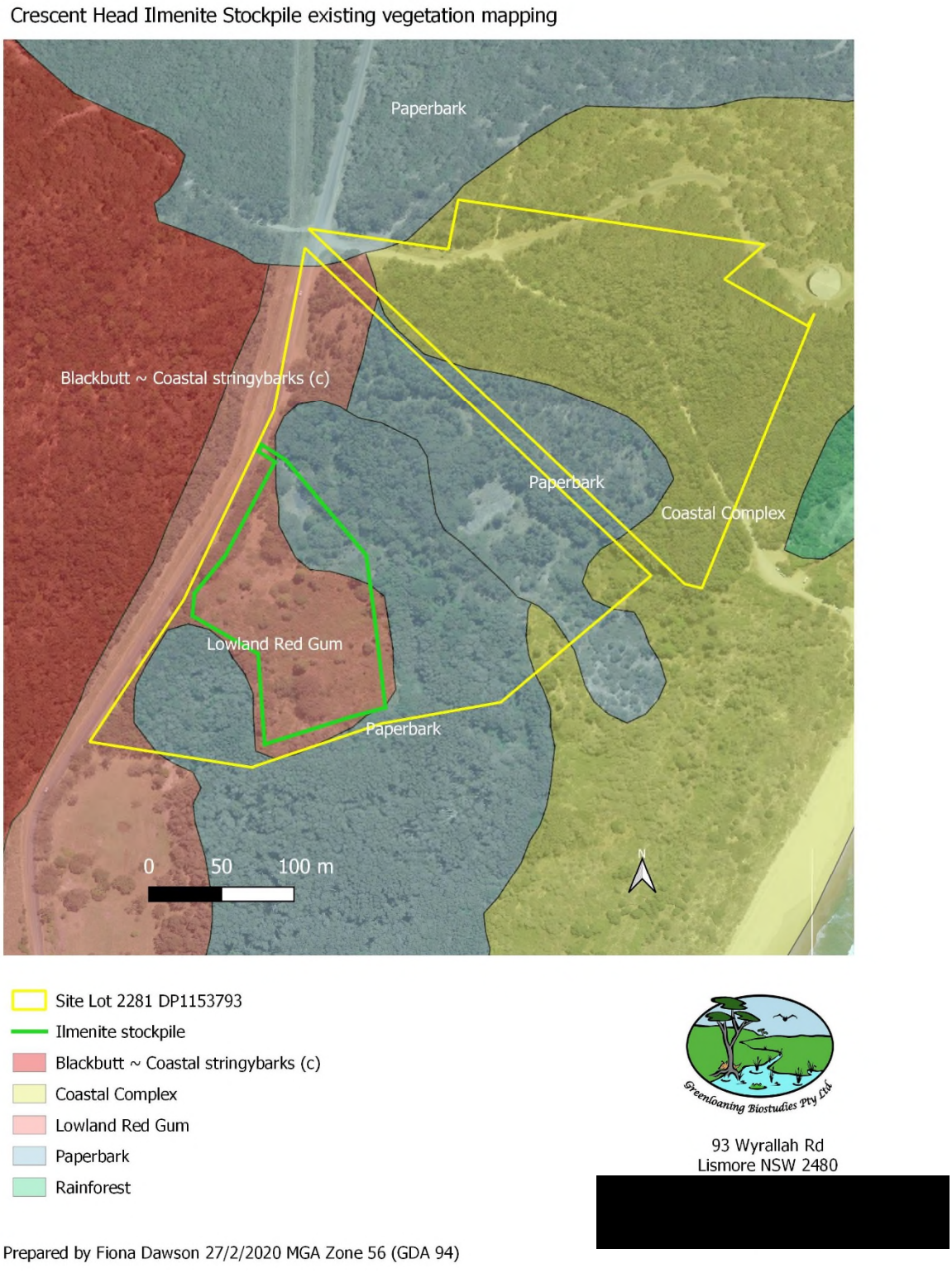


Figure 15 Existing vegetation mapping. Source Kempsey LGA (Eastern Portion) Vegetation. VIS_ID 243 (Telfer & Kendall (2006).

4.2 RESULTS FROM SURVEYS FLORA

4.2.1 *Vegetation Communities and PCTs*

The 2019/20 field inspections and surveys, in conjunction with the desktop assessment processes, yielded the following key findings in relation to the occurrence and distribution of vegetation communities and PCTs occurring on the resource recovery area and subject property:

- The stockpile/impact area which was abandoned and left to regenerate naturally and is generally in low condition with infestations of Lantana, was determined to best fit PCT 1230 *Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion*, although the PCT classification confidence level is very low (OEH, 2020b). This community as it occurs on the stockpile is not considered to be a TEC (refer below for further details);
- Patches of vegetation in the north and a small patch in the south of the stockpile containing old-growth and or Koala food trees within the same community are to be retained;
- In addition, PCT 1230 fringes the stockpile/Point Plomer Road margins and the northern perimeter of the subject property and is conservatively considered a TEC in sectors that may conform to the TEC definition of occurrence on a floodplain (refer below for further details);
- The low lying areas south, south west and south east of the stockpile dominated by Broad-leaved Paperbark (*Melaleuca quinquenervia*) were classified as PCT 1064 *Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion*. This community represents a modified and regenerating form of TEC (refer below for further details);
- A small area on the northeast margin of the stockpile and a more extensive area north east of the stockpile on the western subject property boundary dominated by Swamp Oak (*Casuarina glauca*) was determined to fit PCT 1235 *Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion* and also represents a modified and regenerating form of TEC off the stockpile only (refer below for further details);
- The subject property to the east of the aforementioned communities comprises PCT 686 Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion, not considered to be a TEC (refer below for further details and PCT 1536 Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest which is a modified and regenerating form of TEC (refer below for further details);

The distribution of the vegetation communities within the subject property and on the resource recovery area, is indicated on **Figure 16.** Descriptions of the five PCTs referred to above are detailed below;

***i.** Community 1 - PCT 686 - Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion*

a. Community Attributes and Condition

Vegetation Class: North Coast Wet Sclerophyll Forests
Percentage Cleared: 50%

The vegetation description of this PCT is "Other Diagnostics Features: Tall to very tall open forest (12 – 35m). Landscape Position: In low lying areas on the coast from Kendall north to Coffs Harbour. Upper Stratum Species: *Eucalyptus pilularis; Corymbia intermedia*; Mid Stratum Species: *Breynia oblongifolia; Callistemon salignus; Glochidion ferdinandi; Melaleuca linariifolia; Rubus hillii;* Ground Stratum Species: *Entolasia marginata; Eustrephus latifolius; Lomandra longifolia; Oplismenus imbecillis; Pratia purpurascens; Pseuderanthemum variabile; Pteridium esculentum; Imperata cylindrica var. major"*(OEH, 2020b).

The determination of this community as Wet Sclerophyll Forest and PCT 686 has been based on the following key attributes and as evidenced by Plot CHBAM6:

- The occurrence of upper stratum (Eucalyptus pilularis, Corymbia intermedia), mid stratum (Breynia oblongifolia, Glochidion spp.) and ground stratum (Lomandra longifolia, Imperata cylindrica) species characteristic of this PCT;
- The location of the community in low lying areas on the coast from Kendall north to Coffs Harbour.

As stated in the VIS Classification - Community Profile Report (OEH, 2020b) the classification confidence of this PCT is very low with neither the lithology or landform patterns having been assessed.

Plot CHBAM6 presented in **Appendix F**, and provided as fully formatted tables separately in excel format, provides an example of the variation in composition and structure of the community. The presence of other species not occurring in the PCT description, such as *Casuarina glauca*, *E. robusta, Melaleuca quinquenervia* and vines including *Parsonsia spp.*, *Smilax australis and Geitonoplesium cymosum* indicate the transitional or ecotonal nature of the community, as could be expected when considering the community is surrounded by other PCTs (refer to **Figure 15)**.

The photographs provided in **Appendix B** also illustrate the nature of this area and the level of disturbance. A comparison of the benchmark conditions for the PCT and the condition of the representations of the PCT within the resource recovery /impact area and subject property is provided in **Table 4.1**. A full list of flora species recorded in the community is provided in **Table E1**, **Appendix E.**

b. Status

Plant Community Type 686 is associated with the following TECs, which are listed as Endangered under the BC Act: River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part) and the Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (Part).

This PCT does not appear to conform to the listing advice for the first TEC as "The combination of features that distinguish River-Flat Eucalypt Forest on Coastal Floodplains from other endangered communities on the coastal floodplains include its dominance by either a mixed eucalypt canopy or by a single species of eucalypt belonging to either the genus *Angophora* or the sections *Exsertaria* or *Transversaria* of the genus *Eucalyptus* (Hill 2002); the relatively low abundance or sub-dominance of *Casuarina* and *Melaleuca* species; the relatively low abundance of *Eucalyptus robusta*; and the prominent groundcover of soft-leaved forbs and grasses. It generally occupies central parts of floodplains and raised levees; habitats where flooding is periodic and soils are rich in silt, without deep humic horizons and show little or no influence of saline ground water" (NSWSC 2011-2012a).

There were no Angophora or Red Gum (Exsertaria) species recorded in this community and only one recording of Transversaria (*E. robusta*) at the BAM Plot. In addition the soils were sandy, rather than soils rich in silt as described in the listing advice.

ii. *Community 2 - PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion*

a. Community Attributes and Condition

Vegetation Class: Coastal Swamp Forests
Percentage Cleared: 75%

This PCT is described in the VIS Classification - Community Profile Report (OEH, 2020b) as "Low to very tall woodland and forest in which Broad-leaved Paperbark (*Melaleuca quinquenervia*) commonly dominates the overstorey, or occasionally another paperbark (e.g. *M. alternifolia, M. sieberi, M. linariifolia, M. styphelioides*). Associates include Swamp Mahogany (*Eucalyptus robusta*), Swamp Oak (*Casuarina glauca*) and Swamp Box (*Lophostemon suaveolens*). Understorey and ground layer composition varies with substrate, depth and extent of waterlogging, and water quality. Sawsedges (*Gahnia spp*.), twig-rushes (*Baumea spp*.), Carex spp., Bungwahl Fern (*Blechnum indicum*), Feather Plant (*Baloskion tetraphyllum*), Tea-tree (e.g. *Leptospermum juniperinum*), Bottlebrush (e.g. *Callistemon pachyphyllus*) and certain grasses (e.g. *Hemarthria uncinata, Ischaemum australe*) may dominate, or alternatively rainforest trees, shrubs and vines such as Cabbage Tree Palm (*Livistona australis*), Cheese Tree (*Glochidion ferdinandi*) and Common Silkpod (*Parsonsia straminea*) can be common. This ecosystem is widespread on the coastal lowlands". Additional species such as Forest Red Gum (*E. tereticornis*) are listed in the Species per Stratum section of the Profile.

The determination of this community as PCT 1064 has been based on the following key attributes as evidenced by Plot CHBAM5:

- The dominance of *M.quinquenervia* in the upper stratum and presence of *E. tereticornis* and *Glochidion spp.* in the upper and mid stratum;
- The dominance of the ground stratum by *Gahnia sieberiana* and occurrence of other species characteristic of this PCT including *Parsonsia spp.* and Fern species.

As stated in the VIS Classification - Community Profile Report (OEH, 2020b) the classification confidence of this PCT is medium, however neither the lithology or landform patterns have been assessed.

Plot CHBAM5 presented in **Appendix F** and provided as fully formatted tables separately in excel format, provides an example of the variation in composition and structure of the community, with the presence of other species not occurring in the PCT description such as *Ficus spp*., *Corymbia intermedia, Guioa semiglauca* and vines *Smilax australis* being indicative of the influence of adjoining PCTs (refer to **Figure 15**).

The photographs provided in **Appendix B** also illustrate the nature of this area and the level of disturbance. A comparison of the benchmark conditions for the PCT and the condition of the representations of the PCT within the resource recovery /impact area and subject property is provided in **Table 4.1**. A full list of flora species recorded in the community is provided in **Table E1**, **Appendix E.**

b. Status

Plant Community Type 1064 is associated with the following TECs, which are listed as Endangered under the BC Act: River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part) partially subset of and the Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Equivalent) wholly subset of

This PCT does not conform to the listing advice (see PCT 686 for description) for the *River-Flat Eucalypt Forest* TEC as it is dominated by Paperbark.

It does appear to conform to the listing advice for Swamp Sclerophyll Forest on Coastal Floodplains which is *"*associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains, generally below 20m"(NSWSC 2011-2012b). This BAM plot occurs on alluvial soils as indicated by **Figure 5** at an elevation of < 20m and includes "areas of fernland and tall reedland or sedgeland" (NSWSC 2011-2012b). The presence of *Ficus spp.* (eg Sandpaper Fig) at the plot also conforms to the determination as does the "relatively infrequent occurrence of other eucalypts, *Casuarina glauca* or *Lophostemon suaveolen"* (NSWSC 2011-2012b).

iii. *Community 3 - PCT 1230 - Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion*

a. Community Attributes and Condition

Vegetation Class: Coastal Swamp Forests
Percentage Cleared: 75%

This PCT is described in the VIS Classification - Community Profile Report (OEH, 2020b) as "Mid-high (rarely low) to very tall woodland and forest; Landscape Position: In drainage lines and open depressions mainly on the coastal lowlands, but occasionally further inland. Upper Stratum Species: *Eucalyptus robusta; Melaleuca quinquenervia; Casuarina glauca; Eucalyptus resinifera; Eucalyptus tereticornis; Corymbia intermedia; Lophostemon suaveolens*; Mid Stratum Species*: Acacia maidenii; Baeckea frutescens; Callistemon pachyphyllus; Cordyline stricta; Glochidion ferdinandi; Leptospermum juniperinum; Livistona australis; Melaleuca spp.; Melicope elleryana; Parsonsia straminea*; Ground Stratum Species*: Baloskion tetraphyllum; Blechnum camfieldii; Blechnum indicum; Gahnia spp.; Hypolepis muelleri; Ischaemum australe; Sporadanthus interruptus; Xanthorrhoea fulva;*

The determination of this community as PCT 1230 has been based on the following key attributes as evidenced by Plot CHBAM1, 2 and 3 and additional waypoint descriptions CHF1, 6, 7, 8, 13, 14:

- The dominance of old growth *E. tereticornis* in the upper stratum with *C. intermedia* at Plot 2 which must have already been in existence but was partially buried by the stockpile in the north of the stockpile. The presence of old growth *E. robusta* and *E. tereticornis* in a patch on the south of the stockpile (CHF14);
- The presence of E. tereticornis C. intermedia , M. quinquenervia , C. glauca at CHF1, 6, 7, 8, 13, 14;
- Despite the dominance by regenerating pioneer species in Plot 1 and 3 which are effectively cleared areas created by the stockpile, in particular, *Pteridium esculentum* at Plot 3 and *Imperata cylindrica* at Plot 1, species characteristic of this PCT were recorded at Plot 1 (*E. tereticornis* and *Glochidion ferdinandi*) and therefore was considered to be part of this PCT;
- PCT 1230 was considered the best match for Plot 3 owing to the occasional occurrence of *C. intermedia* as an emergent above the dense *Pteridium esculentum/Lantana* dominating the lower stratum, as well as isolated *Glochidion ferdinandi* and *Leptospermum juniperinum* small trees/shrubs.

As stated in the VIS Classification - Community Profile Report (OEH, 2020b) the classification confidence of this PCT is very low with neither the lithology or landform patterns having been assessed. The community as it occurs on the stockpile has been substantially disturbed from past clearing and the regenerating areas have developed on a totally man-modified substrate of ilmenite. The designation of this community thus is quite problematic and the confidence level for PCT determination is very low. Weed infestations have further influenced the regenerating areas and there is considerable variation in species composition, canopy cover and extent of weed cover over the subject property. This variation has led to the designation of vegetation zones as shown on **Figure 15**, varying in overall condition, as described in **Section 4.2.2**.

Plot CHBAM1, 2 and 3 are presented in **Appendix F** and provided as fully formatted tables separately in excel format, provide examples of the variation in composition and structure of the community, with the presence of other species not occurring in the PCT description such as *Pteridium esculentum, Imperata cylindrica* and *Banksia integrifolia* due to the anthropogenic nature of the stockpile.

The photographs provided in **Appendix B** also illustrate the nature of this area and the level of disturbance. A comparison of the benchmark conditions for the PCT and the condition of the representations of the PCT within the resource recovery /impact area and subject property is provided in **Table 4.1**. A full list of flora species recorded in the community is provided in **Table E1**, **Appendix E.**

b. Status

Plant Community Type 1230 is associated with the following TECs, which are listed as Endangered under the BC Act: Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion (Part); Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part); Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part)

The communities on the stockpile do not meet the criteria for any of these TECs due to the geomorphological nonconformity of the stockpile. All of these TECs require the communities to reside on coastal floodplains and associated soils (NSWSC 2011-2012b, c) whereas the stockpile is anthropogenic and composed of black ilmenite sand.

While the communities off the stockpile may comply with the vegetation descriptions, there is doubt regarding the floodplain status of the lower-lying land surrounding the stockpile, however from a precautionary approach, they would be considered as TECs.

iv. *Community 4 - PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion*

a. Community Attributes and Condition

Vegetation Class: Coastal Swamp Forests
Percentage Cleared: 75%

This PCT is described in the VIS Classification - Community Profile Report (OEH, 2020b) as "Low to very tall woodland and forest. Widespread on poorly drained sites in coastal areas. Upper Stratum Species*: Casuarina glauca; Melaleuca quinquenervia; Eucalyptus tereticornis;* Mid Stratum Species: *Goodenia ovata; Hibiscus diversifolius; Melaleuca ericifolia; Melaleuca stypheliοides; Parsonsia straminea;* Ground Stratum Species: *Baumea juncea; Enydra fluctuans; Fimbristylis ferruginea; Gahnia clarkei; Ischaemum australe; Juncus kraussii;*

The determination of this community as PCT 1235 has been based on the following key attributes as evidenced by Plot CHBAM4 and additional waypoint descriptions CHF4, 9 and 12:

- The dominance of old growth *C. glauca* in all stratums with *E. tereticornis* also present in the upper stratum.

This community also occurs off the stockpile to the east (**Figure 16**) as documented by waypoint descriptions CHF4, 9 and 12. As stated in the VIS Classification - Community Profile Report (OEH, 2020b) the classification confidence of this PCT is very low with neither the lithology or landform patterns having been assessed.

Plot CHBAM4 is presented in **Appendix F,** and provided as fully formatted tables separately in excel format and provides an example of the variation in composition and structure of the community, with the presence of other species not occurring in the PCT description such as *Corymbia intermedia* and *Imperata cylindrica* indicating an ecotonal area . The varied elevation drops down into dense *Smilax australis* and *Hibbertia scandens* at the eastern end indicating a more recently cleared and disturbed area.

The photographs provided in **Appendix B** also illustrate the nature of this area and the level of disturbance. A comparison of the benchmark conditions for the PCT and the condition of the representations of the PCT within the resource recovery /impact area and subject property is provided in **Table 4.1**. A full list of flora species recorded in the community is provided in **Table E1**, **Appendix E.**

b. Status

Plant Community Type 1235 is associated with the following TECs, which are listed as Endangered under the BC Act: Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part); Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part); Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part).

The communities on the stockpile do not meet the criteria for any of these TECs due to the geomorphological nonconformity of the stockpile. These TECs require the communities to reside on coastal floodplains and associated soils (NSWSC 2011-2012b, c), whereas the stockpile is anthropogenic and composed of black ilmenite sand. However the patch situated to the east of the stockpile does conform to the Swamp Oak listing with regard to both vegetation and soils which are mapped as alluvial (**Figure 5**) and is therefore considered to be a TEC.

This community also is listed as Vulnerable under the EPBC Act, and occurrences of the community on the low-lying areas surrounding the stockpile are likely to conform to the definition of *Coastal Swamp Oak* (Casuarina glauca) *Forest of New South Wales and South East Queensland ecological community*. Under this definition however, the community is associated with such landscape features as low-lying alluvial plains and unconsolidated sediments and 'occurrences of swamp oak trees on rocky headlands or other consolidated substrates are not considered to be a part of the ecological community' (Department of the Environment and Energy 2018) The small pocket of regenerating Swamp Oak Forest occurring within the Impact Area on a dry man-modified stockpile of ilmenite thus does not conform to the definition of the community.

Community 5 - PCT 1536 - Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest

c. Community Attributes and Condition

Vegetation Class: Littoral Rainforest
Percentage Cleared: 78%

The vegetation description of this PCT is "Low open forest to closed forest with a canopy characterised by *Cupaniopsis anacardioides* and *Banksia integrifolia*. The mid-storey is composed mainly of shrubs and climbers. The ground layer consists of ferns; graminoids and scattered forbs. Near coastal areas on coastal lowlands of the lower North coast and Central Coast mainly on sands. Upper Stratum Species: *Cupaniopsis anacardioides; Acmena smithii; Banksia integrifolia;* Mid Stratum Species: *Myrsine variabilis; Breynia oblongifolia; Pittosporum revolutum; Polyscias elegans; Notelaea longifolia; Glochidion ferdinandi; Smilax australis; Marsdenia rostrata; Pandorea pandorana; Cissus hypoglauca; Cissus antarctica;* Ground Stratum Species: *Pteridium esculentum; Lomandra longifolia; Viola hederacea; Oplismenus imbecillis"* (OEH, 2020b).

The determination of this community as PCT 1536 has been based on the following key attributes (recorded at waypoint description CHF2, CHF3, CHD16):

- The occurrence of species characteristic of this PCT, viz: Cupaniopsis anacardioides, Notelaea spp., Persoonia spp., Guioa semiglauca, Glochidion ferdinandi, Acmena smithii (var. major), Lomandra longifolia, Geitonoplesium spp., Imperata cylindrical, Breynia oblongifolia, *Monotoca* elliptica, Melaleuca quinquenervia, Eucalyptus tereticornis, Corymbia intermedia;
- The location of the community within 2 km from the ocean;
- The presence of salt tolerant species such as Tuckeroo; and
- The sandy nature of the topsoil.

As stated in the VIS Classification - Community Profile Report (OEH, 2020b) the classification confidence of this PCT is high with lithology described as Mudstone and Sandstone but landform patterns not having been assessed.

The photographs provided in **Appendix B** also illustrate the nature of this area and the level of disturbance. A comparison of the benchmark conditions for the PCT and the condition of the representations of the PCT within the resource recovery /impact area and subject property is provided in **Table 4.2**. A full list of flora species recorded in the community is provided in **Table E1**, **Appendix E.**

d. Status

Plant Community Type 1536 is associated with the following TEC which is listed as Endangered under the BC Act: *Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part)*.

This community conforms to the determination with regard to both vegetation and soils (NSWSC 2011-2012d). It should be noted that although this site is not mapped as Littoral

Rainforest in the recent Coastal SEPP (which amalgamates SEPP 26 Littoral Rainforest), the determination states "The areas mapped for inclusion in SEPP 26 Littoral Rainforest are examples of the ecological community, but the mapping is not exhaustive and stands of this community occur at locations not mapped under SEPP 26. Some stands may be regrowth or in the process of regenerating".

PCT 1536 also conforms to the Commonwealth *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*, listed as Critically Endangered under the EPBC Act, as the representation of the PCT within the subject property meets all of condition thresholds prescribed by the Listing Advice for the community (DAWE, 2015), including:

• The patch must have:

1) at least 25% of the native plant species diversity characteristic of this ecological community in that bioregion (Attachment A) [of the Listing Advice];

OR

2) at least 30% canopy cover of one rainforest canopy (either tree or shrub) species (Attachment A, excluding Banksia and Eucalyptus species that may be part of the ecological community).

Figure 16 BAM Plot locations, PCT's and vegetation zones subdivided by condition, intent and TEC status on the subject property.

Table 4-2 Comparison of On-site Vegetation Community Condition with Community Benchmark Condition

IBRA	PCT1230				1235*	
NSW North Coast	**Benchmark Values**	**On-site Community 3 Zone 2c**	**On-site Community 3 Zone 3c**	**On-site Community 3 Zone 4c***	**Benchmark Values**	**On-site Community 4 Zone 5c**
Tree Richness	5	6	3		4	4
Shrub Richness	7	4	0		7	1
Grass and Grass Like Richness	7	4	1		7	1
Forb Richness	6	0	0		7	0
Fern Richness	2	0	1		2	0
Other Richness	5	4	2		4	4
Tree Cover	36.0	6.21	6.01		28.0	63.1
Shrub Cover	13.0	1.13	0		15.0	0.01
Grass and Grass Like Cover	75.0	25.03	0.01		102.0	1
Forb Cover	3.0	0	0		3.0	0
Fern Cover	2/0	0	70		1.0	0
Other Cover	40	3.6	0.02		2.0	1.12
Total length of fallen logs	43	1	0		12	0
Litter Cover	41	61	72		40	75
Number of Large Trees	5	0	0	0	1	0
Large Tree Threshold Size	50				50	

*Area of Zone 4c was too small and fragmented for establishment of a plot to be practical. No clearing of trees is proposed and clearing operations will be limited primarily to Lantana and lopping of overhanging branches

***4.2.2** Vegetation Zones*

In order to facilitate the assessment process, the PCTs identified in 4.2.1 above were subdivided according to condition, intent (whether the zone is proposed to be cleared, denoted by 'C,' or retained, denoted by 'R') and TEC status. Based on the desktop mapping processes and field survey data, five PCTS were split into seven zones of varying condition and intent on the subject property as summarised below: The zones are indicated on **Figure 16** and summarised in **Table 4.3.**

Table 4-3 Vegetation Zone Attributes

Zone	PCT	Condition	Intent	Area (ha)	TEC	PCT description
1R	1064	Mod-Good	R	1.15	TEC	Paperbark swamp forest of the coastal lowlands
1R	1064	Mod-Good	R	0.8	TEC	Paperbark swamp forest of the coastal lowlands
1Ra	1064	Mod-Good	R	0.04		Paperbark swamp forest of the coastal lowlands
2C	1230	Low	C	0.03		Swamp Mahogany swamp forest on coastal lowlands
2C	1230	Low	C	0.11		Swamp Mahogany swamp forest on coastal lowlands
3C	1230	Low	C	1.14		Swamp Mahogany swamp forest on coastal lowlands
3R	1230	Low	R	0.19		Swamp Mahogany swamp forest on coastal lowlands
3Ra	1230	Mod	R	0.23		Swamp Mahogany swamp forest on coastal lowlands
3Ra	1230	Mod	R	0.07		Swamp Mahogany swamp forest on coastal lowlands
4C	1230	Low	C	0.013		Swamp Mahogany swamp forest on coastal lowlands
4R	1230	Mod-Good	R	0.65		Swamp Mahogany swamp forest on coastal lowlands
4R	1230	Mod-Good	R	0.83		Swamp Mahogany swamp forest on coastal lowlands
4R	1230	Mod-Good	R	0.25		Swamp Mahogany swamp forest on coastal lowlands
4R	1230	Mod-Good	R	0.19		Swamp Mahogany swamp forest on coastal lowlands
5C	1235	Mod	C	0.08		Swamp Oak swamp forest of the coastal lowlands
5R	1235	Mod-Good	R	0.55	TEC	Swamp Oak swamp forest of the coastal lowlands
5R	1235	Mod-Good	R	0.15	TEC	Swamp Oak swamp forest of the coastal lowlands
5R	1235	Mod-Good	R	0.07	TEC	Swamp Oak swamp forest of the coastal lowlands
5R	1235	Mod-Good	R	0.2	TEC	Swamp Oak swamp forest of the coastal lowlands
6R	686	Mod-Good	R	1.24		Blackbutt - Pink Bloodwood shrubby open forest
7R	1536	Good	R	3.49	TEC	Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
7R	1536	Good	R	0.19	TEC	Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
7Ra	1536	Low	R	0.58	TEC	Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
				0.05		Existing cleared area
				0.014		Access track
				0.13		Concrete pad
				12.44		
				10.87		Total retained
				1.37		Total proposed to be cleared
				0.19		Existing cleared/concrete pad
				12.44		

Details on the current vegetation integrity score for the resource recovery /Impact Area are provided in **Table 4.4** and a Vegetation Zone Report for the impact area is provided in **Appendix G**.

Table 4-4 Vegetation Integrity Scores for Vegetation Zone 5 Subject to Impacts

PCT	Zone	Current Vegetation Integrity Score	Future Vegetation Integrity Score
1230	2c	35.7	0
	3c	14.4	0
	4c	n/d (very small disjunct fringes –not sampled)	0
1235	5c	27.9	0

4.2.3 *Native Plant Species Occurrence*

A full list of flora species recorded on the subject property is provided in **Table E1**, **Appendix E**, including species listed as High Threat Exotics (HTEs) under the BAM (referred to as 'Transformer Weeds' under the Commonwealth). A total of 78 flora species has been recorded, the majority of which occurring within the resource recovery /impact area, and Subject Property as a whole, are native species (90%). The proportion of HTEs and other weed species however, in terms of cover, is quite high. Plot data suggests that even within the moderate condition vegetation in Zone 3R for instance, weed species can represent up to almost 50% of the total species richness. In the low condition vegetation sampled in Zones 3c, weed/exotic species outnumber native species and also provide the majority of cover (refer to plot data in **Appendix F** for zone 3c data).

4.2.4 *Threatened Plant Species Occurrence*

No threatened species have been recorded on the subject property to date, and particularly within the resource recovery/impact area. It is always possible however, that an occasional specimen of a threatened plant species may occur, particularly in the areas of the property as a whole that are beyond the impact area and were not subject to detailed surveys and plot sampling. The likelihood of such occurrences also would be expected to increase as the natural regeneration process continues. The likelihood of occurrence of threatened species within the resource recovery /impact area is very low, given the level of existing clearing and mown landscape.

4.2.5 *Justification for Threatened Flora Species Determined to be Unlikely to Occur within the Impact Area*

The following species, although known to be associated with PCT 1230 and/or PCT 1235, have been discounted from the candidate species list for reasons specified under each species heading. The justification for exclusion is based on a number of the provisions of the BAM, viz:

6.4.1.3 The assessor must first use the following criteria to predict the threatened species that require assessment at the site:

(a) the distribution of the species includes the IBRA subregion which the subject land is, in the opinion of the assessor, mostly located within.

6.4.1.14 If the species is a vagrant in the IBRA subregion, the species is considered unlikely to occur and no further assessment is required. The assessor must record in the BAR the reasons for determining that the species is unlikely to occur on the subject land.

6.4.1.17 A candidate species credit species will be considered unlikely to occur on the subject land (or specific vegetation zones) if:

***i.** (a) after carrying out a field assessment of the habitat constraints or microhabitats on the subject land, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).*

***i.** Asperula asthenes* Trailing Woodruff

The Trailing Woodruff is a 'low trailing perennial herb' that 'occurs in damp site, often along river banks (Office of Environment and Heritage (2019c). Potential habitat for this species within the Impact Area is highly marginal and degraded and the species is considered 'unlikely to utilise the subject land' comprising the Impact Area vegetation zones.

***ii.** Lindernia alsinoides Noah's False Chickweed*

This species is a delicate wetland fringe herb known from only a few locations in NSW, one of which has been subject to long term monitoring by one of the authors of this report (Cumberland Ecology and Greenloaning Biostudies 2014). The species also is currently subject to further monitoring by Greenloaning Biostudies under the 'Saving our Species Program' (SOS). Given the man-modified status and elevated topography of the Impact Area, there is no suitable habitat occurring for *L. alsinoides* on the stockpile, the species is 'unlikely to utilise the subject land' comprising the Impact Area and target searches therefore were not warranted.

***iii.** Maundia triglochinoides*

Maundia triglochinoides is found 'in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients' (Office of Environment and Heritage 2019d). Considering that these types of habitats are not characteristic of the Impact Area (there is only one small ditch within the Impact Area, which was dry during field surveys), the species is 'unlikely to utilise the subject land' comprising the impact area and target searches therefore were not warranted.

***iv.** Oberonia titania Red-flowered King of the Fairies*

This orchid species 'occurs in littoral and subtropical rainforest and paperbark swamps Office of Environment and Heritage (2017c), true representations of which do not occur within the Impact Area (refer to **Section 4.2.2**. Additionally, there are no records for this species in the Macleay Hastings IBRA Subregion (BioNet Atlas, 2020). The species therefore is unlikely to utilise the subject land' comprising the Impact Area and target searches therefore were not warranted.

***v.** Phaius australis Southern Swamp Orchid*

Phaius australis is a large terrestrial orchid that typically is associated with swampy grassland or swampy forest (Office of Environment and Heritage 2019e). Given the man-modified status and elevated topography of the Impact Area, with associated communities not representing swampy conditions, there is no suitable habitat occurring for *Phaius australis* on the stockpile, the species is unlikely to utilise the subject land' comprising the Impact Area and target searches therefore were not warranted.

On the basis of the above factors and consistent with section 6.4.1.17 (a) of the BAM, it was determined that, for all of the above species, 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land' comprising the Impact Area.

4.2.6 *Weed Species*

A total of 10 exotic species has been recorded within the subject property (refer to **Table E4**), with five of these species known to occur on the proposed resource recovery area (refer to **Table F4, Appendix F**). Of the total weed species recorded, seven are listed as HTEs under the BAM. The most dominant species in terms of cover and general representation through all vegetation zones comprises Lantana (*Lantana camera*). The species is most consistently prevalent within the regenerating Zone 3c, which visually is dominated by Bracken Fern, but has Lantana distributed throughout at varying levels of cover. Thickets of Lantana also tend to occur around much of the edges of the stockpile, such as at the eastern end of Plot BAM4, and beside the existing access track to the site in the north.

Another HTE, the Slash Pine (*Pinus elliotii,* only occurs as scattered individuals, but a small number of specimens in the southeastern sector are very large trees, representing an ongoing seed source. Bitou Bush (*Chrysanthemoides monilifera*), also listed as a HTE, occurs in scattered clumps, particularly in regenerating areas. Other HTEs recorded tend to be represented as scattered individuals, clusters.

5 Results – Fauna

5.1 RESULTS FROM DESKTOP ASSESSMENTS

The initial desktop assessment process yielded a total of 98 threatened species listed under the BC Act and occurring, or predicted to occur within the subregion. Of the total threatened fauna species listed, 29 are also listed as threatened and/or migratory under the EPBC Act. Refinement of the list of potential threatened species subsequently was undertaken, in conjunction with detailed consideration of the ecological data on threatened species provided in BioNet 2019.

Species such as those reliant on marine, estuarine or wetland habitats, which could not be expected to have any reliance on the subject property habitats, were excluded from the candidate species list. Whilst recognising that some marine species are known to use Littoral Rainforest for shelter, it was considered that the likelihood of the resource recovery area and subject property being used for this purpose was very low, based on the following factors:

- The location being somewhat removed from the vegetation immediately adjacent to the ocean; and
- The disturbed nature of the subject vegetation and associated interrupted canopy cover.

The full lists of threatened species generated from the database searches are provided in **Appendix C** and **Appendix D**. The list of candidate species requiring survey is provided in **Table 5.1**. Preliminary comments on the likelihood of occurrence also are provided in **Appendix C**. The justification for discounting 'ecosystem credit species' from the list of species predicted to occur, and 'species credit species' from the candidate species list is provided in **Section 5.2.4.**

Table 5-1 Candidate Threatened Fauna Species for which Survey was Required, Extent of Potential Habitat and Biodiversity Risk Weightings

Species		**Habitat Features Suitable for the Species and Present on the subject property***	**Feature present in Impact Area**	**Extent of Potential Habitat within resource recovery area (ha)**	**Biodiversity Risk Weighting**
Scientific Name	**Common Name**				
Burhinus grallarius	Bush-stone Curlew	Occurs in open forests and woodlands with a sparse grassy ground layer and fallen timber	Small areas of grassy groundcover	0.19	2
Cercartetus nanus	Eastern Pygmy Possum	Generally prefer woodlands and heath except in NE NSW where mostly in rainforest. Feeds largely on nectar and pollen from Banksias, eucalypts and bottlebrushes	Very scattered food resources in Zones 2c and 3c	Total zones area 1.28 ha, but very little food resources in zone 3c.	2
Lichenostomus fasciogularis	Mangrove Honeyeater	Mangrove woodlands and shrublands are primary habitat - also range into adjacent forests/ woodlands/ shrublands, including Casuarina and paperbark swamp forests/ associations dominated by eucalypts or banksias.	Regenerating Swamp Oak forest	0.08	2
Carterornis leucotis	White-eared Monarch	Occurs in rainforest, especially drier types, such as littoral rainforest, and wet/ dry sclerophyll forests, swamp forest and regrowth forest. - appear to prefer ecotone between rainforest and other open vegetation types/ rainforest edges, such as along roads.	Regenerating Swamp Oak forest/edges of regenerating 1230 near remnant forest/woodland	Approximately 0.1	2
Phascogale tapoatafa	Brush-tailed Phascogale	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter, but also inhabits heath, swamps, rainforest and wet sclerophyll forest.	Could use Zones 2c/3c/4c and 5c for foraging	1.37	2
Phascolarctos cinereus	Koala	Known to use Forest Red Gums and Swamp Mahogany as Preferred KFTs	Known to occur in habitat adjacent to Impact Area. Potentially would move through Zone 2c, 3C and 4c to Zones 1R, 3R supporting KFTs	No Preferred Habitat within Impact Area but movement area 2comprises 1.37 ha	2

Species		**Habitat Features Suitable for the Species and Present on the subject property***	**Feature present in Impact Area**	**Extent of Potential Habitat within resource recovery area (ha)**	**Biodiversity Risk Weighting**
Scientific Name	**Common Name**				
Planigale maculata	Common Planigale	Inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	Could use Zones 2c, 3c, 4c	1.3	2

* Office of Environment and Heritage 2017d, 2017e, 2018c, 2018 d, 2018e, 2018f, 2019f, 2019 g

5.2 RESULTS FROM FAUNA SURVEYS

5.2.1 *Fauna Habitats*

Key habitat features of the subject property, as identified during the on-site surveys, in conjunction with desktop assessments, comprise the following (features associated specifically with the resource recovery /impact area are noted in additional comments in **bold**):

1. Good general and direct connectivity with adjoining habitat to the north, east and soutth-east, with good connectivity for more mobile species also to the west. Point Plomer Road, which is a sealed and well-used local road, represents a break in connectivity for species such as small ground mammals, whilst the gravel access tracks to the beach and reservoir in the north of the subject property would represent a more minor break in connectivity for such species. **Overstorey cover is sparse over most of the impact area, but the existing regenerating areas provide vegetated connectivity with adjoining y habitat**;
2. Some connectivity with habitat to the south, although the connecting habitat is somewhat fragmented immediately adjoining the subject property;
3. Scattered occurrence of rainforest fruiting tree species, particularly figs that would provide foraging resources for a range of fructivorous species. **There are occasional occurrences of such trees within the impact area, as shown on Figure 14 ;**
4. Occasional Banksias providing food resources for nectivorous species known to occur in the locality, such as the Common Blossom Bat (*Syconycteris australis*).
5. Very limited occurrence of small tree hollows. Trees with hollows, as well as any large native trees with potential for hollows, fissures or decorticating bark, have been excluded from the Impact Area;
6. Occasional very large trees that would provide good shelter and nesting potential. **Habitat supporting large trees within the stockpile area have been excluded from the Impact Area**;
7. Small patches of dense understorey/grassy ground cover that would provide cover for some fauna species, such as bandicoots and the Rufous Bettong. The majority of the regenerating vegetation within the Impact Area supports such habitats;
8. Stands of Swamp Oak that provided potential foraging resources for the Glossy Black Cockatoo (*Calyptorhynchus lathami*). **A small patch of young mature Swamp Oak trees occurs within the Impact Area;**
9. Variable occurrence of ground debris, with very limited occurrence of hollow logs. **Ground debris is very sparse to lacking over most of the Impact Area;**
10. A variety of microhabitats likely to provided suitable foraging resources for a range of microbat species. **Some microbats would be likely to forage across sectors of the Impact Area as part of much broader foraging habitat;** and
11. A sandy loam substrate, potentially suitable for burrowing species. **The Impact Area also has sandy soils, but these primarily comprise dense, very soft ilmentite, which would be expected to have limited potential as suitable burrowing substrate**.

As part of an identified wildlife corridor and key fauna habitat area, in conjunction with the features listed above, the Subject Property habitat has recognized value to fauna, albeit the habitat being in a disturbed state, particularly in relation to the Impact Area.

The features of the resource recovery area per se, provide far less value to most fauna species, with minimal upper strata habitat available for arboreal species and mobile species such as many bird and microbat species that forage and/or roost/nest at higher levels. The main habitat attribute of the Impact Area is the relatively continuous ground cover, providing good shelter/foraging shelter for small ground fauna. The overall value of the resource recovery area to fauna species is considered to be low.

5.2.2 *General Fauna Species*

Fauna species recorded on the subject property are listed on **Table E2, Appendix E**. As could be expected, the main species recorded were birds, with 21 species recorded to date on the subject property, with most surveys undertaken within the Impact Area. A much greater number of additional species would be expected to be recorded over time, more particularly in the adjoining swamp forest/woodland habitats. Very few reptile species were observed or captured, and the lack of ground debris within the Impact Area would be expected to limit the suitability and use of the Impact Area by this fauna group. Lace Monitors (*Varanus varius)* were observed however, on a number of occasions, both within the Impact Area and in adjoining swamp forest habitat. Consistent use of the Impact Area by any amphibian species is considered unlikely, given the very dry nature of this area in general.

Thirteen native mammal species were recorded from the site surveys. Signs of bandicoots, likely to be the Norther Brown Bandicoot (*Isoodon macrouris*), were observed during site surveys within the Impact Area and two other small ground mammals, the Bush Rat (*Rattus fuscipes*) and Brown Antechinus (*Antechinus stuartii*) were recorded during both the Elliott trapping programme. The latter two species also were recorded from the hair tube trapping surveys. These species were recorded both within the Impact Area and in adjoining forested habitats.

A number of microbat species were recorded within the stockpile/resource recovery area, either through the harp trapping survey or by call detector surveys and subsequent call analysis. In total, at least five species were recorded, two species captured in harp traps and three species detected from call analysis. Calls from a sixth species potentially were recorded but the calls were not sufficiently distinctive to be confident of identification (refer to **Table E2**, **Appendix E**).

Spotlighting surveys yielded very little in the way of fauna records with only one Common Brush-tail Possum recorded on one occasion in habitat to the north of the Stockpile/resource recovery area.

Full details of fauna species recorded during all surveys are provided in **Appendix E.**

5.2.3 *Threatened Fauna Species*

i. *Amphibians*

No threatened amphibian species was considered likely to occur on the stockpile limited (refer to **Section 5.2.4** for further details).

ii. *Reptiles*

Reptile observations within the subject property and within the Impact Area were very few and potential habitat for any threatened species very limited (refer to **Section 5.2.4** for further details).

iii. *Birds*

No threatened bird species was recorded utilising the Impact Area during site surveys, although the Little Lorikeet (*Glossopsitta pusilla**a) was*** tentatively identified flying through the subject property and other species, such as the White-breasted Sea-eagle and Little Eagle, could be expected to fly over the area as part of their foraging range and .

iv. *Mammals*

As described in **Section 3.3.3**, a range of fauna survey procedures was undertaken to target threatened species with some potential to occur within the subject property, and particularly within the Impact Area. The majority of surveys yielded no threatened species listed under the BC Act or the EPBC Act, or migratory species listed under the EPBC Act, utilising the Impact Area. The Koala SAT Plot searches however, yielded one Koala pellet within the small pocket of remnant and regenerating woodland/forest habitat supporting KFTs in the north of the stockpile area. The sparse number of pellets detected renders the habitat as 'low use activity habitat (Phillips and Callaghan 2011).

However, a precautionary approach has been taken in the context of the potential for 'otherwise…med-high carrying capacity Koala habitat [potentially being the]…result of contemporary population dynamics, landscape configuration and/or historical disturbances including … mining….Such considerations should not necessarily detract from the potential importance of such habitat for longer-term conservation, particularly if preferred koala food trees are present and populations of P. cinereus are known to occur in the general area' (Phillips and Callaghan 2011). The Koala species was known previously to utilise the roadside KFTs and known and potential habitat for the Koala has been excluded from the Impact Area. As indicated in **Figure 17**, the subject property and stockpile have been mapped as primarily Primary and Secondary (A) Preferred Koala Habitat as mapped in the KSC KPoM. The extent of Koala habitat within the subject property and in relation to the Impact Area has been refined however, as shown on **Figure 18**.

No indications of use of Zone 5c, supporting potential Glossy Black Cockatoo food trees, were detected, with inspections of this habitat conducted in September and December 2019 and in February 2020. There is substantial habitat for the species however, within the broader subject property.

Elliott trapping did not yield any records of either the Common Planigale or Eastern Pygmy Possum, although was very successful in capturing two other small mammal species, as described in **Section 2.2.2**. Microbat trapping surveys also did not capture any threatened fauna species, particularly neither the Eastern Cave Bat (*Vespadelus troughtoni*) nor the Southern Myotis (*Myotis macropus*), both of which are 'species credit species.' The former species has however, been recorded in the nearby Goolawah National Park, as have a number of other threatened microbat species, viz: the Eeastern/Large bent-winged Bat (*Miniopterus*

orianae oceanensis), Eastern Cave Bat (*Vespadelus troughtoni*), Eastern Long-eared Bat (*Nyctophilus bifax*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Little Bent-winged Bat (*Miniopterus australis*) (DPIE, 2014).

Bat call detector surveys undertaken to supplement the trapping surveys, yielded one call file for the Little Bent-winged Bat for the stockpile/resource recovery area and it could be assumed that the species would use the Impact Area habitats of Zone 2c, 3c, 4c and 5c to some extent, in conjunction with more vegetated habitats beyond the Impact Area. The species however, tends to favour more timbered habitats (Office of Environment and Heritage 2020) and foraging over the more open habitats is less likely

The Grey-headed Flying Fox (*Pteropus poliocephalus*) also has been recorded within the Goolawah National Park and would be expected to forage through the subject property as part of general potential foraging habitat. Foraging within the Impact Area however, would be expected to be limited to a very small number of individuals feeding on fruiting figs or other very scattered fruiting/flowering trees on a seasonal basis. No camps of the species occur within the subject property. This species also is listed as Vulnerable under the EPBC Act. Another mammal species, the Greater Glider (*Petauroides Volans*) also is listed as Vulnerable under the EPBC Act, but not under the BC Act. The species is considered unlikely to occur within the Subject Property and tends to favour tall moist montane forest. It requires large tree hollows for roosting (Threatened Species Scientific Committee 2016) and there is no suitable habitat for the species within the Impact Area.

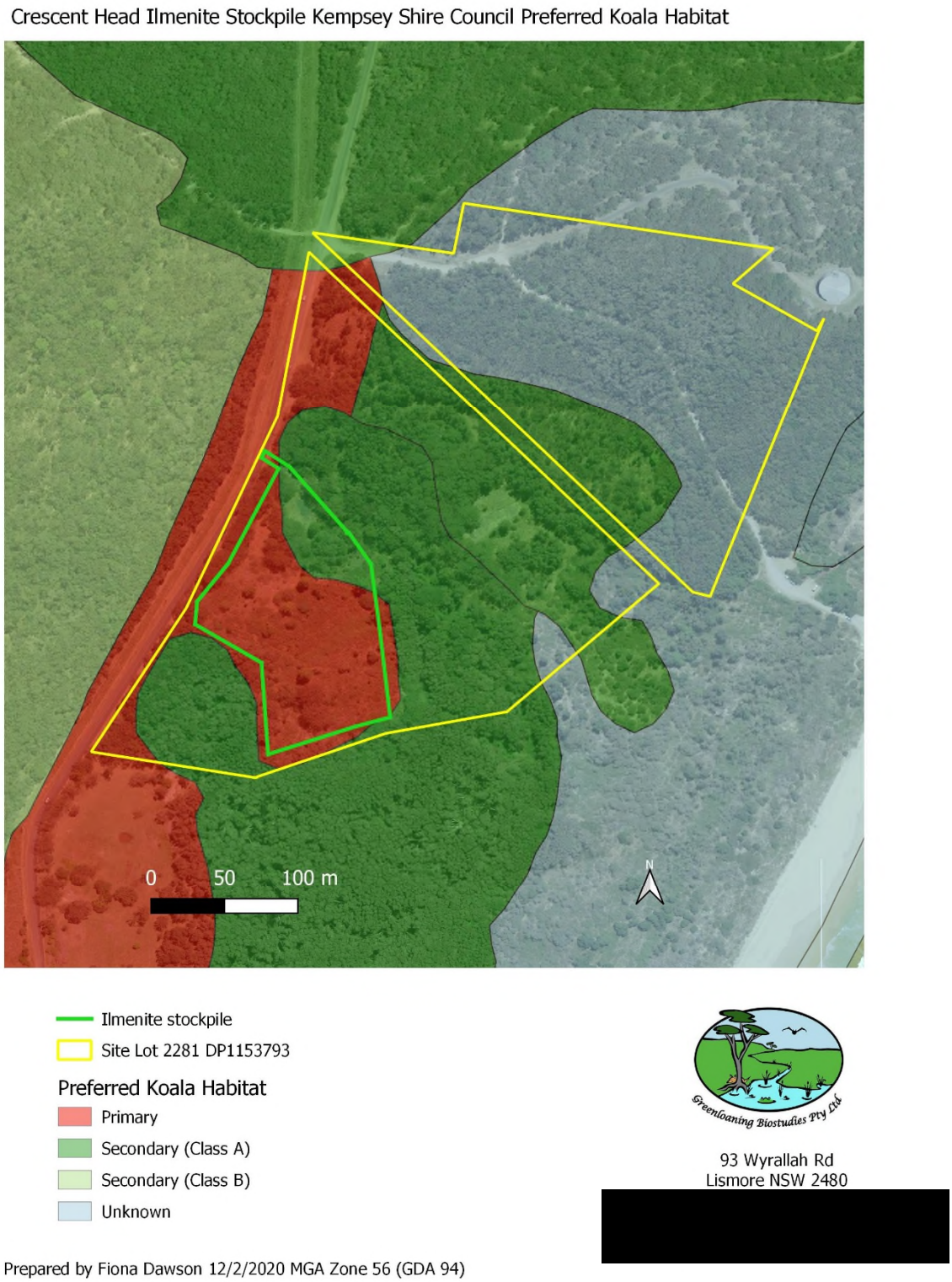
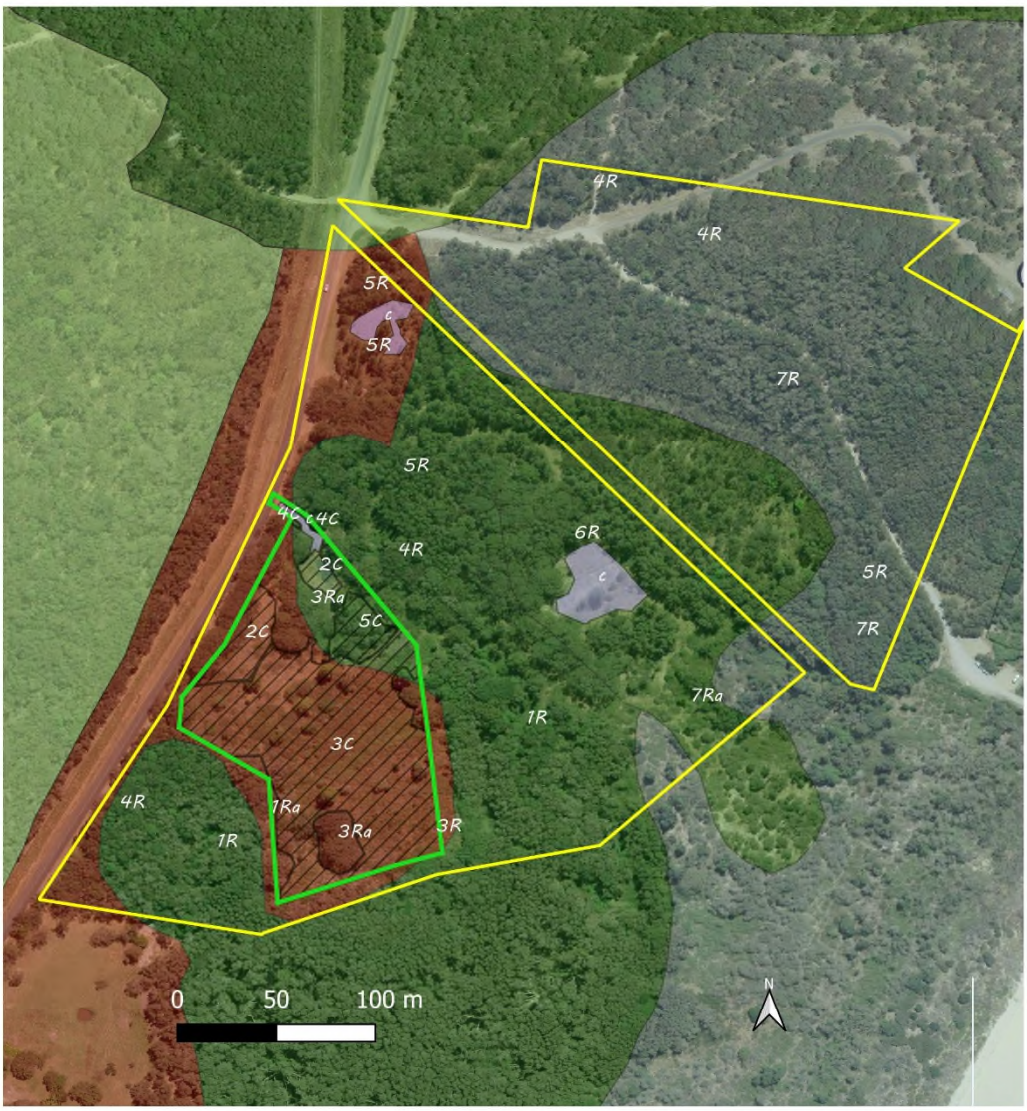


Figure 17 Preferred Koala Habitat as per the KSC KPoM (Source KSC 12/2/20).

Crescent Head Ilmenite Stockpile Koala Habitat Occurring within the Subject Property



Site Lot 2281 DP1153793
Ilmenite stockpile
Zone proposed to be cleared
Existing cleared areas

KSC CKPoM Preferred Koala Habitat
Primary
Secondary (Class A)
Secondary (Class B)
Unknown

Greenloaning Biostudies Pty Ltd

93 Wyrallah Rd
Lismore NSW 2480

[redacted]

Prepared by Fiona Dawson 3/4/2020 MGA Zone 56 (GDA 94)

Figure 18 Koala habitat occurring within the subject property indicating habitat to be retained and cleared

***5.2.4** Justification or Threatened Fauna Species Determined to be Unlikely to Occur within the Impact Area*

The following species, although known to be associated with PCT 1230 and/or PCT 1235, have been discounted from the candidate species list for reasons specified under each species heading. The justification for exclusion is based on a number of the provisions of the BAM, viz:

6.4.1.3 The assessor must first use the following criteria to predict the threatened species that require assessment at the site:

(a) the distribution of the species includes the IBRA subregion which the subject land is, in the opinion of the assessor, mostly located within.

6.4.1.14 If the species is a vagrant in the IBRA subregion, the species is considered unlikely to occur and no further assessment is required. The assessor must record in the BAR the reasons for determining that the species is unlikely to occur on the subject land.

6.4.1.17 A candidate species credit species will be considered unlikely to occur on the subject land (or specific vegetation zones) if:

(a) after carrying out a field assessment of the habitat constraints or microhabitats on the subject land, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).

***i.** Invertebrates*

a. Argynnis hyperbius Laced Fritillary

The Laced Fratillary occurs in 'open swampy coastal habitat' (Office of Environment and Heritage 2017e), and relies on the presence of the food plant, the Arrowhead Violet (*Viola betonicifolia*). Neither swampy habitat, nor the Arrowhead Violet occur within the Impact Area. The original swampy habitat has been modified by the mining and associated stockpile development and it is considered that 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land.'

b. Petalura gigantea Giant Dragonfly

The Giant Dragonfly inhabits 'permanent swamps and bogs with some free water and open vegetation' (Office of Environment and Heritage 2017f). As for the Laced Fratillary, the original swampy habitat has been modified by the mining and associated stockpile development and it is considered that 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land.'

c. *Ocybadistes knightorum* Black Grass-dart Butterfly

The Black Grass-dart Butterfly is known only from an area of the mid north coast from Coffs Harbour to Scotts Head, well to the north of the subject property. Swamp sclerophyll forest, dominated by Swamp Oak and/or Broad-leaved Paperbark tends to be the most favoured habitat. The species also is associated with patches of Floyd's Grass (Office of Environment and Heritage 2017g). As the original swampy habitat has been substantially modified by the mining and associated stockpile development, it is considered that 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land.'

ii. *Amphibians*

a. Crinia tinnula Wallum Froglet

The Wallum Froglets occur in a wide range of habitats, usually in association with acidic swamps on coastal sand plains, including sedgelands and wet heathlands. The species also can inhabit 'drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests' (Office of Environment and Heritage 2017h). There is no suitable habitat for the Wallum Froglet within the man-modified Impact Area and 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land.'

b. Litoria brevipalmata Green-thighed Frog

This species occur in habitats ranging from rainforest and moist eucalypt forest to dry eucalypt forest and heath, favouring areas where surface water gathers following rain. ((Office of Environment and Heritage 2019g). As the Impact Area habitat represents substantially man-modified systems with very limited potential for suitable habitat for the Green-thighed Frog, it is considered that 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land.'

c. Mixophyes iteratus Giant Barred Frog

The Giant Barred Frog occurs in association with permanent or semi-permanent streams, typically with well vegetated stream edges (Office of Environment and Heritage 2017i, A. Martin, unpubl. data)). There is no suitable habitat for the species within the man-modified Impact Area and 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land.

d. *Litoria aurea* Green and Golden Bell Frog

This species occurs in marshes, dams and stream-sides, with optimum habitat including unshaded water-bodies (Office of Environment and Heritage 2017j). There is no suitable habitat for the species within the man-modified Impact Area and 'the habitat is substantially degraded such that the species is unlikely to utilise the subject land.

iii. *Reptiles*

a. Hoplocephalus bitorquatus Pale-headed Snake

This species is mainly found in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. The Pale-headed Snake is nocturnal and uses loose bark, tree-trunks, hollow trunks and limbs of dead trees for diurnal shelter (Office of Environment and Heritage 2017k). The only record for the species within the IBRA Subregion is in the very far north of the Subregion and would be considered a vagrant in the area, based on the current records.

b. Hoplocephalus stephensii Stephens' Banded Snake

Stephen/s Banded Snake is a nocturnal species, occurring in rainforest, eucalypt forest and rocky habitat, sheltering under loose bark, amongst vines, or in hollow trunks, limbs, rock crevices or under slabs during the day shelter (Office of Environment and Heritage 2018g). Suitable shelter habitat for this species is minimal or absent over most of the Impact Area

the habitat is considered 'substantially degraded such that the species is unlikely to utilise the subject land.'

iv. *Birds*

a. Species Requiring Hollows for Breeding

Although the following species may forage to a limited extent within/over the Impact Area, there are no hollows suitable for breeding for any of these species occurring within the Impact Area:

- Calyptorhynchus lathami Glossy Black-Cockatoo;
- Ninox connivens Barking Owl;
- Tyto novaehollandiae Masked Owl;
- Ninox strenua Powerful Owl.

None of these species therefore is likely to use the Impact Area for breeding purposes. Large hollows required by these species (Office of Environment and Heritage, 2019h):also are very limited or absent from the subject property, owing to the combination of past clearing/mining disturbances and the prevalence of tree species not typically supporting many or large hollows.

b. Regent Honeyeater (Anthochaera phrygia)

For a small number of species, the habitat constraint information in the Threatened Biodiversity Data Collection (TBDC) refers to a mapped important area (BAM paragraph 6.3.1.4). Important areas have been determined for the Regent Honeyeater and eleven migratory shorebird species. Examination of the NSW DPIE Map viewer tool (DPIE, 2020c) determined that the subject property is not within the Important Area for the Regent Honeyeater or any migratory shorebirds.

c. Species Nesting in Large Trees

The following species nest in large dead and/or living trees (Office of Environment and Heritage 2017 l, 2017m, 2018g, 2019i):

- *Lophoictinia isura* Square-tailed Kite
- *Hieraaetus morphnoides Little Eagle*
- *Haliaeetus leucogaster White-bellied Sea-Eagle*
- *Pandion cristatus Eastern Osprey*

Such habitat has been excluded from the Impact Area, with the Impact Area habitat thus 'substantially degraded such that the species is unlikely to utilise the subject land.'

d. Lathamus discolor Swift Parrot

There is minimal foraging habitat for the Swift Parrot within the Impact Area and the species breeds in Tasmania (Office of Environment and Heritage 2019h). The species would be a vagrant in the area.

v. *Mammals*

a. Petaurus norfolcensis Squirrel Glider

The Squirrel Glider requires hollows for shelter and breeding (Office of Environment and Heritage 2017n). There is no suitable habitat for the species within the Impact Area, with the

habitat considered to be 'substantially degraded such that the species is unlikely to utilise the subject land.'

b. Grey-headed Flying-fox (Pteropus poliocephalus) (breeding)

Camps of the Grey-headed Flying-fox can sometimes contain thousands of individuals and the same sites can be used for very long periods of time (Office of Environment and Heritage 2017o). These camps are used for roosting and the annual breeding and rearing of young. Mating and conception occur within camps between January and May (DIPNR 2004). Inspection of the Impact Area did not result in any evidence of camps, either current or past and the Impact Area is not considered to represent known or potential breeding habitat by this species.

c. Little Bent-wing-Bat (*Miniopterus australis*) (breeding)

This species has been detected within the stockpile/resource recovery area, on the edge of the Impact Area, as described in **Section 5.2.3**, and the species thus can be assumed to forage in the general area. In terms of breeding habitat however, the Little Bentwing-bat requires caves or similar structures such as tunnels, mines, or culverts (Office of Environment and Heritage 2019m). The occurrence of caves or similar structures is a habitat constraint for breeding purposes for this species. There are no caves or other breeding structures located in the Impact Area, or within the immediate vicinity. Therefore, the Little Bent-wing Bat is not likely to utilise the Impact Area for breeding purposes.

d. Eastern Bent-wing-Bat (*Minopterus schreibersii*) (breeding)

As for the Little Bent-wing Bat, the Eastern Bent-wing Bat requires maternity and nursery caves for breeding (Office of Environment and Heritage 2019n). There are no caves within the impact area, nor are there any in the immediate vicinity. Therefore, the Eastern Bent-wing Bat is not likely to utilise the Impact Area for breeding purposes.

e. Myotis macropus Southern Myotis

The Southern Myotis typically roosts near water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. The species also forages over water (Office of Environment and Heritage 2017p). Roosting habitat for the species within the Impact Area is minimal and there is no foraging habitat present and the living or the habitat is 'substantially degraded such that the species is unlikely to utilise the subject land.'

6 Assessment of Impacts

6.1 BACKGROUND

The mitigation hierarchy of 'avoid, minimise, offset' has been adopted for the proposed resource recovery and the avoidance of impacts as much as possible has been integral to the project planning process. Key biodiversity components considered as part of this process included:

- Occurrence of remnant forest/woodland habitat;
- Occurrence of old growth/large mature trees; and
- Occurrence of Koala Food Trees (KFTs).

6.2 POTENTIAL DIRECT IMPACTS

6.2.1 Direct Impacts

Sources of impacts that would have direct effects on potential threatened species' habitats and threatened ecological communities/TECs, comprise the following:

- Proposed clearing activities associated with the resource recovery process;
- Increased fragmentation of habitat to be retained within the general stockpile footprint until regeneration/rehabilitation works have progressed sufficiently to provide some cover;
- Inadvertent physical damage to habitat features/vegetation from machinery working adjacent to areas to be retained; and
- Injury to ground dwelling fauna or fauna roosting/nesting in trees to be cleared.

i. *Clearing Activities*

The extent of proposed clearing of native vegetation is approximately 1.37 ha, with the clearing primarily comprising the removal of 1.3 ha of low condition regenerating vegetation, with an additional 0.08 ha of moderate condition regenerating Swamp Oak forest (refer to **Table 6.1**. The outline of the resource recovery footprint (Impact Area), encompassing all of the vegetation/habitats to be cleared (Zones 2c, 3c, 4c and 5c), is indicated on **Figure 16**. The total Impact Area encompasses the majority of the identified ilmenite stockpile and access track. The full extent of the stockpile, plus the access track area, is shown on **Figure 6**.

The extent of clearing of trees is restricted to the area of regenerating Swamp Oak forest and isolated trees occurring within Zones 2c and 3c (visible on **Figure 14**). Occasional small saplings of tree species also may be included in the clearing operations, such as along the edges of the access track. An indication of the size of trees within Zone 5c is provided in the Plot 4 data table provided in **Appendix F**, with the majority of trees within the plot less than 20 cm diameter at breast height. Two young Forest Red Gum trees (*Eucalyptus tereticornis*) occurring within Plot 4 were located on the edge of the plot and community and clearing of these trees will be avoided if possible. Scattered small trees or saplings occurring within

Zones 2c and 3c also are generally less than 20 cm, two more mature trees recorded within Plot 3 being less than 30cm dbh and less than 50cm dbh respectively (refer to **Appendix F).**

The removal of the regenerating habitats within Zones 2c, 3c, 4c and 5c is highly unlikely to cause significant adverse effects on any threatened species recorded in the general stockpile area. Key factors influencing this assessment are the general absence of KFTs within the regenerating habitats, lack of any potential breeding habitat for the Little Bent-winged Bat and minimal foraging resources for the Little Lorikeet. Thus there also are no Serious and Irreversible Impacts (SAIIs) associated with the proposed resource recovery operations.

Measures provided in **Section 6.5** will be employed to ensure direct impacts from the proposed clearing for construction purposes overall are minimised.

ii. *Habitat Fragmentation*

The extent of increased fragmentation of habitat will be relatively minor, given that the overall Impact Area is less than 2 ha and both patches of PCT 1230 to be retained are less than 50 m from nearby forest vegetation to be retained. Connectivity similar to the existing level would be expected to be restored within a few years as a result of revegetation/rehabilitation processes.

iii. *Inadvertent Physical Damage to Habitat Features/Vegetation during Construction*

Measures provided in **Section 6.5** will be employed to ensure the potential for inadvertent direct impacts beyond the resource recovery footprint are minimised. Sources of such impacts could include machinery damage to adjoining vegetation, soil compaction around trees to be retained, spillage/placement of fuel/oil on vegetation to be retained or regular movement of resource recovery personnel outside the resource recovery footprint.

iv. *Injury to Fauna*

Pre-clearing surveys, as prescribed in **Section 6.5**, will be undertaken to ensure the risk of any injury to native fauna is minimised. The overall level of risk to fauna is considered to be very low, providing such surveys are undertaken.

6.3 POTENTIAL INDIRECT IMPACTS

Potential indirect impacts associated with the proposed resource recovery that could potentially adversely affect adjoining TECs and potential threatened species habitat include:

- Edge effects from clearing adjacent vegetation;
- Increased noise levels disturbing breeding/nesting activities of fauna species in adjacent habitats;
- Alteration of natural hydrology;
- Introduction of additional exotic weeds from contaminated machinery or footwear;
- Spread of weeds/disease through machinery movements; and
- Temporary increased levels of disturbance and noise associated with the resource recovery operations;

Measures provided in **Section 6.5** will be employed to ensure the potential for indirect impacts on the areas to be retained are avoided or minimised.

Table 6-1 Summary of Areas to be Cleared and Areas to be Retained

Zone	PCT name	Community	TEC	Condition	Area to be Cleared	Area to be Retained
1Ra	1064	Paperbark Swamp Forest of the Coastal Lowlands		Mod-Good		0.04
1R			X	Mod-Good		1.15
1R			X	Mod-Good		0.8
2C	1230	Swamp Mahogany Swamp Forest on Coastal Lowlands (regenerating)		Low	0.14	
3C		Regenerating – dense Bracken Fern with Lantana		Low	1.14	
3R				Low		0.19
3Ra				Mod		0.23
3Ra				Mod		0.07
4C		Disturbed edges of access track		Low	0.013	
4R				Mod-Good		0.65
4R				Mod-Good		0.83
4R				Mod-Good		0.25
4R				Mod-Good		0.19
5C	1235	Swamp Oak Swamp Forest of the Coastal Lowlands		Mod	0.08	
5R			X	Mod-Good		0.55
5R			X	Mod-Good		0.15
5R			X	Mod-Good		0.07
5R			X	Mod-Good		0.2
6R	686	Blackbutt - Pink Bloodwood shrubby open forest		Mod-Good		1.24
7R	1536	Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	X	Good		3.49
7R			X	Good		0.19
7Ra			X	Low		0.58
					1.373	**10.87**
c	N/A	Already Cleared		N/A	**0.194**	
					12.44	

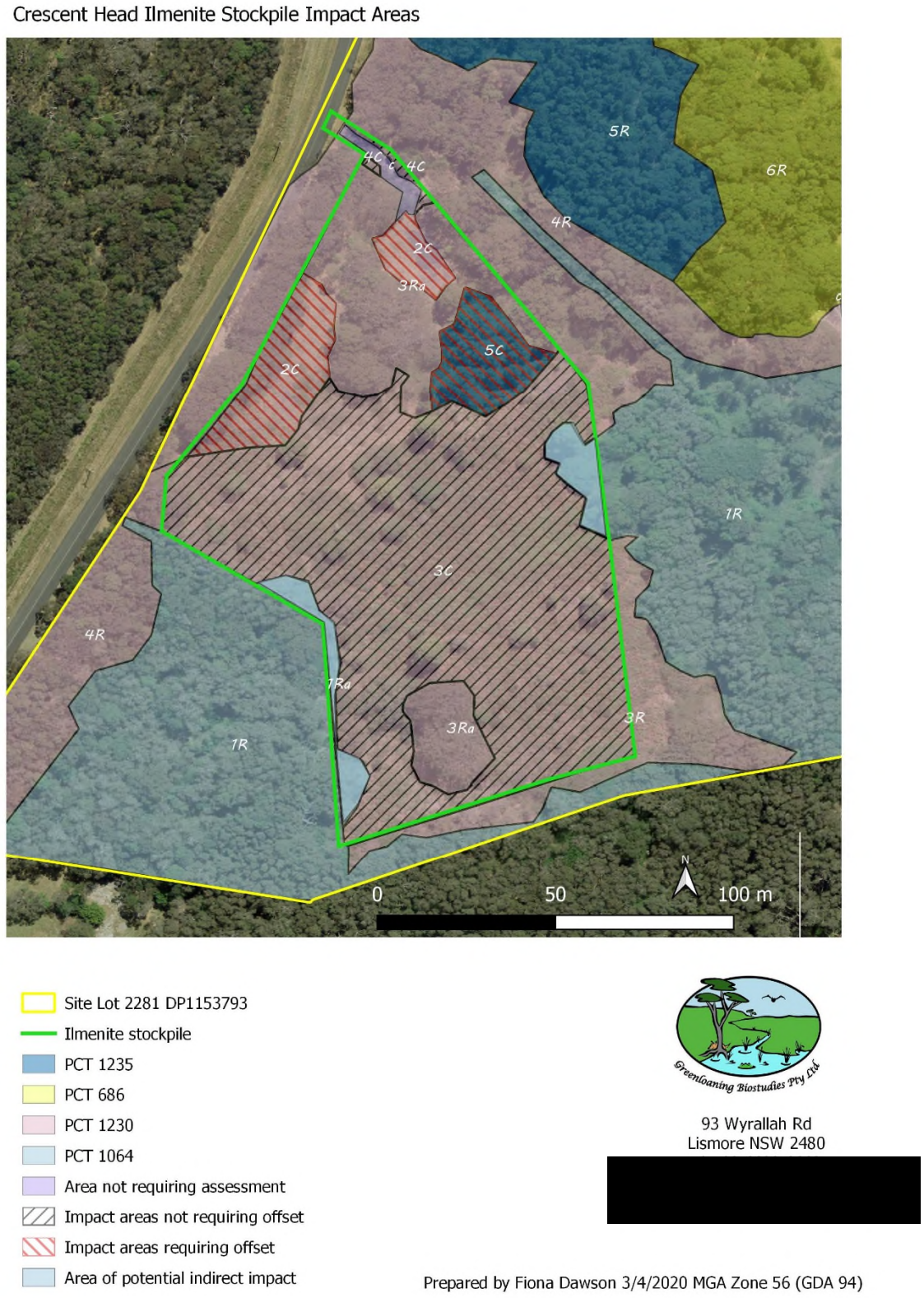


Figure 19 Resource recovery area indicating vegetation zones and direct impact areas requiring or not requiring offsets, indirect impact areas and areas not requiring assessment

6.4 AVOIDANCE OF IMPACTS

***6.4.1** Avoidance of Impact on Endangered Ecological Communities and Known/Potential Threatened Species Habitat*

Direct impacts on TECs will be avoided by the restriction of clearing and resource recovery operations to the defined resource recovery Impact Area, as shown on **Figure 16** and the retention and protection of the remainder of the vegetation within the subject property. Although the PCTs defined as occurring within the Impact Area can represent remnant/regenerating forms of TECs, as described in **Section 4.2.1**, the representation of these PCTs within the stockpile and Impact Area do not represent TECs (refer to **Section 4.2.1.** iii and **4.2.1.**IV). No threatened flora was detected within these communities but protection of the vegetation zones adjoining the Impact Area and stockpile also will protect potential threatened flora species habitat in these areas. This also will serve to protect habitat considered to have some potential to provide temporary or occasional foraging or roosting habitat for some threatened fauna species which have been tentatively identified or assumed to occur on the subject property for the purpose of this BDAR. The total area of vegetation for which any clearing is to be avoided totals approximately 10.9 ha.

Mitigation measures to ensure that both direct and indirect impacts are avoided, or the potential for such impacts is minimised, are provided in **Section 6.5**.

***6.4.2** Minimising Impacts on Biodiversity*

The following procedures are proposed to ensure that all impacts, or potential impacts, as outlined in **Section 6.2**, are either avoided or minimised as much as possible and any risks to individuals of fauna species that may be present during clearing activities and subsequent resource recovery operations are minimal:

- Maintenance and protection of all vegetation outside the impact area and thus within the designated area for conservation;
- Prior to the commencement of any construction works on site, clear marking of any trees to be protected in the immediate vicinity of clearing and distinctive marking of trees to be removed, such that there is no room for confusion regarding tree removal/protection. KFTs will be a priority for this procedures;
- Clear delineation of total Impact Area to avoid any confusion by resource recovery machinery operator/s;
- Pre-clearing checks by a suitably qualified ecologist to be undertaken immediately prior to clearing activities to ensure there are no fauna issues, such as small ground fauna sheltering in dense grass/ground cover, nesting birds, roosting microbats, requiring specific procedures. In the unlikely scenario of an individual Koala being located in one of the trees within Zones 2c, 3c, or 5c immediately prior to clearing, a buffer of 10m will be established around the tree and the Koala left to move on of its own accord ;
- Supervision of clearing operations by a suitably qualified ecologist/fauna spotter/wildlife carer if potential fauna issues are identified;
- Ongoing restriction of resource recovery operations to daylight hours; and

- Ongoing maintenance of best practice on-site biosecurity hygiene measures for machinery and on-site personnel to minimise the risk of introducing or spreading exotic weeds, pests or diseases.
- Development and implementation of an approved Rehabilitation Plan, which will identify appropriate management zones for remaining vegetation on the Site and for effective rehabilitation of the areas to be cleared. The Plan will prescribe management measures, including planting and weed control procedures. KFTs are recommended to be a priority for proposed plantings post resource recovery.

6.5 MITIGATION MEASURES

6.5.1 Offsets

The outcomes from the Biodiversity Assessment Calculator are summarised in the Calculator reports provided in **Appendix G** and vegetation integrity scores are provided in **Table 4.4.** As could be expected, the vegetation integrity score (overall condition) of Zone 3c, encompassing the majority of the resource recovery /impact area, was very low (refer to **Table 4.3** and **Table 6.2**). The vegetation integrity score of 14.3 thus was below the threshold level requiring further assessment for a non-TEC or threatened species habitat and no offsets would be required for the disturbance to this vegetation community. The retirement of a small number of credits however, is required for the other vegetation zones within the Impact Area.

As no threatened flora or fauna 'species credit species' was detected within the Impact Area as a whole, no credit requirements were generated for 'species credit species.' The credit requirements for the proposed resource recovery operation are summarised in **Table 6.2**. The Credit Summary Report generated from the project BAM Calculator assessment is provided in **Appendix G.**

A key objective of the final layout of the Impact Area was to avoid clearing of KFTs. If however, any KFTs are inadvertently damaged, or very young saplings hidden by dense weed growth are inadvertently removed, such trees will be replaced as part of the rehabilitation measures at a ratio of 10:1. Similarly, if any such young saplings are located within proposed clearing zones during pre-clearing surveys, a similar compensatory planting ratio will be followed.

Given that an integral component of the proposed resource recovery process is the retention and protection of the small pockets of remnant forest/woodland occurring on the property, management measures to ensure protection of these areas during the resource recovery operation are proposed, as outlined in **Section 6.6.2**.

Table 6-2 Changes in Vegetation Integrity, Ecosystem and Species Credits for the Resource Recovery Impact Area

PCT	Zone	Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Score	Number of Required Ecosystem Credits	Number of Required Species Credits
1230	2c	35.7	0	-35.7	2	0
1230	3c	14.3	0	-14.3	0	0
1235	5c	27.9	0	-27.9	1	0

***6.5.2** General Management Measures*

To ensure both appropriate management of the areas of vegetation to be retained during the resource recovery operations, and effective rehabilitation/revegetation of the areas to be cleared, the preparation of a site specific Revegetation/Rehabilitation Plan is proposed. This plan would prescribe the vegetation to be protected in the long term, vegetation management procedures to be employed, primarily comprising planting of KFTs, other suitable native species, weed control measures, desired outcomes to be achieved and measures of success. The plan also will need to take into account any changes in drainage patterns associated with removal of the ilmenite stockpile. Of key importance to vegetation management measures would be the control of High Threat Exotic weeds species (HTEs) (refer to **Tables F1-F4, Appendix F**).

Site rehabilitation works would need to be carried out by an appropriately qualified and experienced contractor.

6.6 MANAGEMENT ISSUES AND KEY THREATENING PROCESSES

The primary management issues or factors requiring consideration as identified for the subject property and more particularly the Impact Area to be rehabilitated/revegetated comprise:

- Ongoing weed control and potential for new weed infestations;
- Changed topography and associated changes to drainage patters in the general environs of the stockpile;
- Variations in seasonal conditions inhibiting successful outcomes.

Weed species posing the most significant threat to successful site rehabilitation and some species are identified as key threats within the nearby Goolawah Nation Park. These include Bitou Bush, Lantana and Winter Senna (*Senna pendula* var. *glabrata*); exotic grasses such as Couch (*Cynodon dactylon*) and Broad-leaved Paspalum (*Paspalum distichum*), and exotic vines such as Coastal Morning Glory (*Ipomoea cairica*) and *Asparagus* spp. (DPIE, 2014).

The above issues generally relate to some of the Key Threatening Processes (KTPs) listed under the BC Act. A summary of the likely extent of the proposed resource recovery increasing the level of any of the listed KTPs is provided in **Table 6.3**. Full discussion of the above issues and the measures by which they would be addressed would be expected to be provided as part of the Rehabilitation Plan. However, a summary of the proposed measures to ensure protection of existing habitats, minimising the potential for harm to habitats/species and rehabilitation procedures is provided in **Table 6.4**.

6.7 FINAL IMPACT ANALYSIS

Clearing of a total of approximately 1.37 ha of previously cleared and regenerating land, some of which has substantial HTE infestations (Zone 3c), is unavoidable if the proposed resource recovery process is to proceed. The extent of clearing has been minimised however, by ensuring the resource recovery operations are to be located within the existing previously cleared area (Zones 2c, 3c, 4c and 5c), and do not impinge on the remnant forest/woodland areas supporting KFTs (Zone 2R), nor on the adjoining forested areas representing TECs. None

of the trees to be removed within the Impact Area is in the large mature class, based on benchmark conditions for PCT 1230 and PCT 1235, and the majority are less than 20 cm dbh (refer to **Appendix F)**. The clearing operations trigger the requirement for a total of 3 ecosystem credits to be retired under the Biodiversity Offset Scheme. The full Credit Summary Report from the BAM calculator is provided in **Appendix G**. There are no SAIIs associated with the proposed resource recovery operations.

There will be some minor increases in habitat fragmentation within the ilmenite stockpile footprint for the duration of the resource recovery process and subsequent early stages of regeneration/rehabilitation of the Impact Area. There also will be some short term (approximately 36 weeks) increase in diurnal noise levels during week days, when machinery and trucks will be operating. However, no threatened flora or fauna species with potential to occur either within the Impact Area on the subject property, is considered likely to be significantly adversely affected by the clearing activities and subsequent works within the resource recovery area.

The potential for physical damage to KFTs and habitat to be retained, and injury to fauna species from clearing operations will be minimised by a range of mitigation measures, as provided in **Section 6.4.2**.

The proposed management measures, encompassing preparation and implementation of a site-specific Revegetation/Rehabilitation Plan, are expected to improve the habitat value of the Impact Area and stockpile per se over time. The overall outcome will be protection of existing, albeit low use, Koala habitat within the subject property, a relatively short term loss of the current limited biodiversity values within the Impact Area, and in the longer term, a net gain in biodiversity stockpile area.

Table 6-3 Likely Extent of Increased Threatening Processes from the Proposed Resource Recovery

Threatening Process	**Likely Level of Increase from Proposed Resource Recovery Operations**
Aggressive exclusion of birds from woodland and forest habitat by abundant noisy miners, Manorina melanocephala	No increase likely
Alteration of habitat following subsidence due to longwall mining	N/A
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	No increase likely
Anthropogenic climate change	Minimal incremental
Bushrock removal	N/A
Clearing of native vegetation	Minor increase
Competition and grazing by the feral European rabbit, Oryctolagus cuniculus	N/A
Competition and habitat degradation by feral goats, Capra hircus	N/A
Competition from feral honey bees, Apis mellifera	N/A
Death or injury to marine species following capture in shark control programs on ocean beaches	N/A
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	N/A
Forest eucalypt dieback associated with over-abundant psyllids and bell miners	N/A
Herbivory and environmental degradation caused by feral deer	No increase likely
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	No increase likely
Importation of red imported fire ants, Solenopsis invicta	No increase likely
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	No increase likely

Threatening Process	**Likely Level of Increase from Proposed Resource Recovery Operations**
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	No increase likely
Infection of native plants by Phytophthora cinnamomi	No increase likely
Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	No increase likely
Introduction of the large earth bumblebee, Bombus terrestris	No increase likely
Invasion and establishment of exotic vines and scramblers	No increase likely
Invasion and establishment of scotch broom, Cytisus scoparius	N/A
Invasion and establishment of the cane toad, Bufo marinus	No increase likely
Invasion of native plant communities by African olive, Olea europaea subsp. cuspidata	N/A
Invasion of native plant communities by Chrysanthemoides monilifera	Potential for Increase - to be managed
Invasion of native plant communities by exotic perennial grasses	Potential for Increase - to be managed
Invasion of the yellow crazy ant, Anoplolepis gracilipes into NSW	No increase likely
Invasion, establishment and spread of Lantana, Lantana camara	Potential for Increase - to be managed
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	No increase likely
Loss of hollow-bearing trees	No increase likely
Loss or degradation (or both) of sites used for hill-topping by butterflies	N/A
Predation and hybridisation by feral dogs, Canis lupus familiaris	N/A
Predation by Gambusia holbrooki (plague minnow or mosquito fish)	N/A

Threatening Process	**Likely Level of Increase from Proposed Resource Recovery Operations**
Predation by the European red fox, Vulpes vulpes	No increase likely
Predation by the feral cat, Felis catus	No increase likely
Predation by the ship rat, Rattus rattus on Lord Howe Island	N/A
Predation, habitat degradation, competition and disease transmission by feral pigs, Sus scrofa	N/A
Removal of dead wood and dead trees	Very minor increase

Table 6-4 Management Measures

Item	Action	Outcome	Timing	Responsibility
1	Clear marking of any trees to be protected in the immediate vicinity of proposed clearing, particularly KFTs	Maintenance and protection of all vegetation outside the resource recovery footprint and thus within the designated area for conservation	Prior to the commencement of any clearing works on site	Project Manager/ Project Ecologist
2	Distinctive marking/flagging of trees to be removed	Ensuring there is no room for confusion regarding tree removal/protection	Prior to the commencement of any clearing works on site	Project Manager/ Project Ecologist
3	Pre-clearing checks for Koalas and other fauna species/ specific habitat that may need clearing supervision	No fauna issues , such as Koalas sheltering in shade tree, nesting birds, roosting microbats, requiring specific procedures, need to be addressed unexpectedly	Immediately prior to clearing activities	Suitably qualified ecologist
4	Supervision of clearing operations	Any identified fauna issues are dealt with appropriately and no individuals are subject to risk of injury	During clearing	Suitably qualified ecologist
5	Preparation of a Revegetation/Rehabilitation Management Plan for the Impact Area and stockpile	Ensuring vegetation management/weed control measures for the Impact Area and stockpile are appropriately planned and the biodiversity value of the area is increased	Pre-project commencement	Suitably qualified ecologist/bush regenerator
6	Implementation of the approved Revegetation/ Rehabilitation Management Plan	Commencement of planting programme on suitably prepared substrate and landform	Immediately post construction (during suitable weather conditions)	Project Manager in conjunction with suitably qualified bush regenerator
7	Monitoring of effectiveness of the Revegetation/ Rehabilitation Management Plan measures	Ensuring the outcomes for Item 6 are achieved, and identifying any issues with the success of the Revegetation/ Rehabilitation Management Plan that need to be addressed/resolved	Within 2 years post completion of resource recovery operations - monitoring schedule to be provided in VMP	Project Manager in conjunction with suitably qualified ecologist/bush regenerator as required

7 Conclusions and Recommendations

7.1 CONCLUSIONS

On the basis of the BAM assessment process for the proposed resource recovery, the following conclusions have been made:

- The subject property, encompassing the proposed resource recovery /Impact Area, is part of a patch of remnant and regenerating bushland, well connected with other coastal vegetation to the north, east and south-east, and adjoining Goolawah National Park to the east and south-east. Point Plomer Road separates the subject property from extensive vegetation to the west, and would provide a barrier to some fauna species;
- As such, the resource recovery /Impact Area and subject property form part of a defined wildlife corridor and key fauna habitat area;
- The total extent of native vegetation within the 1500 m buffer for the subject property has been estimated to be 62%;
- The resource recovery /Impact Area and subject property, have been subject to substantial past disturbances associated with sand mining operations in the 1960s and 1970s. The ilmenite stockpile was formed during the course of the sand mining activities;
- The majority of the resource recovery /Impact Area has been cleared previously, with only two small patches of remnant forest/woodland remnant and regenerating vegetation retained. Scattered regenerating native trees, a small patch of regenerating Swamp Oak plus dense native ground cover species occur over the remainder of the resource recovery /Impact Area. Dense infestations of Lantana, listed as a the High Threat Exotic under the BAM, occur in patches, particularly around the edges of the ilmenite stockpile and in the southern portion of the resource recovery /Impact Area ;
- Five Plant Community Types have been identified as occurring on the subject property, viz;
  - PCT 686 - Blackbutt - Pink Bloodwood shrubby open forest of the coastal lowlands of the NSW North Coast Bioregion
  - PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion
  - PCT 1230 - Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion and
  - PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion; AND
  - PCT 1536 - Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest.
- The remnant vegetation parches occurring on the stockpile have been assigned to PCT 1230, and the majority of the regenerating areas also have been assigned to PCT 1230. The patch of regenerating Swamp Oak has been assigned to PCT 1235. The identification of these PCTs, particularly PCT 1230, is considered as 'best fit' only, on the basis of species occurrence and in the context of recognising that the vegetation occurring on an ilmenite stockpile would not be representative of a natural system;
- Both PCTs identified within the resource recovery /Impact Area can represent Threatened Ecological Communities but the occurrence of these communities on an elevated ilmenite stockpile renders both communities as not conforming to the definition of the associated

Threatened Ecological Communities align with Threatened Ecological Communities listed under the *Biodiversity Conservation Act 2016*;

- No threatened flora species has been detected on the subject property, or within the resource recovery /Impact Area, although there remains minor potential for such species to occur in the main body of vegetation to be retained;
- One threatened fauna species, the Koala, was known previously from the immediate vicinity of the subject property and resource recovery /Impact Area. Target surveys as part of the BAM assessment process, yielded one Koala pellet within the small patch of remnant forest/woodland supporting Koala Food Trees in the north of the ilmenite stockpile. The stockpile habitat represents 'low use' Koala habitat. There also was a tentative record of another threatened fauna species, the Little Lorikeet, flying through the subject property and microbat detection surveys yielded one record of the Little Bent-winged Bat. None of these three species would have any reliance on the habitats occurring within the resource recovery /Impact Area, although they may pass through/over the area. The lorikeet and microbat also could use the habitat for very limited foraging purposes;
- Development of the site will require the clearing of a total of 1.37 ha of regenerating vegetation, comprising 1.29 ha of low condition PCT 1230, and 0.08 ha of moderate condition PCT 1235. No old growth or large mature trees will be removed and the majority of young trees to be removed are less than 20 cm diameter breast height;
- There are no Serious and Irreversible Impacts associated with the project;
- The two patches of remnant and regenerating forest/woodland supporting Koala Food Trees will be retained and protected;
- All vegetation beyond the resource recovery /Impact Area, which encompasses some areas of Threatened Ecological Communities, will be retained and protected from disturbance during the course of the resource recovery operations;
- No credits are required to be retired for threatened fauna species, but the proposed clearing activities trigger the requirements for 3 ecosystem credits to be retired;
- The detailed measures required to protect vegetation to be retained, and to rehabilitate and revegetate the ilmenite stockpile post resource recovery operations will be provided in a site specific Revegetation/Rehabilitation Management Plan prior to the commencement of works on the subject property;
- The project will result in a short term loss in existing, but limited biodiversity values within the resource recovery /Impact Area, and short term (approximately 36 months) increases in local noise levels. The overall outcome in the long term however, is expected to be an improvement in biodiversity on the subject property.

7.2 RECOMMENDATIONS

The following broad measures are recommended to minimise short term risks of damage to habitat to be protected or injury to fauna during clearing operations, and to maximise the potential for long term positive biodiversity outcomes from the resource recovery project as a whole:

- All clearing and construction works follow best practice procedure, incorporating the measures provided in **Chapter 6** of this BDAR; and
- Habitat regeneration, enhancement processes and weed control measures be detailed in a site-specific Revegetation/Rehabilitation Management Plan for the property.

8 References and Bibliography

See 3.2.2.iii for GIS spatial data sources

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Appendix A BDAR Requirements and Compliance Tables

Table A.1 Minimum information requirements for the Biodiversity Development Assessment Report– Stage 1: Biodiversity assessment

Report Section	Information	BDAR Reference	Maps & Data	BDAR Reference
Introduction	Introduction to the biodiversity assessment including: Identification of development site footprint, including: Operational footprint Construction of footprint indicating clearing associated with temporary construction facilities and infrastructure General description of development/BS site Sources of information used in the assessment, including reports and spatial data	S1.1 S 1.1, S 1.5 S 1.5 S 1.2, p2	Site Map Location Map Digital shape files for all maps and spatial data	Figure 1, Figure 2 Figure 4
Landscape features	Identification of landscape features at the development/BS site, including: IBRA bioregions and subregions, NSW landscape region and area (ha) Native vegetation extent in the buffer area Cleared areas Evidence to support differences between mapped vegetation extent and aerial imagery Rivers and streams classified according to stream order Wetlands within, adjacent to and downstream of the site Connectivity features Areas of geological significance and soil hazard features Site context components, including: Identification of method applied (i.e., linear or site-based) Percent native vegetation cover in the landscape	S 1.4 S 1 4 S 1.4.4 S 1.4.2 S1.4.4 S1.4.1 S1.4.4 S1.4.1	IBRA bioregions and subregions NSW landscape regions Rivers and streams Wetlands Connectivity of different areas of habitat Areas of geological significance and soil hazard features Native vegetation extent	Figure 1 Figure 9 Figure 9 Figure12 Figure 5 Figure 1.6 Figure 13

Report Section	Information	BDAR Reference	Maps & Data	BDAR Reference
		S 3.2.2		
Native vegetation	Identify native vegetation extent within the development/biodiversity stewardship site, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery. Describe PCTs within the development/BSS, including: Vegetation class Vegetation type Area (ha) for each vegetation type Species relied upon for identification of vegetation type and relative abundance Justification of evidence used to identify a PCT TEC status Estimate of percent cleared value of PCT Perform a vegetation integrity assessment of the development/BSS, including: Mapping vegetation zones Patch size Assessing vegetation integrity using benchmark data Survey effort as described in Subsection 5.3.4 Determining the vegetation integrity score Composition condition score Structure condition score Function condition score Vegetation integrity score Where use of local data is proposed:	S 4.1.2 S 4.2.1 Table 4.2 and Appendix G S3.3, S 3.4 Appendix F Table 4.4 N/A	Map of native vegetation extent within the development Map of PCTs within the development Map of plot locations relative to PCTs Map of TECs Plot field data Plot field data sheets Patch size of intact native vegetation Table of current vegetation integrity scores for each vegetation zone within the development/BSS.	Figure 13 Figure 15, Figure 16 Figure 16 Figure 16 Figure 16 Appendix F appendix F App F Figure 13 Table 4.4

Report Section	Information	BDAR Reference	Maps & Data	BDAR Reference
Threatened species	Identify ecosystem credit species associated with PCTs on both the development site and BSS as outlined in Section 6.2, including: List of species derived Justification for exclusion of any ecosystems credit species predicted above. Identify species credit species on both the development site and BSS as outlined in Section 6.3 to 6.5, including: List of candidate species Justification for inclusions and exclusions based on habitat features Indication of presence based on targeted survey or expert report Details of targeted survey technique, effort, timing and weather Species polygons Biodiversity risk weighting for the species Threatened species survey	Appendix C, Appendix G S4.2.5, S5.2.4. S4.1.1, Table 4.1, S5.1, Table 5.1 App C, S4.2.4 S5.2.3 S4.2.4, S5.2.3 S 3.3 S3.3 Table 4.1, Table 5.1 S3.3.2, S3.3.3	Table of habitats or habitat components and their sensitivity classes Table detailing the list of species credit species and presence status on site as determined by targeted survey, indicating also where presence was assumed and/or where presence was determined by expert report Species credit species polygons Table detailing species and habitat feature/component associated with species and its abundance on site	Table 5.1 Appendix G Figure 18 N/A

Table A.2 Minimum information requirements for the BDAR– Stage 2: Impact assessment (biodiversity values)

Report Section		Information	BDAR Reference	Maps & Data	BDAR Reference
Avoid and minimise impacts		Demonstration of efforts to avoid and minimise impacts on biodiversity values in accordance with Chapter 8.	S6.4	Table of measures to be implemented before, during and	Table 6.4

Report Section		Information	BDAR Reference	Maps & Data	BDAR Reference
		Assessment of direct and indirect impacts unable to be avoided at the development site in accordance with Sections 9.1 and 9.2. The assessment would include but not be limited to: type, frequency, intensity, duration and consequence of impact.	S6.2, S6.3, S6.6	after construction to avoid and minimise the impacts of the project, including action, outcome, timing and responsibility Map of final project footprint, including construction and operation Maps demonstrating indirect impact zones where applicable	Figure 4 Figure 19 N/A
Impact summary		Identification and an assessment of the impacts which are potential serious and irreversible impacts, in accordance with Subsections 10.2.2 for impacts on CEECs and 102.3 for threatened species. Identification of impacts requiring offset in accordance with Section 10.3.	N/A 6.5.1, S 6.6, Appendix G S6.6.1	Map showing the location of serious and irreversible impacts Map of impacts requiring offset Map of impacts not requiring offset Map of areas not requiring assessment	N/A Figure 19 Figure 19

Report Section		Information	BDAR Reference	Maps & Data	BDAR Reference
		Identification of impacts not requiring offset in accordance with Paragraph 10.3.2.2. Identification of areas not requiring assessment in accordance with Section 10.4.	6.5.1, S 6.6, Appendix G		
Impact summary		Ecosystem credits and species credits that measure the impact for the development on biodiversity values, including: Future vegetation integrity score for each vegetation zone at the development site Change in vegetation integrity score Number of required ecosystem credits for the impact of development on each vegetation zone at a development site Number of required species credits for each threatened species that is impacted on by the development.	Table 4.1 Table 6.2 Table 6.2 Table 6.2 M/A	Table of PCTs requiring offset and the number of ecosystem credits required Table of threatened species requiring offset and the number of species credits required	Table 6.1, Appendix G N/A
Biodiversity credit report		Credit classes for ecosystem credits and species credits at the development site.	Appendix G	Table of credit class and matching credit profile	Appendix G

Appendix B Site Photographs

All photographs sourced from Greenloaning unless otherwise indicated

Burnt out car bodies dumped in close proximity to the access track, with habitat degraded by Lantana and Slash Pine.

Looking from stockpile south towards Point Plomer Road and roadside Koala Food Trees which are to be retained (PS, 2019), as well as trees to the left.

BAM Plot 3 PCT 1230, looking northeast across degraded stockpile habitat comprising Bracken Fern, Lantana and small regenerating trees, to be cleared for resource recovery.

BAM Plot 1 PCT 1230, stockpile dominated by Blady Grass to be cleared.

Harp net located in north east of stockpile, looking southeast along BAM4 transect towards PCT 1235 Swamp Oak and Lantana patches.

Lace monitor observed during fauna surveys Dec 2019 in Swamp Sclerophyll Forest habitat to the south of the stockpile and Impact Area.

BAM Plot 2 PCT 1230 Old growth Forest Red Gum cluster on stockpile above a ground and mid stratum of Blady Grass and Lantana. This cluster is to be retained.

Zone 3Ra PCT 1230 Cluster of old growth trees to be retained including Ficus

PCT 1064 Paperbark Swamp Forest, with Gahnia a common ground storey species, in moderate to good condition to be retained. Categorised as a TEC off stockpile.

PCT 1064 Paperbark Swamp Forest with some Lantana, particularly on the edges adjacent to the stockpile. Moderate to good condition to be retained. Categorised as a TEC off stockpile.

Appendix C Threatened Species Records and Potential for Occurrence on Site

Table C.1 Fauna Species Recorded on the Subject property (GL = Greenloaning Biostudies Pty Ltd, PS = Pandanus Solutions

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10183	Crinia tinnula	Wallum Froglet	Known	U	Within 10 km of coast	V,P	0	Animalia	Amphibia	<5ha	relictual with < 10%	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10483	Litoria aurea	Green and Golden Bell Frog	Known	U		E1,P	V	Animalia	Amphibia						
NSW North Coast - Macleay Hastings	10484	Litoria booroolongensis	Booroolong Frog	Predicted	U		E1,P	E	Animalia	Amphibia						
NSW North Coast - Macleay Hastings	10485	Litoria brevipalmata	Green-thighed Frog	Known	U		V,P	0	Animalia	Amphibia						
NSW North Coast - Macleay Hastings	10493	Litoria subglandulosa	Glandular Frog	Predicted	U	North of Hastings River *(Port Macquarie)*	V,P	0	Animalia	Amphibia						
NSW North Coast - Macleay Hastings	10536	Mixophyes balbus	Stuttering Frog	Known	U		E1,P,2	V	Animalia	Amphibia						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10538	Mixophyes iteratus	Giant Barred Frog	Known	U		E1,P,2	E	Animalia	Amphibia						
NSW North Coast - Macleay Hastings	10620	Philoria sphagnicolus	Sphagnum Frog	Known	U		V,P	0	Animalia	Amphibia						
NSW North Coast - Macleay Hastings	10056	Anseranas semipalmata	Magpie Goose	Known	U		V,P	0	Animalia	Aves	<5ha	fragmented 11-30%	n	n/a	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10105	Botaurus poiciloptilus	Australasian Bittern	Known	U		E1,P	E	Animalia	Aves	<5ha	relictual with < 10%	n	Brackish or freshwater wetlands	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10113	Burhinus grallarius	Bush Stone-curlew	Known	P		E1,P	0	Animalia	Aves	<5ha	fragmented 11-30%	y	n/a, Fallen/standing dead timber incl logs Null	all year	n
NSW North Coast - Macleay Hastings	10127	Calidris alba	Sanderling	Known	U	Within 2 km of coast	V,P	C,J,K	Animalia	Aves	<5ha	relictual with < 10%	n	As per mapped areas (contact OEH for maps)	n/a	n
NSW North Coast -	10128	Calidris tenuirostris	Great Knot	Known	U	Within 5 km of coast or tidal	V,P	CE,C,J,K	Animalia	Aves	<5ha	relictual with < 10%	n	As per mapped areas (contact OEH for maps)	n/a	y

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings						influenced water bodies										
NSW North Coast - Macleay Hastings	10140	Calyptorhynchus lathami	Glossy Black-Cockatoo	Known	P		V,P,2	0	Animalia	Aves	<5ha	relictual with < 10%	y	Breeding: Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Foraging: Presence of Allocasuarina and casuarina species	Apr- Aug	n
NSW North Coast - Macleay Hastings	10161	Charadrius leschenaultii	Greater Sand-plover	Known	U	Within 5 km of coast	V,P	V,C,J,K	Animalia	Aves	<5ha	relictual with < 10%	n	Foraging: As per mapped areas (contact OEH for maps)	n/a	n
NSW North Coast - Macleay Hastings	10162	Charadrius mongolus	Lesser Sand-plover	Known	U	Within 5 km of coast	V,P	E,C,J,K	Animalia	Aves	<5ha	relictual with < 10%	n	Foraging: As per mapped areas (contact OEH for maps)	n/a	n
NSW North Coast - Macleay Hastings	10171	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Known	U		V,P	0	Animalia	Aves	<5ha	relictual with < 10%	y	n/a	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10176	Coracina lineata	Barred Cuckoo-shrike	Known	P		V,P	0	Animalia	Aves	5-24ha	fragmented 11-30%	y Only fleshy-fruited tree species	n/a	n/a ECS	n/a ECS

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10275	Ephippiorhynchus asiaticus	Black-necked Stork	Known	U		E1,P	0	Animalia	Aves	<5ha	relictual with < 10%	y Large (>50cm dbh) tall live or dead trees within 100m of a wetland.	Shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300m of these swamps. Shallow lakes, lake margins and estuaries within 300m of these waterbodies	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10280	Esacus magnirostris	Beach Stone-curlew	Known	U	Within 2 km of coast	E4A,P	0	Animalia	Aves	<5ha	relictual with < 10%	n	Foraging: As per mapped areas (contact OEH for maps)	all year	y
NSW North Coast - Macleay Hastings	10382	Grus rubicunda	Brolga	Known	U		V,P	0	Animalia	Aves	<5ha	relictual with < 10%	n	n/a	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10385	Haematopus fuliginosus	Sooty Oystercatcher	Known	U	Within 5 km of coast	V,P	0	Animalia	Aves	<5ha	relictual with < 10%	n	Within 100m of estuarine areas and the ocean	all year	n
NSW North Coast - Macleay Hastings	10386	Haematopus longirostris	Pied Oystercatcher	Known	U	Within 5 km of coast	E1,P	0	Animalia	Aves	<5ha	relictual with < 10%	n	Within 100m of estuarine areas and the ocean	all year	n
NSW North Coast -	10435	Irediparra gallinacea	Comb-crested Jacana	Known	U		V,P	0	Animalia	Aves	<5ha	relictual with < 10%	n	Freshwater wetlands with a good surface	n/a ECS	n/a ECS

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings														cover of floating aquatic vegetation		
NSW North Coast - Macleay Hastings	10441	Ixobrychus flavicollis	Black Bittern	Known	U		V,P	0	Animalia	Aves	<5ha	fragmented 11-30%	n	Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10455	Lathamus discolor	Swift Parrot	Known	U		E1,P,3	CE	Animalia	Aves	<5ha	relictual with < 10%	y Note that the species is only present during March to September - winter migrant	As per mapped areas	n/a ECS	y
NSW North Coast - Macleay Hastings	10477	Lichenostomus fasciogularis	Mangrove Honeyeater	Known	P	Within 10 km of coast	V,P	0	Animalia	Aves	<5ha	variegated 31-70%	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10478	Limicola falcinellus	Broad-billed Sandpiper	Known	U		V,P	C,J,K	Animalia	Aves						
NSW North Coast - Macleay Hastings	10479	Limosa limosa	Black-tailed Godwit	Known	U		V,P	C,J,K	Animalia	Aves						
NSW North Coast -	10495	Lophoictinia isura	Square-tailed Kite	Known	P (foraging)		V,P,3	0	Animalia	Aves						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10519	Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10540	Carterornis leucotis	White-eared Monarch	Known	P		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10561	Ninox connivens	Barking Owl	Known	P (foraging)		V,P,3	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10562	Ninox strenua	Powerful Owl	Known	P (foraging)		V,P,3	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10580	Oxyura australis	Blue-billed Duck	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10583	Pachycephala olivacea	Olive Whistler	Known	U		V,P	0	Animalia	Aves						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10585	Pandion cristatus	Eastern Osprey	Known	P (overhead)		V,P,3	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10608	Pezoporus wallicus wallicus	Eastern Ground Parrot	Known	U		V,P,3	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10707	Ptilinopus magnificus	Wompoo Fruit-Dove	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10708	Ptilinopus regina	Rose-crowned Fruit-Dove	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10709	Ptilinopus superbus	Superb Fruit-Dove	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10722	Chthonicola sagittata	Speckled Warbler	Known	U		V,P	0	Animalia	Aves						
NSW North Coast -	10734	Rostratula australis	Australian Painted Snipe	Known	U		E1,P	E	Animalia	Aves						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10769	Sternula albifrons	Little Tern	Known	U	Within 10 km of coast and tidal influenced water bodies	E1,P	C,J,K	Animalia	Aves						
NSW North Coast - Macleay Hastings	10771	Stictonetta naevosa	Freckled Duck	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10819	Tyto longimembris	Eastern Grass Owl	Known	U		V,P,3	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10820	Tyto novaehollandiae	Masked Owl	Known	P (foraging)		V,P,3	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	10821	Tyto tenebricosa	Sooty Owl	Known	U		V,P,3	0	Animalia	Aves						
NSW North Coast -	10841	Anthochaera phrygia	Regent Honeyeater	Known	U		E4A,P	CE	Animalia	Aves						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	20039	Turnix maculosus	Red-backed Button-quail	Predicted	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20111	Glossopsitta pusilla	Little Lorikeet	Known	P		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20129	Petroica phoenicea	Flame Robin	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20131	Hieraaetus morphnoides	Little Eagle	Known	P		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20133	Petroica boodang	Scarlet Robin	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20134	Circus assimilis	Spotted Harrier	Known	U		V,P	0	Animalia	Aves						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	20135	Daphoenositta chrysoptera	Varied Sittella	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20143	Epthianura albifrons	White-fronted Chat	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20166	Calidris ferruginea	Curlew Sandpiper	Known	U		E1,P	CE,C,J,K	Animalia	Aves						
NSW North Coast - Macleay Hastings	20284	Numenius madagascariensis	Eastern Curlew	Known	U		P	CE,C,J,K	Animalia	Aves						
NSW North Coast - Macleay Hastings	20303	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Known	U		V,P	0	Animalia	Aves						
NSW North Coast - Macleay Hastings	20310	Calidris canutus	Red Knot	Known	U		P	E,C,J,K	Animalia	Aves						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	20313	Limosa lapponica baueri	Bar-tailed Godwit (baueri)	Predicted	U		P	V,C,J,K	Animalia	Aves						
NSW North Coast - Macleay Hastings	20322	Haliaeetus leucogaster	White-bellied Sea-Eagle	Known	P (overhead)		V,P	C	Animalia	Aves						
NSW North Coast - Macleay Hastings	10030	Acronychia littoralis	Scented Acronychia	Known	P	Within 5 km of coast	E1	E	Plantae	Flora	n/a	n/a	y	n/a	all year	y
NSW North Coast - Macleay Hastings	10037	Allocasuarina defungens	Dwarf Heath Casuarina	Known	P	Within 15 km of coast	E1	E	Plantae	Flora	n/a	n/a	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10040	Allocasuarina simulans	Nabiac Casuarina	Known	U		V	V	Plantae	Flora	n/a	n/a	n	sandy soil	all year	y
NSW North Coast - Macleay Hastings	10044	Niemeyera whitei	Rusty Plum, Plum Boxwood	Known	U		V	0	Plantae	Flora	n/a	n/a	y	n/a	all year	n
NSW North Coast -	10067	Arthropteris palisotii	Lesser Creeping Fern	Known	U		E1,3	0	Plantae	Flora	n/a	n/a	n	n/a	all year	y

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10068	Asperula asthenes	Trailing Woodruff	Known	U		V	V	Plantae	Flora	n/a	n/a	y	n/a	Oct-Dec	n
NSW North Coast - Macleay Hastings	10129	Callistemon linearifolius	Netted Bottle Brush	Known	U		V,3	0	Plantae	Flora	n/a	n/a	y	n/a	Oct-Jan	n
NSW North Coast - Macleay Hastings	10160	Chamaesyce psammogeton	Sand Spurge	Known	U	Within 1 km of coast	E1	0	Plantae	Flora	n/a	n/a	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10187	Cryptostylis hunteriana	Leafless Tongue Orchid	Predicted	U		V,P,2	V	Plantae	Flora	n/a	n/a	n	n/a	Nov-Jan	n
NSW North Coast - Macleay Hastings	10196	Cynanchum elegans	White-flowered Wax Plant	Known	U		E1	E	Plantae	Flora	n/a	n/a	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10213	Dendrobium melaleucaphilum	Spider orchid	Known	P		E1,P,2	0	Plantae	Flora	n/a	n/a	y	n/a		

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10237	Diuris disposita	Willawarrin Doubletail	Known	U		E1,P,2	0	Plantae	Flora	n/a	n/a	n	n/a	Sep-Oct	y
NSW North Coast - Macleay Hastings	10336	Galium australe	Tangled Bedstraw	Known	U		E1	0	Plantae	Flora	n/a	n/a	n	n/a	Oct-Feb	y
NSW North Coast - Macleay Hastings	10364	Grevillea guthrieana	Guthrie's Grevillea	Known	U		E1	E	Plantae	Flora	n/a	n/a	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10393	Haloragis exalata subsp. velutina	Tall Velvet Sea-berry	Known	U		V	V	Plantae	Flora	n/a	n/a	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10399	Hibbertia hexandra	Tree Guinea Flower	Known	U		E1	0	Plantae	Flora	n/a	n/a	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10507	Marsdenia longiloba	Slender Marsdenia	Known	U		E1	V	Plantae	Flora						
NSW North Coast -	10511	Maundia triglochinoides	Maundia triglochinoides	Known	U		V	0	Plantae	Flora						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10514	Melaleuca biconvexa	Biconvex Paperbark	Known	P/U	South of Kempsey	V	V	Plantae	Flora						
NSW North Coast - Macleay Hastings	10516	Melaleuca groveana	Grove's Paperbark	Known	U		V	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	10571	Oberonia titania	Red-flowered King of the Fairies	Known	U		V,P,2	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	10587	Parsonsia dorrigoensis	Milky Silkpod	Known	U		V	E	Plantae	Flora						
NSW North Coast - Macleay Hastings	10610	Phaius australis	Southern Swamp Orchid	Known	U		E1,P,2	E	Plantae	Flora						
NSW North Coast - Macleay Hastings	10622	Philotheca obovatifolia	Philotheca obovatifolia	Known	U		E1,P	0	Plantae	Flora						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10656	Pomaderris queenslandica	Scant Pomaderris	Known	U		E1	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	10753	Senna acclinis	Rainforest Cassia	Known	U		E1	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	10765	Sophora tomentosa	Silverbush	Known	U	Within 2 km of coast	E1	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	10794	Syzygium paniculatum	Magenta Lilly Pilly	Known	U		E1	V	Plantae	Flora						
NSW North Coast - Macleay Hastings	10802	Thesium australe	Austral Toadflax	Known	U		V	V	Plantae	Flora						
NSW North Coast - Macleay Hastings	10808	Tinospora smilacina	Tinospora Vine	Known	U		E1	0	Plantae	Flora						
NSW North Coast -	10816	Tylophora woollsii	Cryptic Forest Twiner	Known	U		E1	E	Plantae	Flora						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10868	Peristeranthus hillii	Brown Fairy-chain Orchid	Known	P/U	Within 5 km of coast	V,P,2	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	10922	Lindernia alsinoides	Noah's False Chickweed	Known	U		E1	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	10939	Pultenaea maritima	Coast Headland Pea	Known	U	Within 1 km of coast	V	0	Plantae	Flora						
NSW North Coast - Macleay Hastings	20268	Eucalyptus largeana	Craven Grey Box	Known	U		E1	E	Plantae	Flora						
NSW North Coast - Macleay Hastings	20295	Solanum sulphureum	Manning Yellow Solanum	Known	U		E1	E	Plantae	Flora						
NSW North Coast - Macleay Hastings	20341	Rhodamnia rubescens	Scrub Turpentine	Known	U		E4A	0	Plantae	Flora						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10064	Argynnis hyperbius	Laced Fritillary	Known	U	Within 15 km of coast	E1	CE	Animalia	Insecta	<5ha	relictual with < 10%	n	Arrowhead Violet (Viola betonicifolia)	Mar-Jun	y
NSW North Coast - Macleay Hastings	10573	Ocybadistes knightorum	Black Grass-dart Butterfly	Known	U		E1	0	Animalia	Insecta						
NSW North Coast - Macleay Hastings	10600	Petalura gigantea	Giant Dragonfly	Known	U		E1	0	Animalia	Insecta						
NSW North Coast - Macleay Hastings	10033	Aepyprymnus rufescens	Rufous Bettong	Known	P		V,P	0	Animalia	Mammalia	<5ha	variegated 31-70%	n	n/a	all year	n
NSW North Coast - Macleay Hastings	10155	Cercartetus nanus	Eastern Pygmy-possum	Known	P		V,P	0	Animalia	Mammalia	<5ha	fragmented 11-30%	n	n/a	Oct-Mar	n
NSW North Coast - Macleay Hastings	10158	Chalinolobus nigrogriseus	Hoary Wattled Bat	Known	P		V,P	0	Animalia	Mammalia	5-24ha	relictual with < 10%	y	n/a	n/a ECS	n/a ECS
NSW North Coast -	10207	Dasyurus maculatus	Spotted-tailed Quoll	Known	P		V,P	E	Animalia	Mammalia	<5ha	relictual with < 10%	n	n/a	n/a ECS	n/a ECS

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10331	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Known	U		V,P	0	Animalia	Mammalia	5-24ha	variegated 31-70%	y	n/a	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10444	Phoniscus papuensis	Golden-tipped Bat	Known	U		V,P	0	Animalia	Mammalia	<5ha	fragmented 11-30%	n	n/a	n/a ECS	n/a ECS
NSW North Coast - Macleay Hastings	10501	Macropus parma	Parma Wallaby	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10533	Miniopterus australis	Little Bent-winged Bat	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10534	Miniopterus orianae oceanensis	Large Bent-winged Bat	Known	P (foraging)		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10544	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Known	P (foraging)		V,P	0	Animalia	Mammalia						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10549	Myotis macropus	Southern Myotis	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10601	Petaurus australis	Yellow-bellied Glider	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10604	Petaurus norfolcensis	Squirrel Glider	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10613	Phascogale tapoatafa	Brush-tailed Phascogale	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10616	Phascolarctos cinereus	Koala	Known	P (on fringes/moving through)		V,P	V	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10635	Planigale maculata	Common Planigale	Known	P		V,P	0	Animalia	Mammalia						
NSW North Coast -	10662	Potorous tridactylus	Long-nosed Potoroo	Known	U		V,P	V	Animalia	Mammalia						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10687	Pseudomys gracilicaudatus	Eastern Chestnut Mouse	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10696	Pteropus alecto	Black Flying-fox	Known	P		P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10697	Pteropus poliocephalus	Grey-headed Flying-fox	Known	P		V,P	V	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10741	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Known	P		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10748	Scoteanax rueppellii	Greater Broad-nosed Bat	Known	P		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10785	Syconycteris australis	Common Blossom-bat	Known	U		V,P	0	Animalia	Mammalia						

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
NSW North Coast - Macleay Hastings	10805	Thylogale stigmatica	Red-legged Pademelon	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10829	Vespadelus troughtoni	Eastern Cave Bat	Known	U		V,P	0	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	20306	Petauroides volans	Greater Glider	Known	U		P	V	Animalia	Mammalia						
NSW North Coast - Macleay Hastings	10146	Caretta caretta	Loggerhead Turtle	Known	U	Within 250m of the high tide mark	E1,P	E	Animalia	Reptilia	<5ha	variegated 31-70%	n	Elevated sand dune above watertable and high tide. *Also has n/a ticked*	Dec-Apr	y
NSW North Coast - Macleay Hastings	10172	Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	Known	U		V,P	V	Animalia	Reptilia	<5ha	relictual with < 10%	n	Leaf and bark litter, Timber and logs on the ground	all year	n
NSW North Coast - Macleay Hastings	10216	Dermochelys coriacea	Leatherback Turtle	Known	U		E1,P	E	Animalia	Reptilia	<5ha	variegated 31-70%	n	Elevated sand dune above watertable and high tide	Dec-Apr	y
NSW North Coast -	10259	Liopholis whitii	White's Skink	Known	U		P	0	Animalia	Reptilia	?	?	n	?	?	?

IBRA Sub-region	Profile ID	Scientific Name	Common Name	Occurrence in Subregion	Likelihood of Occurrence in Impact Area	Geographic Restrictions	BC Act Status	EPBC Act Status	Kingdom	Class	Patch	% cover	Paddock trees important?	Habitat constraint	Survey months	SAII
Macleay Hastings																
NSW North Coast - Macleay Hastings	10412	Hoplocephalus bitorquatus	Pale-headed Snake	Known	U		V,P	0	Animalia	Reptilia	<5ha	fragmented 11-30%	y Within 500 m of moderate to good vegetation	n/a	Nov-Mar	n
NSW North Coast - Macleay Hastings	10413	Hoplocephalus bungaroides	Broad-headed Snake	Predicted	U		E1,P,2	V	Animalia	Reptilia	5-24ha	variegated 31-70%	n	Rocky areas Including escapments, outcrops and pogodas within the Sydney Sandstone geologies	Aug-Sep	y
NSW North Coast - Macleay Hastings	10414	Hoplocephalus stephensii	Stephens' Banded Snake	Known	U		V,P	0	Animalia	Reptilia	25-100ha	variegated 31-70%	y Within 500 m from forest	At or within 500 m of Hollow bearing trees, aboreal vine tangles, fallen/standing dead timber incl logs	all year	n
NSW North Coast - Macleay Hastings	10843	Xenus cinereus	Terek Sandpiper	Known	U	Tidal influenced water bodies within 15 km of coast	V,P	C,J,K	#N/A	#N/A						
NSW North Coast - Macleay Hastings	10859	Zieria lasiocaulis	Willi Willi Zieria	Known	U		E1	E	#N/A	#N/A						

Appendix D Protected Matters Search Report – EPBC Act

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

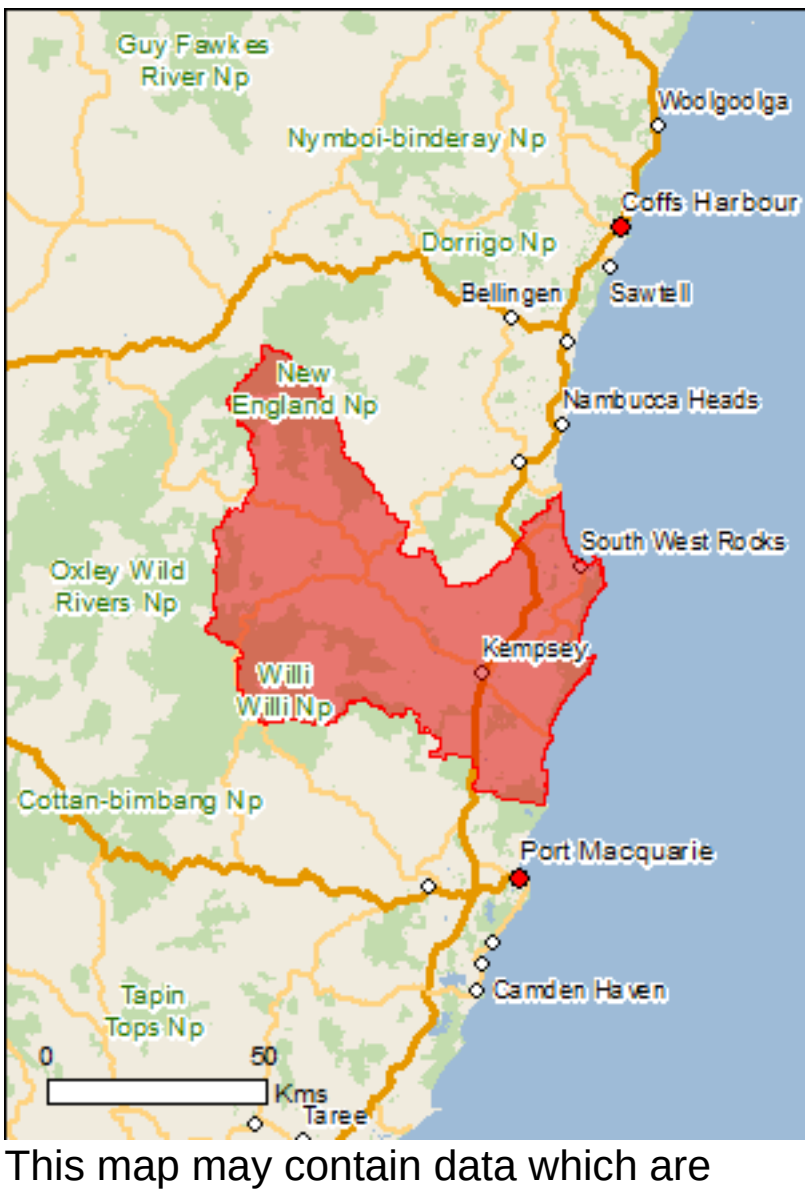
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

LGA KEMPSEY SHIRE COUNCIL, NSW

Report created: 09/04/20 11:54:17



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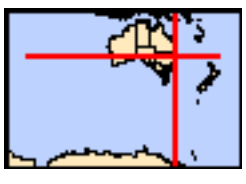

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://environment.gov.au/protection/environment-assessments

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Significance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Threatened Ecological Communities:	6
Threatened Species:	104
Migratory Species:	60

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits-and-application-forms

Commonwealth Lands:	7
Commonwealth Heritage Places:	2
Listed Marine Species:	79
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	37
Regional Forest Agreements:	1
Invasive Species:	40
Nationally Important Wetlands:	3

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Gondwana Rainforests of Australia	NSW	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
Gondwana Rainforests of Australia	NSW	Listed place

Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	Critically Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Threatened Species [Resource Information]

Name	Status	Type of Presence
BIRDS		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Atrichornis rufescens Rufous Scrub-bird [655]	Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
FISH		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
FROGS		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat known to occur within area
INSECTS		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
MAMMALS		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pseudomys oralis Hastings River Mouse, Koontoo [98]	Endangered	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
PLANTS		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat known to occur within area
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat likely to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat known to occur within area
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Callistemon pungens [55581]	Vulnerable	Species or species habitat known to occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Diuris eborensis [88275]	Endangered	Species or species habitat likely to occur within area
Diuris ochroma Pale Golden Moths [64565]	Vulnerable	Species or species habitat likely to occur within area
Diuris pedunculata Small Snake Orchid, Two-leaved Golden Moths, Golden Moths, Cowslip Orchid, Snake Orchid [18325]	Endangered	Species or species habitat likely to occur within area
Diuris venosa Veined Doubletail, Goat Orchid, Veined Donkey-orchid [6425]	Vulnerable	Species or species habitat may occur within area
Eucalyptus largeana Craven Grey Box [18581]	Endangered	Species or species habitat known to occur within area
Eucalyptus nicholii Narrow-leaved Peppermint, Narrow-leaved Black Peppermint [20992]	Vulnerable	Species or species habitat may occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat likely to occur within area
Gaultheria viridicarpa J.B.Williams subsp. viridicarpa ms. Green Waxberry [67411]	Vulnerable	Species or species habitat known to occur within area
Gingidia rupicola Mountain Angelica, Broad-leafed Carrot [86880]	Endangered	Species or species habitat likely to occur within area
Grevillea guthrieana [64521]	Endangered	Species or species habitat known to occur within area
Hakea archaeoides [66702]	Vulnerable	Species or species habitat may occur within area
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat known to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Marsdenia longiloba Clear Milkvine [2794]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Neoastelia spectabilis [6404]	Vulnerable	Species or species habitat likely to occur within area
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat likely to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat known to occur within area
Plectranthus nitidus Nightcap Plectranthus, Silver Plectranthus [55742]	Endangered	Species or species habitat likely to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Sarcochilus fitzgeraldii Ravine Orchid [19131]	Vulnerable	Species or species habitat likely to occur within area
Sarcochilus hartmannii Waxy Sarcochilus, Blue Knob Orchid [4124]	Vulnerable	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area
Tasmannia glaucifolia Fragrant Pepperbush [21975]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Tylophora woollsii [20503]	Endangered	Species or species habitat likely to occur within area
Zieria lasiocaulis Willi Willi Zieria [64547]	Endangered	Species or species habitat known to occur within area
REPTILES		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Saiphos reticulatus		
Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat known to occur within area
SHARKS		
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Breeding may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Broadcasting Commission
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Australian Telecommunications Corporation
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Telstra Corporation Limited
Defence - 41 RNSWR KEMPSEY ; KEMPSEY GRES DEPOT

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Kempsey Post Office	NSW	Listed place
Smoky Cape Lighthouse	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Sterna albifrons Little Tern [813]		Breeding may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Histiogamphelus briggsii		
Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa		
Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata		
Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Solegnathus dunckeri		
Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus spinosissimus		
Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus		
Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus		
Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra		
Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus		
Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus		
Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris		
Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer		
Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus		
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Arakoon	NSW
Boonanghi	NSW
Boonanghi	NSW
Carrai	NSW
Carrai	NSW
Clybucca	NSW
Clybucca	NSW
Cunnawarra	NSW
Fifes Knob	NSW
Fishermans Bend	NSW
Forestry Management Areas in Kempsey (FMZ2)	NSW
Forestry Management Areas in Urunga (FMZ1)	NSW
Gads Sugarloaf	NSW
Goolawah	NSW
Goolawah	NSW
Gumbaynggirr	NSW
Hat Head	NSW
Jobs Mountain	NSW
Kumbatine	NSW
Kumbatine	NSW
LNE Special Management Zone No1	NSW
Limeburners Creek	NSW
Maria	NSW
New England	NSW
Ngambaa	NSW
Oxley Wild Rivers	NSW
Pee Dee	NSW
Skillion	NSW
The Castles	NSW
UNE_LNE_OldGrowth	NSW
Werrikimbe	NSW
Willi Willi	NSW
Willi Willi Caves	NSW
Yarrahapinni Wetlands	NSW
Yarravel	NSW
Yarriabini	NSW
Yessabah	NSW

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit,

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Clybucca Creek Estuary	NSW
Limeburners Creek Nature Reserve	NSW
Swan Pool/Belmore Swamp	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining oigations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environment and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-Forestry Corporation, NSW
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix E Flora and Fauna Species Recorded on Subject Property

Table E.1 Flora Species Recorded on the Subject Property (GL = Greenloaning Biostudies Pty Ltd, PS = Pandanus Solutions

Scientific name	Common name	BAM Growth form code	Recorded by GL Sep 2019 - Feb 2020	Recorded by PS Feb 2018	Recorded within impact area (GL x, PS y)
Natives					
Acacia longifolia ssp. sophorae	Coastal Wattle	Shrub (SG)	√	√	*x y*
Acmena smithii	Lilly Pilly	Tree (TG)	√	√	*x*
Alphitonia excels	Red Ash	Tree (TG)	√		*x*
Archontophoenix cunninghamiana	Bangalow Palm	Other (OG)		√	
Asplenium australasicum	Birds nest Fern	Fern (EG)	√	√	
Banksia integrifolia	Coast banksia	Tree (TG)	√	√	*x y*
Banksia serrata	Old Man Banksia	Tree (TG)		√	*y*
Billardiera scandens	Dumpling	Other (OG)	√		*x*
Blechnum indicum	Swamp water fern	Fern (EG)		√	
Breynia oblongifolia	Breynia	Shrub (SG)	√		*x*
Cassytha glabella	Dodder	Other (OG)		√	*y*
Casuarina glauca	Swamp Oak	Tree (TG)	√		*x*
Cinnamomum oliveri	Oliver's sassafras	Tree (TG)	√		*x*
Clematis glycinoides	Headache Vine	Other (OG)	√		*x*
Clerodendrum floribundum	Clerodendrum	Shrub (SG)	√		
Coleocarya gracilis	Tuft Rush	Grass & grasslike (GG)		√	
Corymbia gummifera	Red Bloodwood	Tree (TG)		√	
Corymbia intermedia	Pink Bloodwood	Tree (TG)	√	√	*x*
Cupaniopsis anacardioides	Tuckeroo	Tree (TG)	√	√	*x y*
Cymbopogon refractus	Barbed wire Grass	Grass & grasslike (GG)	√		*x*
Cyperus spp.	Sedge spp.	Grass & grasslike (GG)	√		*x*
Dianella spp.	Dianella spp.	Forb (FG)	√		*x*
Digitaria parviflora	Smallflower Fingergrass	Grass & grasslike (GG)		√	*y*
Dipodium punctatum	*Hyacinth Orchid*	Forb (EG)	√		
Eragrostis interrupta		Grass & grasslike (GG)		√	*y*
Eragrostis parviflora	Weepy Lovegrass	Grass & grasslike (GG)		√	*y*
Eriachne spp.		Grass & grasslike (GG)		√	*y*

Eucalyptus grandis	Flooded Gum	Tree (TG)		√	*y*
Eucalyptus pilularis	Blackbutt	Tree (TG)	√	√	*y*
Eucalyptus racemosa	Scribbly Gum	Tree (TG)		√	*y*
Eucalyptus robusta	Swamp Mahogany	Tree (TG)	√	√	
Eucalyptus tereticornis	Forest red Gum	Tree (TG)	√	√	
Fern spp.	Fern spp.	Fern (EG)	√		
Ficus coronata	Creek Sandpaper Fig	Shrub (SG)	√	√	
Ficus macrophylla	Moreton Bay Fig	Tree (TG)		√	*y*
Ficus rubiginosa	Rusty Fig	Tree (TG)	√		*x*
Ficus spp.	Fig spp.	Tree (TG)	√		
Fimbristylis nutans	Fringe Rush	Grass & grasslike (GG)		√	
Gahnia sieberiana	Red-fruit saw-sedge	Grass & grasslike (GG)	√		
Geitonoplesium cymosum	Scrambling Lily	Other (OG)	√		*x*
Glochidion ferdinandi	Cheese Tree	Tree (TG)	√		*x*
Glochidion spp.	Cheese Tree spp.	Tree (TG)	√		
Gompholobium virgatum	Wallum Pea	Shrub (SG)		√	
Grass spp.	Grass spp.	Grass & grasslike (GG)	√		
Guioa semiglauca	Guioa	Tree (TG)	√		*x*
Hibbertia linearis	Guinea Flower	Shrub (SG)		√	
Hibbertia scandens	Twining Guinea Flower	Other (OG)	√		*x*
Imperata cylindrica	Blady Grass	Grass & grasslike (GG)	√	√	*x y*
Juncus continuus	Rush	Grass & grasslike (GG)		√	
Livistona australis	Cabbage Palm	Other (OG)		√	
Lomandra spp.	Lomandra spp.	Grass & grasslike (GG)	√		*x*
Maclura cochinchinensis	Cockspur vine	Other (OG)	√		
Melaleuca quinquenervia	Broadleaved paperbark	Tree (TG)	√	√	
Melicope elleryana	Pink Eudia	Tree (TG)		√	
Monotoca elliptica	Tree Broom-heath	Shrub (SG)	√		
Myrsine variabilis	Muttonwood	Shrub (SG)	√		
Oplismenus imbecillis	Creeping Beard Grass	Grass & grasslike (GG)	√	√	
Panicum simile	Two Colour Panic	Grass & grasslike (GG)		√	*y*
Parsonsia straminea	Common Silkpod	Other (OG)	√		
Persoonia linearis	Narrow Leaved Geebung	Shrub (SG)		√	*y*
Persoonia spp.	Geebung spp.	Shrub (SG)	√		*x*
Platycerium bifurcatum	Elkhorn Fern	Fern (EG)	√		
Pteridium esculentum	Common Bracken	Fern (EG)	√	√	*x y*

Smilax australis	Smilax	Other (OG)	√	√	*x y*
Smilax glyciphylla	Sarsaparilla Vine	Other (OG)		√	*y*
Stephania japonica	Snake vine	Other (OG)	√		*x*
Themeda triandra	Kangaroo Grass	Grass & grasslike (GG)		√	*y*
Exotics					
Asparagus aethiopicus	Ground asparagus	High Threat Exotic	√		*x*
Chrysanthemoides monilifera	Bitou bush	High Threat Exotic	√	√	*x y*
Lantana camara	Lantana	High Threat Exotic	√	√	*x y*
Ochna serrulata	Mickey mouse	High Threat Exotic	√		*x*
Paspalum mandiocanum	Broad-leaved Paspalum	Exotic	√		*x*
Paspalum mandiocanum/notatum	Paspalum	Exotic	√		*x*
Paspalum urvilei	Vasey Grass	Exotic		√	*y*
Pinus elliotii	Slash pine	High Threat Exotic	√	√	*x y*
Senna pendula	Cassia/Senna	High Threat Exotic	√		*x*
Salvinia molesta	Duck Weed	High Threat Exotic		√	

Table E.2 Fauna Species Recorded on the Subject Property

Scientific Name	**Common Name**	**Conservation Status**		**Species Recorded on Subject Property**	**Species Likely to Occur within the Subject Property**
		BC Act	**EPBC Act**		
Reptiles					
Varanus varius	Lace Monitor				
Ctenotus robustus	Eastern Striped Skink			X (s)	
	Skink sp.			X (s)	
Morelia spilota	Carpet Python				X
Pseudechis porphyriacus	Red-bellied Black Snake				X
Avifauna					
Acanthiza reguloides	Buff-rumped Thornbill?			X (s)	
Anthochaera chrysoptera	Little Wattle Bird			X (s)	

Caligavis chrysops	Yellow-faced Honeyeater				X
(*Cisticola* exilis	Golden-headed Cisticola			X (s)	
Colluricincla harmonica	Grey Shrike-thrush				X
Columba leucomela	White-headed Pigeon				X
Coracina novaehollandiae	Black-faced Cuckoo-shrike				X
Corvus orru	Torresian Crow			X (s)	
Dacelo novaeguineae	Laughing Kookaburra			X (s)	
Eopsaltria australis	Eastern Yellow Robin			X (s)	
Eurystomus orientalis	Dollarbird				X
Gerygone mouki	Brown Gerygone			X	
Glossopsitta pusilla	Little Lorikeet		V	X (OH)	
Gymnorhina tibicen	Australian Magpie			X (s)	
Hirundo neoxena	Welcome Swallow				X
Malurus cyaneus	Superb Fairy-wren				X
Meliphaga lewinii	Lewin's Honeyeater			X	
Merops ornatus	Rainbow Bee-eater			X (H) (s)	
Neochmia temporalis	Red-browed Finch			X (s)	X
Ocyphaps lophotes	Crested Pigeon				X
Pachycephala rufiventris	Rufous Whistler				X
Philemon corniculatus	Noisy friarbird			X (s)	
Phylidonyris niger	White-cheeked Honeyeater			X (s)	
Platycercus eximius	Eastern Rosella			X (s)	
Psophodes olivaceus	Eastern Whip Bird			X (s)	
Rhipidura leucophrys	Willie Wagtail			X (s)	
Rhipidura leucophrys *Rhipidura albiscapa*	Grey Fantail			X (s)	
Sphecotheres vieilloti	Australasian Figbird				X
Strepera graculina	Pied Currawong			X	
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet			X	
Mammals					
Isoodon sp.?	Bandicoot sp?			X (s)	
Antechinus stuartii	Brown Antechinus			X (s)	
Phascolarctos cinereus	Koala	V	V	X (s)	
Trichosurus vulpecula	Common Brush-tailed Possum			X (s)	
Macropus rufogriseus	Red-necked Wallaby			X (s)	
Rattus rattus	Bush Rat			X (s)	
Pteropus poicalocephalus	Grey-headed Flying-fox	V	V		X

Chalinolobus gouldii	Gould's Wattled Bat			X (s)	
Miniopterus australis	Little Bent-winged Bat	V		X (s)	
Nyctophilus geoffroyi	Lesser Long-eared Bat			X (s)	
Ozymops ridei	Ride's Free-tailed Bat			X (s)	
Scotorepens orion	Eastern Broad-nosed Bat			X (s)	
Vespadelus pumilus	Eastern Forest Bat			X (s)	

Table E.3 Combined Fauna Survey Results Tables

Harp Netting Results

Date	Trap Number	Species	Sex	Description	Easting	Northing
3/12/2019	CHD1	0			496976	6540284
4/12/2019	CHD1	*Nyctophilus geoffroyi*	Male	Adult	496976	6540284
		Nyctophilus geoffroyi	Female	Non-breeding Young	496976	6540284
5/12/2019	CHD1	0			496976	6540284
3/12/2019	CHD2	*Vespadelus pumilis*	Female	Adult - 146g, 34-1 (forearm length) head-body 44-9	496976	6548241
4/12/2019	CHD2	0			496976	6548241
5/12/2019	CHD2	0			496976	6548241

Total Trap Nights: CHD1 = 3 & CHD2 = 3

Bat Detector Results

Date:	19/03/2019	6/12/2019	Total
Total files:	40	8	48
# of files with noise only	32	3	35
Miniopterus australis	1	0	1
Ozimops ridei	1	3	4
O. ridei or *Chalinolobus gouldii*	2	1	3
Scotorepens orion	4	2	6

Hair Tube Results (Total Trap Nights = 120)

Sample Number	Easting	Northing	Trapline number	Comments/Species Recorded
281	496956	6548280	2	Contained no hairs
282	496961	6548280	2	*Antechinus stuartii*
284	496974	6548271	2	Insufficient hair to identify

291	496992	6548277	2	*Rattus fuscipes*
292	497047	6548293	2	*Antechinus stuartii*
293	497006	6548286	2	*Rattus fuscipes*
294	497010	6548292	2	*Antechinus stuartii*
295	497031	6548292	2	Insufficient hair to identify
296	497060	6548278	2	*Antechinus stuartii*

Elliot Trapping Results

					START OF TRAPLINE		END OF TRAPLINE				
Date	**Weather Conditions**	**Trap Night**	**Trap number**	**Trap Line**	**Easting**	**Northing**	**Easting**	**Northing**	**Species**	**Sex**	**Comments**
4/12/2019		1	455		496951	6548299	496973	6548216	*Antechinus stuartii*	Female	net weight 26g. Brown feet.
4/12/2019	fine and warm	1	467	1	496951	6548299	496973	6548216	*Rattus fuscipes*	Male	net weight 110g. Droppings observed on cage
5/12/2019		2	471		496951	6548299	496973	6548216	*Rattus fuscipes*	Female	
5/12/2019		2	488		496952	6548278	497079	6548342	*Rattus fuscipes*		
5/12/2019	fine and cool	2	494		496952	6548278	497079	6548342	Unknown escaped	NA	
6/12/2019		3	477	2	496952	6548278	497079	6548342	*Rattus fuscipes*	Female	net weight 129g
6/12/2019	fine and cool	3	481		496952	6548278	497079	6548342	*Rattus fuscipes*	Male	net weight 126g
4/12/2019		1	479		496952	6548278	497079	6548342	*Rattus fuscipes*	Female	net weight 72g
4/12/2019	fine and warm	1	485		496952	6548278	497079	6548342	*Rattus fuscipes*	Female	net weight 123g

Camera Trapping Results

Trap Number	Camera Site	Date	Location Description	Eastings	Northings	Species sighted
Camera Trap 1	Access Track	6/12/2019 - 15/12/2019	Approx 5m from new bat trap	496978	6548292	0
Camera Trap 2	Trapline	6/12/2019 - 15/12/2019	Approx 4m South of Elliot Trapline 1	496944	6548295	0
Camera Trap 3	Creek Line	6/12/2019 - 15/12/2019	Facing along the creek	4970236	6548298	0

Total Trap Nights

3 Camera traps X 7 nights = 21 trap nights

Spotlighting Results

				START OF SURVEY		END OF SURVEY		
Date	**Time**	**Location**	**Habitat Type**	**Easting**	**Northing**	**Easting**	**Northing**	**Species**
4/12/2019	9.49pm - 9.59pm	Road	Forest Red Gum	496967	6548418	496871	6548188	0
4/12/2019	9:10pm - 9.25pm	Bush Track		496988	6548413	497090	6548236	0
5/12/2019	8:45pm -9:00pm	Road	Forest Red Gum	496967	6548418	496871	6548188	
5/12/2019	9:10Ppm - 9.20pm	Bush Track		496988	6548413	497090	6548236	2 Common Brush tailed Possums observed

Total Survey Nights

2 nights spotlighting down track = 2

Total = 4 survey nights

Appendix F Vegetation Community Attributes – Plot Data

HBAM1

BAM Site - Field Survey Form				**Site Sheet no:**	
		Survey Name	**Zone ID**	**Recorders**	
Date:	20.09.19		2c	Alison Martin, Fiona Dawson	
Zone	**Datum**	**Plot ID:**	CHBAM1	**Plot dimensions:**	50m x 20m
56	GDA 94				
Easting	**Northing**	**IBRA region:**	Macleay Hastings IBRA subregion	**Midline bearing from 0m:**	180°
496948	6548290				
Vegetation Class:		Blady Grass on Ilmenite Stockpile		**Confidence (H, M, L):**	
Plant Community Type:		Regeneration	**EEC:** No	**Confidence (H, M, L):**	

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400m² plot)		**Sum values**
Count of **Native Richness**	**Trees**	6
	Shrubs	4
	Grasses etc.	4
	Forbs	0
	Ferns	0
	Other	4
Sum of **Cover** of native vascular plants by growth form group	**Trees**	6.21
	Shrubs	1.03
	Grasses etc.	25.03
	Forbs	0
	Ferns	0
	Other	3.6
Hight Threat Weed cover		21.14

BAM Attribute (1000m² plot)		
DBH	**# Tree Stems Count**	**# of Hollow Bearing Trees**
80 + cm	0	0
50 - 79 cm	0	0
30 - 49 cm	0	0
20 - 29 cm	0	0
10 - 19 cm	4	0
5 - 9 cm	5	0
< 5 cm	17	0
Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)		1

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	**Litter Cover (%)**	Bare ground cover %	14.002

Subplot score (% in each)	70%	95 %	70 %	50 %	20 %	Cryptogam cover %	0.004
Average of the 5 subplots	61%					Rock cover %	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter). Assessors may also record the cover of rock, bare ground and cryptograms.

400m² plot: Sheet _ of _		**Survey Name**	**Plot Identifier**	**Recorders**												
Date:	20/09/2019	0	CHBAM1	Alison Martin, Fiona Dawson												
GF Code	**Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable**			**N, E, or HTE**	**Cover**	**Abund**	**Stratum**	**Voucher**	**Common name**	**Cover % U**	**Cover % UM**	**Cover % LM**	**Cover % G**	**TOTAL**	**Lookup**	***Count***
Tree (TG)	*Cupaniopsis anacardioides*			N	0.15	2	LM,UM		Tuckeroo		0.1	0.05		0.15	Tree (TG)	*1*
Shrub (SG)	*Leucopogon spp.*			N	0.01	1	G		Leucopogon				0.01	0.01	Shrub (SG)	*1*
Tree (TG)	*Banksia integrifolia*			N	1.01	11	UM		Coast banksia		1		0.01	1.01	Tree (TG)	*1*
Tree (TG)	*Eucalyptus tereticornis*			N	3	5	U,UM		Forest red Gum	2	1			3	Tree (TG)	*1*
Tree (TG)	*Endiandra sieberi*			N	2.02	2	UM,LM,G		Hard Corkwood		2	0.01	0.01	2.02	Tree (TG)	*1*
Other (OG)	*Corymbia spp.*			N	3	0	U		Bloodwood	3				3	Other (OG)	*1*
Shrub (SG)	*Acacia longifolia*			N	1	>5	LM		Coastal Wattle			1		1	Shrub (SG)	*1*
Shrub (SG)	*Breynia oblongifolia*			N	0.01	>5	LM		Breynia			0.01		0.01	Shrub (SG)	*1*
Tree (TG)	*Glochidion ferdinandi*			2	0.01	2	LM,UM		Cheese Tree			0.01		0.01	Tree (TG)	*1*
Tree (TG)	*Guioa semiglauca*			N	0.02	3	LM,G		Guioa			0.01	0.01	0.02	Tree (TG)	*1*
Shrub (SG)	*Ficus coronata*			N	0.01	1	G		Creek Sandpaper Fig				0.01	0.01	Shrub (SG)	*1*
Grass & grasslike (GG)	*Oplismenus imbecillis*			N	0.01	5	G		Creeping Beard Grass				0.01	0.01	Grass & grasslike (GG)	*1*
Grass & grasslike (GG)	*Imperata cylindrica*			N	25	>100	G		Bladey Grass				25	25	Grass & grasslike (GG)	*1*
Grass & grasslike (GG)	*Cymbopogon refractus*			N	0.01	5	G		Barbed Wire Grass			0.01		0.01	Grass & grasslike (GG)	*1*
Grass & grasslike (GG)	*Cyperus spp.*			N	0.01	1	G	#1	Cyperus sp.				0.01	0.01	Grass & grasslike (GG)	*1*
Other (OG)	*Hibbertia scandens*			N	0.2	>10	LM		Twining Guinea Flower			0.1	0.1	0.2	Other (OG)	*1*
Other (OG)	*Smilax australis*			N	0.2	>10	LM		Smilax			0.1	0.1	0.2	Other (OG)	*1*
Other (OG)	*Geitonoplesium cymosum*			N	0.2	>5	LM		Scrambling Lily			0.1	0.1	0.2	Other (OG)	*1*
#N/A					0									0	#N/A	*blank*
#N/A					0									0	#N/A	*blank*
0					0											
										5	*4.1*	*1.4*	25.37	35.87		
	Asparagus aethiopicus			HT E	0.1	2	G		Ground asparagus				0.1	0.1		
	Lantana camara			HT E	10	>100	LM		Lantana			10		10		
	Chrysanthemoides monilifera			HT E	10.01	>50	LM,G		Bitou bush			10	0.01	10.01		
	Senna pendula			HT E	1.01	10	LM,G		Cassia			1	0.01	1.01		
	Pinus elliotii			HT E	0.01	1	LM		Slash pine			0.01		0.01		
	Paspalum mandiocanum			E	0.01	>10	G		Broad-leaved Paspalum				0.01	0.01		

GF Code: see Growth form definitions in Appendix 1 **N:** native**, E:** exotic**, HTE:** high threat exotic **GF- circle code** if 'top 3'

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, …, 10, 15, 20, 25, …100% (foliage cover); **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% + 4 x 5 m, 25% + 10 x 10m

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

	Cover % U	Cover % UM	Cover % LM	Cover % G	TOTAL	Lookup	*Count*
TOTAL WEEDS	0	0	21.01	0.13	21.14		
TOTAL COVER	5	4.1	22.41	25.5			
	Cover % U	**Cover % UM**	**Cover % LM**	**Cover % G**	**TOTAL**	**Lookup**	***Count***
SUM NATIVE COVER				SUM NATIVE RICHNESS			
Other (OG)		*3.6*		4			
Fern (EG)		*0*		0			
Tree (TG)		*6.21*		6			
Grass & grasslike (GG)		*25.03*		4			
Shrub (SG)		*1.03*		4			
Forb (FG)		*0*		0			
		35.87		18			
OTHER DATA	Bloodwood canopy overhanging plot DBH 44.5, 18m height						
Height:							
Bangalows							
SwampOak							
Top 3							
Forb (FG)							
Mid							
Lower mid							
Vines							
Ground							
	MODERATE CONDITION						

Description:

Black sand approx 1-2m depth
Clearing severity code 3
Weediness severity code 2
Zone is cleared, moderate condition Bladey Grass regrowth
on stockpile of black sand Ilmenite dominated by Bladey Grass with weed infestation
around perimeter. Southern end of plot grades into dense bracken regrowth

CHBAM3

BAM Site - Field Survey Form				**Site Sheet no:**	
		Survey Name	**Zone ID**	**Recorders**	
Date:	20/09/19	Crescent Head	3c	Alison Martin, Fiona Dawson	
Zone	**Datum**	**Plot ID:**	CHBAM3	**Plot dimensions:**	50m x 20m
56	GDA 94				
Easting	**Northing**	**IBRA region:**	Macleay Hastings IBRA subregion	**Midline bearing from 0m:**	120°
496961	6548224				
Vegetation Class:		Bracken & RF pioneers regenerating		**Confidence (H, M, L):**	
Plant Community Type:		Regeneration /Lamtana	**EEC:**	**Confidence (H, M, L):**	

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400m² plot)		**Sum values**
Count of **Native Richness**	**Trees**	3
	Shrubs	0
	Grasses etc.	1
	Forbs	0
	Ferns	1
	Other	2
Sum of **Cover** of native vascular plants by growth form group	**Trees**	6.01
	Shrubs	0
	Grasses etc.	0.01
	Forbs	0
	Ferns	70
	Other	0.02
Hight Threat Weed cover		11.12

BAM Attribute (1000m² plot)		
DBH	**# Tree Stems Count**	**# of Hollow Bearing Trees**
80 + cm	0	0
50 - 79 cm	0	0
30 - 49 cm	1	0
20 - 29 cm	1	0
10 - 19 cm	2	0
5 - 9 cm	1	0
< 5 cm	2	0
Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	0	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**
For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	**Litter Cover (%)**
Bare ground cover %	23.6

Subplot score (% in each)	90 %	80 %	10 %	85 %	95%	Cryptogam cover %	0
Average of the 5 subplots	72%					Rock cover %	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter). Assessors may also record the cover of rock, bare ground and cryptograms.

	Survey Name	Plot Identifier	Recorders
Date: 20/09/2019	Crescent Head	CHBAM3	Alison Martin, Fiona Dawson

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E, or HTE	Cover	Abund	stratum	voucher	Common name	Cover % U	Cover % UM	Cover % LM	Cover % G	TOTAL	Lookup	*Count*
Tree (TG)	*Ficus rubiginosa*	N	3	1	UM	#2	Rusty Fig		3			3	Tree (TG)	*1*
Tree (TG)	*Guioa semiglauca*	N	1.01	1.01	UM, G		Guioa		1		0.01	1.01	Tree (TG)	*1*
Tree (TG)	*Alphitonia excelsa*	N	2	5	UM		Red Ash		2			2	Tree (TG)	*1*
Grass & grasslike (GG)	*Imperata cylindrica*	N	0.01	>50	G		Blady Grass				0.01	0.01	Grass & grasslike (GG)	*1*
Other (OG)	*Billardiera scandens*	N	0.01	1	G	#3	Dumpling				0.01	0.01	Other (OG)	*1*
Other (OG)	*Dianella sp.*	N	0.01	1	G		Dianella				0.01	0.01	Other (OG)	*1*
Fern (EG)	*Pteridium esculentum*	N	70	>1000	LM		Common Bracken			70		70	Fern (EG)	*1*
#N/A		N	0									0	#N/A	*blank*
								0	6	70	0.04	76.04		
	Pinus elliottii	HT E	4		U,UM		Slash pine	2	2			4		
	Paspalum mandiocanum/notatum	E	0.01		G		Paspalum				0.01	0.01		
	Senna pendula	HT E	0.1		LM		Senna			0.1		0.1		
	Lantana camara	HT E	5		LM		Lantana			5		5		
	Chrysanthemoides monilifera	HT E	2		LM		Bitou Bush			2		2		
	Ochna serrulata	HT E	0.01		G		Mickey Mouse				0.01	0.01		
							TOTAL WEEDS	2	2	7.1	0.02	11.12	SUM H TE COVER	
							TOTAL COVER	2	*8*	*77.1*	0.06			

GF Code: see Growth form definitions in Appendix 1 **N:** native**, E:** exotic**, HTE:** high threat exotic **GF- circle code** if 'top 3'
Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, …, 10, 15, 20, 25, …100% (foliage cover); **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% + 4 x 5 m, 25% + 10 x 10m
Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

							SUM NATIVE COVER				SUM NATIVE RICHNESS			
							Other (OG)		*0.02*		2			
							Fern (EG)		*70*		1			
							Tree (TG)		*6.01*		3			
							Grass & grasslike (GG)		*0.01*		1			
							Shrub (SG)		*0*		0			
							Forb (FG)		*0*		0			
									76.04		7			
							OTHER DATA							

							Height:							
							Bangalows							
							SwampOak							
							Top 3							
							Forb (FG)							
							Mid							
							Lower mid							
							Vines							
							Ground							
								POOR CONDITION (Lantana)						
							Description:	Ilmenite stockpile (black sand) - approx 1-2m high						
								Two ridges & a swale in the centre						
								Scattered small trees regenerating dominated by bracken						
								Thickets of Lantana						
								Many birds						
								More RF elements to the east						
								Occasional Lomandra in 50 x 20						
								Fauna: *Bandicoot (diggings)*						
								White cheeked honeyeater						
								Wattle Bird						
								Grey Fantail						
								Small macropod (Rufus Bettong?) - check records						
								Wallaby (red-neck)						

CHBAM4

BAM Site - Field Survey Form				**Site Sheet no:**	
		Survey Name	**Zone ID**	**Recorders**	
Date:	20/09/19	Crescent Head	5c	Alison Martin, Fiona Dawson	
Zone	**Datum**	**Plot ID:**	CHBAM4	**Plot dimensions:**	50m x 20m
56	GDA 94				
Easting	**Northing**	**IBRA region:**	Macleay-Hastings sub IBRA region	**Midline bearing from 0m:**	95°
496979	6548280				
Vegetation Class:		Swamp Oak forest on Ilmenite stockpile		**Confidence (H, M, L):**	
Plant Community Type:			**EEC:** Y	**Confidence (H, M, L):**	

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400m² plot)		**Sum values**
Count of **Native Richness**	**Trees**	4
	Shrubs	1
	Grasses etc.	1
	Forbs	0
	Ferns	0
	Other	4
Sum of **Cover** of native vascular plants by growth form group	**Trees**	63.1
	Shrubs	0.01
	Grasses etc.	1
	Forbs	0
	Ferns	0
	Other	1.12
Hight Threat Weed cover		35.1

BAM Attribute (1000m² plot)		
DBH	**# Tree Stems Count**	**# of Hollow Bearing Trees**
80 + cm	0	0
50 - 79 cm	0	0
30 - 49 cm	4	0
20 - 29 cm	6	0
10 - 19 cm	28	0
5 - 9 cm	24	0
< 5 cm	16	0
Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	0	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**
For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	**Litter Cover (%)**				
Subplot score (% in each)	75 %	95 %	95 %	100 %	10%
Average of the 5 subplots	75%				

Bare ground cover %	2 1
Cryptogam cover %	0
Rock cover %	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter). Assessors may also record the cover of rock, bare ground and cryptograms.

400m² plot: Sheet _ of _		**Survey Name**	**Plot Identifier**	**Recorders**
Date:	20/09/2019	Crescent Head	CHBAM4	Alison Martin, Fiona Dawson

GF Code	**Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable**	**N, E, or HTE**	**Cover**	**Abund**	**stratum**	**voucher**	**Common name**	**Cover % U**	**Cover % UM**	**Cover % LM**	**Cover % G**	**TOTAL**	**Lookup**	***Count***
Tree (TG)	*Alphitonia excelsa*	N	5	1	UM		Red Ash		5			5	Tree (TG)	*1*
Tree (TG)	*Casuarina glauca*	N	52.1	76	U, UM,LM,G		Swamp Oak	50	2	0.1		52.1	Tree (TG)	*1*
Tree (TG)	*Endiandra sieberi*	N	4	1	U		Hard Corkwood	4				4	Tree (TG)	*1*
Tree (TG)	*Eucalyptus tereticornis*	N	2	1	U		Forest Red Gum	2				2	Tree (TG)	*1*
Other (OG)	*Maclura cochinchinensis*	N	0.01	2	LM		Cockspur vine			0.01		0.01	Other (OG)	*1*
Other (OG)	*Hibbertia scandens*	N	0.1	>30	LM		Twining Guinea Flower			0.1		0.1	Other (OG)	*1*
Other (OG)	*Smilax australis*	N	1	>30	LM		Smilax			1		1	Other (OG)	*1*
Other (OG)	*Stephania japonica*	N	0.01	1	LM		Snake vine			0.01		0.01	Other (OG)	*1*
Grass & grasslike (GG)	*Imperata cylindrica*	N	1	>30	G		Bladey Grass				1	1	Grass & grasslike (GG)	*1*
Shrub (SG)	*Breynia oblongifolia*	N	0.01	>10	G		Breynia				0.01	0.01	Shrub (SG)	*1*
								56	*7*	*1.22*	1.01	65.23		*10*
	Pinus elliotii	HT E	5	2	U		Slash pine	5				5		
	Lantana camara	HT E	30	>30	LM		Lantana			30		30		
	Senna pendula	HT E	0.1	>20	LM		Cassia			0.1		0.1		
			0									0		
			0									0		
			0									0		

GF Code: see Growth form definitions in Appendix 1 **N:** native**, E:** exotic**, HTE:** high threat exotic **GF- circle code** if 'top 3'

Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, …, 10, 15, 20, 25, …100% (foliage cover); **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% + 4 x 5 m, 25% + 10 x 10m

Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

TOTAL WEEDS		5	*0*	*30.1*	0	35.1	SUM HTE COVER	
TOTAL COVER		61	*7*	*31.32*	1.01			
SUM NATIVE COVER				SUM NATIVE RICHNESS				
Other (OG)		*1.12*		4				
Fern (EG)		*0*		0				
Tree (TG)		*63.1*		4				
Grass & grasslike (GG)		*1*		1				
Shrub (SG)		*0.01*		1				
Forb (FG)		*0*		0				
		65.23		10				
OTHER DATA								
Height:								
Bangalows								

Swamp Oak							
Top 3							
Forb (FG)							
Mid							
Lower mid							
Vines							
Ground							
Description:	MODERATE CONDITION						
Ilmenite stockpile with Swamp Oak forest & Lantana, black sand approx 2m depth, clearing severity code 3							
Grades into Bracken @ eastern end & hollow bearing old growth @ western end. Varied elevation drops down							
into dense smilax, hibbertia & bracken at the eastern end.							

Samples ID per A Martin/F Dawson

Sample #	Location	Species
1	CHBAM3	*Cyparaceae*
2	CHBAM3	*Ficus rubiginosa*
3	CHBAM3	*Billardiera scandes*

Appendix G BAM Calculator Reports

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00018092/BAAS18002/19/00018097

Assessment name
Ilmenite Resource Recovery Project Crescent Head

BAM data last updated *
05/05/2020

Assessor Name
Alison Martin

Report Created
25/05/2020

BAM Data version *
26

Assessor Number
BAAS18002

Assessment Type
Part 4 Developments (General)

BAM Case Status
Finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Assessment Revision
0

Date Finalised
25/05/2020

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	1230_Low2c	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	Low2c	0.14	1	

2	1230_Low3c	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	Low3c	1.14	1	
3	1235_Mod5c	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Mod5c	0.1	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018092/BAAS18002/19/00018097	Ilmenite Resource Recovery Project Crescent Head	05/05/2020
Assessor Name	**Report Created**	**BAM Data version ***
Alison Martin	25/05/2020	26
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18002	Part 4 Developments (General)	Finalised
	Assessment Revision	**Date Finalised**
	0	25/05/2020

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Barred Cuckoo-shrike	Coracina lineata	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Common Blossom-bat	Syconycteris australis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Golden-tipped Bat	Phoniscus papuensis	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Greater Broad-nosed Bat	Scoteanax rueppellii	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Little Bent-winged Bat	Miniopterus australis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Little Eagle	Hieraaetus morphnoides	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Masked Owl	Tyto novaehollandiae	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Powerful Owl	Ninox strenua	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion

Spotted-tailed Quoll	Dasyurus maculatus	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Square-tailed Kite	Lophoictinia isura	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Superb Fruit-Dove	Ptilinopus superbus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Varied Sittella	Daphoenositta chrysoptera	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Threatened species not within the area of these PCT's

Common Name	Scientific Name	Vegetation Types(s)
Australasian Bittern	Botaurus poiciloptilus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Australian Painted Snipe	Rostratula australis	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Barred Cuckoo-shrike	Coracina lineata	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Black Bittern	Ixobrychus flavicollis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Black-necked Stork	Ephippiorhynchus asiaticus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Common Blossom-bat	Syconycteris australis	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Eastern Osprey	Pandion cristatus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Freckled Duck	Stictonetta naevosa	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Glossy Black-Cockatoo	Calyptorhynchus lathami	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Golden-tipped Bat	Phoniscus papuensis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Hoary Wattled Bat	Chalinolobus nigrogriseus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Koala	Phascolarctos cinereus	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Little Lorikeet	Glossopsitta pusilla	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Pale-vented Bush-hen	Amaurornis moluccana	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
		1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion
Regent Honeyeater	Anthochaera phrygia	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Swift Parrot	Lathamus discolor	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Varied Sittella	Daphoenositta chrysoptera	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion
Yellow-bellied Glider	Petaurus australis	1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion

BAM Candidate Species Report

Proposal Details

Assessment Id
00018092/BAAS18002/19/00018097

Proposal Name
Ilmenite Resource Recovery Project Crescent Head

BAM data last updated *
05/05/2020

Assessor Name
Alison Martin

Report Created
25/05/2020

BAM Data version *
26

Assessor Number
BAAS18002

Assessment Type
Part 4 Developments (General)

BAM Case Status
Finalised

Assessment Revision
0

Date Finalised
25/05/2020

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List of Species Requiring Survey

Name	Presence	Survey Months
Acronychia littoralis Scented Acronychia	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Alexfloydia repens Floyd's Grass	No (surveyed)	Jan Feb Mar Jul Aug Sep Oct Nov Dec
Burhinus grallarius Bush Stone-curlew	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	Jan Feb Mar Oct Nov Dec
Dendrobium melaleucaphilum Spider orchid	No (surveyed)	Aug Sep

Lichenostomus fasciogularis Mangrove Honeyeater	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Carterornis leucotis White-eared Monarch	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Peristeranthus hillii Brown Fairy-chain Orchid	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Phascogale tapoatafa Brush-tailed Phascogale	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Phascolarctos cinereus Koala	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Planigale maculata Common Planigale	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Allocasuarina defungens Dwarf Heath Casuarina	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Eucalyptus seeana - endangered population Eucalyptus seeana population in the Greater Taree local government area	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

List of Species Not On Site

Name
Argynnis hyperbius Laced Fritillary
Asperula asthenes Trailing Woodruff
Calyptorhynchus lathami Glossy Black-Cockatoo
Crinia tinnula Wallum Froglet

Hoplocephalus bitorquatus Pale-headed Snake
Hoplocephalus stephensii Stephens' Banded Snake
Melaleuca biconvexa Biconvex Paperbark
Litoria brevipalmata Green-thighed Frog
Lophoictinia isura Square-tailed Kite
Maundia triglochinoides Maundia triglochinoides
Miniopterus australis Little Bent-winged Bat
Miniopterus orianae oceanensis Large Bent-winged Bat
Mixophyes iteratus Giant Barred Frog
Myotis macropus Southern Myotis
Ninox connivens Barking Owl
Tyto novaehollandiae Masked Owl
Anthochaera phrygia Regent Honeyeater
Lindernia alsinoides Noah's False Chickweed
Hieraaetus morphnoides Little Eagle
Haliaeetus leucogaster White-bellied Sea-Eagle
Ninox strenua Powerful Owl
Oberonia titania Red-flowered King of the Fairies
Ocybadistes knightorum Black Grass-dart Butterfly
Pandion cristatus Eastern Osprey
Petaurus norfolcensis Squirrel Glider
Phaius australis Southern Swamp Orchid
Pteropus poliocephalus Grey-headed Flying-fox
Lathamus discolor Swift Parrot
Litoria aurea Green and Golden Bell Frog
Petalura gigantea Giant Dragonfly
Potorous tridactylus Long-nosed Potoroo

BAM Credit Summary Report

Proposal Details

Assessment Id
00018092/BAAS18002/19/00018097

Proposal Name
Ilmenite Resource Recovery Project Crescent Head

BAM data last updated *
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Assessor Name
Alison Martin

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Assessor Number
BAAS18002

BAM Case Status
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Assessment Revision
0

Assessment Type
Part 4 Developments (General)

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Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion								
1	1230_Low2c	35.7	0.1	0.25	High Sensitivity to Potential Gain	2.00		2
2	1230_Low3c	14.3	1.1	0.25	High Sensitivity to Potential Gain	2.00		0

							Subtotal	**2**
Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion								
3	1235_Mod5c	27.9	0.1	0.25	High Sensitivity to Potential Gain	2.00		1
							Subtotal	**1**
							Total	**3**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00018092/BAAS18002/19/00018097

Proposal Name
Ilmenite Resource Recovery Project Crescent Head

BAM data last updated *
05/05/2020

Assessor Name
Alison Martin

Assessor Number
BAAS18002

BAM Data version *
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Proponent Names
Crown Land

Report Created
25/05/2020

BAM Case Status
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Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
25/05/2020

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Potential Serious and Irreversible Impacts

Nil

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

Name
Amaurornis moluccana / Pale-vented Bush-hen
Botaurus poiciloptilus / Australasian Bittern
Chalinolobus nigrogriseus / Hoary Wattled Bat
Ephippiorhynchus asiaticus / Black-necked Stork
Falsistrellus tasmaniensis / Eastern False Pipistrelle
Ixobrychus flavicollis / Black Bittern
Stictonetta naevosa / Freckled Duck
Anthochaera phrygia / Regent Honeyeater
Glossopsitta pusilla / Little Lorikeet
Pandion cristatus / Eastern Osprey
Petaurus australis / Yellow-bellied Glider
Phascolarctos cinereus / Koala
Rostratula australis / Australian Painted Snipe
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Lathamus discolor / Swift Parrot

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	Not a TEC	1.3	2.00
1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Not a TEC	0.1	1.00

1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region
Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1232, 1718, 1723, 1730	Coastal Swamp Forests >=70% and <90%	No	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region

	Coastal Floodplain Wetlands This includes PCT's: 780, 828, 835, 1234, 1235, 1386, 1651, 1720, 1727, 1728	Coastal Floodplain Wetlands >=70% and <90%	No	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00018092/BAAS18002/19/00018097

Proposal Name
Ilmenite Resource Recovery Project Crescent Head

BAM data last updated *
05/05/2020

Assessor Name
Alison Martin

Assessor Number
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BAM Data version *
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Proponent Name(s)
Crown Land

Report Created
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Assessment Type
Part 4 Developments (General)

Date Finalised
25/05/2020

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Potential Serious and Irreversible Impacts

Nil

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

Name
Amaurornis moluccana / Pale-vented Bush-hen
Botaurus poiciloptilus / Australasian Bittern
Chalinolobus nigrogriseus / Hoary Wattled Bat
Ephippiorhynchus asiaticus / Black-necked Stork
Falsistrellus tasmaniensis / Eastern False Pipistrelle
Ixobrychus flavicollis / Black Bittern
Stictonetta naevosa / Freckled Duck
Anthochaera phrygia / Regent Honeyeater
Glossopsitta pusilla / Little Lorikeet
Pandion cristatus / Eastern Osprey
Petaurus australis / Yellow-bellied Glider
Phascolarctos cinereus / Koala
Rostratula australis / Australian Painted Snipe
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)
Lathamus discolor / Swift Parrot

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Variations)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	Not a TEC	1.3	2.00
1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Not a TEC	0.1	1.00

1230-Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region
Coastal Swamp Forests This includes PCT's: 839, 1064, 1227, 1230, 1232, 1718, 1723, 1730	Coastal Swamp Forests >=70% and <90%	No	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	HBT	IBRA region
Forested Wetlands	Tier 4 or higher	No	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	**Like-for-like credit retirement options**			
	Class	Trading group	HBT	IBRA region
	Coastal Floodplain Wetlands This includes PCT's: 780, 828, 835, 1234, 1235, 1386, 1651, 1720, 1727, 1728	Coastal Floodplain Wetlands >=70% and <90%	No	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options			
	Formation	Trading group	HBT	IBRA region
	Forested Wetlands	Tier 4 or higher	No	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00018092/BAAS18002/19/00018097	63	0	25/05/2020

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Alison Martin	BAAS18002	Ilmenite Resource Recovery Project Crescent Head	Finalised

Assessment Type	Date Finalised
Part 4 Developments (General)	25/05/2020

PCT list

Price calculated	PCT common name	Credits
Yes	**1230 -** Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	2
Yes	**1235 -** Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	1

Species list

Price calculated	Species	Credits

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Macleay Hastings	**1230 -** Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	No	Coastal Swamp Forests >=70% and <90%	19.73%	$298.38	2.5639	$9,229.49	2	$18,458.98
Macleay Hastings	**1235 -** Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	No	Coastal Floodplain Wetlands >=70% and <90%	19.73%	$161.84	2.2610	$5,006.00	1	$5,006.00
							Subtotal (excl. GST)		**$23,464.98**
							GST		**$2,346.50**
							Total ecosystem credits (incl. GST)		**$25,811.48**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price

Biodiversity payment summary report

No species available

Grand total	**$25,811.48**