JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (BDAR)

Broken Head Quarry
Broken Head

A Report Prepared for
Winten Property Pty Ltd

MARCH 2024

JWA Pty Ltd
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BDAR CERTIFICATION

This Biodiversity Development Assessment Report is certified by **Adam McArthur** – a suitably qualified person and accredited assessor under the accreditation scheme prepared under Section 6.10 of the NSW *Biodiversity Conservation Act 2016* (BC Act), **accreditation number BAAS18069**.

The report has been prepared based on the requirements of, and information provided under the Biodiversity Assessment Method (DPIE 2020a) and submitted via the Biodiversity Offsets and Agreement Management System (BOAMS) on 13th March 2024, **case number (00043292/BAAS18069/23/00043293/Revision:1)**.

Signed _____ Date: 14th March 2024

DOCUMENT CONTROL

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RW1	15/02/24	Grant Brearley Adam McArthur	GB AM	Adam McArthur	AM
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EXECUTIVE SUMMARY

This Biodiversity Development Assessment Report (BDAR) has been prepared by Mr Adam McArthur (Accredited Assessor Certification No. BAAS18069) to support and planning proposal that has been lodged with Byron Shire Council (BSC) for rezoning to facilitate a residential subdivision at the Broken Head Quarry, Broken Head; formally described as Lot 1 in DP 123302 and Lot 2 in DP 700806 (the subject site).

The preparation of this BDAR has been triggered as the proposal exceeds the Biodiversity Offset Scheme (BOS) threshold set out in Clause 7.1(1) of the Biodiversity Conservation Regulation 2017 (BCR) as it involves the clearing of native vegetation on land included on the Biodiversity Values Map published under clause 7.3.

A detailed assessment of composition, structure and function of site vegetation was completed on the 23rd and 24th November 2023 utilising the Biodiversity Assessment Method (BAM). This assessment was completed by a suitably qualified person and accredited assessor under the accreditation scheme prepared under Section 6.10 of the *Biodiversity Conservation Act 20016* (BC Act).

The assessment identified four (4) Plant Community Types (PCTs) consisting of three (3) intact / good condition, one (1) modified / disturbed, one (1) regrowth and two (2) planted vegetation zones (VZs) occur within the proposed development impact area (the subject land).

The majority of site vegetation within the proposed development impact area is representative of PCT 3147 - Far North Brush Box-Bloodwood Wet Forest and has been previously cleared and disturbed as part of former quarry operations and have either naturally regenerated within native vegetation and/or have been actively revegetated since the cessation of quarrying activities on the subject site.

The remaining areas of site vegetation within the proposed development impact area are representative of PCT 3121 - Broken Head Lowland Rainforest and PCT 3011 - Far North Lowland Subtropical Rainforest, which are representative of the Threatened Ecological Community (TEC) Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions listed within schedules of the BC Act, and potentially representative of the TEC Lowland Rainforest of Subtropical Australia listed within schedules of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Targeted threatened fauna surveys were completed in accordance with the relevant survey timing and effort requirements of the Threatened Biodiversity Data Collection (TBDC), threatened species survey guides or best-practice methods as follows:

- by one (1) accredited assessor/principal ecologist and one (1) senior ecologist for a total of approximately twelve (12) person hours on the 29th and 30th September 2023; and

- by one (1) accredited assessor/principal ecologist, one (1) senior ecologist and two (2) field assistants for a total of approximately 150 person hours between the 11th – 16th December 2023.

Three (3) threatened flora species listed within schedules of the BC Act were recorded on the subject site:

- Corokia (*Corokia whiteana*) (a species credit species);
- Red-flowered king of the fairies (*Oberonia titania*) (a species credit species); and
- Scrub turpentine (*Rhodamnia rubescens*) (a species credit species);

One (1) threatened fauna species listed within schedules of the BC Act was recorded from the subject site:

- Common Planigale (*Planigale maculata*) (a species credit species).

In addition, a number of species credit species have been assumed to be present in accordance with the requirements of Section 5.3.1 of the BAM as site surveys were not completed during the specified time of year or using the appropriate survey methods:

- Black-tailed Antechinus (*Antechinus arktos*);
- Barking owl (*Ninox connivens*);
- Powerful Owl (*Ninox strenua*);
- Cryptic Forest Twiner (*Tylophora woollsii*); and
- Masked Owl (*Tyto novaehollandiae*).

A number of measures to avoid and mitigate impacts on existing flora, fauna and habitat values of the site have been discussed. The proposed development has been situated and designed where possible to be restricted to the RU1 zoned land and areas of the site that were historically disturbed as part of the former quarry operations where native vegetation that are in the poorest condition. Vegetation integrity (VI) scores (out of 100) of the areas to be impacted are as follows:

- Vegetation zone 1 = 59.9 (0.07 ha to be impacted);
- Vegetation zone 3b = 66.4 (0.06 ha to be impacted);
- Vegetation zone 4a = 68.9 (1.90 ha to be impacted);
- Vegetation zone 4b = 22.6 (0.94 ha to be impacted);
- Vegetation zone 5 = 63.9 (0.07 ha to be impacted);
- Vegetation zone 11a = 19.3 (1.93 ha to be impacted); and
- Vegetation zone 11b = 16.5 (1.68 ha to be impacted).

The intact/better quality vegetation occurring on the site (i.e. vegetation in the west and northeast of the site representing TECs and other VZ in good condition etc.) have been avoided where possible. The proposed development has also been located and designed to

avoid direct impacts on all threatened flora specimen. Overall, the proposed development will result in unavoidable impacts on 2.10 ha of intact native vegetation, 0.94 ha of regrowth vegetation and 3.62 ha of planted native vegetation.

Using the Biodiversity Assessment Method Calculator (BAM-C), a total of seventy-two (72) ecosystem credits and three hundred and sixty-nine (369) species credits have been calculated as applicable for the unavoidable loss of site vegetation as follows:

Ecosystem credits

- PCT 3011-Far North Lowland Subtropical Rainforest = 2 credits;
- PCT 3121-Broken Head Lowland Rainforest = 2 credits;
- PCT 3147-Far North Brush Box-Bloodwood Wet Forest = 66 credits; and
- PCT 3148-Far North Brush Box-Walnut Wet Forest = 2 credits.

Species credits

- Black-tailed Antechinus (*Antechinus arktos*) (**assumed present**) = 4 credits;
- Barking Owl (*Ninox connivens*) (**assumed present**) = 67 credits;
- Powerful Owl (*Ninox strenua*) (**assumed present**) = 67 credits;
- Red-flowered king of the fairies (*Oberonia titania*) = 4 credits;
- Common planigale (*Planigale maculata*) = 80 credits;
- Cryptic Forest Twiner (*Tylophora woollsii*) (**assumed present**) = 80 credits; and
- Masked Owl (*Tyto novaehollandiae*) (**assumed present**) = 67 credits.

In accordance with the requirements of the NSW Biodiversity Offsets Scheme, proponents have two (2) primary ways that they can satisfy their offset credit obligation:

1. They can identify and purchase the required 'like for like' credits in the market and then retire those credits via the Office of Environment and Heritage (OEH) Biodiversity Offsets and Agreement Management System (BOAMS).

OR

2. They can use the Offsets Payment Calculator to determine the cost of their credit obligation and transfer this amount to the Biodiversity Conservation Fund via the OEH BOAMS. The responsibility for identifying and securing the offset obligation would then be transferred to the Biodiversity Conservation Trust.

These credits will need to be purchased or retired as an offset for the removal of site vegetation.

In addition to the above, this BDAR has included an assessment of compliance with relevant local legislation including any relevant requirements of the Byron Development Control Plan (DCP) – Chapter B1 within the Byron Local Environmental Plan (LEP) 2014 and the Byron Coast Comprehensive Koala Plan of Management (BCCKPoM).

The proposed development generally complies with the requirements of Chapter B1; however, some variations to the development standards are required as contemplated by Clause 6. The proposed development will utilise predominantly cleared and degraded land on the subject site; however, will result in the removal of small areas of TECs and native vegetation, that is (among other things) considered to be potentially suitable habitat for threatened flora and fauna species. The removal of this vegetation is not considered to represent a significant impact and will be compensated by way of ecosystem or species credits calculated under the BAM-C.

The strategic placement of the proposed development in cleared and degraded areas of the subject site ensure that there are negligible impacts to the value of a mapped wildlife corridor and minor waterways. Hollow-bearing trees that were evident on the subject site are predominately located within the vegetated areas. It is expected that none of these features will be impacted; however, as a contingency, if they must be removed, hollows should be offset at a 1:1 offset ratio through the provision of nest boxes.

An assessment of compliance with the requirements of the BCCKPoM has determined that preferred koala habitat (i.e. 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) does not occur at the subject site and therefore the BCCKPoM does not apply.

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ABBREVIATIONS

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016*
BCCKPoM	Byron Coast Comprehensive Koala Plan of Management
BCD	Biodiversity and Conservation Division
BCR	*Biodiversity Conservation Regulation 2017*
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
BSC	Byron Shire Council
DCP	Development Control Plan
DECCW	Department of Environment, Climate Change and Water
DPIE	Department of Planning, Industry and Environment
DPE	Department of Planning and Environment
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESCP	Erosion and Sediment Control Plan
Ha	Hectare
HEV	High Environmental Value
IBRA	Interim Biogeographic Regionalisation of Australia
Km	Kilometre
KAP	Koala Activity Precinct
KMA	Koala Management Area
KMP	Koala Management Precinct
LEP	Local Environmental Plan
LGA	Local Government Area
m	Metres
mm	Millimetres
NCRP	North Coast Regional Plan 2041
NSW	New South Wales
OEH	Office of Environment and Heritage
PCT	Plant Community Type
PKH	Potential Koala Habitat
QLD	Queensland
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Protection Policy
SEQ	Southeast Queensland
SMP	Stormwater Management Plan
SPRAT	Specific Profiles and Threats
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VI	Vegetation Integrity
VMRP	Vegetation Management and Rehabilitation Plan
VZ	Vegetation Zone

1 INTRODUCTION

1.1 Background

JWA Pty Ltd has been engaged by Winten Property Pty td to prepare a Biodiversity Development Assessment Report (BDAR) to support a Planning Proposal that has been lodged with Byron Shire Council (BSC) for rezoning to facilitate a residential subdivision at the Broken Head Quarry, Broken Head; formally described as Lot 1 in DP 123302 and Lot 2 in DP 700806 (the subject site). More specifically, this BDAR responds to advice from the Biodiversity and Conservation Division (BCD) of the Department of Planning and Environment (DPE), at the request of BSC, relating to ecological matters.

The BCD advice refers to the North Coast Regional Plan 2041 (NCRP) which has been prepared by DPE to "guide planning and decision-making by the NSW Government and councils and to inform decisions by the private sector and the wider community". The NCRP introduces the concept of High Environmental Value (HEV) assets. The NCPR describes Potential HEV assets as including:

- Land with high biodiversity value that is particularly sensitive to impacts from development and clearing (as shown on the NSW Government's Biodiversity Values map);
- Native vegetation of high conservation value, including vegetation types that have been over cleared or occur within over cleared landscapes, threatened ecological communities, old growth forest and rainforest;
- Key habitat of threatened species;
- Important wetlands, estuaries and lakes; and
- Areas of geological significance.

Potential HEV assets are shown at the regional scale on the Potential High Environmental Values map. As the NCPR has been prepared to guide decision-making at a regional scale, it notes that "*this mapping is not appropriate for use at a property scale*".

The NCRP further states:

> *"To protect, maintain and enhance biodiversity, HEV assets need to be identified at the site map scale and then used to inform strategic planning, LEPs and planning proposals."*

and that:

> *"At the planning proposal stage, HEV assets within the planning area should be identified through site investigations and suitable mechanisms put in place to protect HEV."*

Additionally, Strategy 3.1 of the NCRP includes that:

- *"Strategic planning and local plans must consider opportunities to protect biodiversity values by:*

- *focusing land-use intensification away from HEV assets and implementing the 'avoid, minimise and offset' hierarchy in strategic plans, LEPs and planning proposals.*
- *identifying HEV assets within the planning area at Planning Proposal stage through site investigations.*

This BDAR has been prepared to provide a detailed and site-specific assessment of ecological values of the site in accordance with the requirements of the NCRP.

Detailed assessment of vegetation integrity (condition) in NSW is completed in accordance with the Biodiversity Assessment Method (BAM). The BAM determines the integrity of native vegetation (a score out of 100). A BDAR is then prepared by an accredited assessor and identifies the measures utilised to avoid, minimise and offset the residual impacts of a development.

Section 6.12 of the *Biodiversity Conservation Act 2016* (BC Act) requires that a BDAR:

- *"assesses in accordance with the biodiversity assessment method the biodiversity values of the land"; and*
- *"sets out the measures that the proponent of the proposed development … proposes to take to avoid or minimise the impact of the proposed development".*

The Act clearly provides for a 'mitigation hierarchy', commencing with avoidance. Similarly, the BAM (2020) expresses the expectation that avoidance must be demonstrated before minimisation or mitigation of impacts. Examples of avoidance and minimising impacts provided in Section 7.1.2 of the BAM include locating the development:

- in areas that have no biodiversity values and/or;
- in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores).

The preparation of this BDAR has involved the following:

- An assessment of the biodiversity values of the clearing area utilising the BAM (DPIE 2020a) including:
  - An assessment of the landscape features and site context;
  - Determining the presence of Threatened Ecological Communities (TECs), Plant Community Types (PCTs), and the condition (vegetation integrity) of native vegetation on the subject site;
  - Determining the habitat suitability for Threatened species on the subject site.
- An impact assessment of the proposed vegetation removal on biodiversity values in accordance with the requirements of the BAM including:

  - Documenting measures to avoid and/or minimise impacts of the proposed vegetation removal;
  - Assessing direct and indirect impacts on native vegetation and habitat;
  - Discussing measures to mitigate and manage unavoidable impacts;
  - Identification of any serious and irreversible impacts; and
  - Calculating the offset requirement associated with the proposed additional clearing area.
- Targeted threatened flora and fauna surveys to confirm, reduce or remove relevant Biodiversity Offset Credit obligations.

1.2 The Subject Site

The subject site is located on The Coast Road, Broken Head and is formally described as Lot 1 in DP 123302 and Lot 2 in DP 700806 (**FIGURE 1**). The subject site covers an area of approximately 32.32 ha and comprises intact vegetation that is well connected across the surrounding landscape. Central portions of the subject site associated with past quarry activities are largely cleared and degraded, with several areas of advanced and/or recent rehabilitation.

The subject site is located 5.7 km south-southwest from the coastal township of Byron Bay near the suburb of Suffolk Park and is 1.2 km west of the coastal fringe. A recent aerial photograph of the subject site is provided in **FIGURE 2.**

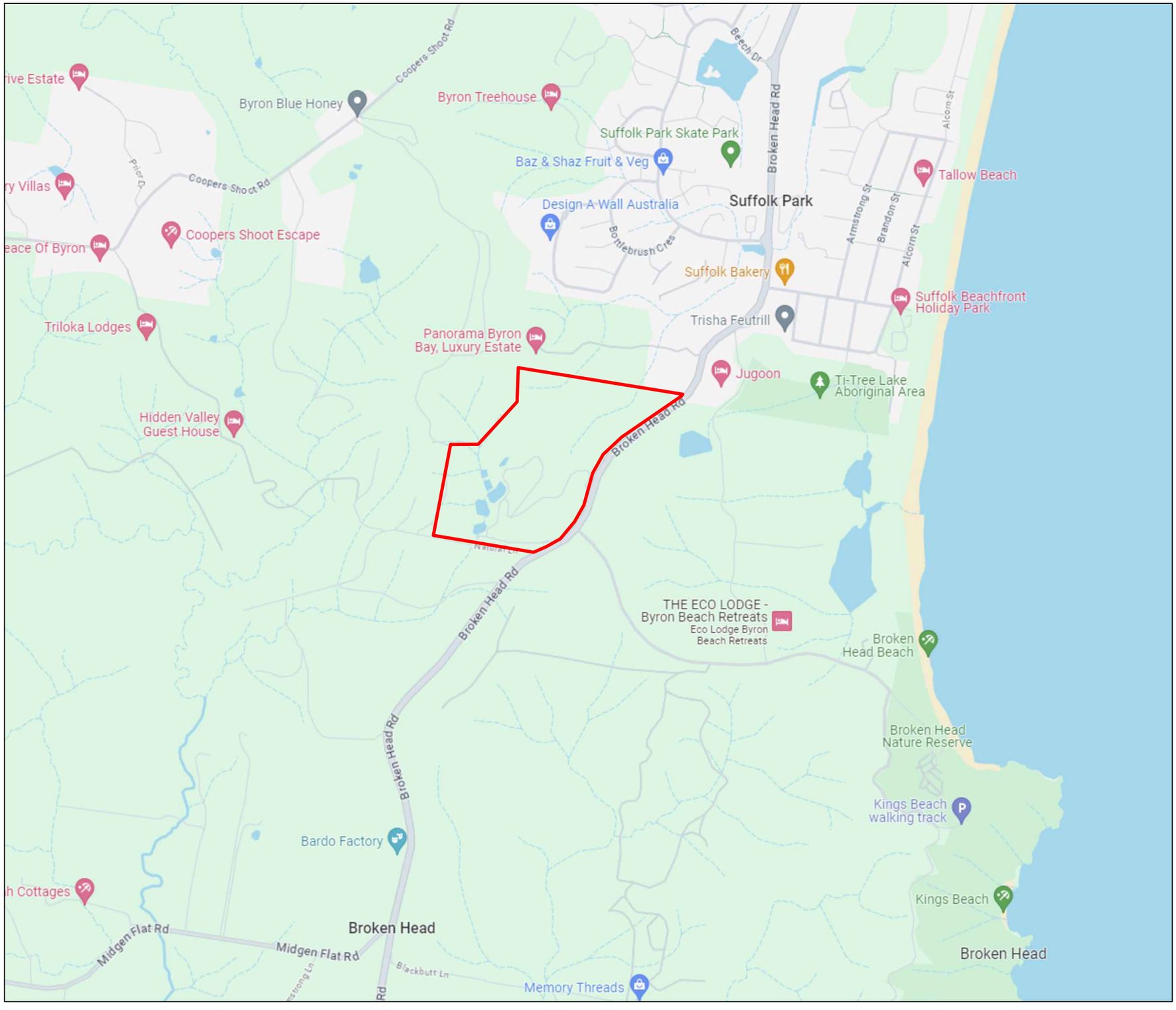
1.3 Planning Context

The subject site is located within the BSC Local Government Area (LGA) and is therefore subject to the Byron Local Environmental Plan (LEP) 2014 and associated plans, policies and controls. Under the Byron LEP the site is zoned as RU2 – Rural Landscape and C2 – Environmental Conservation. A zoning plan is provided in **FIGURE 3**.

1.4 The Planning Proposal

Following a meeting with BSC Strategic Planners, the planning proposal has been developed to rezone the RU1 zoned land on the subject site to R2 Low Density Residential. The proposed rezoning and concept residential subdivision layout is shown in **FIGURE 4**.

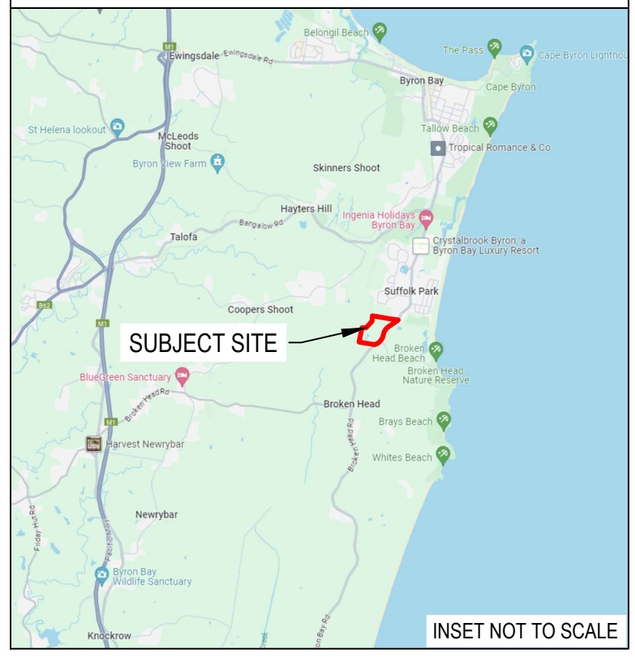
The concept subdivision is for ninety-two (92) residential lots and an open space area/park. The project has been designed with perimeter roads which will form part of the required Asset Protection Zones (APZs). For areas requiring deeper APZs at the interface, Outer Protection Areas (OPAs) will be managed through selective thinning and planting of fire-resistant vegetation. These OPAs will be managed under community title arrangements, so as to not place a burden to council.



LEGEND

Subject Site

REGIONAL CONTEXT



INSET NOT TO SCALE

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SOURCE: Google Maps

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Winten Property Group

PROJECT
BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 1

PREPARED: BW
DATE: 4 March 2024
FILE: N202009_BDAR_20240304.dwg

TITLE

LOCALITY PLAN

N

LEGEND

Subject Site

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SOURCE: MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

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FIGURE 2

PREPARED: BW
DATE: 4 March 2024
FILE: N202009_BDAR_20240304.dwg

TITLE

AERIAL PHOTOGRAPH

LEGEND

- Subject Site

Zoning - Byron LEP 2014

- RU1 - Primary Production
- RU2 - Rural Landscape
- C2 - Environmental Conservation
- C3 - Environmental Management
- DM - Deferred Matter

Scale 1 : 4000

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SOURCE: BSC Interative Mapping - Land Zoning (accessed 15/02/24)

SCALE: 1 : 4000 @ A3

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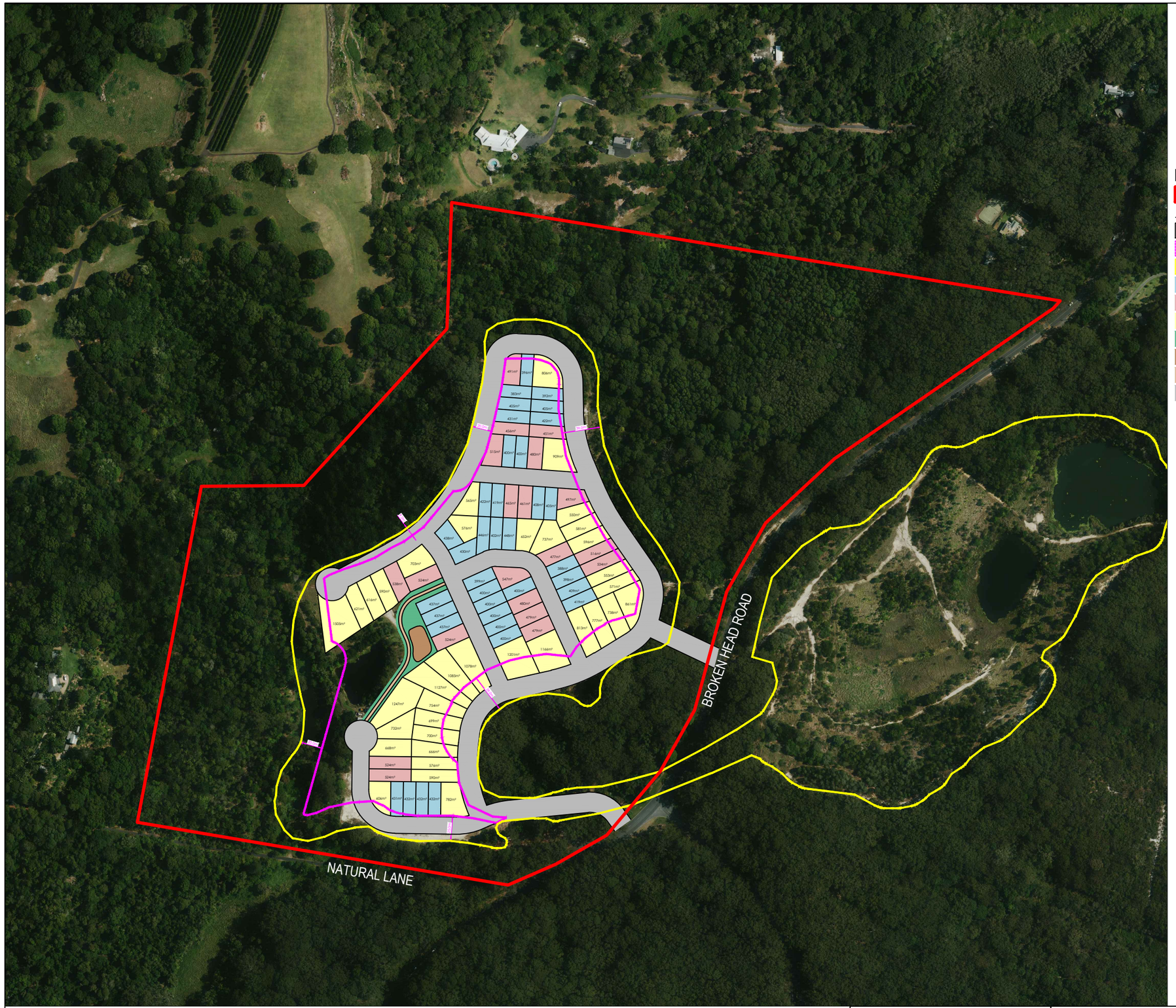
BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 3

PREPARED: BW
DATE: 4 March 2024
FILE: N202009_BDAR_20240304.dwg

TITLE

ZONING PLAN



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LEGEND

- Subject Site

Proposed Development Layout

- Proposed Lots
- Asset Protection Zone (APZ)
- Existing Zone Boundary
- Proposed Lots 0-449m^2
- Proposed Lots 450-550m^2
- Proposed Lots >550m^2
- Proposed Open Space
- Proposed Park
- Proposed Pathway
- Proposed Road

Scale 1 : 4000

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SOURCE: Winten Property Group (20230918 -ACAD-240392-PSK-001 to 003[A].dwg); MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

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BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 4

PREPARED: BW
DATE: 14 March 2024
FILE: N202009_BDAR_20240314.dwg

TITLE
PROPOSED DEVELOPMENT LAYOUT

1.5 Personnel

This BDAR has been prepared by accredited assessor Mr Adam McArthur (Certification No. BAAS18069). All content and fieldwork are in accordance with the BAM (DPIE 2020a). A copy of Adam's CV is provided in **APPENDIX 1**.

1.6 Sources of Information

Sources of information used or consulted in the assessment, including reports and spatial data, are as follows:

- Biodiversity Assessment Method (DPIE 2020a);
- Biodiversity Assessment Method 2020 Operational Manual – Stage 1 (DPE 2022a);
- Biodiversity Assessment Method 2020 Operational Manual – Stage 2 (DPE 2023a);
- Biodiversity Assessment Method 2020 Operational Manual – Stage 3 (DPIE 2020b);
- Biodiversity Offsets and Agreement Management System (BOAMS);
- Biodiversity Assessment Method Calculator (BAM-C) https://www.lmbc.nsw.gov.au/bamcalc;
- Australian Government's Species Profiles and Threats database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl;
- Office of Environment and Heritage (OEH) threatened species database https://www.environment.nsw.gov.au/threatenedSpeciesApp/;
- Descriptions for NSW (Mitchell) Landscapes - Version 2 (Mitchell 2002);
- A Directory of Important Wetlands in Australia - 3rd Edition (Environment Australia 2001);
- Proposed development layouts provided by the proponent;
- MetroMap (aerial imagery);
- Interim Biogeographic Regionalisation of Australia (IBRA) Regions and Subregions (DPE 2023b);
- NSW (Mitchell) Landscapes - Version 3.1 (DPE 2016);
- Fauna Corridors for North East NSW (DPE 2010); and
- State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) mapping (DPE 2022b).

2 LANDSCAPE FEATURES

2.1 Introduction

This section of the BDAR provides details of landscape features at the subject site (in accordance with Section 3.1 of the BAM) including:

- Interim Biogeographic Regionalisation for Australia (IBRA bioregions) and subregions, NSW landscape region and area (ha);
- Native vegetation extent and cleared areas within the buffer area;
- Rivers and streams (classified according to stream order);
- Wetlands within, adjacent to and downstream of the site;
- Connectivity features;
- Any areas of geological significance and soil hazard features; and
- Site context components, including:
    - identification of method applied (i.e. linear or site-based); and
    - percent native vegetation cover in the landscape (development site and biodiversity stewardship site).

2.2 IBRA Bioregions and Subregions, NSW Landscape Region and Area

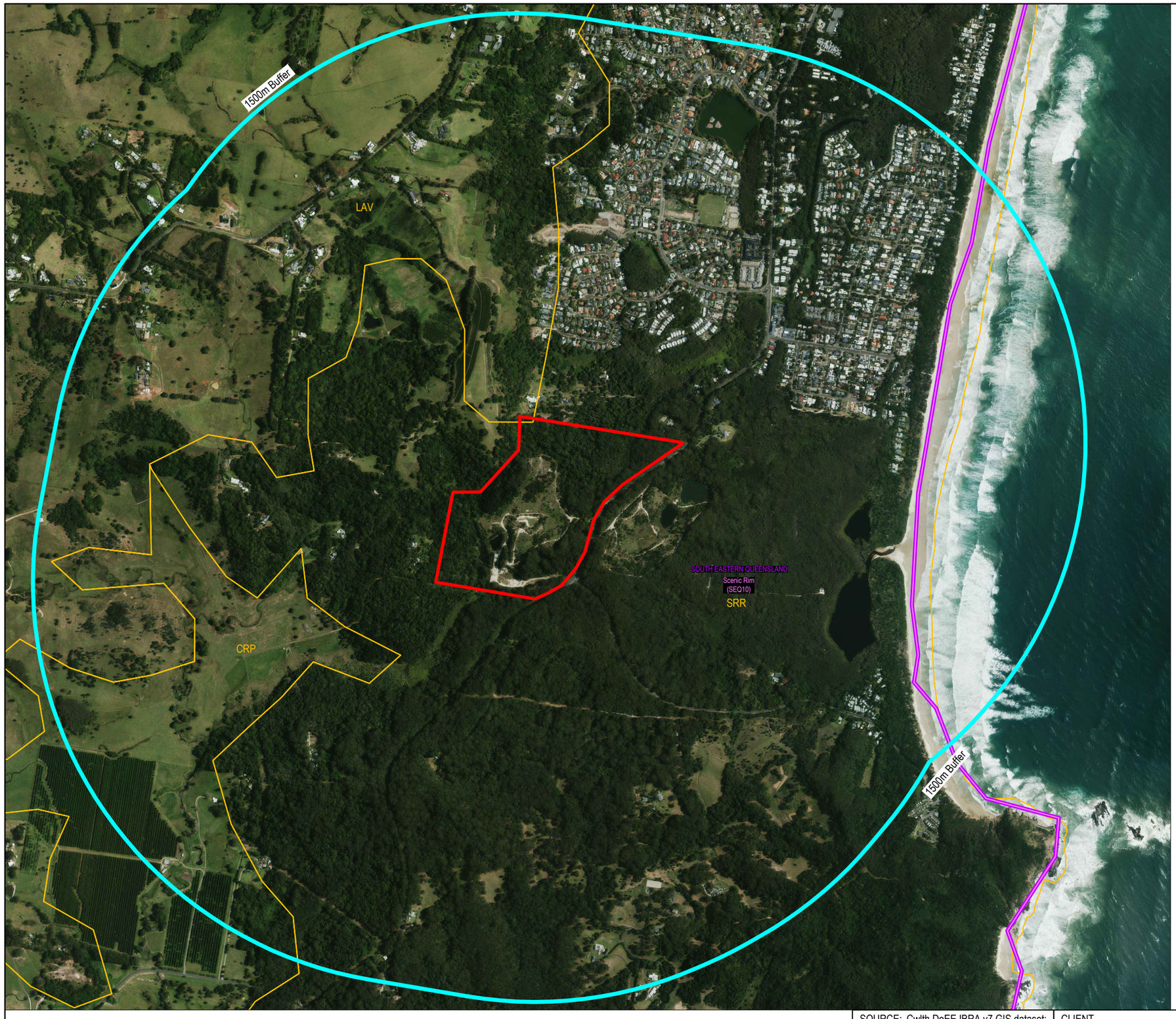
The subject site is located within the Scenic Rim subregion of the South East Queensland (SEQ) IBRA bioregion (SEQ10). Mitchell (2002) mapping (v3.1) places the subject site within the Summervale Range NSW landscape region. The subject sites position within the IBRA and Mitchell landscapes is shown in **FIGURE 5**.

2.3 Native Vegetation Extent and Cleared Areas in the Buffer Area

As per the BAM 2020 methodology (Section 4.3.2) a buffer of 1,500 m was established around the site and a calculation of native vegetation cover was derived using recent aerial photography. Native vegetation and cleared areas occurring within a 1,500 m buffer area to the subject site are shown in **FIGURE 6**. It is estimated that the extent of native vegetation on the subject site and within the buffer area is approximately 550 ha (51%).

2.4 Rivers and Streams

Several waterways are mapped on the subject site (**FIGURE 6**). This includes several first order watercourse in the northern and western portions of the site and a second order watercourse that runs through the western portion of the site in association with several dams.



N

LEGEND

- Subject Site
- 1500m Buffer to Subject Site
- IBRA Region - South Eastern Queensland
- IBRA Subregion
  - SEQ10 Scenic Rim
- NSW (Mitchell) Landscape
  - SRR Summervale Range
  - CRP Clarence - Richmond Alluvial Plains
  - LAV Lamington Volcanic Slopes

Scale 1 : 15 000

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SOURCE: Cwlth DoEE IBRA v7 GIS dataset; NSW OEH NSW (Mitchell) Landscapes v3.1 GIS dataset; MetroMap Aerial dated 31/10/23

SCALE: 1 : 15 000 @ A3

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Byron Shire Council LGA

FIGURE 5

PREPARED: BW
DATE: 4 March 2024
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TITLE

IBRA & NSW LANDSCAPE REGIONS

N

LEGEND

- Subject Site
- 1500m Buffer to Subject Site

Vegetation within 1500m Buffer

- Native Vegetation
- Cleared Areas
- Waterbodies
- Mapped watercourses and drainage lines

Scale 1 : 15 000

0 200m 400m 600m

SOURCE: MetroMap Aerial dated 09/07/23

SCALE: 1 : 15 000 @ A3

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FIGURE 6

PREPARED: BW
DATE: 7 March 2024
FILE: N202009_BDAR_20240306.dwg

TITLE
NATIVE VEGETATION CLEARED AREAS & WATERWAYS WITHIN 1500M BUFFER

2.5 Wetlands Within, Adjacent to and Downstream of the Subject Site

Coastal wetlands are mapped under the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) in areas adjacent to the south-western corner and northern boundary of the subject site (**FIGURE 7**). A proximity area for coastal wetlands associated with the coastal wetland to the southwest extends onto the subject site.

2.6 Connectivity Features

The subject site is mapped as occurring in the Broken Head Regional Corridor delineated by the Key Habitats and Corridors mapping prepared by the Department of Environment, Climate Change and Water (DECCW) (**FIGURE 8**). The Hogans Subregional Corridor also occurs to the west of the site.

2.7 Site Context Components

2.7.1 Introduction

The assessment of site context involved the application of the site-based method. The following landscape attributes were assessed:

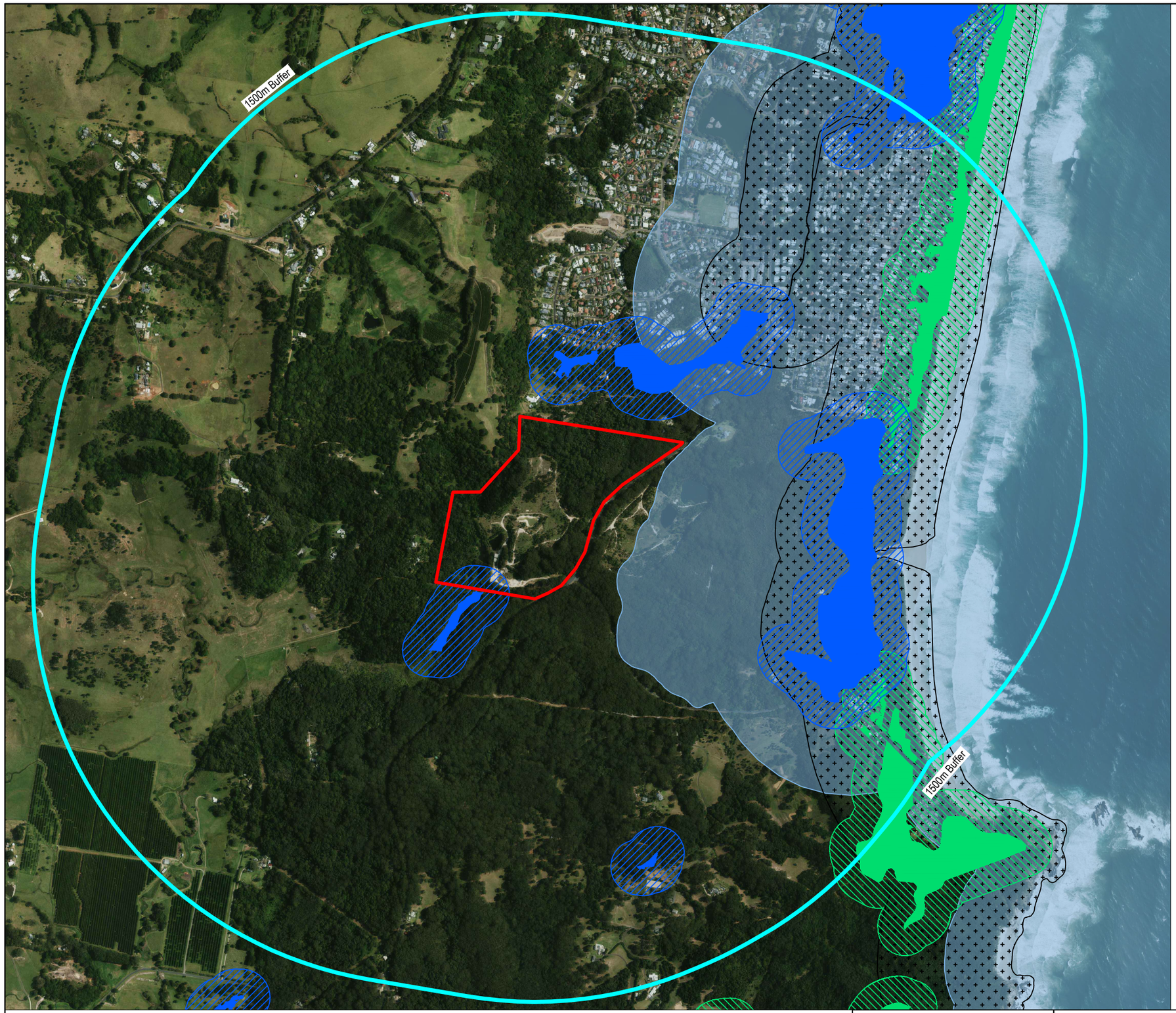
- Percent native vegetation cover in the landscape; and
- Patch size.

2.7.2 Percent Native Vegetation Cover

Native vegetation and cleared areas occurring within a 1,500 m buffer area to the subject site are shown in **FIGURE 6**. It is estimated that the native vegetation cover within the buffer area is 51%. The >30–70% native vegetation cover class has therefore been used to assess the habitat suitability of the subject site for Threatened species in **SECTION 4**.

2.7.3 Patch Size

Native vegetation and cleared areas occurring within a 1,500 m buffer area to the subject site are shown in **FIGURE 6.** The patch size in which the subject vegetation occurs has been estimated to be approximately 1,250 ha. The ≥100 ha patch size class has therefore been used to assess the habitat suitability of the subject site for Threatened species in **SECTION 4.**



N

LEGEND

- Subject Site
- 1500m Buffer to Subject Site

Resilience & Hazards SEPP 2021

- Coastal Wetlands
- Proximity Area for Coastal Wetlands
- Littoral Rainforest
- Proximity Area for Littoral Rainforest
- Coastal Environmental Area
- Coastal Use Area

Scale 1 : 15 000

0 200m 400m 600m

SOURCE: NSW Govt. SEPP (Resilience & Hazards) 2021 GIS dataset; MetroMap Aerial dated 31/10/23

SCALE: 1 : 15 000 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Winten Property Group

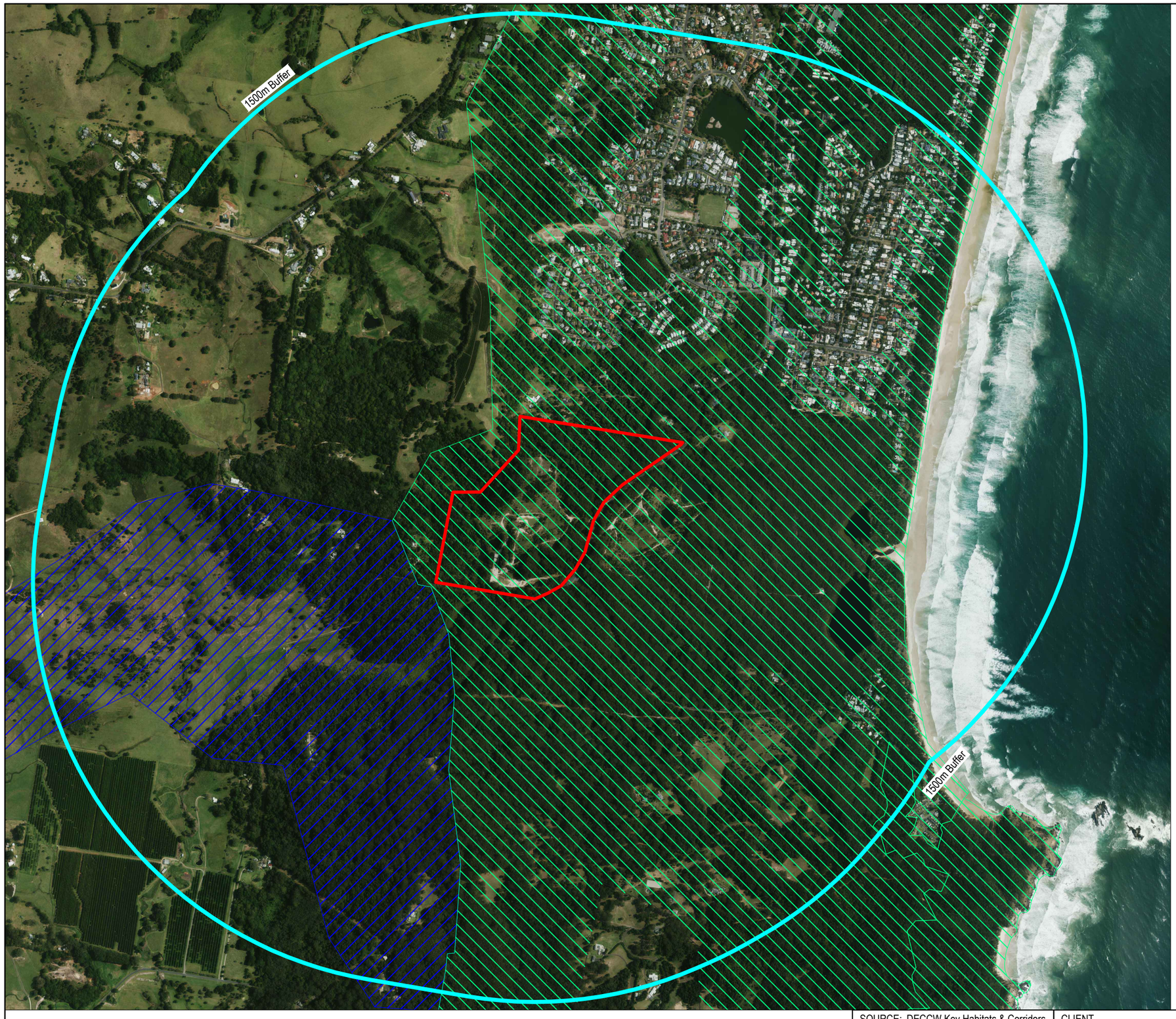
PROJECT
BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 7

PREPARED: BW
DATE: 4 March 2024
FILE: N202009_BDAR_20240304.dwg

TITLE

RESILIENCE & HAZARDS SEPP 2021



N

LEGEND

- Subject Site
- 1500m Buffer to Subject Site

Fauna Corridors of North East NSW

- Regional corridor
- Subregional corridor

Scale 1 : 15 000

0 200m 400m 600m

SOURCE: DECCW Key Habitats & Corridors NE NSW GIS Dataset; MetroMap Aerial dated 31/10/23

SCALE: 1 : 15 000 @ A3

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Winten Property Group

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BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 8

PREPARED: BW
DATE: 4 March 2024
FILE: N202009_BDAR_20240304.dwg

TITLE

CORRIDORS

3 NATIVE VEGETATION ASSESSMENT

3.1 Introduction

This section of the BDAR identifies native vegetation extent within the development site, including any cleared areas (in accordance with the requirements of Section 4 of the BAM). This section describes Plant Community Types (PCTs) within the development site 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 (as outlined in Paragraph 4.2 of the BAM);
- Threatened Ecological Community (TEC) status (as outlined in Paragraph 4.2 of the BAM); and
- Estimate of percent cleared value of PCT (as outlined in Paragraph 4.2.1.5 of the BAM).

This Section also includes the results of a vegetation integrity assessment of the development site, including:

- Mapping vegetation zones (in accordance with Subsection 4.3.1 of the BAM);
- Patch size;
- Assessing vegetation integrity using benchmark data (in accordance with Subsection 4.3.3.5 of the BAM);
- Survey effort (as described in Subsection 4.3.4 of the BAM); and
- Determining the vegetation integrity score (in accordance with Appendix H of the BAM) including:
    - composition condition score;
    - structure condition score;
    - function condition score; and
    - vegetation integrity score.

3.2 Methodology

3.2.1 Site Assessment

Vegetation to be impacted by the planning proposal layout (the subject land) was assessed on the 23rd and 24th November 2023 using a plot-based vegetation survey based on 20 m x 20 m and 20 m x 50 m plots in accordance with the BAM (**FIGURE 9**).

PLOT 1
PLOT 2
PLOT 3B
PLOT 4A
PLOT 4B
PLOT 5
PLOT 7
PLOT REHAB 1
PLOT REHAB 2
Rhodamnia rubescens
Rhodamnia rubescens
Oberonia titania
Corokia whiteana (x7)
Common planigale
BROKEN HEAD ROAD
NATURAL LANE

N

LEGEND

- Subject Site
- Survey Plot

Threatened Species Records

- Common Planigale (*Planigale maculata*)
- Corokia (*Corokia whiteana*)
- Red-flowered King of the Fairies (*Oberonia titania*)
- Scrub Turpentine (*Rhodamnia rubescens*)

Vegetation Zones (VZ)

- VZ 1 - Tall closed rainforest (*Araucaria cunninghamii*) (PCT 3121)
- VZ2 - Tall closed subtropical rainforest (Mixed rainforest species) (PCT 3002)
- VZ3B - Mid-high closed subtropical rainforest (Mixed rainforest species +/- *Cinnamomum camphora*) (PCT 3011)
- VZ4A - Tall open/closed wet sclerophyll forest (*Eucalyptus pilularis*) (PCT 3147)
- VZ4B - Low to mid-high regrowth (*Acacia melanoxylon +/- Eucalyptus pilularis*) (PCT 3147 - derived)
- VZ5 - Tall closed wet sclerophyll forest (*Lophostemon confertus*) (PCT 3148)
- VZ7 - Mid-high open/closed swamp sclerophyll forest (*Melaleuca quinquenervia*) (PCT 3990)
- VZ9 - Low closed shrubland (Heathland) (PCT 3801)
- VZ11a - Advanced regeneration/revegetation areas (3147 - derived)
- VZ11b - Recent regeneration/revegetation works (3147 - derived)
- Cleared land
- Dams

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Winten Property Group

PROJECT
BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 9

PREPARED: BW
DATE: 14 March 2024
FILE: N202009_BDAR_20240314.dwg

TITLE
VEGETATION ZONES & THREATENED SPECIES

The information contained in **TABLE 1** below was collected.

TABLE 1
VEGETATION SURVEY DATA COLLECTED AT THE SUBJECT LAND

Attribute	Survey requirement
Stratum (and layer)	Stratum and layer in which each species occurs
Growth form	Growth form for each recorded species
Species name	Scientific name and common name
Cover	Estimate the % foliage cover across the plot of each species rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2…), or whole numbers up to 5% (1,2,3…), or to the nearest 5% where greater than 5% cover (5,10,15,20,25…)
Abundance rating	For species with cover less than or equal to 5%, count or estimate the number of individuals or shoots of each species within the plot, using the following intervals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000, 1500, 2000, etc. Numbers above 20 are estimates only, and the recorded abundance is the upper end of each class (e.g. 50 represents an estimated abundance of between 20 and 50). For species with cover greater than 5%, abundance estimates are not required (but may be recorded if desired)

The Vegetation Zones (VZs) assessed and the relevant number of plots/transects assessed are detailed in **TABLE 2** below. The location and orientation of the vegetation plot is shown in **FIGURE 9.** A total of nine (9) plot/transects were surveyed, with data from seven (7) of these utilised in the BAM-Calculator (BAM-C).

Two (2) VZs comprised of intact/good quality vegetation were observed on site and will be avoided by the proposed development entirely. These VZs did not therefore require plot data that was collected to be entered into the BAM-C but have been mapped for context. An additional five (5) VZs were identified on site and mapped for context but are well removed from the proposed development layout.

TABLE 2
VEGETATION SURVEY DETAILS

Vegetation zones (VZ)	Condition	PCT	Impact Area	Number of plots/transects	Plot details
VZ1: Tall closed rainforest (*Araucaria cunninghamii*)	Good condition	**3121** - Broken Head Lowland Rainforest	0.07 ha	1	Plot 1 (20 m x 50 m)
VZ2: Tall closed subtropical rainforest (Mixed rainforest species)	Good condition	**3002** - Lower Richmond Hills Dry-Subtropical Rainforest	0.00 ha*	1	Plot 2 (20 m x 50 m)
VZ3a: Mid-high closed subtropical rainforest (Mixed rainforest species)	Good condition	**3011** - Far North Lowland Subtropical Rainforest	0.00 ha*	1	Plot 3a (20 m x 50 m)
VZ3b: Mid-high closed subtropical rainforest (Mixed rainforest species +/- *Cinnamomum camphora*)	Modified /disturbed	**3011** - Far North Lowland Subtropical Rainforest	0.06 ha	1	Plot 3b (20 m x 50 m)
VZ4a: Tall open/closed wet sclerophyll forest (*Eucalyptus pilularis*)	Good condition	**3147** - Far North Brush Box-Bloodwood Wet Forest	1.90 ha	1	Plot 4a (20 m x 50 m)
VZ4b: Low to mid-high regrowth (*Acacia melanoxylon* +/- *Eucalyptus pilularis*)	Regrowth	**3147** - Far North Brush Box-Bloodwood Wet Forest (Derived)	0.94 ha	1	Plot 4b (20 m x 50 m)
VZ5: Tall closed wet sclerophyll forest (*Lophostemon confertus*)	Good condition	**3148** - Far North Brush Box-Walnut Wet Forest	0.07 ha	1	Plot 5 (20 m x 50 m)
VZ6: Tall open/closed dry sclerophyll forest (*Eucalyptus pilularis*/*Corymbia intermedia*)	Good condition	**3551** - Northern Sands Blackbutt-Red Mahogany Forest	0.00 ha	n/a	n/a
VZ7: Mid-high open/closed swamp sclerophyll forest (*Melaleuca quinquenervia*)	Good condition	**3990** - Far North Paperbark Gahnia Swamp Forest	0.00 ha	n/a	n/a
VZ8: Mid-high open swamp sclerophyll forest (*Eucalyptus robusta*)	Good condition	**3990** - Far North Paperbark Gahnia Swamp Forest	0.00 ha	n/a	n/a
VZ9: Low closed shrubland (Heathland)	Good condition	**3801** - Far North Sandplain Wallum Heath	0.00 ha	n/a	n/a
VZ10: Low closed sedgeland/rushland	Good condition	**3913** - Northern Sandplain Wet Heath	0.00 ha	n/a	n/a

Vegetation zones (VZ)	Condition	PCT	Impact Area	Number of plots/transects	Plot details
VZ11a: Advanced regeneration/revegetation areas	Planted	**3147** - Far North Brush Box-Bloodwood Wet Forest (Derived)	1.93 ha	1	Rehab 1 (20 m x 50 m)
VZ11b: Recent regeneration/revegetation works	Planted	**3147** - Far North Brush Box-Bloodwood Wet Forest (Derived)	1.68 ha	1	Rehab 2 (20 m x 50 m)
Nil vegetation	Nil vegetation	**n/a**	4.40 ha	n/a	n/a

Notes:

* Plot data was collected from VZ2 and VZ3a but was not required to be entered into the BAM-C as no impacts will occur in these areas.

3.2.2 Identifying PCTs and TECs

Identification of PCTs and potential TECs on the subject site was completed by comparing data collected from the subject site to:

1. Detailed descriptions of PCTs and relevant geographic distributions within the BioNet Vegetation Classification;
2. Detailed descriptions of TECs on the OEH website and in the relevant NSW Scientific Committee Determinations; and
3. Survey data and/or individual species records held in BioNet.

3.2.3 Vegetation Integrity Assessment (Site Condition)

The survey plot was established around a central 50 m transect as follows:

a) One (1) 400 m^2 plot (standard 20 m x 20 m) was used to assess all of the composition and structure attributes. The plot used for the floristic vegetation survey (**FIGURE 9**) was also used as a vegetation integrity plot.

b) One (1) 1,000 m^2 plot (standard 20 m x 50 m) was used to assess the function attributes: number of large trees, tree regeneration, stem size class, length of logs, high threat exotic weed cover and number of trees with hollows.

c) Five (5) 1 m^2 sub-plots are used to assess average litter cover (and other optional groundcover components) for the plot.

The composition, structure and relevant function attributes listed in **TABLE 3** below were assessed.

TABLE 3
GROWTH FORM GROUPS AND ATTRIBUTES USED TO ASSESS THE COMPOSITION, STRUCTURE AND FUNCTION COMPONENTS OF VEGETATION INTEGRITY

Growth form groups used to assess composition and structure	Attributes used to assess function
a) Tree	a) Number of large trees
b) Shrub	b) Tree regeneration
c) Grass and grass like	c) Tree stem size class
d) Forb	d) Total length of fallen logs
e) Fern	e) Litter cover
f) Other	f) High threat exotic weed cover
	g) Hollow bearing trees

3.3 Results

3.3.1 Vegetation Zones (VZs)

Surveys of the subject land and surrounds recorded a total of fourteen (14) VZs (**FIGURE 9**). Only the VZs occurring on the subject land are described below:

- Vegetation Zone 1: Tall closed rainforest (*Araucaria cunninghamii*). VZ1 occurs to the west of the quarry pit and has a mature tree canopy comprised almost entirely

of hoop pine (*Araucaria cunninghamii*) up to 25 m in height, with mid-dense to sparse midstorey and groundcover components comprised of a mixture of rainforest species. It is apparent from a review of historical aerial photography (circa 1947) that this remnant vegetation was isolated from similar vegetation types and potentially grazed as part of a dairy farm that operated at that time. The mapped extent of this vegetation zone on the subject site covers a total area of approximately 1.61 ha (**FIGURE 9**), of which 0.07 ha will be impacted.

- Vegetation Zone 3b: Mid-high closed subtropical rainforest (Mixed rainforest species +/- *Cinnamomum camphora*). VZ3 occurs to the north-east of the quarry pit. The canopy is generally comprised of advanced regrowth vegetation comprised of a mixture of rainforest species, including ribbonwood (*Euroschinus falcatus*), guioa (*Guioa semiglauca*), brown bollygum, riberry (*Syzygium luehmannii*), three-veined laurel (*Cryptocarya triplinervis*), and the introduced camphor laurel (*Cinnamomum camphora*) up to 16m in height. The midstorey is comprised of sparse/scattered native rainforest shrubs occurs, and the dense groundcover stratum is comprised of a mixture of native grasses and forbs. Examination of historical aerial photography (circa 1947) clearly shows that this regenerating rainforest vegetation largely corresponds in distribution with the land previously cleared for dairy farming. The mapped extent of this vegetation zone on the subject site covers a total area of approximately 0.91 ha (**FIGURE 9**), of which 0.06 ha will be impacted.
- Vegetation Zone 4a: Tall open/closed wet sclerophyll forest (*Eucalyptus pilularis*). This zone occurs to the south and east of the quarry pit. The mature canopy is generally dominated by blackbutt (*Eucalyptus pilularis*) up to an average of 25 m in height, with some remnant/old growth areas up to 30 m in height. A sub-canopy layer occurs in less disturbed areas and is comprised of brown bollygum, hard corkwood (*Endiandra sieberi*) and blue lilly pilly (*Syzygium oleosum*). A mid-dense midstorey of a mixture of native rainforest shrubs occurs, and the mid-dense to sparse groundcover stratum is comprised of a mixture of native grasses and forbs. The mapped extent of this vegetation zone on the subject site covers a total area of approximately 9.66 ha (**FIGURE 9**), of which 1.90 ha will be impacted.
- Vegetation Zone 4b: Low to mid-high regrowth (*Acacia melanoxylon +/- Eucalyptus pilularis*). This zone occurs along the northern and eastern periphery of the quarry pit and has regrown subsequent to historic clearing. The canopy is generally dominated by blackwood wattle (*Acacia melanoxylon*) and blackbutt (*Eucalyptus pilularis*) up to an average of 10-12 m in height. Other species commonly present include long-leaf wattle (*A. longissima*), coast banksia (*Banksia integrifolia*) and blue lilly pilly (*Syzygium oleosum*). The sparse midstorey and mid-dense groundcover stratum are generally comprised of a mixture of exotic grasses and common agricultural weeds. The mapped extent of this vegetation zone on the subject site covers a total area of approximately 1.16 ha (**FIGURE 9**), of which 0.94 ha will be impacted.
- Vegetation Zone 5: Tall closed wet sclerophyll forest (*Lophostemon confertus*). VZ2 occurs to the north of the quarry pit. The mature canopy is generally dominated by brushbox up to 24 m in height. A sparse midstorey of a mixture of native rainforest shrubs occurs, and the mid-dense to sparse groundcover stratum is comprised of a

mixture of native grasses and forbs. The mapped extent of this vegetation zone on the subject site covers a total area of approximately 3.52 ha (**FIGURE 9**), of which 0.07 ha will be impacted.

- Vegetation Zone 11a: Advanced regeneration/revegetation areas. VZ11a occurs throughout the quarry pit and surrounding areas. This zone includes areas that have either naturally regenerated within native vegetation and/or have been actively revegetated since the cessation of quarrying activities on the subject site. Native vegetation in these areas is estimated to be 5-10 years old. The mapped extent of this vegetation zone on the subject site covers a total area of approximately 2.01 ha (**FIGURE 9**), of which 1.93 ha will be impacted.
- Vegetation Zone 11b: Recent regeneration/revegetation works. VZ11b occurs throughout the quarry pit and surrounding areas. This zone includes areas that have recently either naturally regenerated within native vegetation and/or have been actively revegetated within the last 1 – 2 years. The mapped extent of this vegetation zone on the subject site covers a total area of approximately 1.69 ha (**FIGURE 9**), of which 1.68 ha will be impacted.

3.3.2 Applicable PCT and TEC

The following determinations have been made with consideration of soil type, vegetation types occurring in similar locations in the locality, regenerating native species (where present) and community structure and descriptive attributes provided in the BioNet Vegetation Classification System.

VZ1 described above is considered to be representative of PCT 3121 - Broken Head Lowland Rainforest.

VZ3b described above is considered to be representative of PCT 3011 - Far North Lowland Subtropical Rainforest.

PCTs 3011 and 3121 are representative of the TEC **Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions** listed within schedules of the *Biodiversity Conservation Act 2016* (BC Act), and potentially representative of the TEC **Lowland Rainforest of Subtropical Australia** listed within schedules of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

VZ4a described above is considered to be representative of PCT 3147 - Far North Brush Box-Bloodwood Wet Forest.

VZ4b described above is considered to have been derived from PCT 3147 - Far North Brush Box-Bloodwood Wet Forest. In accordance with Paragraph 4.2(a) of the BAM the most likely PCT that would have occurred prior to disturbance has been determined, as the subject vegetation has been highly modified to the extent that it has reduced species richness and is missing structural layers.

VZ11a and VZ11b described above have also been assigned to PCT 3147 - Far North Brush Box-Bloodwood Wet Forest in accordance with the requirements of the Streamlined assessment module: planted native vegetation, Biodiversity Assessment Method operational manual (DPE 2022) as the native vegetation was planted to restore this PCT.

PCT 3147 is not representative of any TEC listed within schedules of the Biodiversity Conservation Act 2016 (BC Act) or the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

VZ5 described above is considered to be representative of PCT 3148 - Far North Brush Box-Walnut Wet Forest.

PCT 3148 is not representative of any TEC listed within schedules of the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

3.3.3 Vegetation Integrity (Site Condition) Score

3.3.3.1 Background

To determine the vegetation integrity score, the composition score, structure score and function score were calculated by entering the collected plot survey data (**APPENDIX 2**) into the online Biodiversity Assessment Method Calculator (BAM-C). The relevant BAM-C workings are summarised below.

3.3.3.2 Composition Condition

VZ1 (PCT 3121 - Broken Head Lowland Rainforest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	23	12	2	3	6	15
Observed mean ($\bar{x}$)	10	6	1	2	4	3
Unweighted composition score (UCS_i)	46.7	59.1	59.1	84.3	84.3	8.6
Weighted composition score (WCS_i)	17.6	11.6	1.9	4.1	8.3	2.1
Dynamic weighting (w_i)	0.38	0.2	0.03	0.05	0.1	0.25

Composition condition score = 45.7

VZ3 (PCT 3011 - Far North Lowland Subtropical Rainforest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	23	12	2	3	6	15
Observed mean ($\bar{x}$)	18	11	1	1	5	9
Unweighted composition score (UCS_i)	94	98.9	59.1	27.6	96.4	75.7
Weighted composition score (WCS_i)	35.4	19.5	1.9	1.4	9.5	18.6
Dynamic weighting (w_i)	0.38	0.2	0.03	0.05	0.1	0.25

Composition condition score = 86.3

VZ4a (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	15	13	6	6	4	12
Observed mean ($\bar{x}$)	4	8	2	2	3	8
Unweighted composition score (UCS_i)	16.9	77.9	27.6	27.6	91.9	84.3
Weighted composition score (WCS_i)	4.5	18.1	3	3	6.6	18.1
Dynamic weighting (w_i)	0.27	0.23	0.11	0.11	0.07	0.21

Composition condition score = 53.1

VZ4b (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	15	13	6	6	4	12
Observed mean ($\bar{x}$)	5	5	1	0	0	1
Unweighted composition score (UCS_i)	27.6	37	5.5	0	0	1
Weighted composition score (WCS_i)	7.4	8.6	0.6	0	0	0.2
Dynamic weighting (w_i)	0.27	0.23	0.11	0.11	0.07	0.21

Composition condition score = 16.8

VZ5 (PCT 3148 - Far North Brush Box-Walnut Wet Forest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	15	13	6	6	4	12
Observed mean ($\bar{x}$)	7	8	2	1	1	6
Unweighted composition score (UCS_i)	52.8	77.9	27.6	5.5	14.6	59.1
Weighted composition score (WCS_i)	14.2	18.1	3	0.6	1	12.7
Dynamic weighting (w_i)	0.27	0.23	0.11	0.11	0.07	0.21

Composition condition score = 49.5

VZ11a (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	15	13	6	6	4	12
Observed mean ($\bar{x}$)	7	1	1	3	0	0
Unweighted composition score (UCS_i)	52.8	0.8	5.5	59.1	0	0
Weighted composition score (WCS_i)	14.2	0.2	0.6	6.3	0	0
Dynamic weighting (w_i)	0.27	0.23	0.11	0.11	0.07	0.21

Composition condition score = 21.3

VZ11b (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	15	13	6	6	4	12
Observed mean ($\bar{x}$)	8	7	4	1	0	0
Unweighted composition score (UCS_i)	65	65.9	84.3	5.5	0	0
Weighted composition score (WCS_i)	17.4	15.3	9	0.6	0	0
Dynamic weighting (w_i)	0.27	0.23	0.11	0.11	0.07	0.21

Composition condition score = 42.4

3.3.3.3 Structure Condition

VZ1 (PCT 3121 - Broken Head Lowland Rainforest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	155	23	1	1	26	48
Observed mean ($\bar{x}$)	116.4	7.9	0.2	3.1	0.4	0.3
Unweighted structure score (USS_i)	91.9	29.4	8.6	100	0	0
Weighted structure score (WSS_i)	56.1	2.7	0	0.4	0	0
Dynamic weighting (w_i)	0.61	0.09	0	0	0.1	0.19

Structure condition score = 59.2

VZ3 (PCT 3011 - Far North Lowland Subtropical Rainforest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	155	23	1	1	26	48
Observed mean ($\bar{x}$)	83	25.5	40	0.1	3.4	10.6
Unweighted structure score (USS_i)	65.4	100	100	1.6	3.1	10.9
Weighted structure score (WSS_i)	39.9	9.1	0.4	0	0.3	2.1
Dynamic weighting (w_i)	0.61	0.09	0	0	0.1	0.19

Structure condition score = 51.7

VZ4a (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	93	26	11	3	8	32
Observed mean ($\bar{x}$)	95.5	5.9	1	0.6	61.1	5.5
Unweighted structure score (USS_i)	100	11.6	1.2	8.6	100	6
Weighted structure score (WSS_i)	53.8	1.7	0.1	0.1	4.6	1.1
Dynamic weighting (w_i)	0.54	0.15	0.06	0.02	0.05	0.18

Structure condition score = 61.5

VZ4b (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	93	26	11	3	8	32
Observed mean ($\bar{x}$)	27.3	11.4	10	0	0	2
Unweighted structure score (USS_i)	21	47.4	98.7	0	0	0.5
Weighted structure score (WSS_i)	11.3	7.1	6.3	0	0	0.1
Dynamic weighting (w_i)	0.54	0.15	0.06	0.02	0.05	0.18

Structure condition score = 24.8

VZ5 (PCT 3148 - Far North Brush Box-Walnut Wet Forest)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	93	26	11	3	8	32
Observed mean ($\bar{x}$)	96	1	21	2	1	2.5
Unweighted structure score (USS_i)	100	0.1	100	84.3	2.7	0.9
Weighted structure score (WSS_i)	53.8	0	6.4	1.5	0.1	0.2
Dynamic weighting (w_i)	0.54	0.15	0.06	0.02	0.05	0.18

Structure condition score = 61.9

VZ11a (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	93	26	11	3	8	32
Observed mean ($\bar{x}$)	21.5	0.1	20	0.7	0	0
Unweighted structure score (USS_i)	12.1	0	100	12.4	0	0
Weighted structure score (WSS_i)	6.5	0	6.4	0.2	0	0
Dynamic weighting (w_i)	0.54	0.15	0.06	0.02	0.05	0.18

Structure condition score = 13.1

VZ11b (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Tree	Shrub	Grass & grass like	Forb	Fern	Other
Benchmark	93	26	11	3	8	32
Observed mean ($\bar{x}$)	1.1	3.9	49	0.1	0	0
Unweighted structure score (USS_i)	0	4.3	100	0.1	0	0
Weighted structure score (WSS_i)	0	0.6	6.4	0	0	0
Dynamic weighting (w_i)	0.54	0.15	0.06	0.02	0.05	0.18

Structure condition score = 7

3.3.3.4 Function Condition

VZ1 (PCT 3121 - Broken Head Lowland Rainforest)

Item	Number of large trees	Litter cover	Length of fallen logs	Stem size class	Tree regeneration <5cm diameter	High threat weed cover
Benchmark	6	81	48	4	Present	
Observed mean ($\bar{x}$)	4	94	15	4	1	0
Weighted function score (WFS_i)	29.5	15	4.8	15	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 79.3

VZ3 (PCT 3011 - Far North Lowland Subtropical Rainforest)

Item	Number of large trees	Litter cover	Length of fallen logs	Stem size class	Tree regeneration <5cm diameter	High threat weed cover
Benchmark	6	81	48	4	Present	
Observed mean ($\bar{x}$)	3	78	2	4	1	15.3
Weighted function score (WFS_i)	20.7	14.9	0	15	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 65.7

VZ4a (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest)

Item	Number of large trees	Litter cover	Length of fallen logs	Stem size class	Tree regeneration <5cm diameter	High threat weed cover
Benchmark	3	80	53	5	Present	
Observed mean ($\bar{x}$)	3	86	65	5	1	0
Weighted function score (WFS_i)	35	15	20	15	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 100

VZ4b (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Number of large trees	Litter cover	Length of fallen logs	Stem size class	Tree regeneration <5cm diameter	High threat weed cover
Benchmark	3	80	53	5	Present	
Observed mean ($\bar{x}$)	0	14	5	3	1	17.3
Weighted function score (WFS_i)	0	0.9	0.3	11.4	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 27.6

VZ5 (PCT 3148 - Far North Brush Box-Walnut Wet Forest)

Item	Number of large trees	Litter cover	Length of fallen logs	Stem size class	Tree regeneration <5cm diameter	High threat weed cover
Benchmark	3	80	53	5	Present	
Observed mean ($\bar{x}$)	2	91	25	5	1	0
Weighted function score (WFS_i)	29.5	15	10.8	15	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 85.3

VZ11a (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Number of large trees	Litter cover	Length of fallen logs	Stem size class	Tree regeneration <5cm diameter	High threat weed cover
Benchmark	3	80	53	5	Present	
Observed mean ($\bar{x}$)	0	6	0	1	1	0.1
Weighted function score (WFS_i)	0	0.1	0	1.3	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 16.4

VZ11b (PCT 3147 - Far North Brush Box-Bloodwood Wet Forest - Derived)

Item	Number of large trees	Litter cover	Length of fallen logs	Stem size class	Tree regeneration <5cm diameter	High threat weed cover
Benchmark	3	80	53	5	Present	
Observed mean ($\bar{x}$)	0	5	0	0	1	0.1
Weighted function score (WFS_i)	0	0.1	0	0	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 15.1

3.3.3.5 Final Vegetation Integrity Score

Vegetation Zone	Composition	Structure	Function	Vegetation Integrity Score (out of 100)
1	45.7	59.2	79.3	**59.9**
3b	86.3	51.7	65.7	**66.4**
4a	53.1	61.5	100	**68.9**
4b	16.8	24.8	27.6	**22.6**
5	49.5	61.9	85.3	**63.9**
11a	21.3	13.1	16.4	**16.6**
11b	42.4	7	15.1	**16.5**

4 THREATENED SPECIES ASSESSMENT

4.1 Introduction

This section of the BDAR assesses habitat suitability for Threatened species (in accordance with Section 5 of the BAM). In particular, this section of the BDAR identifies:

- Ecosystem credit species associated with PCTs on the development site including:
    - list of species derived (in accordance with Sections 5.1.1 and 5.2.1 of the BAM); and
    - justification for exclusion of any ecosystem credit species predicted (in accordance with Sections 5.2.1 and 5.2.2 of the BAM).
- Species credit species on the development site (in accordance with Sections 5.1 to 5.3 of the BAM) 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; and
    - biodiversity risk weighting for the species.

4.2 Threatened Plant Surveys

4.2.1 Methods

Targeted threatened plant surveys were completed on the subject site in accordance with Surveying threatened plants and their habitats: NSW survey guide for the BAM (DPIE 2020c) as follows:

- by one (1) accredited assessor/principal ecologist and one (1) senior ecologist for a total of approximately twelve (12) person hours on the 29th and 30th September 2023;
- by one (1) accredited assessor for a total of approximately six (6) person hours on the 23rd and 24th November 2023 (in association with Vegetation Integrity plots); and
- by one (1) accredited assessor/principal ecologist and one (1) senior ecologist for a total of approximately ten (10) person hours between the 11th – 16th December 2023.

The surveys utilised the parallel field-traverse survey technique which involved searching along a grid of parallel traverses within potentially suitable habitat for the target species. The surveyors walked at a reasonable walking pace while making a visual sweep either side of the traverse.

4.2.2 Results

Three (3) threatened plant species were recorded on the subject site (**FIGURE 9**):

- A small clump of Corokia (*Corokia whiteana*) comprised of seven (7) individuals within VZ4a in the south-eastern portion of the site;
- A single small specimen of Red-flowered king of the fairies (*Oberonia titania*) within VZ1 in the western portion of the site; and
- Two (2) separate records of Scrub turpentine (*Rhodamnia rubescens*) – one (1) within VZ6 in the north-eastern portion of the subject site, and one (1) within VZ3 in the north-western portion of the subject site.

Species polygons have therefore been identified for these species in accordance with the requirements of Section 5.2.5 of the BAM (refer **SECTION 6.3**).

4.3 Threatened Fauna Surveys

4.3.1 Introduction

Targeted threatened fauna surveys were completed in accordance with the relevant survey timing and effort requirements of the Threatened Biodiversity Data Collection (TBDC), threatened species survey guides or best-practice methods as follows:

- by one (1) accredited assessor/principal ecologist and one (1) senior ecologist for a total of approximately twelve (12) person hours on the 29th and 30th September 2023; and
- by one (1) accredited assessor/principal ecologist, one (1) senior ecologist and two (2) field assistants for a total of approximately 150 person hours between the 11th – 16th December 2023.

In addition to the above, any native fauna species heard calling or otherwise observed whilst traversing the site on 23rd and 24th November 2023 were identified to species level.

Habitat and ecology details, the methods utilised and the results of the surveys for each of targeted species (automatically generated by the BAM-C) are addressed in the following sections.

4.3.2 Pouched frog (Assa darlingtoni)

4.3.2.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Pouched frogs are only about 20 mm long. They are grey to pinkish brown or red, usually with distinctive darker patches on the head and body. The sides are usually dark grey to black and there may be a dark broken stripe from the nostril through the eye and down each side. The belly is cream or white with a brown mottled throat and there is a pink spot at the base of each arm. Skin is smooth on the back and the belly but the sides may be rough or warty. Fingers and toes are unwebbed

and all digits have slightly swollen tips without fringes. The most distinctive feature, in the male, is the twin pouches, one on each side, where the tadpoles are carried after hatching from eggs laid on the ground. Males call from leaf litter, rocks or logs with a series of rapidly repeated 'Eh..Eh..Eh..Eh..Eh..Eh..', usually between six to ten notes, and most vigorously around dawn and dusk.

- Relict species occupying disparate and restricted mesic forest refugia mainly within north-east NSW but extends into far SEQ. Occurs in dense but scattered colonies. There are five isolated populations: Dorrigo Plateau, Gibraltar Range, Border Ranges and two in SEQ.
- Pouched frogs live in cool, moist rainforest, including Antarctic Beech, or moist eucalypt forest in mountainous areas, mostly above 800 m but have been found as low as 300m.
- They spend most of the time in damp leaf litter, or under rocks and rotten logs.

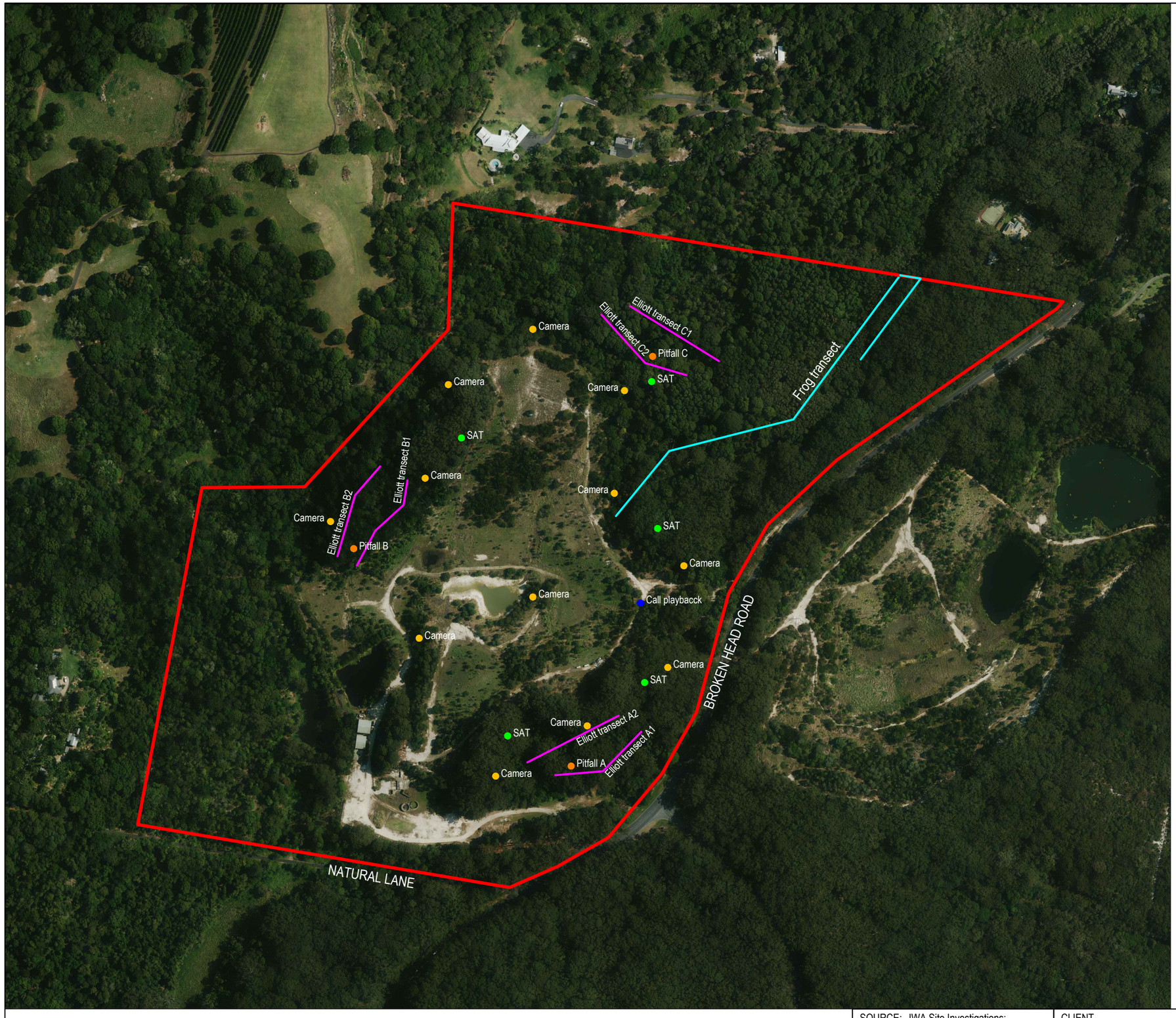
4.3.2.2 Survey Methods

The TBDC notes that surveys for the Pouched frog should be completed between September and March and references the NSW Survey Guide for Threatened Frogs (DPIE 2020) for information on targeted survey requirements.

The following methodology as identified by DPIE (2020) was therefore employed to target the Pouched frog:

- Aural-visual surveys as described within the NSW Survey Guide for Threatened Frogs (DPIE 2020) were completed over four nights between 11th – 16th December 2023. Aural-visual surveys included a combination of listening for the calls of frogs and searching for individuals along a transect.
- Each aural-visual survey commenced with an aural survey where the surveyors listened for calls (in silence and darkness), for a minimum of five minutes. The aural survey process was repeated every approx. 50 metres of the transect.
- The visual survey was employed to detect frogs via 'eyeshine'. Suitable habitat was scanned along the transect, around and between aural survey points, using a headlamp.
- The aural-visual surveys also included a call-playback component where a loudspeaker was used to broadcast the advertisement calls of target threatened frogs to elicit either an advertisement or territorial response call. Call playbacks were completed at the same location as the aural surveys and were undertaken after the aural survey for each point. The calls were broadcast continuously through the speaker for a period of no less than two minutes, followed by a two-minute listening period.

As no likely habitat for the target species was identified on the subject land, a single 500m transect was established focusing on potential habitat (i.e. natural drainage channel and associated swamp sclerophyll forest) within the broader subject site (**FIGURE 10**).



LEGEND

- Subject Site

Fauna Survey Locations

- Call Playback
- Camera Trap
- Elliott Transect
- Frog Transect
- Pitfall Trap
- SAT Site

N

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Winten Property Group

PROJECT
BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 10

PREPARED: BW
DATE: 8 March 2024
FILE: N202009_BDAR_20240306.dwg

TITLE

FAUNA SURVEY LOCATIONS

In addition to the above, any frogs heard calling or otherwise observed whilst traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.2.3 Results

The Pouched frog was not recorded from the subject site.

4.3.3 Glossy Black-Cockatoo (Calyptorhynchus lathami)

4.3.3.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The South-eastern Glossy black-cockatoo is a small brown-black cockatoo with a massive, bulbous bill and a short crest. Males have a prominent red tail panel, while that of females is yellow to orange-red. The coloured tail panel is barred black in juvenile birds, with the extent of barring decreasing with age. The female usually has irregular pale-yellow markings on the head and neck, and may have yellow flecks on the underparts and underwing.
- The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland (QLD) coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia.
- Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods.
- Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.

The TBDC also notes that this species may need larger patches and more intact landscapes for breeding.

4.3.3.2 Survey Methods

The TBDC notes that surveys for the Glossy black-cockatoo should be completed between January to September and the following survey methodology is provided:

- Assessors should look for signs of breeding on site as follows:
    - begging birds of any age or sex; or
    - lone adult males identified during the breeding season (April to August); or
    - an occupied nest.

- Where signs of breeding on site are present, potential nest trees should be identified. Potential nest trees contain hollows that are:
    - at least 8 m above the ground; and
    - in stems with a diameter of at least 30 cm; and
    - hollow diameter is at least 15 cm; and
    - stem angle is at least 45 degrees, and may be near-vertical or vertical.
- Where potential nest trees are identified on site, monitor for this species during the breeding season (Apr – Aug) to confirm the presence of any actual nest trees on site. DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

With consideration of the above, searches for signs of Glossy black-cockatoo breeding on site were completed on the on the 29th and 30th September 2023. A combination of the area search method and the species-time curve approach was utilised during bird surveys on the site, where the observer walked through the site and the survey session ceased when no additional species were identified within a 5-minute period.

In addition to the above, any birds observed visually or aurally whilst traversing the site on the on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.3.3 Results

The Glossy black-cockatoo was not recorded from the subject site.

4.3.4 Eastern pygmy-possum (Cercartetus nanus)

4.3.4.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Eastern pygmy-possums are tiny (15 to 43 grams) active climbers, with almost bare, prehensile (capable of curling and gripping) tails, and big, forward-pointing ears. They are light brown above and white below. Adults have a head and body length between 70 - 110 mm and a tail length between 75 - 105 mm.
- The Eastern pygmy-possum is found in south-eastern Australia, from southern QLD to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes, and Wagga Wagga on the western slopes.
- Throughout this range they are found in a broad range of habitats from rainforest through to sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern

NSW where they are most frequently encountered in rainforest. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities.

- They feed largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, and an important pollinator of heathland plants such as banksias. Soft fruits are eaten when flowers are unavailable. They also feed on insects throughout the year, and this feed source may be more important in habitats where flowers are less abundant such as wet forests.
- They shelter in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts). Nest-building appears to be restricted to breeding females. Tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.
- Eastern pygmy-possums appear to be mainly solitary, with each individual using several nests. Males have non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares.
- Young can be born whenever food sources are available, however most births occur between late spring and early autumn.
- Eastern pygmy-possums are agile climbers, but can be caught on the ground in traps, pitfalls or postholes. They are generally nocturnal.
- Eastern pygmy-possums frequently spend time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.

4.3.4.2 Survey Methods

The TBDC notes that surveys for the Eastern pygmy-possum should be completed between October and March. No specific survey methodology is provided however it is noted that the species "is very difficult to detect, especially via spotlighting".

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published. The following methodology was therefore adapted from details provided for the closely related Mountain pygmy-possum (*Burramys parvus*) within the Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPC 2011):

- 20 Elliott A were traps installed at three (3) separate survey sites (**FIGURE 10**);
- At each survey site, traps were placed alternately placed on the ground and on tree branches or temporary arboreal platforms approx. 10 metres apart in two parallel straight lines (transects) separated by approx. 25 metres;

- traps were baited with universal mixture (i.e. rolled oats, peanut butter and honey) and set for four (4) consecutive nights between 11th - 16th December 2023 for a total effort of 240 trap nights.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.4.3 Results

The Eastern pygmy-possum was not recorded from the subject site.

4.3.5 Three-toed snake-tooth skink (Coeranoscincus reticulatus)

4.3.5.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Three-toed Snake-tooth Skink is a large burrowing lizard with a head and body length of up to 23 cm and a thick, long tail. It has four very short legs, each with three clawed toes, and has long, curved teeth. The body colour varies from fawn to dark brown, usually with a dark collar on the back of the neck and fine patterning on the belly. Because of its burrowing habits it is seldom seen.
- The Three-toed Snake-tooth Skink occurs on the coast and ranges from the Macleay valley in NSW to SEQ. It is very uncommon south of Grafton.
- Throughout this range they inhabit rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. They live in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs.

4.3.5.2 Survey Methods

The TBDC notes that surveys for the Three-toed Snake-tooth Skink should be completed between September and April and references the Threatened reptiles - Biodiversity Assessment Method survey guide (DPE 2022) for information on targeted survey requirements.

The following methodology as identified by DPE (2022) was therefore employed to target the Three-toed Snake-tooth Skink:

- Three (3) pitfall trap lines each comprising of six (6) 20L buckets spaced 3 m apart on a 15 m line transect and linked by a drift-fence were installed on the subject site (**FIGURE 10**). The traps were set for four (4) consecutive nights between 11th - 16th December 2023 for a total effort of 72 trap nights.
- In addition, active searches were completed in the vicinity of the survey sites and involved lifting cover and raking through leaf litter and the upper soil layers. A total of approximately 2 hours (120 person minutes) was spent on four (4) consecutive days.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.5.3 Results

The Three-toed Snake-tooth Skink was not recorded from the subject site.

4.3.6 Wallum Froglet (Crinia tinnula)

4.3.6.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Wallum froglets are small (to about 20mm) and extremely variable in colour and pattern. They range from light grey or brown to dark grey above and usually white or light brown below (sparsely flecked or heavily mottled with darker patches). They have a relatively pointed snout that projects beyond the lower jaw. A fine median line of white dots often occurs on the underside on the throat that may continue across the belly. They have no webbing on their feet and toe pads are absent. Pupils are horizontal. The call is a distinctive short high-pitched ringing 'tching..tching..', heard throughout the year, particularly following rain.
- Wallum froglets are found along the coastal margin from Litabella National Park in SEQ to Kurnell in Sydney.
- Wallum froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests.
- The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months, but can occur throughout the year following rain. Eggs of 1.1-1.2mm are deposited in water with a pH of <6 and tadpoles take 2-6 months to develop into frogs.
- Wallum froglets shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are wet or very damp and often located near the water's edge. Males may call throughout the year and at any time of day, peaking following rain.

4.3.6.2 Survey Methods

The TBDC notes that surveys for the Wallum froglet can be undertaken anytime of the year and references the NSW Survey Guide for Threatened Frogs (DPIE 2020) for information on targeted survey requirements.

The following methodology as identified by DPIE (2020) was therefore employed to target the Wallum froglet:

- Aural-visual surveys as described within the NSW Survey Guide for Threatened Frogs (DPIE 2020) were completed over four nights between 11th – 16th December 2023. Aural-visual surveys included a combination of listening for the calls of frogs and searching for individuals along a transect.

- Each aural-visual survey commenced with an aural survey where the surveyors listened for calls (in silence and darkness), for a minimum of five minutes. The aural survey process was repeated every approx. 50 metres of the transect.
- The visual survey was employed to detect frogs via 'eyeshine'. Suitable habitat was scanned along the transect, around and between aural survey points, using a headlamp.
- The aural-visual surveys also included a call-playback component where a loudspeaker was used to broadcast the advertisement calls of target threatened frogs to elicit either an advertisement or territorial response call. Call playbacks were completed at the same location as the aural surveys and were undertaken after the aural survey for each point. The calls were broadcast continuously through the speaker for a period of no less than two minutes, followed by a two-minute listening period.

As no likely habitat for the target species was identified on the subject land, a single 500m transect was established focusing on potential habitat (i.e. natural drainage channel and associated swamp sclerophyll forest) within the broader subject site (**FIGURE 10**).

In addition to the above, any frogs heard calling or otherwise observed whilst traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.6.3 Results

The Wallum froglet was not recorded from the subject site.

4.3.7 Coxen's fig-parrot (Cyclopsitta diophthalma coxeni)

4.3.7.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Coxen's fig-parrots are small, dumpy, green parrots with very short tails. The wings are blue-edged and appear to be set well back in flight. At rest there are two obvious red spots on the back. The head has distinctive red and blue markings with a prominent blue forehead in the adults. They can distinguished from small lorikeets by their short tail and lack of underwing colour.
- Limited to about five populations scattered between Bundaberg in QLD and the Hastings River in NSW. The total number is thought to be less than 200 birds which makes it one of Australia's most endangered birds.
- Usually recorded from drier rainforests and adjacent wetter eucalypt forest but rarely seen due to its small size and cryptic habits. Also found in the wetter lowland rainforests that are now largely cleared in NSW.

- The bird shows a decided preference for fig trees, but also feeds on other fruiting rainforest species, lichen, nectar and grubs.

4.3.7.2 Survey Methods

The TBDC notes that surveys for the Coxen's fig-parrot can be completed anytime of the year. No specific survey methodology is provided however it is noted that "to maximise detection of the species surveys should only be undertaken when figs trees are fruiting on site."

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

With consideration of the above, searches for Coxen's fig parrots on site were completed on the on the 29th and 30th September 2023 and between 11th – 16th December 2023. Ripe fruits were observed on the small number of Strangler figs (*Ficus watkinsiana*) present in VZ3b during both survey periods. A combination of the area search method and the species-time curve approach was utilised during bird surveys on the site, where the observer walked through the site and the survey session ceased when no additional species were identified within a 5-minute period.

In addition to the above, any birds observed visually or aurally whilst traversing the site on the on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.7.3 Results

The Coxen's fig-parrot was not recorded from the subject site.

4.3.8 Endangered Emu (Dromaius novaehollandiae) population in the New South Wales North Coast Bioregion and Port Stephens local government area

4.3.8.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Emu is a large flightless bird that stands up to 1.9 m tall, with long legs and neck and shaggy grey-brown to dark-brown or grey-black plumage on the upperparts and usually paler underparts. The feathering of the head and neck is sparse around the upper neck with blue skin, which is darker in females, on the face and upper neck. Females are larger than males on average and are usually the larger of the birds in a pair. The downy young are conspicuously striped, with the striping gradually lost up to 3-5 months of age when they begin to acquire feathered juvenile plumage. Immature birds have a dark head and neck.

- Emus can be seen singly, in pairs or in loose groups, some of which consist of family groups. Males hatch the eggs and care for the chicks. Emus give a range of bubbling and grunting calls and deep drumming or booming sounds.
- The Emu is now generally absent from densely settled regions and largely absent from south-eastern coastal and subcoastal regions. The species was formerly widespread in north-eastern NSW but is now restricted to coastal and near-coastal areas between Evans Head and Red Rock and a small, isolated population further west in the Bungawalbin area.
- On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest.
- Emus are omnivorous, taking a wide range of seeds and fruits, invertebrates (mainly insects) and foliage and other plant material. They take material directly from plants or bend down to take items from the ground, picking up the food and tossing them back in the throat before swallowing.
- Most breeding occurs in late autumn and winter, but better data are needed for the north-eastern NSW population. Eggs are laid on a platform of grass, twigs, leaves and bark on the ground, often at the base of some vegetation and with good views from the nest.

4.3.8.2 Survey Methods

The TBDC notes that surveys for the Emu can be completed anytime of the year and should use camera traps or identify tracks, scats and feathers.

With consideration of the above, the following survey methods were employed on the subject site targeting the Emu:

- A total of twelve (12) cameras were installed on the subject site on the 23rd November 2023. The cameras were evenly spaced on and adjacent to the subject land approx. 100m apart (**FIGURE 10**) and were left in place for four (4) weeks.
- Searches for tracks, scats and feathers were completed whilst traversing the site.

In addition to the above, any birds observed visually or aurally whilst traversing the site on the 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.8.3 Results

The Emu was not recorded from the subject site.

4.3.9 Red Goshawk (Erythrotriorchis radiatus)

4.3.9.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Red goshawk is a large, reddish-brown hawk with long and broad wings, deeply 'fingered' wing-tips, and heavy yellow legs. The upperparts are largely grey-brown, heavily scaled with rufous, and the underparts are rufous heavily streaked darker; the head is pale streaked with black. Females are paler than males below, with a whitish lower underbody. In flight from below, the underwing and undertail appear largely white with black barring, and with a rufous panel on the leading edge of the inner wing, and blackish wing-tip. The flight is fast with strong wing-beats interspersed with glides. It also soars, showing a distinctive underwing pattern of rust-red wing-lining contrasting with whitish, heavily barred flight-feathers. The male's call is a series of high pitched, strident yelps and the female's call is harsher. When perched it sits upright.
- This species is distributed sparsely through northern and eastern Australia, from the western Kimberley Division of northern Western Australia to north-eastern QLD and south to far north-eastern NSW, and with scattered records in central Australia. The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers.
- Red goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.
- Adults appear to occupy territories throughout the year and breeding territories are traditionally used from year to year. Adults have large home-ranges, estimated in the Northern Territory to be as great as about 120 km^2 for females and 200 km^2 for males.
- Red goshawks mainly eat medium to large birds, including species as large as Australian brush-turkeys, Kookaburras, Tawny frogmouths, Sulphur-crested cockatoos and Rainbow lorikeets, but they also take mammals, reptiles and insects.
- Red Goshawks usually hunt from concealed or, less often, exposed perches, but also fly close above or through forest or woodland searching for prey. They often hunt from perches early in the morning and late in the day and tend to hunt more on the wing at other times of the day.
- The breeding behaviour of Red Goshawks is not well known. Breeding is likely to be in spring and summer in southern QLD and NSW. The birds lay clutches of 1-2 eggs between July and September, in a stick nest in a tall tree (>20 m tall) within 1 km of a watercourse or wetland. Young fledge around November and December.
- In winter in eastern Australia, the birds appear to move from nesting sites in the ranges to coastal plains, where they are associated with permanent wetlands.

4.3.9.2 Survey Methods

The TBDC notes that surveys for the Red goshawk can be completed anytime of the year however no specific survey methodology is provided. A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

With consideration of the above, searches for the Red goshawk on site were completed on the on the 29th and 30th September 2023 and between 11th – 16th December 2023. A combination of the area search method and the species-time curve approach was utilised during bird surveys on the site, where the observer walked through the site and the survey session ceased when no additional species were identified within a 5-minute period.

In addition to the above, any birds observed visually or aurally whilst traversing the site on the on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.9.3 Results

The Red goshawk was not recorded from the subject site.

4.3.10 White-bellied Sea-Eagle (Haliaeetus leucogaster)

4.3.10.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The White-bellied sea-eagle is a large eagle that has long broad wings and a short, wedge-shaped tail. It measures 75–85 cm in length, and has a wingspan of 180–220 cm. Adults are predominantly white and grey. The head, breast and belly, and the feathering on the legs, are white. The back and upper surfaces of the wings are grey, and the undersides are greyish-black with a smaller area of white along the leading edge. The tail is grey at the base, and has a white tip. The large, hooked bill is grey with a darker tip, and the eye is dark brown. The legs and feet are cream-white, with long black talons. Both sexes are similar in appearance but females are larger than the males. Juveniles are brown with lighter markings.
- White-bellied sea-eagles may be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young.
- The White-bellied sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In NSW it is widespread along the east coast, and along all major inland rivers and waterways.
- Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.

- Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.
- Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.

The TBDC also notes that the species is highly selective in nesting locations.

4.3.10.2 Survey Methods

The TBDC notes that surveys for the White-bellied sea-eagle should be completed between July to December and the following survey methodology is provided:

- Breeding habitat is defined as:
    - live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines and the presence of a large stick nest within tree canopy; or
    - an adult with nest material; or
    - adults observed duetting within breeding period.
- Due to the similarities in nest structure and use of the same nests by White-bellied Sea Eagles and Wedge-tailed Eagles, where a nest is observed without a bird present, searches for prey remains/feathers below the structure should be undertaken. The differing diets of both species and distinctive adult feathers, should provide evidence of nest use, however; where prey items/feathers are absent, repeat visits to the nest until a bird is observed should be undertaken.
- Where a breeding site has been identified in accordance with the BAM, the species polygon buffer should be established by one of two methods:
    - where the breeding site is within an urban or peri-urban area, a circular polygon with a 250m radius from the breeding site is applied.
    - where the breeding site is 500m or more from an urban or peri-urban area, a circular polygon with a 500m radius from the breeding site is applied.
- Species polygons do not account for foraging habitat as the White-bellied Sea Eagle forages on water.

With consideration of the above, searches for signs of White-bellied sea-eagle breeding on site were completed on the 29th and 30th September 2023 and between 11th – 16th December 2023. A combination of the area search method and the species-time curve approach was utilised during bird surveys on the site, where the observer walked through the site and the survey session ceased when no additional species were identified within a 5-minute period.

In addition to the above, any birds observed visually or aurally whilst traversing the site on the on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.10.3 Results

The White-bellied sea-eagle was not recorded from the subject site.

4.3.11 Stephen's banded snake (Hoplocephalus stephensii)

4.3.11.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Stephens' banded snake is a medium-sized partly tree-dwelling snake up to one metre long. It is brown or yellow brown above, with a series of irregular, broad, dark crossbands. The head is black with a brown crown and a brown or cream patch on either side of the nape and the lips are barred with black and cream.
- It occurs along the coast and ranges from southern QLD to Gosford in NSW.
- Throughout this range it inhabits rainforest and eucalypt forests and rocky areas up to 950 m in altitude.
- Stephens' banded snake is nocturnal, and shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day.
- At night it hunts frogs, lizards, birds and small mammals.

The TBDC also notes that the species uses very old primary forest with many large old hollow bearing trees. Habitat needs to be well connected and geographically large. Juveniles and subadults will regularly inhabit small hollows, while adults are usually found in larger hollows. The species reproduces usually triennially or less often, never annually.

4.3.11.2 Survey Methods

The TBDC notes that surveys for Stephens' banded snake should be completed between October and March and references the Threatened reptiles - Biodiversity Assessment Method survey guide (DPE 2022) for information on targeted survey requirements.

The following methodology as identified by DPE (2022) was therefore employed to target the Stephens' banded snake:

- Spotlight surveys in areas of suitable habitat.

  Note: Given the impact areas of the proposed development layout are restricted to the edges of vegetation surrounding the quarry pit, these vegetation edges were the focus of the spotlighting surveys.

- Searches were completed for snakes climbing on trees, on the ground, or moving in open areas by using eyeshine; and
- 2 hours (120 person minutes) x four (4) consecutive nights between 11th – 16th December 2023.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.11.3 Results

The Stephens' banded snake was not recorded from the subject site.

4.3.12 Olongburra Frog (Litoria olongburensis)

4.3.12.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Olongburra frog is a small species, about 3cm long. It is smooth light green or light brown above, cream and granular below. A dark brown streak runs from the nostril to the eye, then from behind the eye down the side of the body. From the eye, this streak is bordered below by a raised white stripe that breaks into a series of spots towards the flank. The snout is pointed and undercut and the call is a very rapid buzz, repeated several times.
- Olongburra frogs are found in coastal wallum swamps from Fraser Island in southern QLD to Yuraygir National Park in northern NSW.
- The Olongburra frog is an "acid" frog confined to the coastal sandplain wallum swamps. Their life-cycle is adapted to the acidic pH (2.8-5.5) of these wetlands. Frogs are highest in abundance in relatively undisturbed wallum swamps.
- Breeding habitat is characterised by the presence of emergent sedges, with upright species such as Baumea spp. and Schoenus spp. preferred by adult frogs for perching. Frogs can be found in breeding habitat all year. However, little is known about habitat use when breeding is not occurring and drier areas adjacent to primary habitat may also be utilised.
- Breeding occurs mainly in spring, summer and autumn after rain. Eggs are laid singly in water at the base of sedges.

4.3.12.2 Survey Methods

The TBDC notes that surveys for the Olongburra frog should be completed between August and March and references the NSW Survey Guide for Threatened Frogs (DPIE 2020) for information on targeted survey requirements.

The following methodology as identified by DPIE (2020) was therefore employed to target the Olongburra frog:

- Aural-visual surveys as described within the NSW Survey Guide for Threatened Frogs (DPIE 2020) were completed over four nights between 11th – 16th December 2023. Aural-visual surveys included a combination of listening for the calls of frogs and searching for individuals along a transect.
- Each aural-visual survey commenced with an aural survey where the surveyors listened for calls (in silence and darkness), for a minimum of five minutes. The aural survey process was repeated every approx. 50 metres of the transect.
- The visual survey was employed to detect frogs via 'eyeshine'. Suitable habitat was scanned along the transect, around and between aural survey points, using a headlamp.
- The aural-visual surveys also included a call-playback component where a loudspeaker was used to broadcast the advertisement calls of target threatened frogs to elicit either an advertisement or territorial response call. Call playbacks were completed at the same location as the aural surveys and were undertaken after the aural survey for each point. The calls were broadcast continuously through the speaker for a period of no less than two minutes, followed by a two-minute listening period.

As no likely habitat for the target species was identified on the subject land, a single 500m transect was established focusing on potential habitat (i.e. natural drainage channel and associated swamp sclerophyll forest) within the broader subject site (**FIGURE 10**).

In addition to the above, any frogs heard calling or otherwise observed whilst traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.12.3 Results

The Olongburra frog was not recorded from the subject site.

4.3.13 Parma wallaby (Macropus parma)

4.3.13.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- A small wallaby, with a head and body length up to 52 cm. Fur is a uniform greyish-brown on the back and shoulders with a dark stripe along the spine ending mid-back. It has a white stripe on the cheek and upper lip and a white belly. When hopping, remains close to the ground in an almost horizontal position with the forearms tucked tightly against the body, and the tail curved upwards in a shallow U-shape.

- Range is now confined to the coast and ranges of central and northern NSW from the Gosford district to south of the Bruxner Highway between Tenterfield and Casino.
- Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.
- Typically feed at night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas.
- During the day they shelter in dense cover.

4.3.13.2 Survey Methods

The TBDC notes that surveys for the Parma wallaby can be completed anytime of the year however no specific survey methodology is provided. A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

With consideration of the above, searches for the Parma wallaby on site were completed utilising a combination of spotlight surveys and camera traps using the following methodology:

- Spotlight Surveys
    - Spotlight surveys in areas of suitable habitat.
    - Note: Given the impact areas of the proposed development layout are restricted to the edges of vegetation surrounding the quarry pit, these vegetation edges were the subject if the spotlighting surveys.
    - Searches were completed for wallabies on the ground, or moving in open areas by using eyeshine; and
    - 2 hours (120 person minutes) x four (4) consecutive nights between 11th – 16th December 2023.
- Camera Traps
    - A total of twelve (12) cameras were installed on the subject site on the 23rd November 2023. The cameras were evenly spaced on and adjacent to the subject land approx. 100m apart (**FIGURE 10**) and were left in place for four (4) weeks.

In addition to the above, any ground-dwelling mammal species observed whilst traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.13.3 Results

The Parma wallaby was not recorded from the subject site.

4.3.14 Barking Owl (Ninox connivens)

4.3.14.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Barking owl is medium-sized owl (42 cm, 650 g), smaller than the similar Powerful owl and larger than the Southern boobook. It has bright yellow eyes and no facial-disc. Upperparts are brown or greyish-brown, and the white breast is vertically streaked with brown. The large talons are yellow. Males are typically larger than their mate and have a more square crown. The quick, dog-like 'wook-wook' territorial call is diagnostic, but the yapping of foxes, dogs and even Sugar Gliders is sometimes attributed to this species. Pairs of birds perform call-and-answer duets, the male's tone being the deeper, which often rise to an excited rapid pitch. This species is also famous for a rarely used high-pitched tremulous scream that has earned it the name 'screaming-woman bird'.
- The Barking Owl is found throughout continental Australia except for the central arid regions. Although still common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests.
- Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils.
- Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance.
- Preferentially hunts small arboreal mammals such as Squirrel gliders and Common ringtail possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Can catch bats and moths on the wing, but typically hunts by sallying from a tall perch.
- Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.
- Two or three eggs are laid in hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas).

- Nesting occurs during mid-winter and spring, being variable between pairs and among years. As a rule of thumb, laying occurs during August and fledging in November.

4.3.14.2 Survey Methods

The TBDC notes that surveys for the Barking owl should be completed between May and December and the following survey methodology is provided:

- Assessors should look for signs of breeding on site as follows:
    - suitable habitat; and
    - presence of male and female; or
    - calling to each other (duetting); or
    - find nest.
- Where signs of breeding on site are present, potential nest trees should be identified. Potential nest trees are living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.
- Where potential nest trees are identified on site then, night monitoring at the identified potential nest locations for a minimum of 2 nights should be undertaken to detect the presence of any owl of this species using a potential nest tree or demonstrating behaviour focussed on a potential nest tree (e.g. investigating the hollow or roosting within 10 m).

With consideration of the above, searches for signs of Barking owl breeding on site were completed between 11th – 16th December 2023. A combination of spotlighting and call playback surveys were utilised as follows (adapted from Debus 1995):

- After arriving at the call playback location (**FIGURE 10**), wait for a 10 minute period while scanning the surrounding area using a spotlight and listening for unsolicited calls. Do not broadcast calls if the target taxon is detected in this period.
- Broadcast the call of the target taxon for 10–20 seconds.
- Listen for the response or appearance of the target taxon for between 30–60 seconds.
- The broadcast and listening sequence was repeated five times.
- The area surrounding the call playback location was then searched for a 10 minute period after the broadcasts had finished to check for birds that were attracted but did not vocalise.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.14.3 Results

The Barking owl was not recorded from the subject site.

4.3.15 Atlas Rainforest Ground-beetle (Nurus atlas)

4.3.15.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Atlas Rainforest Ground-beetle is a large, heavily-built, black-coloured ground beetle about 3 to 3.5 cm in length. Its larger size distinguishes it from the related Shorter Rainforest Ground-beetle.
- Historically widespread in heavily timbered high rainfall areas east of the Great Dividing Range on the north coast of NSW. The species had not been seen for many years and was thought to be extinct until it was rediscovered in Victoria Park near Lismore in 1973. Presently it is only known from this location and a few others in the Lismore-Alstonville area.
- Inhabits low-elevation rainforest and wet eucalypt forest with a well-developed rainforest understorey. Other habitat requirements may be relatively undisturbed old-growth forests on highly productive soils and consistently high moisture levels.
- It is flightless and preys on other ground invertebrates.

4.3.15.2 Survey Methods

The TBDC notes that surveys for the Atlas Rainforest Ground-beetle can be completed any time of the year and the presence of the species is generally identified by the presence of burrows. It is limited to a very small area of NSW.

With consideration of the above, searches for potential burrows were completed between 11th - 16th December 2023 and whilst generally traversing the site. Active searches were completed in the vicinity of the survey sites and involved lifting cover and raking through leaf litter and the upper soil layers. A total of approximately 2 hours (120 person minutes) was spent on four (4) consecutive days.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.15.3 Results

The Atlas Rainforest Ground-beetle was not recorded from the subject site.

4.3.16 Shorter Rainforest Ground-beetle (Nurus brevis)

4.3.16.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Shorter Rainforest Ground-beetle is a relatively large, heavily built, wingless, carabid beetle. It is black with a metallic green sheen and can be distinguished from the closely related Atlas Rainforest Ground-beetle by its smaller size.

- Described in the mid 1800s, it was thought to be extinct until the early 1970s when a population was located in Lismore. Currently the only known populations occur in Lismore and the Richmond Range near Mallanganee, west of Casino.
- Inhabits Subtropical and warm temperate rainforest.
- Nurus brevis is a flightless carabid that lives in small burrows of up to about 50cm, that it excavates with its powerful mandibles. Burrows are characteristically beneath roots, rocks or logs.
- Nurus brevis is an ambush predator. It maintains a cleared stage at the burrow entrance and waits at the entrance for passing leaf litter invertebrates.

4.3.16.2 Survey Methods

The TBDC notes that surveys for the Shorter Rainforest Ground-beetle can be completed any time of the year and the presence of the species is generally identified by the presence of burrows. It is limited to a very small area of NSW.

With consideration of the above, searches for potential burrows were completed between 11th - 16th December 2023 and whilst generally traversing the site. Active searches were completed in the vicinity of the survey sites and involved lifting cover and raking through leaf litter and the upper soil layers. A total of approximately 2 hours (120 person minutes) was spent on four (4) consecutive days.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.16.3 Results

The Shorter Rainforest Ground-beetle was not recorded from the subject site.

4.3.17 Coastal petaltail (Petalura litorea)

4.3.17.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Coastal petaltail is closely related to the Giant dragonfly and is one of the largest dragonflies in Australia. Males have a hindwing of 5.2-5.5cm. Their abdomen is 7-7.9cm with orange petal-shaped claspers at the terminal end used to help grasp the female during mating. Females have a hindwing of 4.9-5.8cm and an abdomen of 5.9-7.4cm, without claspers. Both sexes have widely-spaced eyes and a predominantly brownish-black segmented body with contrasting light yellow linear markings along the back and sides. The larvae are also very large, up to 5cm in length. When the dragonflies emerge from the larvae, they leave behind characteristic shells (exuviae). The Coastal Petaltail is more slender than the Giant Dragonfly, with a better defined and more strongly contrasting colour pattern. There are also differences between the two species in head structure with the Coastal Petaltail more similar to the northern Petalura species than to the Giant Dragonfly.

- The Coastal Petaltail is known from Byfield (near Yeppoon in QLD) to Bonville (south of Coffs Harbour). In NSW it is known from a very small number of locations, including Brooms Head, Tucabia, Diggers Camp and Bonville.
- The Coastal Petaltail occupies a variety of permanent to semi-permanent coastal freshwater wetlands.
- Adults emerge from late October to late January and probably live for no more than three months.
- Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt flying insects on the wing over the swamp and around its margins.
- Immediately after mating, females lay eggs into suitable egg laying sites within the swamp.
- Larvae dig long branching burrows under the swamp. They are slow growing and the larval stage lasts at least 10 years.

4.3.17.2 Survey Methods

The TBDC notes that surveys for the Coastal Petaltail should be completed between November and February however no specific survey methodology is provided.

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

With consideration of the above, searches for Coastal Petaltail were completed during other targeted surveys and whilst generally traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.17.3 Results

The Coastal Petaltail was not recorded from the subject site.

4.3.18 Southern Greater Glider (Petauroides volans)

4.3.18.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Southern Greater Glider is the largest gliding possum in eastern Australia. It has a weight range of 900-1700 g. Females are larger than males. It has a head and body length of 350-450mm and a long furry tail measuring 450-600mm. The Southern Greater Glider has thick fur that increases its apparent size. Fur colour is white or cream below and varies from dark grey, dusky brown through to light mottled grey and cream above. It has large ears with hair that projects past the outer ear edge.

It has strongly reflective eyeshine in the beam of a spotlight making it easy to detect.

- The Southern Greater Glider occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in QLD, south through NSW and the Australian Capital Territory into Victoria.
- It feeds exclusively on eucalypt leaves, buds, flowers and mistletoe and shelters during the day in tree hollows and will use up to 18 hollows in their home range.
- They occupy a relatively small home range with an average size of 1 to 3 ha. They give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age.
- Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent.
- Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees.
- Very loyal to their territory.

4.3.18.2 Survey Methods

The TBDC notes that surveys for the Southern greater glider can be completed anytime however no specific survey methodology is provided.

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

Given the species is readily detected by spotlighting, the following methodology as detailed by DPE (2022) was therefore employed to target the Southern greater glider:

- Spotlight surveys in areas of suitable habitat.

  Note: Given the impact areas of the proposed development layout are restricted to the edges of vegetation surrounding the quarry pit, these vegetation edges were the focus of the spotlighting surveys.
- Searches were completed for gliders by scanning trees for movement and/or eyeshine; and
- 2 hours (120 person minutes) x four (4) consecutive nights between 11th – 16th December 2023.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.18.3 Results

The Southern greater glider was not recorded from the subject site.

4.3.19 Squirrel Glider (Petaurus norfolcensis)

4.3.19.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Adult Squirrel Gliders have a head and body length of about 20 cm. They have blue-grey to brown-grey fur above, white on the belly and the end third of the tail is black. There is a dark stripe from between the eyes to the mid-back and the tail is soft and bushy averaging about 27 cm in length. Squirrel Gliders are up to twice the size of Sugar Gliders, their facial markings are more distinct and they nest in bowl-shaped, leaf lined nests in tree hollows. Squirrel Gliders are also less vocal than Sugar Gliders.
- The species is widely though sparsely distributed in eastern Australia, from northern QLD to western Victoria.
- Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.
- Prefers mixed species stands with a shrub or Acacia midstorey.
- Live in family groups of a single adult male one or more adult females and offspring.
- Require abundant tree hollows for refuge and nest sites.
- Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.

4.3.19.2 Survey Methods

The TBDC notes that surveys for the Squirrel glider can be completed anytime however no specific survey methodology is provided.

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

Given the species is readily detected by spotlighting, the following methodology as detailed by DPE (2022) was therefore employed to target the Squirrel glider:

- Spotlight surveys in areas of suitable habitat.

  Note: Given the impact areas of the proposed development layout are restricted to the edges of vegetation surrounding the quarry pit, these vegetation edges were the focus of the spotlighting surveys.
- Searches were completed for gliders by scanning trees for movement and/or eyeshine; and
- 2 hours (120 person minutes) x four (4) consecutive nights between 11th – 16th December 2023.

Elliott trapping deployed for the Eastern pygmy-possum (**SECTION 4.3.4**) would also have been suitable to target the Squirrel glider. Elliott trapping was completed using the following methodology from the Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPC 2011):

- 20 Elliott A were traps installed at three (3) separate survey sites (**FIGURE 10**);
- At each survey site, traps were placed alternately placed on the ground and on tree branches or temporary arboreal platforms approx. 10 metres apart in two parallel straight lines (transects) separated by approx. 25 metres;
- traps were baited with universal mixture (i.e. rolled oats, peanut butter and honey) and set for four (4) consecutive nights between 11th - 16th December 2023 for a total effort of 240 trap nights.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.19.3 Results

The Squirrel glider was not recorded from the subject site.

4.3.20 Koala (Phascolarctos cinereus)

4.3.20.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Koala is an arboreal marsupial with fur ranging from grey to brown above, and white below. It has large furry ears, a prominent black nose and no tail. It spends most of its time in trees and has long, sharp claws, adapted for climbing. Adult males weigh 6 - 12 kg and adult females weigh 5 - 8 kg. During breeding, males advertise with loud snarling coughs and bellows.
- The Koala has a fragmented distribution throughout eastern Australia from north-east QLD to the Eyre Peninsula in South Australia. In NSW, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range.
- Inhabit eucalypt woodlands and forests where they feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.
- Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees but will descend and traverse open ground to move between trees.
- Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.

- Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.
- Females breed at two years of age and produce one young per year.

4.3.20.2 Survey Methods

The TBDC notes that surveys for the Koala can be completed anytime and references the Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method Survey Guide (DPE 2022) for information on targeted survey requirements.

The following methodology as identified by DPE (2022) was therefore employed to target the Koala:

- Scat detection method i.e. Spot Assessment Technique (SAT) (Phillips & Callaghan 2011; Phillips & Hopkins 2008; Phillips & Hopkins 2009):
    - Five (5) SAT sites were identified within potentially suitable habitat at approx. 150m spacings;
    - the tree of any species closest to the grid intersect coordinates was located and marked – this is identified as the centre tree.
    - Moving outwards from the centre tree, the 29 nearest trees of any species to the centre tree were identified.
    - A radial search for koala scat was undertaken beneath each of the 30 marked trees, within a prescribed search area extending 1 m from the base of each tree. Scat search effort was a minimum of two person-minutes for each tree.
    - Searches began with a brief inspection of the undisturbed litter or grass and grass like growth form cover within the 1 m search area. If no koala scats were detected, a more thorough inspection of the search area, involving disturbance by hand of the litter or grass and grass like growth form cover, was completed.
    - The search at each tree was concluded when:
        - a koala scat was detected, or
        - the search time ended with no koala scat detected.
    - Where the search time ended before a koala scat was detected, the SAT survey continued at the next nearest tree.
    - All 30 trees at each SAT site were sampled until a koala scat was detected, or all had been sampled. Koala presence within an area of suitable habitat is confirmed by detection of a koala scat.
- Non-scat detection methods were also deployed as follows:
    - Spotlight surveys in areas of suitable habitat:

- Note: Given the impact areas of the proposed development layout are restricted to the edges of vegetation surrounding the quarry pit, these vegetation edges were the focus of the spotlighting surveys.
- Searches were completed for Koalas in trees, on the ground, or moving in open areas by using eyeshine; and
- 2 hours (120 person minutes) x four (4) consecutive nights between 11th – 16th December 2023.

- call playback surveys:
  - After arriving at the call playback location (**FIGURE 10**), wait for a 10 minute period while scanning the surrounding area using a spotlight.
  - Broadcast the call for 10–20 seconds.
  - Listen for the response for between 30–60 seconds.
  - The broadcast and listening sequence was repeated five times.
  - The area surrounding the call playback location was then searched for a 10 minute period.

In addition to the above, signs of koala activity (i.e. scats, scratches) were searched for whilst traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.20.3 Results

The Koala was not recorded from the subject site.

4.3.21 Southern Pink Underwing Moth (Phyllodes imperialis)

4.3.21.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Southern Pink Underwing Moth is named for the brilliant pink patches on its dark hindwing (which also have eight white spots on the trailing edge). The grey/brown forewings are approximately 6cm long with white spots on the underside. When at rest the moth resembles a dead leaf. Young caterpillars are dull brown. However, as they mature they develop a dramatic 'head' display when alarmed: two large 'eye' spots and a double row of white 'teeth'. The pupal stage is a bronze-coloured 5cm case consisting of silk and leaves surrounded by metallic brown bands.
- The Southern Pink Underwing Moth is distributed from Nambour in SEQ to Bellingen in northern NSW. In NSW it is known to occur in a small number of localities from the QLD border to Wardell, and there is a disjunct population in the Bellingen area.

- The Southern Pink Underwing Moth is found in subtropical rainforest below about 600 m elevation.
- Potential breeding habitat is restricted to areas where the caterpillar's food plant, a native rainforest vine, *Carronia multisepalea*, occurs in subtropical rainforest.
- Adult Southern Pink Underwing Moths require the low light conditions of the rainforest in order to breed.

4.3.21.2 Survey Methods

The TBDC notes that surveys for the Southern Pink Underwing Moth should be completed between December and February however no specific survey methodology is provided.

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

Targeted surveys on the subject site included searches for adults and the larval host plant - Carronia Vine (*Carronia multisepalea*) whilst generally traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.21.3 Results

The Southern Pink Underwing Moth was not recorded from the subject site.

4.3.22 Common Planigale (Planigale maculata)

4.3.22.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Common Planigales are tiny marsupials with a body length of about 8 cm and a tail as long again. They differ from the common house mouse in having a long, pointed snout with sharp teeth and large rounded ears. The head has a flattened appearance. Their fur is grey brown above, sometimes with tiny white spots, and paler below.
- The species is distributed throughout coastal north-eastern NSW, coastal east QLD and Arnhem Land. The species reaches its confirmed southern distribution limit on the NSW lower north coast however there are reports of its occurrence as far south as the central NSW coast west of Sydney.
- Throughout this range it inhabits rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.
- They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks.

- They are fierce carnivorous hunters and agile climbers, preying on insects and small vertebrates, some nearly their own size.
- They breed from October to January. The female builds a nest lined with grass, eucalypt leaves or shredded bark.

4.3.22.2 Survey Methods

The TBDC notes that surveys for the Common planigale can be completed at any time of the year, and that surveys must be undertaken using pitfall traps.

With consideration of the above, pitfall traps were employed on the subject site targeting the Common planigale as described by DPE (2022):

- Three (3) pitfall trap lines each comprising of six (6) 20L buckets spaced 3 m apart on a 15 m line transect and linked by a drift-fence were installed on the subject site (**FIGURE 10**).
- The traps were set for four (4) consecutive nights between 11th - 16th December 2023 for a total effort of 72 trap nights.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.22.3 Results

The Common planigale was recorded from within VZ4a in the south-eastern portion of the subject site (**FIGURE 9**). A species polygon has therefore been identified for this species in accordance with Section 5.2.5 of the BAM (refer **SECTION 6.3**).

4.3.23 Long-nosed Potoroo (Potorous tridactylus)

4.3.23.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Adult long-nosed potoroos weigh up to 1.6 kg (740 - 1640 grams) and have a head and body length of about 360 mm and a tail length between 200 - 260 mm. Its fur is greyish-brown above and light grey below. It is distinguished from the slightly larger, but very similar long-footed potoroo in a number of subtle ways including its shorter tail (less than 250 mm long) and smaller hind-foot (shorter than its head). Also, unlike the long-footed potoroo the long-nosed potoroo lacks a leathery pad on the sole of its foot, just behind the inner toe (a hallucal pad).
- The long-nosed potoroo is found on the south-eastern coast of Australia, from QLD to eastern Victoria and Tasmania, including some of the Bass Strait islands. There are geographically isolated populations in western Victoria. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm.
- Throughout this range it inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and

may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.

- The fruit-bodies of hypogeous (underground-fruiting) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil.
- Often digs small holes in the ground in a similar way to bandicoots.
- Mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours.
- Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha.
- Breeding peaks typically occur in late winter to early summer and a single young is born per litter. Adults are capable of two reproductive bouts per annum.

4.3.23.2 Survey Methods

The TBDC notes that surveys for the Long-nosed potoroo can be completed at any time of the year utilising camera trapping.

With consideration of the above, camera traps were deployed on the subject site targeting the Long-nosed potoroo:

- A total of twelve (12) cameras were installed on the subject site on the 23rd November 2023. The cameras were evenly spaced on and adjacent to the subject land approx. 100m apart (**FIGURE 10**) and were left in place for four (4) weeks.
- Bait cannisters containing universal mixture (i.e. rolled oats, peanut butter and honey) and truffle oil were placed in front of cameras and baits replaced after two (2) weeks.

In addition to the above, any ground-dwelling mammal species observed whilst traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.23.3 Results

The Long-nosed potoroo was not recorded from the subject site.

4.3.24 Mitchell's Rainforest Snail (Thersites mitchelliae)

4.3.24.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- Mitchell’s Rainforest Snail is a large native land snail with a shell up to 55 mm wide and 50 mm high, triangular in profile, and with a thickened lip. The shell is deep

reddish chestnut to black in colour with two prominent yellow bands. The body colour is black with a thin lighter line along the back.

- Found in remnant vegetation on the coastal plain between the Richmond River and Tweed River on the NSW north coast. It has also been recorded from some adjacent mid-elevation areas including Wilsons River and Mount Jerusalem.
- Throughout this range it inhabits remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. Slightly higher ground around the edges of wetlands with palms and fig trees are particularly favoured habitat.
- Typically found amongst leaf litter on the forest floor, and occasionally under bark in trees.
- Active at night and feeds on leaf litter, fungi and lichen.

4.3.24.2 Survey Methods

The TBDC notes that surveys for Mitchell's Rainforest Snail can be completed anytime, but particularly at night during a rain event however no specific survey methodology is provided.

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

The Mitchell's Rainforest Snail was targeted during spotlighting surveys using the following methodology as detailed by DPE (2022):

- Spotlight surveys in areas of suitable habitat.

  Note: Given the impact areas of the proposed development layout are restricted to the edges of vegetation surrounding the quarry pit, these vegetation edges were the focus of the spotlighting surveys.
- Searches were completed for snails on trees or on the ground; and
- 2 hours (120 person minutes) x four (4) consecutive nights between 11th – 16th December 2023.

In addition to the above, signs of Mitchell's Rainforest Snail presence (i.e. shells) were searched for whilst traversing the site on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.24.3 Results

The Mitchell's Rainforest Snail was not recorded from the subject site.

4.3.25 Black-breasted Button-quail (Turnix melanogaster)

4.3.25.1 Habitat and ecology

The following information was sourced from the TBDC (accessed 5/12/2023):

- The Black-breasted Button-quail is a fairly large and plump, dark, quail-like ground bird, similar in size to Brown Quail (*Coturnix ypsilophora*), which are quite unrelated. The upperparts are mottled with rufous-brown, black, grey and white, and the fore neck and breast are black with profuse white spotting and barring. In males, the face and throat are white with fine black speckling; in females the head and neck are black with some white speckling. Adults have off-white eyes, grey bill and pale-yellow legs. Juvenile birds resemble males but are duller in colour. The call of females is a very low and resonant repeated booming oo-oom, which is also described as a low and tremulous drumming.
- The Black-breasted Button-quail is endemic to SEQ and far north-eastern NSW, at scattered sites from the Byfield region south to the Border Ranges and mainly on and east of the Great Divide but extending inland to the inner western slopes, up to 300 km from the coast. There have been few recent records in north-eastern NSW, with only ten records, from six localities, in the 20 years to 2000, though there are many records directly adjacent to NSW across the QLD border. There have been no published reports since 2000.
- Preferred habitat includes drier low closed forests, including dry rainforests, vine forest and vine thickets, often in association with Hoop Pine, and Bottletree scrubs. The understorey may be dense or sparse, but a deep, moist leaf-litter layer, in which the birds forage, is an important component of habitat. Birds have been recorded using Lantana thickets at edges of rainforest or Lantana understorey of forest or rainforest, but it is not known if Lantana associations are suitable for sustaining breeding.
- In NSW, as well as drier rainforests, may occupy wetter subtropical rainforests, sometimes in association with moist eucalypt forest.
- Black-breasted Button-quails forage in leaf-litter by pivot-feeding, scratching at the leaf-litter with one leg while pivoting the body on the other, displacing leaves and soil, and exposing invertebrate prey. This method of foraging produces distinctive circular saucer-shaped depressions, often termed platelets, 15-25cm in diameter.
- Birds feed during the day and at night. The diet consists mainly of small, ground-dwelling invertebrates and seeds.
- Breeding has been recorded from September to May but it is possible that breeding occurs throughout the year at some sites. Clutches comprise 3-5 eggs, and females may lay several clutches in a season. Eggs are incubated, and young cared for, solely by the male.
- Usually seen in pairs or in small, probably family groups. Females, which are territorial, are occasionally seen singly.

4.3.25.2 Survey Methods

The TBDC notes that surveys for Black-breasted Button-quail can be completed anytime however no specific survey methodology is provided.

A desktop search for other relevant threatened species survey guides or best-practice methods was therefore completed. There are currently no relevant threatened species survey guides published.

The Black-breasted Button-quail was targeted during bird surveys using a combination of the area search method and the species-time curve approach, where the observer walked through the site and the survey session ceased when no additional species were identified within a 5-minute period.

In addition to the above, any birds observed visually or aurally whilst traversing the site on the on 29th and 30th September 2023, 23rd and 24th November 2023 and between 11th – 16th December 2023 were identified to species level.

The above combined survey effort is considered more than adequate to detect this species given the limited available habitat within and surrounding the impact area.

4.3.25.3 Results

The Black-breasted Button-quail was not recorded from the subject site.

4.3.26 Species 'Assumed Present'

A number of species credit species have been assumed to be present in accordance with the requirements of Section 5.3.1 of the BAM as site surveys were not completed during the specified time of year or using the appropriate survey methods:

- Black-tailed Antechinus (*Antechinus arktos*);
- Powerful Owl (*Ninox strenua*);
- Cryptic Forest Twiner (*Tylophora woollsii*); and
- Masked Owl (*Tyto novaehollandiae*).

Species polygons have therefore been identified on the subject site for these species in accordance with the requirements of Section 5.2.5 of the BAM (refer **SECTION 6.3**).

4.4 Ecosystem Credit Species

APPENDIX 3 lists the ecosystem credit species that have been automatically generated by the BAM-C. Details of required habitat components, geographic limitations, and applicable sensitivity classes for each species is also provided.

No ecosystem credit species were recorded on or adjacent to the subject site. A small number of ecosystem credit species automatically generated by the BAM-C were removed

from the assessment as the necessary habitat components were absent in the assessment area (refer **TABLE 4**).

It is noted that Paragraph 9.2.1.1 of the BAM states that:

> *The assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:*
>
> *a. ≥15, where the PCT is representative of an EEC or a CEEC;*
>
> *b. ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community;*
>
> c. *≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.*

In this instance Vegetation Zones 11a and 11b have been assigned to PCT 3147 - Far North Brush Box-Bloodwood Wet Forest, which is associated with threatened species habitat (as represented by ecosystem credits) but have vegetation integrity scores of <17 (i.e. 16.6 and 16.5 respectively). An assessment of threatened species habitat (ecosystem credits) for these vegetation zones is therefore not required.

TABLE 4
ECOSYSTEM CREDIT SPECIES REMOVED FROM CANDIDATE SPECIES LIST

Species	Reason for determining that species is unlikely to occur on the subject land	Justification
Pale-vented Bush-hen (*Amaurornis moluccana*)	Habitat constraints	No suitable waterbodies or dense vegetation, within 300m of, or in shallows of streams or other natural or artificial wetlands occurs on the site.
Black-necked Stork (*Ephippiorhynchus asiaticus*)	Habitat constraints	No swamps, shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands, shallow lakes, lake margins and estuaries occur on or within 300m of the site.
Black Bittern (*Ixobrychus flavicollis*)	Habitat constraints	No suitable waterbodies or land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation occur on the site.
Black-striped Wallaby (*Macropus dorsalis*)	Geographic limitations	The subject land is not west of Kyogle.
Hastings River Mouse (*Pseudomys oralis*)	Geographic limitations	The subject land is not above 250m altitude.

4.5 Species Credit Species

APPENDIX 4 lists the species credit species that have been derived from the BAM-C. Details of required habitat components, geographic limitations, applicable sensitivity classes,

whether any targeted surveys were completed, indication of presence based on targeted surveys, indication of where presence was assumed and/or where presence was determined by expert report, and the biodiversity risk weighting for each species is also provided.

Targeted surveys have been completed for threatened species on the subject site on the on the 29th and 30th September 2023, 23rd and 24th November 2023, and between the 11th – 16th December 2023. The methodology and results of these surveys are discussed in **SECTIONS 4.2 and 4.3**.

In total, four (4) species credit species were recorded on or adjacent to the subject land (**FIGURE 9**):

- Corokia (*Corokia whiteana*);
- Red-flowered king of the fairies (*Oberonia titania*);
- Common planigale (*Planigale maculata*); and
- Scrub turpentine (*Rhodamnia rubescens*).

Species polygons have therefore been identified on the subject site for these species in accordance with the requirements of Section 5.2.5 of the BAM (refer **SECTION 6.3**).

A number of species credit species were removed from the BAM-C as either the necessary habitat components (i.e. breeding, foraging or roosting habitat) were absent in the assessment area, or due to geographic limitations, or in accordance with Paragraph 5.2.3.2(a)ii of the BAM as it was determined that the available habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones). Species that were removed from the candidate species list, along with the rationale behind the decision to remove them, are provided in **TABLE 5**.

TABLE 5
SPECIES CREDIT SPECIES REMOVED FROM CANDIDATE SPECIES LIST

Species	Reason for determining that species is unlikely to occur on the subject land	Justification
Marblewood (*Acacia bakeri*)	Geographic limitations	The subject land does not occur within Mt Jerusalem National Park or within a 10 km buffer around this National Park.
Giant fern (*Angiopteris evecta*)	Habitat constraints	Potential habitat on the subject site (i.e. sedimentation ponds) are substantially degraded such that the species is unlikely to utilise the subject land.
Laced Fritillary (*Argynnis hyperbius*)	Habitat constraints	Arrowhead violet (*Viola betonicifolia*) does not occur on the subject land.
Needle-leaf Fern (*Belvisia mucronata*)	Habitat constraints	No cliffs, escarpments or suitable boulders were observed on the site.
Mark's Cassia (*Cassia marksiana*)	Geographic limitations	The subject land does not occur within 20 km of Mt Nullum.

Species	Reason for determining that species is unlikely to occur on the subject land	Justification
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Habitat constraints	The site does contain cliffs or occur within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2km of old mines or tunnels.
Swift parrot (Breeding) (*Lathamus discolor*)	Habitat constraints	The site does not occur within the mapped Important Habitat areas.
Lenwebbia sp. Main Range	Habitat constraints	The site does contain cliffs or escarpments or occur within 300m of these features.
Fine-leaved tuckeroo (*Lepiderema pulchella*)	Geographic limitations	The site does not occur north of the southern arm of the Tweed River.
Square-tailed Kite (Breeding) (*Lophoictinia isura*)	Habitat constraints	No nest trees were observed on the subject site.
Little Bent-winged Bat (Breeding) (*Miniopterus australis*)	Habitat constraints	Maternity caves are not present on the subject land.
Large Bent-winged Bat (Breeding) (*Miniopterus orianae oceanensis*)	Habitat constraints	Maternity caves are not present on the subject land.
Giant barred frog (*Mixophyes iteratus*)	Habitat constraints	No suitable land within 50m of semi-permanent and permanent drainages occur on the subject site.
Eastern osprey (Breeding) (*Pandion cristatus*)	Habitat constraints	The site does not contain suitable breeding habitat i.e. presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting.
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	Habitat constraints and Geographic limitations	The subject land does not occur within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines, or occur west of Lismore.
Mountain Frog (*Philoria kundagungan*)	Habitat constraints	The subject land does not contain boggy headwaters of streams and soaks.
Loveridge's Frog (Philoria loveridgei)	Habitat constraints	The subject land does not contain boggy headwaters of rainforest streams and soaks.
Grey-headed flying-fox (Breeding) (*Pteropus poliocephalus*)	Habitat constraints	No roosting sites (camps) representing breeding habitat occur on the subject land.
Ravine Orchid (*Sarcochilus fitzgeraldii*)	Habitat constraints	The subject land does not contain suitable cliffs, exposed rockfaces and vertical moist cliffs, rocky areas, exposed rockfaces and boulders.

Species	Reason for determining that species is unlikely to occur on the subject land	Justification
Hartman's Sarcochilus (*Sarcochilus hartmannii*)	Habitat constraints	The subject land does not contain suitable cliffs, rocky areas, rock outcrops or occur within 100m of these features.
Cameron's Tarenna (*Triflorensia cameronii*)	Geographic limitations	The subject land does not occur within 5km of Lismore.
Peach Myrtle (*Uromyrtus australis*)	Geographic limitations	The site does not occur within 2 km of Whian Whian State Conservation Area, or the Goonengerry, Nightcap, or Mt Jerusalem National Parks.

5 AVOIDANCE & MINIMISATION OF IMPACTS

5.1 Introduction

Section 6.4 of the BC Act sets out the purpose of the NSW Biodiversity Offset Scheme (BOS). This clause establishes a requirement to identify appropriate biodiversity conservation measures to offset or compensate for impacts on biodiversity values, after steps are taken to avoid or minimise those impacts.

Section 6.12 of the BC Act requires that a BDAR "assesses in accordance with the biodiversity assessment method the biodiversity values of the land" and "sets out the measures that the proponent of the proposed development … proposes to take to avoid or minimise the impact of the proposed development". The Act clearly provides for a 'mitigation hierarchy', commencing with avoidance. Similarly, the BAM (2020) expresses the expectation that avoidance must be demonstrated before minimisation or mitigation of impacts.

With consideration of the above, the proponent must apply the mitigation hierarchy whereby avoidance, minimising and mitigation measures should be implemented in the first instance as the primary strategies for managing the potential adverse impacts of a project as they directly reduce the scale and intensity of the potential impacts of a project. Offsets are then used to address the 'unavoidable impacts' that remain after avoidance and mitigation measures have been put in place. Only after the application of the mitigation hierarchy should offsets on residual impacts (i.e. those impacts that require a biodiversity offset) be considered.

Pursuant to s 6.4(1) of the BC Act, the following sections of the BDAR outline the methods by which the proposed development have avoided and minimised impact on biodiversity values.

5.2 Avoidance Measures

5.2.1 Background

The first step in the mitigation hierarchy is to avoid the potential impacts of a project. Avoidance of impacts may be achieved through planning and assessment of the project including suitable site selection and project design. An example would be locating the project in areas of low biodiversity significance, siting the development footprint to avoid a TEC or habitats of threatened species or populations, or modifying a project to limit indirect impacts on adjacent ecological values.

The following sections outline the projects avoidance strategy. Constraints to avoiding biodiversity values are also discussed.

5.2.2 Site Selection

The subject site was selected for the proposed development based on its former use as a quarry site and lack of significant environmental features such as wetlands.

The site contains dunal sand which has been quarried since the 1920s. Extraction of materials from the quarry ceased in 2015 and processing of extracted materials ceased in 2016. The site is currently vacant, excluding an unused demountable building associated with the former use.

Substantial portions of the site have been historically cleared to allow for sand extraction works and the site has undergone extensive disturbance over time. These disturbed areas of the site contain limited to no existing native vegetation or are in poor condition (i.e. have a lower vegetation integrity score).

5.2.3 Location and Design of the Project

The proposed development has been situated and designed where possible to be restricted to the RU1 zoned land and areas of the site that were historically disturbed as part of the former quarry operations. The impacts of the project have been avoided by situating the proposed development in areas:

- Where there are no significant environmental features such as wetlands;
- Where there are limited biodiversity values;
- Outside of the environmental conservation zoned land (i.e. C2 Zone); and
- Where there is limited to no existing native vegetation or where the existing native vegetation and threatened species habitat is in poor condition (i.e. have a low vegetation integrity score).

The proposed development has been located to avoid (where possible) direct impacts on areas of significant biodiversity values located in the western and northeastern portions of the sites, with these areas to be retained and maintained in the future for their biodiversity values. Specifically, the proposed development has been located to avoid direct impacts on the majority of significant vegetation and intact/better quality vegetation on the site including:

- Vegetation Zone 1 (PCT 3121) which is representative of the TEC Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions listed within schedules of the BC Act, and potentially representative of the TEC Lowland Rainforest of Subtropical Australia listed within schedules of the EPBC Act – will be retained except for a very small area (only 0.07 ha to be impacted) directly adjacent to the development footprint.
- Vegetation Zone 2 (PCT 3002) which is representative of the TEC Swamp sclerophyll forest on coastal floodplains listed within schedules of the BC Act - will be retained in its entirety;
- Vegetation Zone 3b (PCT 3121) which is representative of the TEC Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions listed within schedules of the BC Act, and potentially representative of the TEC Lowland Rainforest of Subtropical Australia listed within schedules of the EPBC Act – will be retained except for a very small area (only 0.06 ha to be impacted) directly adjacent to the development footprint.

- Vegetation Zone 4a (PCT 3147) and Vegetation Zone 5 (PCT 3148) which represent the best quality vegetation on the site (i.e. the VZs have a vegetation integrity score of 68.9 and 63.9 respectively) will be retained where possible (1.90 ha and 0.07 ha to be impacted respectively) directly adjacent to the development footprint.

Overall, the project has been located in an area where the development footprint will generally only impact areas of native vegetation that are in the poorest condition. The proposed development has been located generally within an area limited to areas previously impacted by the former quarry. Vegetation integrity (VI) scores (out of 100) of the areas to be impacted are as follows (refer to **SECTION 6** for detailed discussion of direct impacts):

- Vegetation zone 1 = 59.9 (0.07 ha to be impacted);
- Vegetation zone 3b = 66.4 (0.06 ha to be impacted);
- Vegetation zone 4a = 68.9 (1.90 ha to be impacted);
- Vegetation zone 4b = 22.6 (0.94 ha to be impacted);
- Vegetation zone 5 = 63.9 (0.07 ha to be impacted);
- Vegetation zone 11a = 19.3 (1.93 ha to be impacted); and
- Vegetation zone 11b = 16.5 (1.68 ha to be impacted).

Within the site, the following threatened flora species have been identified:

- A small clump of Corokia (*Corokia whiteana*) – listed as Endangered within schedules of the BC Act and the EPBC Act;
- A single small specimen of Red-flowered king of the fairies (*Oberonia titania*) – listed as Vulnerable within schedules of the BC Act; and
- Two (2) separate records of Scrub turpentine (*Rhodamnia rubescens*) – listed as Critically Endangered within schedules of the BC Act and EPBC Act.

The proposed development has been located and designed to avoid direct impacts on all threatened flora specimen.

The project has been designed to incorporate perimeter roads at the bushland interface. The perimeter roads will provide a hard edge between the development area and areas of retained vegetation, which will minimise potential edge effects such as weed control, management of exotic species and boundary encroachments by private landowners. The perimeters roads will also serve as part of the Asset Protection Zones for majority of the lots. For areas requiring deeper APZs at the interface (such as the north-eastern corner), these areas will be managed as Outer Protection Areas (OPA) and managed through selective thinning and planting of fire resistant vegetation. These OPAs are will be managed under community title arrangements, so as to not place a burden on council.

5.3 Minimisation Measures

5.3.1 Introduction

The next step in the mitigation hierarchy is minimisation. A range of measures will be implemented during the construction phase and post-construction/operational phase of the development to minimise impacts on biodiversity values at the subject site and are discussed in the following sections.

5.3.2 Construction Phase

5.3.2.1 Education of Site Personnel

A construction personnel induction program shall be developed by the Proponent to highlight the presence of significant vegetation and habitat values on the site. The general induction of all construction personnel will cover such matters as:

- Demarcation of the work area;
- Areas on, or adjacent to, the site in which significant vegetation and/or habitat values occur;
- Threats to significant vegetation and habitat values associated with construction activities;
- Requirement to report any incidents within the significant vegetation and habitat areas, and actions required;
- Construction personnel are prohibited from bringing dogs onto the site; and
- Requirements of relevant Management Plans, particularly protocols for vegetation clearing/bulk earthworks and measures to protect retained native vegetation (e.g. erosion and sediment control, slope stabilisation, weed control etc.).

5.3.2.2 Fauna Protection Measures

Vegetation will be inspected for fauna by a suitably qualified ecologist immediately prior to the commencement of clearing/earthworks. Any fauna detected within proposed clearing areas will be relocated to suitable habitat outside of the subject site. Consideration will be given to appropriate release times and locations for specific fauna groups and a record kept of all species encountered/relocated.

Habitat features such as fallen timber, hollow logs and/or rocks shall be retained if possible or relocated to an appropriate location within retained vegetation as replacement habitat for ground-dwelling fauna.

5.3.2.3 Vegetation Protection Measures

During construction activities, temporary high visibility fencing will be erected to assist in the protection of retained offsite vegetation from all construction activities by restricting access from machinery and contractors. This fencing will be erected in accordance with *Australian Standard 4970-2009 Protection of Trees*. Temporary signage will be provided

along all temporary fencing during the construction phase stating "Conservation Area – No Unauthorised Entry".

No machinery, rubbish or spoil will be stored within retained offsite vegetation during the construction phase of the development. Vehicle/equipment wash-down areas or access tracks will not be located in or immediately adjacent to retained vegetation.

5.3.2.4 Stormwater Management, Erosion and Sediment Controls

Protocols for maintaining hydrological processes and minimising erosion and sedimentation will be developed as part of the project. A Stormwater Management Plan (SMP) and an Erosion and Sediment Control Plan (ESCP) will be prepared and approved by Council prior to commencement of site works. Disturbance of soils shall be minimised as far as possible and appropriate sediment and erosion controls established. Stormwater flows will be managed to replicate (where possible) the natural pre-development flow patterns in terms of frequency, quantity and quality.

5.3.2.5 Weed Control

Weed hygiene protocols will be applied to the proposed clearing/earthworks area subject to this BDAR. Vegetation waste shall be taken to an appropriate waste disposal facility or mulched for reuse on site if fertile weed material is not present.

5.3.3 Post-construction/Operational Phase

5.3.3.1 Appropriate Landscaping

Landscape species should comprise locally occurring native species to reduce the potential for weed invasion.

5.3.3.2 Regeneration and Revegetation Measures

A Vegetation Management and Rehabilitation Plan (VMRP) will be prepared and approved by Council prior to the commencement of site works. The VMRP will outline specific measures to:

- Enhance the vegetation to be retained within Conservation Areas;
- Revegetate disturbed areas where appropriate with locally occurring native species to achieve fully structured vegetation communities;
- Reduce detrimental edge effects and other disturbance related impacts on the retained vegetation;
- Improve the value of the subject site as habitat for fauna groups including the relocation/placement of rocks and other ground cover (e.g. logs, stumps and fallen timber) in conservation areas/retained vegetation;
- Manage weeds using plantings of locally occurring native species and best practice weed control methods; and

- Contribute a significant area of native habitat (existing and restored) to the local landscape.

A Concept Site Regeneration and Revegetation Plan showing the areas of the site proposed to be rehabilitated and the APZ management measures to be completed is provided in **FIGURE 11**.

Areas directly adjacent to the proposed development that are subject to an Asset Protection Zone will be actively managed to minimise bushfire risk. This will include selective clearing to reduce canopy cover to 30% within Outer Protection Areas (OPAs) and 15% within Inner Protection Areas (IPAs), and landscaping with rainforest/fire retardant native shrubs and groundcover species.

Areas of existing vegetation to be retained will be subject to assisted natural regeneration works including weed control and infill planting. Remaining portions of the site outside the development footprint that are not currently vegetated will be revegetated.

5.3.3.3 Replacement of Habitat Features

Whilst stags and hollow-bearing trees occur within the vegetated areas of the subject site, none are expected to be impacted by the proposed development. As a contingency, if habitat trees must be removed following final design, hollows will be offset at a 1:1 offset ratio through the provision of nest boxes. For each hollow or pipe identified in any removed trees, compensation in the form of suitable sized nesting boxes will be installed in the adjacent retained vegetation.

The exact number of nest boxes will be determined post clearing by a fauna spotter catcher / ecologist who is required to accurately document the number of hollows removed. Note is to be made of the sizes and types of hollows removed so to ensure that adequate numbers and types of nest boxes have been provided. The exact type, location and orientation of the nest box is to be determined and the installation completed by a suitably qualified Ecologist.

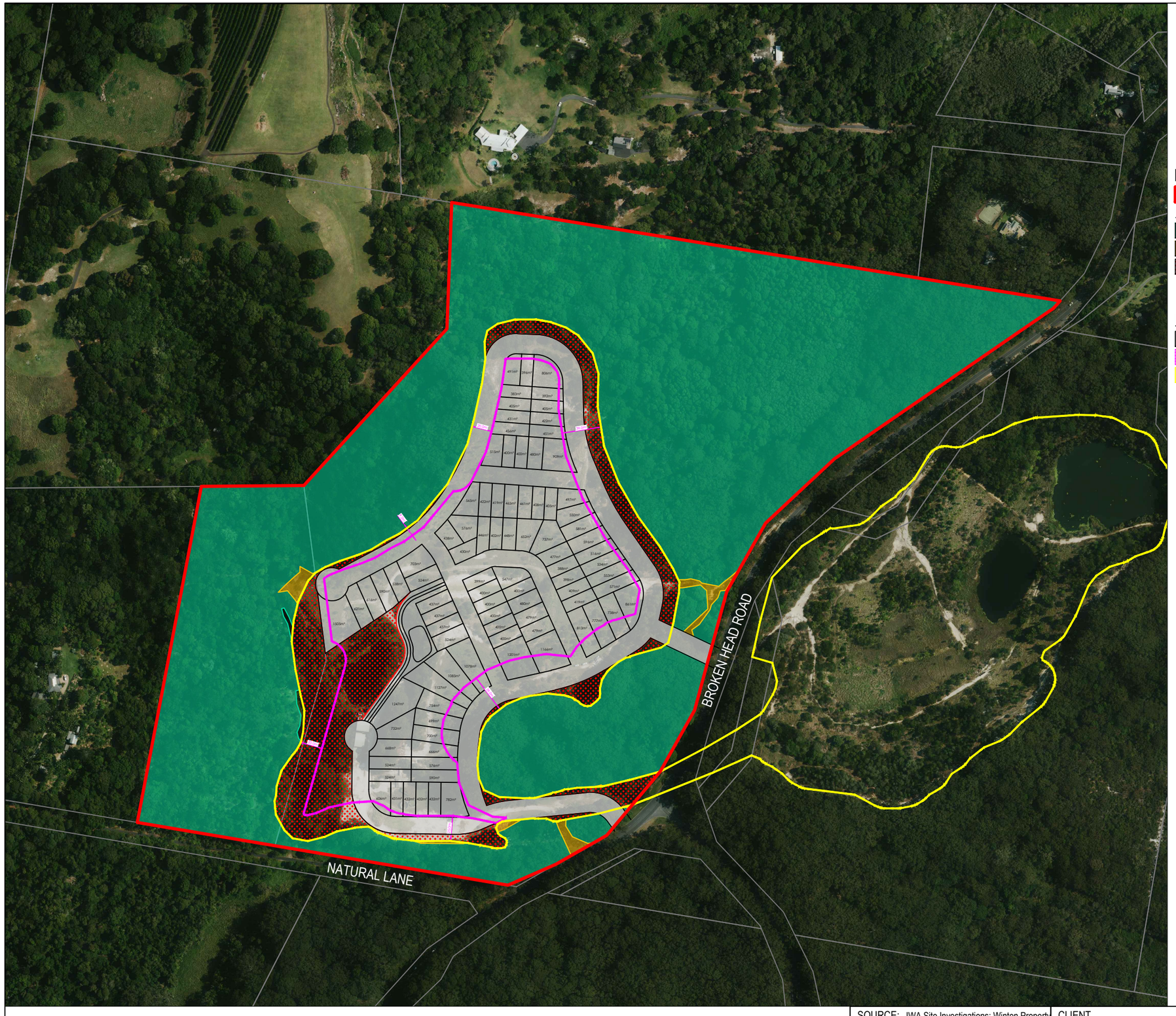
5.3.3.4 Monitoring and Reporting

The VMRP to be prepared will include a detailed monitoring program to be completed by a qualified Ecologist to determine compliance with performance criteria of the plan. The monitoring program will include specific measurable performance targets and reporting requirements.

5.4 Additional Statutory Considerations

5.4.1 Introduction

Although this is a Planning Proposal, it is acknowledged that under future Part 4 development applications, the consent authority will have discretion over what measures are necessary to avoid and minimise impacts in accordance with Section 7.13(6) of the NSW BC Act. In this regard, assuming BSC will be the consent authority, it is anticipated BSC will



N

LEGEND

Subject Site

Concept SRRP Management Zones (MZ)

MZ1 - Assisted natural regeneration

MZ2 - Revegetation

MZ3 - Asset Protection Zone

Note: selective clearing to reduce canopy cover to 10% and landscaping with rainforest / fire retardant native shrubs and groundcover species.

Proposed Development Layout

Proposed Lots

Asset Protection Zone (APZ)

Existing Zone Boundary

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; Winten Property Group (20230918-ACAD-240392-PSK-001 to 003[A].dwg); MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

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FIGURE 11

PREPARED: BW
DATE: 14 March 2024
FILE: N202009_BDAR_20240314.dwg

TITLE
CONCEPT
SITE REGENERATION
& REVEGETATION
PLAN

consider compliance with the relevant local legislation including any relevant requirements of Chapter B1 – Biodiversity of the *Byron Shire Development Control Plan 2014* (Byron DCP) within the Byron LEP 2014 and the Byron Coast Comprehensive Koala Plan of Management (BCCKPoM) in order to be satisfied that sufficient steps have been taken to avoid and minimise impacts on biodiversity values. On this basis, an assessment of the concept layout against the relevant DCP and BCCKPoM provisions has been undertaken to inform this Planning Proposal, and is included in the following sections.

5.4.2 *Byron DCP (2014) Chapter B1 - Biodiversity*

5.4.2.1 Background

The Byron DCP supplements the statutory provisions of Byron LEP 2014 by providing more details, guidelines and controls applying to the various forms of development permitted under the provisions of the LEP. For the purposes of this EA, Chapter B1 – Biodiversity of the Byron DCP is relevant.

The aim of Chapter B1 is to ensure that, subject to any relevant overarching state or commonwealth legislation, the planning and design of new development maintains or improves ecological values within Byron Shire thereby increasing the resilience of natural areas and supporting both biodiversity and climate adaptation. The objectives of the Chapter B1 are:

1) Identify, retain and restore native vegetation and habitats for native species in patches of a size and configuration that will enable existing plant and animal communities to survive in the long term and support climate adaptation.
2) Identify and retain high carbon storage ecosystems (e.g. blue carbon systems such as salt marsh, mangroves and sea grasses), wildlife corridors and refugia.
3) Provide development controls that prevent the degradation or loss of ecological values and or biodiversity.
4) Provide guidance on the information required to enable informed decision- making.
5) Ensure that construction and operational impacts of development are avoided and or mitigated using current best practice standards.
6) Provide guidance on acceptable measures to avoid or minimise the impact of proposed development on biodiversity including proposals affected by Part 7 of the BC Act and the Koala Habitat Protection SEPP.
7) Compensate for unavoidable habitat losses in accordance with applicable legislation, or in the absence of such legislation, contemporary best practice.

This section provides an assessment of compliance with the relevant sections of the Byron DCP – Chapter B1 (Biodiversity).

5.4.2.2 Applicability to the Subject Site

TABLE 6 below identifies the red flagged values and applicable ecological setbacks defined within Chapter B1 that occur on or adjoining the subject site. In accordance with Chapter

B1, the following red flagged values and applicable ecological setbacks occur on the subject site and are shown in **FIGURES 12A and 12B**:

- Threatened Ecological Communities – 30 m setback;
- Old growth forests - 30 m setback;
- Important wetlands – 50 m setback;
- Land within a defined wildlife corridor – 20 m setback;
- Areas within a species polygon for threatened fauna or other significant fauna that are known or predicted to occur at the site – 20 m setback;
- Areas with a species polygon for threatened flora or other significant flora that are known or predicted to occur at the site – 10 m setback;
- A first order stream – 10 m setback;
- A second order stream – 20 m setback;
- Very large native trees – 10 m setback; and
- Stags and hollow-bearing trees – 10 m setback.

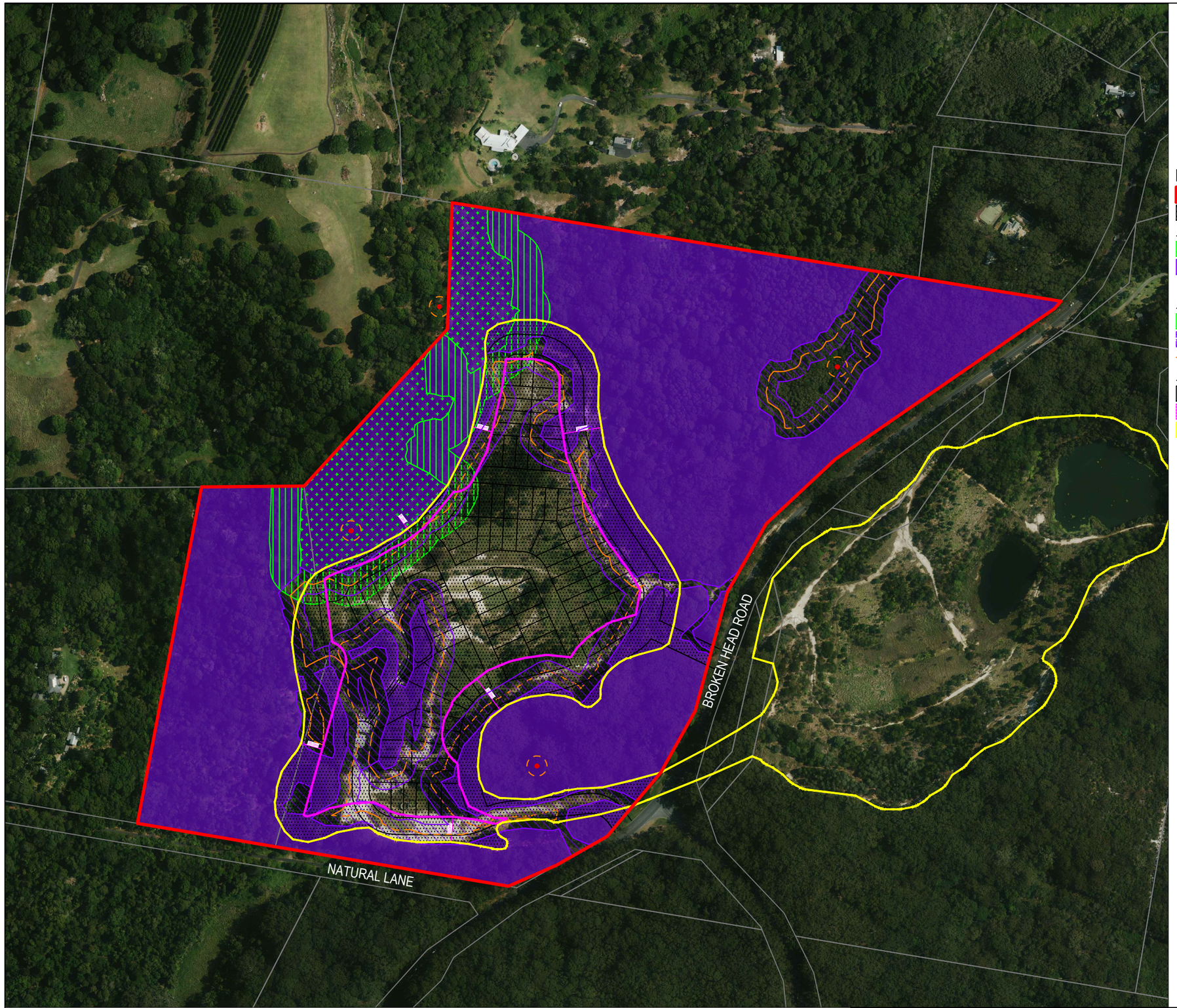
With consideration of the above red flagged values, it is noted that the Clause 6 of Part B1.2.1 – Development Envelope Controls states:

> *6. Minor variations to the red flagged areas identified in Table 3 may be considered to achieve practical outcomes. Some examples include:*
>
> *a. minor incursions into the ecological setbacks;*
>
> *b. ecological setbacks that necessarily overlap with access roads or other linear infrastructure (e.g. a narrow access road that does not require clearing with native vegetation on each side);*
>
> *c. isolated patches of native vegetation with an area of less than 1000m^2;*
>
> *d. ecological setbacks arising from adjoining land not in the same ownership;*
>
> *e. threatened or other significant fauna that are considered vagrant, highly nomadic, or are not closely associated with the habitat on site;*
>
> *f. areas subject to a controlled activity approval under the Water Management Act 2000.*
>
> *g. threatened or other significant flora that occur as seedlings or saplings outside of their natural habitat.*

TABLE 6 below quantifies impacts on the red flagged values and applicable ecological setbacks defined within Chapter B1 that occur on or adjoining the subject site. The proposed development generally complies with the requirements of Chapter B1; however, does require some variations to the development standard as contemplated by Clause 6.

These proposed variations in accordance with Clause 6 are illustrated in **FIGURES 12A and 12B** and outlined in **TABLE 6**. Where there is a potential non-compliance, details and

justification of the proposed variations to the development standard are provided in accordance with Clause 6.



N

LEGEND

- Subject Site
- Proposed Impact Area

Byron DCP - Section B1 - Red Flagged Areas

- Threatened Ecological Communities
- Threatened flora and fauna species polygon
- Threatened flora records

Byron DCP - Section B1 - Ecological Setbacks

- 30m setback to Threatened Ecological Communities
- 20m setback to Threatened fauna species polygon
- 10m setback to Threatened flora species polygon and record

Proposed Development Layout

- Proposed Lots
- Asset Protection Zone (APZ)
- Existing Zone Boundary

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; Winten Property Group (20230918-ACAD-240392-PSK-001 to 003[A].dwg); MetroMap Aerial dated 31/10/23

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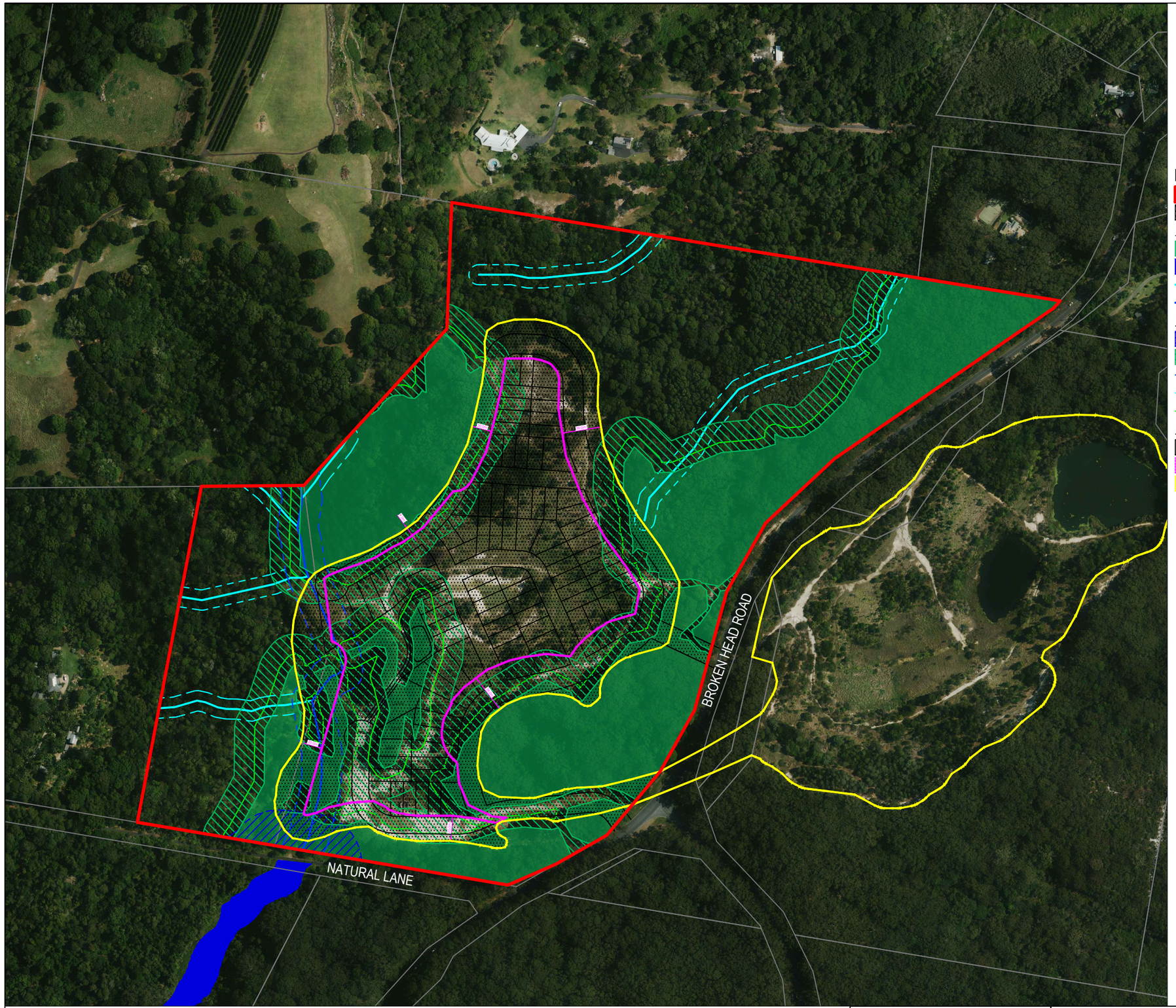
FIGURE 12A

PREPARED: BW
DATE: 14 March 2024
FILE: N202009_BDAR_20240314.dwg

TITLE

BYRON DCP
SECTION B1



LEGEND

- Subject Site
- Proposed Impact Area

Byron DCP - Section B1 - Red Flagged Areas

- Old growth including very large native trees, stags and hollow-bearing trees
- Important wetlands (offsite)
- 1st order stream
- 2nd order stream

Byron DCP - Section B1 - Ecological Setbacks

- 50m setback to important wetlands (offsite)
- 30m setback to old growth
- 20m setback to 2nd order stream
- 10m setback to 1st order stream
- 10m setback to very large native trees, stags and hollow-bearing trees

Proposed Development Layout

- Proposed Lots
- Asset Protection Zone (APZ)
- Existing Zone Boundary

N

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; Winten Property Group (20230918-ACAD-240392-PSK-001 to 003[A].dwg); MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

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Byron Shire Council LGA

FIGURE 12B

PREPARED: BW
DATE: 8 March 2024
FILE: N202009_BDAR_20240306.dwg

TITLE

BYRON DCP
SECTION B1

TABLE 6
RED FLAGGED VALUES ON OR ADJOIING THE SUBJECT SITE

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
HEV Vegetation						
Threatened Ecological Communities	✓	PCTs 3121 and 3011 are representative of the TEC **Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions** listed within schedules of the BC Act, and potentially representative of the TEC **Lowland Rainforest of Subtropical Australia** listed within schedules of the EPBC Act.	30 m	The following direct impacts will occur to TECs: • PCT 3121 – 0.07 ha (5%) • PCT 3011 – 0.06 ha (6%)	Encroachment in polygon and on ecological setback buffer.	The proposed works will directly impact a small area of existing TECs on the site and encroach in some areas on the arbitrary 30 m buffer to these TECs required under Chapter B1. As can be seen on **FIGURE 12A**, it is noted that much of the DCP nominated setback area occurs on land subject to a high degree of clearing and disturbance due to previous quarry works. The proposed development has been situated and designed to reduce impacts on TECs by generally restricting development to areas of the site that were historically disturbed as part of the former quarry operations. Current / past land use over the subject site has resulted in extensive land clearing within the quarry pit as evidenced by the minimal occurrence of large remnant trees outside of the retained forest patches. The better-quality areas of TECs will be retained and protected on the subject site where possible. Impacts on TECs are generally restricted to the disturbed edge adjoining the quarry pit and the encroachment into the 30 m buffer will also occur within these disturbed areas. In addition, the project has been designed to incorporate perimeter roads at the bushland interface. The perimeter roads will provide a hard edge between the development area and areas of retained vegetation, which will minimise potential edge effects such as weed control, management of exotic species and boundary encroachments by private landowners. The perimeters roads will also serve as part of the Asset Protection Zones for majority of the lots. For areas requiring deeper APZs at the interface (such as the north-eastern corner), these areas will be managed as Outer Protection Areas (OPA) and managed through selective thinning and planting of fire resistant vegetation. These OPAs are will be managed under community title arrangements, so as to not place a burden on council. It is proposed to rehabilitate the retained vegetation (including TECs) on site and revegetate disturbed areas where appropriate with locally occurring native species to achieve fully structured vegetation communities. These works will enhance and restore

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
						the existing TECs to be retained and reduce detrimental edge effects and other disturbance related impacts on the retained TECs. A Vegetation Management and Rehabilitation Plan (VMRP) is proposed to be prepared outlining these works and approved by Council. Furthermore, using the Biodiversity Assessment Method Calculator (BAM-C), a total of four (4) ecosystem credits have been calculated as applicable for the loss of TECs. These include: • PCT 3011-Far North Lowland Subtropical Rainforest = 2 credits; • PCT 3121-Broken Head Lowland Rainforest = 2 credits; As discussed throughout this BDAR, in accordance with the requirements of the NSW BOS, proponents have two (2) primary ways that they can satisfy their offset credit obligation: 1. They can identify and purchase the required 'like for like' credits in the market and then retire those credits via the Office of Environment and Heritage (OEH) Biodiversity Offsets and Agreement Management System (BOAMS). OR 2. They can use the Offsets Payment Calculator to determine the cost of their credit obligation and transfer this amount to the Biodiversity Conservation Fund via the OEH BOAMS. The responsibility for identifying and securing the offset obligation would then be transferred to the Biodiversity Conservation Trust. These credits will need to be purchased or retired as an offset for the removal of site vegetation.
Over-cleared vegetation types	☒	The subject site does not contain a vegetation type of which more than 70% has been cleared in the Catchment Management Area.	20 m	n/a	n/a	n/a
Over-cleared landscapes	☒	The subject site occurs with the Summervale Range which is not considered an over-cleared landscape	20 m	n/a	n/a	n/a
Old growth	✓	VZ1 and VZ4a are considered to be old growth.	30 m	The following direct impacts will occur to old growth: • VZ1 – 0.07 ha (5%) • VZ4a – 1.90 ha (20%)	Encroachment in polygon and on ecological setback buffer.	The proposed works will directly impact a small area of existing old growth forest on the site and encroach in some areas on the arbitrary 30 m buffer to these old growth forests required under Chapter B1. As can be seen on **FIGURE 12B**, it is noted that much of the DCP

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
						nominated setback area occurs on land subject to a high degree of clearing and disturbance due to previous quarry works. The proposed development has been situated and designed to reduce impacts on significant vegetation by generally restricting development to areas of the site that were historically disturbed as part of the former quarry operations. Current / past land use over the subject site has resulted in extensive land clearing within the quarry pit as evidenced by the minimal occurrence of large remnant trees outside of the retained forest patches. The better-quality areas of significant vegetation will be retained and protected on the subject site where possible. Impacts on old growth forests are generally restricted to the disturbed edge adjoining the quarry pit and the encroachment into the 30 m buffer will also occur within these disturbed areas. In addition, the project has been designed to incorporate perimeter roads at the bushland interface. The perimeter roads will provide a hard edge between the development area and areas of retained vegetation, which will minimise potential edge effects such as weed control, management of exotic species and boundary encroachments by private landowners. The perimeters roads will also serve as part of the Asset Protection Zones for majority of the lots. For areas requiring deeper APZs at the interface (such as the north-eastern corner), these areas will be managed as Outer Protection Areas (OPA) and managed through selective thinning and planting of fire resistant vegetation. These OPAs will be managed under community title arrangements, so as to not place a burden on council. It is proposed to rehabilitate the retained vegetation (including old growth forests) on site and revegetate disturbed areas where appropriate with locally occurring native species to achieve fully structured vegetation communities. These works will enhance and restore the existing significant vegetation to be retained and reduce detrimental edge effects and other disturbance related impacts. A Vegetation Management and Rehabilitation Plan (VMRP) is proposed to be prepared outlining these works and approved by Council.

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
						In addition, whilst stags and hollow-bearing trees occur within the vegetated areas of the subject site and none are expected to be impacted by the proposed development, if habitat trees must be removed following final design, hollows will be offset at a 1:1 offset ratio through the provision of nest boxes. For each hollow or pipe identified in any removed trees, compensation in the form of suitable sized nesting boxes will be installed in the adjacent VZs. The exact number of nest boxes will be determined post clearing by a fauna spotter catcher / ecologist who is required to accurately document the number of hollows removed. Note is to be made of the sizes and types of hollows removed so to ensure that adequate numbers and types of nest boxes have been provided. The exact type, location and orientation of the nest box is to be determined and the installation completed by a suitably qualified Ecologist. Furthermore, Using the Biodiversity Assessment Method Calculator (BAM-C), a total of forty-nine (49) ecosystem credits have been calculated as applicable for the loss of this vegetation: • VZ1 = 2 credits; and • VZ4a = 66 credits. As discussed throughout this BDAR, in accordance with the requirements of the NSW BOS, proponents have two (2) primary ways that they can satisfy their offset credit obligation: 3. They can identify and purchase the required 'like for like' credits in the market and then retire those credits via the Office of Environment and Heritage (OEH) Biodiversity Offsets and Agreement Management System (BOAMS). OR 4. They can use the Offsets Payment Calculator to determine the cost of their credit obligation and transfer this amount to the Biodiversity Conservation Fund via the OEH BOAMS. The responsibility for identifying and securing the offset obligation would then be transferred to the Biodiversity Conservation Trust. These credits will need to be purchased or retired as an offset for the removal of site vegetation.

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
Important wetlands	✓	Coastal wetlands are mapped in areas adjacent to the south-western corner and northern boundary of the subject site. The required Ecological Setback associated with the coastal wetland to the southwest extends onto the subject site.	50 m	n/a	n/a	n/a
Other wetlands	☒	The site does not contain any other wetlands.	20 m	n/a	n/a	n/a
Other bushland on a slope >18 degrees	☒	The subject site does not contain slopes greater than 18 degrees.	20 m	n/a	n/a	n/a
Pre-existing protected habitat	☒	No pre-existing protected habitat occurs onsite.	20 m or as above, whichever is larger	n/a	n/a	n/a
Wildlife Corridors						
Land within a defined wildlife corridor	✓	The subject site is mapped as occurring in the Broken Head Regional Corridor delineated by the Key Habitats and Corridors mapping prepared by the DECCW.	20 m	The proposed development will remove 3.04 ha of vegetation (i.e. VZs 1, 3B, 4A, 4B and 5) and 3.62 ha of regeneration / revegetation areas (i.e. VZs 11a & 11b) from with the mapped wildlife corridor.	Encroachment in wildlife corridor	Most of the impact on the mapped wildlife corridor will occur within areas that have been historically cleared and disturbed. With this considered it is unlikely that this limited vegetation and degraded land would provide a significant contribution to regional or sub-regional corridors. It is proposed to rehabilitate the retained vegetation on site and revegetate disturbed areas where appropriate with locally occurring native species to achieve fully structured vegetation communities. These works will enhance the existing vegetation to be retained within mapped wildlife corridor and improve the value of the subject site as habitat for fauna groups. A Vegetation Management and Rehabilitation Plan (VMRP) is proposed to be prepared outlining these works and approved by Council. With the proposed retention of intact tracts of vegetation management/rehabilitation works, the subject site will remain a safe and viable corridor for wildlife occupying the broader landscape.
Threatened and Significant Species						
Areas with a species polygon for threatened fauna or other significant fauna that are known or predicted to occur at the site.	✓	Potentially suitable habitat (i.e. species polygon) is available for the following threatened species known or precited to occur on the subject site: • Black-tailed antechinus; • Common Planigale; • Masked owl; and • Powerful owl.	20 m	The proposed development will generally be located within cleared areas of the subject site; however, the following direct impacts on species polygons will occur: • Black-tailed antechinus – 0.13 ha; • Powerful owl – 1.97 ha;	Encroachment in polygon and on ecological setback buffer.	All threatened flora specimens occurring on the subject site will be retained and a minimum 10 m buffer to the proposed development as required by Chapter B1 will be provided. The majority of threatened fauna habitat will be retained and protected on the subject site, however the arbitrary 20 m buffer to these habitat areas required under Chapter B1 will not be achieved in all

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
				• Common planigale – 3.04 ha; • Masked owl – 2.85 ha.		areas. As can be seen on **FIGURES 12A and 12B**, it is noted that much of the DCP nominated setback area occurs on land subject to a high degree of clearing and disturbance due to previous quarry works. The proposed development has been situated and designed to reduce impacts on threatened species habitat by generally restricting development to areas of the site that were historically disturbed as part of the former quarry operations. Current / past land use over the subject site has resulted in extensive land clearing within the quarry pit as evidenced by the minimal occurrence of large remnant trees outside of the retained forest patches. The better-quality areas of threatened species habitat will be retained and protected on the subject site where possible. Impacts on threatened species habitat are generally restricted to the disturbed edge adjoining the quarry pit and the encroachment into the 10 m buffer will also occur within these disturbed areas. In addition, the project has been designed to incorporate perimeter roads at the bushland interface. The perimeter roads will provide a hard edge between the development area and areas of retained vegetation, which will minimise potential edge effects such as weed control, management of exotic species and boundary encroachments by private landowners. The perimeters roads will also serve as part of the Asset Protection Zones for majority of the lots. For areas requiring deeper APZs at the interface (such as the north-eastern corner), these areas will be managed as Outer Protection Areas (OPA) and managed through selective thinning and planting of fire resistant vegetation. These OPAs will be managed under community title arrangements, so as to not place a burden on council. It is proposed to rehabilitate the retained vegetation (including threatened species habitat) on site and revegetate disturbed areas where appropriate with locally occurring native species to achieve fully structured vegetation communities. These works will enhance and restore the existing threatened species habitat to be retained and reduce detrimental edge effects and other disturbance related impacts on the threatened fauna. A Vegetation Management and Rehabilitation Plan (VMRP) is proposed to be

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
						prepared outlining these works and approved by Council. In addition, whilst stags and hollow-bearing trees occur within the vegetated areas of the subject site and none are expected to be impacted by the proposed development, if habitat trees must be removed following final design, hollows will be offset at a 1:1 offset ratio through the provision of nest boxes. For each hollow or pipe identified in any removed trees, compensation in the form of suitable sized nesting boxes will be installed in the adjacent VZs. The exact number of nest boxes will be determined post clearing by a fauna spotter catcher / ecologist who is required to accurately document the number of hollows removed. Note is to be made of the sizes and types of hollows removed so to ensure that adequate numbers and types of nest boxes have been provided. The exact type, location and orientation of the nest box is to be determined and the installation completed by a suitably qualified Ecologist. Furthermore, using the BAM-C, a total of 157 fauna species credits have been calculated as applicable for the unavoidable loss of site vegetation as follows: • Black-tailed Antechinus (assumed present) = 4 credits; • Powerful Owl (assumed present) = 46 credits; • Common planigale = 61 credits; and • Masked Owl (assumed present) = 46 credits. As discussed throughout this BDAR, in accordance with the requirements of the NSW BOS, proponents have two (2) primary ways that they can satisfy their offset credit obligation: 1. They can identify and purchase the required 'like for like' credits in the market and then retire those credits via the OEH BOAMS. OR 2. They can use the Offsets Payment Calculator to determine the cost of their credit obligation and transfer this amount to the Biodiversity Conservation Fund via the OEH BOAMS. The responsibility for identifying and securing the offset obligation would then be transferred to the Biodiversity Conservation Trust.

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
						These credits will need to be purchased or retired as an offset for the removal of site vegetation.
Areas with a species polygon for threatened flora or other significant flora that are known or predicted to occur at the site.	✓	The following threatened flora species have been recorded from the subject site: • Corokia; • Red-flowered king of the fairies; • Scrub turpentine; and • Cryptic forest twiner.	10 m	The proposed development will generally be located within cleared areas of the subject site. There will be no direct impacts on threatened flora species however, the following potential impacts on threatened flora habitat are expected: • Corokia – no impacts; • Red-flowered king of the fairies – 0.13 ha; • Scrub turpentine – no impacts; and • Cryptic Forest Twiner – 3.04 ha.	Encroachment in polygon and on ecological setback buffer.	All threatened flora specimens occurring on the subject site will be retained and a minimum 10 m buffer to the proposed development as required by Chapter B1 will be provided. The majority of threatened flora habitat will be retained and protected on the subject site, however the arbitrary 10 m buffer to these habitat areas required under Chapter B1 will not be achieved. As can be seen on **FIGURES 12A and 12B**, it is noted that much of the DCP nominated setback area occurs on land subject to a high degree of clearing and disturbance due to previous quarry works. The proposed development has been situated and designed to reduce impacts on threatened species habitat by generally restricting development to areas of the site that were historically disturbed as part of the former quarry operations. Current / past land use over the subject site has resulted in extensive land clearing within the quarry pit as evidenced by the minimal occurrence of large remnant trees outside of the retained forest patches. The better-quality areas of threatened species habitat will be retained and protected on the subject site where possible. Impacts on threatened species habitat are generally restricted to the disturbed edge adjoining the quarry pit and the encroachment into the 10 m buffer will also occur within these disturbed areas. In addition, the project has been designed to incorporate perimeter roads at the bushland interface. The perimeter roads will provide a hard edge between the development area and areas of retained vegetation, which will minimise potential edge effects such as weed control, management of exotic species and boundary encroachments by private landowners. The perimeters roads will also serve as part of the Asset Protection Zones for majority of the lots. For areas requiring deeper APZs at the interface (such as the north-eastern corner), these areas will be managed as Outer Protection Areas (OPA) and managed through selective thinning and planting of fire resistant vegetation. These OPAs will be managed under community title arrangements, so as to not place a burden on council.

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
						It is proposed to rehabilitate the retained vegetation (including threatened species habitat) on site and revegetate disturbed areas where appropriate with locally occurring native species to achieve fully structured vegetation communities. These works will enhance and restore the existing threatened species habitat to be retained and reduce detrimental edge effects and other disturbance related impacts on the threatened flora. A Vegetation Management and Rehabilitation Plan (VMRP) is proposed to be prepared outlining these works and approved by Council. Furthermore, using the BAM-C, a total of 84 flora species credits have been calculated as applicable for the unavoidable loss of site vegetation as follows: • Red-flowered king of the fairies = 4 credits; and • Cryptic Forest Twiner (assumed present) = 80 credits. As discussed throughout this BDAR, in accordance with the requirements of the NSW BOS, proponents have two (2) primary ways that they can satisfy their offset credit obligation: 1. They can identify and purchase the required 'like for like' credits in the market and then retire those credits via the OEH BOAMS. OR 2. They can use the Offsets Payment Calculator to determine the cost of their credit obligation and transfer this amount to the Biodiversity Conservation Fund via the OEH BOAMS. The responsibility for identifying and securing the offset obligation would then be transferred to the Biodiversity Conservation Trust. These credits will need to be purchased or retired as an offset for the removal of site vegetation.
Koala Habitat						
Koala habitat outside of areas defined within a Comprehensive Koala Plan of Management.	☒	Koala habitat is not mapped on the subject site but is within the area defined under the BCCKPoM.	20 m	n/a	n/a	n/a

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
Isolated or scattered koala use trees with evidence of koala activity	☒	No evidence of koalas was recorded during field surveys.	20 m	n/a	n/a	n/a
Any other areas where koalas are present and/or koala habitat is planted with public monies.	☒		20 m	n/a	n/a	n/a
Waterways and Riparian Areas (from the top of the bank)						
First order stream	✓	Several waterways are mapped on the subject site. This includes two (2) first order watercourse in the northern portion of the site and a second order watercourse that runs along the southwestern boundary in association with several dams.	10 m	The proposed development will impact on the following: • approximately 50 m of a 2nd order stream plus the associated buffer in the southwestern extent of the subject site; and • A negligible area (approximately 5 m) of buffer to a 1st order stream in the northeastern extent.	Encroachment in waterway and/or on ecological setback buffer.	Whilst there will be minor direct impacts to mapped waterways and associated buffers on the subject site as a result of future subdivision development (e.g. construction of roads, establishment of APZs), it is important to note that these impacts will occur within areas of the disused quarry. These areas are cleared and degraded, and in this regard the watercourses in these locations are in a highly modified and unnatural state, noting that constructed dams also occur along the alignment, and therefore impacts are not considered to be significant..
Second order stream	✓		20 m			
Third order stream	☒		30 m			
Fourth order stream	☒		40 m			
Estuarine area	☒		50 m			
Flying Fox Camps						
Year round or intermittent	☒	No known flying fox camps are located in the vicinity of the subject site.	100 m	n/a	n/a	n/a
Other Habitat Features						
Very large native trees (Local native trees that have a trunk diameter of greater than or equal to 0.8 metres at 1.4 metres above the natural ground level)	✓	Large native trees occur within VZ1 and VZ4a.	10 m	n/a	n/a	Whilst large native trees occur within the vegetated areas of the subject site, none will be impacted by the proposed development.
Stags and hollow-bearing trees	✓	Stags and hollow-bearing trees occur within VZ1 and VZ4a.	10 m	n/a	n/a	Whilst stags and hollow-bearing trees occur within the vegetated areas of the subject site, none are expected to be impacted by the proposed development.

Red Flags	Applicable to Subject Site?	Details	Required Ecological Setback	Predicted Impacts	Potential Non-compliance with DCP Provisions	Justification and/or Compensation
						As a contingency, if habitat trees must be removed following final design, hollows will be offset at a 1:1 offset ratio through the provision of nest boxes. For each hollow or pipe identified in any removed trees, compensation in the form of suitable sized nesting boxes will be installed in the adjacent VZs. The exact number of nest boxes will be determined post clearing by a fauna spotter catcher / ecologist who is required to accurately document the number of hollows removed. Note is to be made of the sizes and types of hollows removed so to ensure that adequate numbers and types of nest boxes have been provided. The exact type, location and orientation of the nest box is to be determined and the installation completed by a suitably qualified Ecologist.
Raptor nests	☒	No known raptor nests were recorded on or are known from the subject site.	50 m	n/a	n/a	n/a

5.4.3 Byron Coast Comprehensive Koala Plan of Management 2015 (BCCKPoM)

5.4.3.1 Background

The BCCKPoM was adopted by BSC in August 2016 on the back of a Byron Coast Koala Habitat Study prepared in 2012 (Biolink 2012). In accordance with the objectives of the Koala SEPP 2021 (now part of the Biodiversity and Conservation SEPP) and the approved NSW Koala Recovery Plan, the overarching vision of the BCCKPoM is that the Byron Coast koala population will be recovered to more sustainable levels over the next two decades.

The BCCKPoM applies to those lands within the identified koala planning area. The overall vision of the Plan is to enable a long-term, sustainable future for koala populations inhabiting the koala planning area. This vision is envisaged to be realised by way of the following aims:

a) an increase in the total area of potential koala habitat in central parts of the koala planning area by a minimum of 20% to at least 1,800 ha, including consolidated linkages within and beyond the koala planning area;

b) the presence of a self-sustaining, stable koala population of 250 - 300 individuals distributed equitably along the Byron Coast; and

c) a community that is collectively informed and committed to a sustainable future for the Byron Coast koalas.

The Koala Management Framework is expressed in the BCCKPoM through:

- the identification and classification of koala habitat;
- the identification of areas known to contain resident koala populations;
- the division of the koala planning area into Koala Management Areas (KMAs) and Koala Management Precincts (KMPs); and
- management principles for habitat buffer areas and koala corridors.

The subject site is located within the South Byron Coast KMA and within the Suffolk Park – Broken Head KMP, which covers an area of approximately 929 ha. The management objective for this KMP is to *enable an increase in the habitat occupancy rate by koalas*.

5.4.3.2 Applicability to the Proposed Development

As per Part 12, Table 10 'Development Assessment Flowchart' of the BCCKPoM several criteria are to be addressed to determine the levels of assessment and to govern management considerations. The steps are as follows:

- **Step 1 – Does the application require development consent?** Yes.
- **Step 2 – Does the application include land within the Byron coast koala planning area?** Yes.
- **Step 3 – Does the application relate to land > 1 hectare?** Yes.
- **Step 4 – Does the land contain potential koala habitat (PKH)?** No

For the purposes of the BCCKPoM, PKH is defined in SEPP44 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*.' The trees within Schedule 2 include:

- Forest red gum (*Eucalyptus tereticornis*);
- Tallowwood (*E. microcorys*);
- Grey gum (*E. punctata*);
- Ribbon or manna gum (*E. viminalis*);
- River red gum (*E. camaldulensis*);
- Broad leaved scribbly gum (*E. haemastoma*);
- Scribbly gum (*E. signata*);
- White box (*E. albens*);
- Bimble box or poplar box (*E. populnea*); and
- Swamp mahogany (*E. robusta*).

Koala trees as listed above do not constitute at least 15% of the total number of trees in the upper or lower strata of the tree component of any VZ on the subject site. The subject site therefore does not contain PKH and the BCCKPoM does not apply.

6 IMPACT SUMMARY

6.1 Introduction

This section of the BDAR identifies, assesses, and summarises the likely direct and indirect impacts of the proposed development. Furthermore, impacts of the proposed development are identified that are:

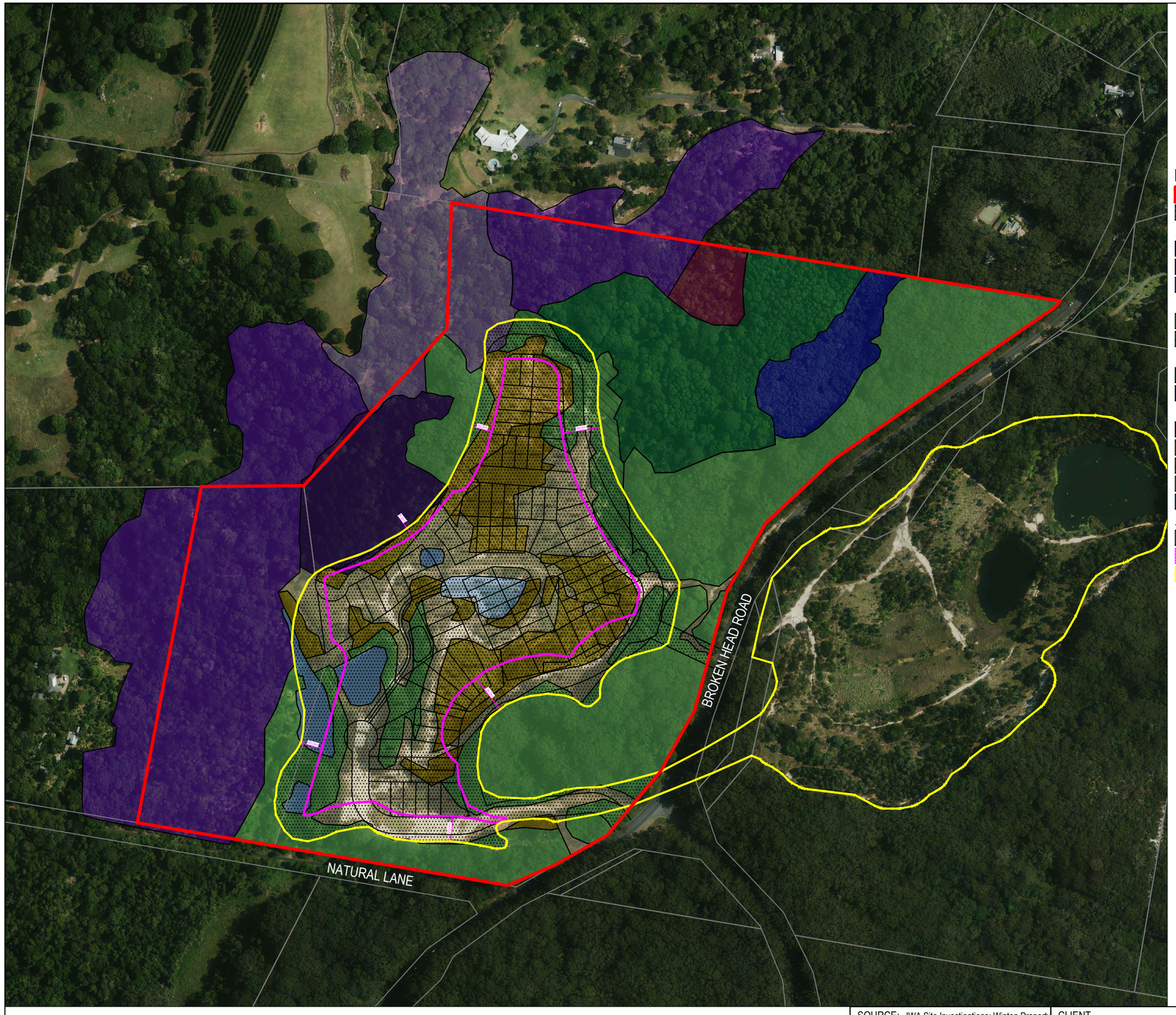
- Considered to be potentially serious and irreversible impacts (in accordance with Section 10.2); and
- Require offsets (in accordance with Section 9.2 of the BAM).

6.2 Direct Impacts on Native Vegetation

The proposed development has been located to avoid impacts on better quality vegetation (i.e. areas with a high vegetation integrity score) as far as practicable but will result in unavoidable impacts on 2.10 ha of intact native vegetation, 0.94 ha of regrowth vegetation and 3.62 ha of planted native vegetation.

Direct impacts on vegetation communities as a result of the proposed additional clearing are summarised in **TABLE 7** and shown in **FIGURE 13**.

The direct impacts on VZs 1, 3b, 4a, 4b and 5 will reduce the vegetation integrity score over these areas from 59.9, 66.4, 68.9, 22.6, 63.9 to 0 respectively.



N

LEGEND

- Subject Site
- Proposed Impact Area

Vegetation Zones (VZ)

- VZ 1 - Tall closed rainforest (*Araucaria cunninghamii*) (PCT 3121)
- VZ2 - Tall closed subtropical rainforest (Mixed rainforest species) (PCT 3002)
- VZ3B - Mid-high closed subtropical rainforest (Mixed rainforest species +/- *Cinnamomum camphora*) (PCT 3011)
- VZ4A - Tall open/closed wet sclerophyll forest (*Eucalyptus pilularis*) (PCT 3147)
- VZ4B - Low to mid-high regrowth (*Acacia melanoxylon +/- Eucalyptus pilularis*) (PCT 3147 - derived)
- VZ5 - Tall closed wet sclerophyll forest (*Lophostemon confertus*) (PCT 3148)
- VZ7 - Mid-high open/closed swamp sclerophyll forest (*Melaleuca quinquenervia*) (PCT 3990)
- VZ9 - Low closed shrubland (Heathland) (PCT 3801)
- VZ11a - Advanced regeneration/revegetation areas (3147 - derived)
- VZ11b - Recent regeneration/revegetation works (3147 - derived)
- Cleared land
- Dams

Proposed Development Layout

- Proposed Lots
- Asset Protection Zone (APZ)
- Existing Zone Boundary

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; Winten Property Group (20230918-ACAD-240392-PSK-001 to 003[A].dwg); MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

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Winten Property Group

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BDAR
Lot 1 DP123302
Broken Head Road, Suffolk Park NSW
Byron Shire Council LGA

FIGURE 13

PREPARED: BW
DATE: 8 March 2024
FILE: N202009_BDAR_20240306.dwg

TITLE

IMPACT ON VEGETATION ZONES

TABLE 7
DIRECT IMPACTS ON VEGETATION ZONES

Vegetation Zone	PCT	TEC	Direct Impacts# (%)
VZ1: Tall closed rainforest (*Araucaria cunninghamii*)	**3121** - Broken Head Lowland Rainforest (Good condition)	TEC **Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions** listed within schedules of the BC Act, and potentially representative of the TEC **Lowland Rainforest of Subtropical Australia** listed within schedules of the EPBC Act	0.07 ha (5%)
VZ3b: Mid-high closed subtropical rainforest (Mixed rainforest species +/- *Cinnamomum camphora*)	**3011** - Far North Lowland Subtropical Rainforest (Good condition)	TEC **Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions** listed within schedules of the BC Act, and potentially representative of the TEC **Lowland Rainforest of Subtropical Australia** listed within schedules of the EPBC Act	0.06 ha (6%)
VZ4a: Tall open/closed wet sclerophyll forest (*Eucalyptus pilularis*)	**3147** - Far North Brush Box-Bloodwood Wet Forest (Good condition)	n/a	1.90 ha (20%)
VZ4b: Low to mid-high regrowth (*Acacia melanoxylon +/- Eucalyptus pilularis*)	**3147** - Far North Brush Box-Bloodwood Wet Forest (Regrowth)	n/a	0.94 ha (81%)
VZ5: Tall closed wet sclerophyll forest (*Lophostemon confertus*)	**3148** - Far North Brush Box-Walnut Wet Forest (Good condition)	n/a	0.07 ha (2%)
VZ11a: Advanced regeneration/revegetation areas	**3147** - Far North Brush Box-Bloodwood Wet Forest (Derived)	n/a	1.93 ha (96%)
VZ11b: Recent regeneration/revegetation works	**3147** - Far North Brush Box-Bloodwood Wet Forest (Derived)	n/a	1.68 ha (100%)

6.3 Direct Impacts on Threatened Species

Four (4) species credit species were recorded on or adjacent to the subject land:

- Corokia (*Corokia whiteana*) - a small clump comprised of seven (7) individuals was recorded within VZ4a in the south-eastern portion of the site (**FIGURE 9)**. A species polygon has been identified on the subject site and includes a 30m buffer to these plants (**FIGURE 14A**).
- Red-flowered king of the fairies (*Oberonia titania*) - a single small specimen was recorded within VZ1 in the western portion of the site (**FIGURE 9)**. A species polygon has been identified on the subject site and includes VZ1 and VZ3b (**FIGURE 14B**).
- Common planigale (*Planigale maculata*) – this species was recorded from within VZ4a in the south-eastern portion of the subject site (**FIGURE 9**). A species polygon has been identified on the subject site and includes VZs 1, 2, 3b, 4a, 4b, 5 and 9 (**FIGURE 14A**).
- Scrub turpentine (*Rhodamnia rubescens*) - one (1) specimen was recorded within VZ6 in the north-eastern portion of the subject site, and one (1) specimen was recorded within VZ3 in the north-western portion of the subject site (**FIGURE 9**). A species polygon has been identified on the subject site and includes a 30m buffer to these plants (**FIGURE 14B**).

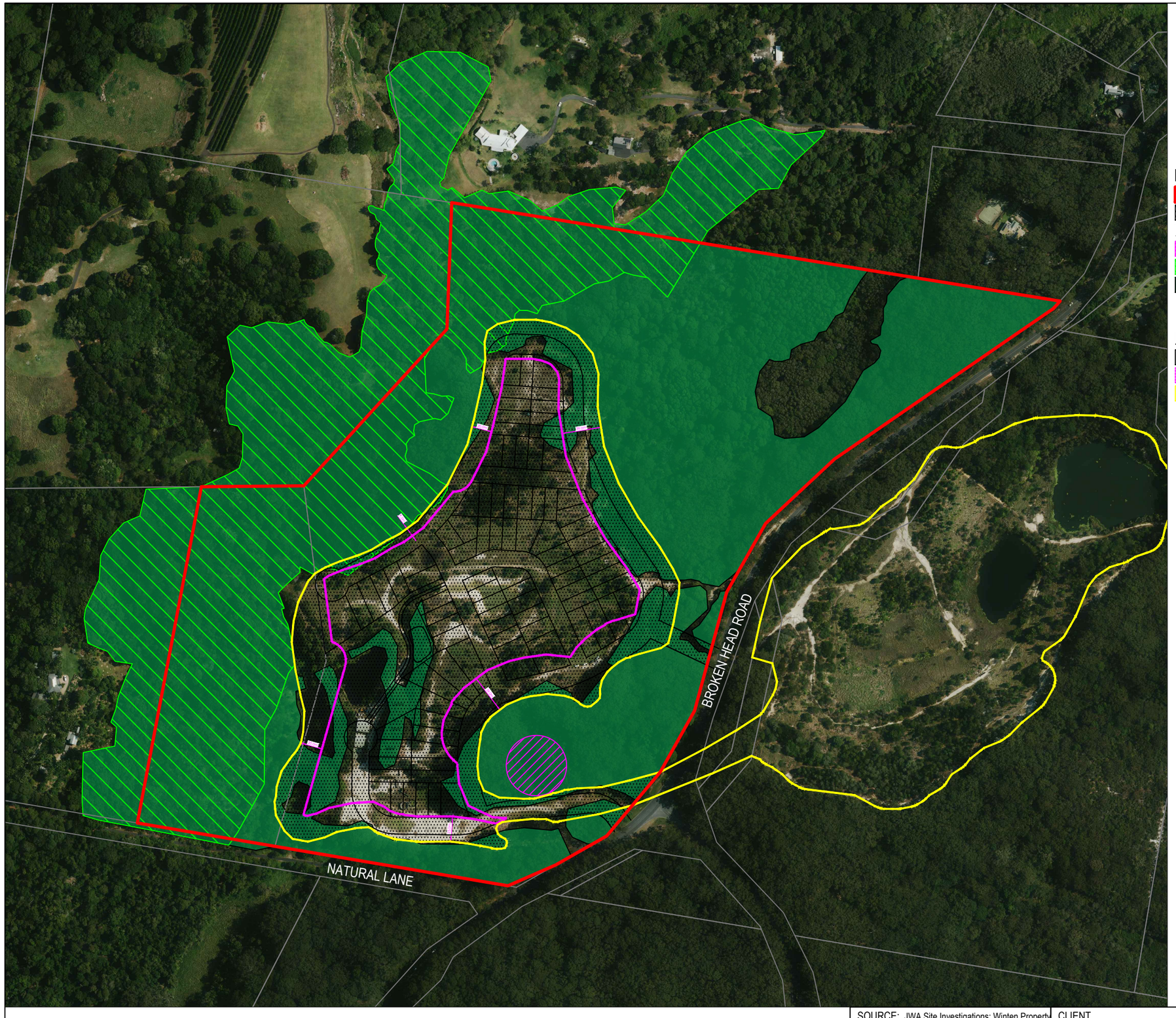
An additional five (5) threatened fauna species have been assumed to be present in accordance with the requirements of Section 5.3.1 of the BAM as site surveys were not completed for all species during the specified time of year or using the appropriate survey methods:

- Black-tailed Antechinus (*Antechinus arktos*) - a species polygon has been identified on the subject site and includes VZs 1, 2, and 3b (**FIGURE 14A**);
- Barking Owl (*Ninox connivens*) - a species polygon has been identified on the subject site and includes VZs 2, 4a and 5 (**FIGURE 14B**);
- Powerful Owl (*Ninox strenua*) - a species polygon has been identified on the subject site and includes VZs 2, 4a and 5 (**FIGURE 14B**);
- Cryptic Forest Twiner (*Tylophora woollsii*) - a species polygon has been identified on the subject site and includes VZs 1, 2, 3b, 4a, 4b, 5 and 9 (**FIGURE 14A**); and
- Masked Owl (*Tyto novaehollandiae*) - a species polygon has been identified on the subject site and includes VZs 2, 4a and 5 (**FIGURE 14B**).

Direct impacts on these species polygons as a result of the proposed development are shown in **FIGURES 14A and 14B** and amount to:

- Black-tailed Antechinus (*Antechinus arktos*) – 0.13 ha;
- Corokia (*Corokia whiteana*) – no impacts;
- Barking owl (*Ninox connivens*) - 1.97 ha;
- Powerful Owl (*Ninox strenua*) – 1.97 ha;

- Red-flowered king of the fairies (*Oberonia titania*) – 0.13 ha;
- Common planigale (*Planigale maculata*) – 3.04 ha;
- Scrub turpentine (*Rhodamnia rubescens*) – no impacts;
- Cryptic Forest Twiner (*Tylophora woollsii*) – 3.04 ha; and
- Masked Owl (*Tyto novaehollandiae*) – 2.85 ha.



N

LEGEND

- Subject Site
- Proposed Impact Area

Threatened Species Polygon

- Species polygon for Corokia (Corokia whiteana)
- Species polygon for Black-tailed Antechinus (*Antechinus arktos*)
- Species polygon for:
  - Common Planigale (*Planigale maculata*)
  - Cryptic Forest Twiner (*Tylophora woollsii*)

Proposed Development Layout

- Proposed Lots
- Asset Protection Zone (APZ)
- Existing Zone Boundary

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; Winten Property Group (20230918-ACAD-240392-PSK-001 to 003[A].dwg); MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

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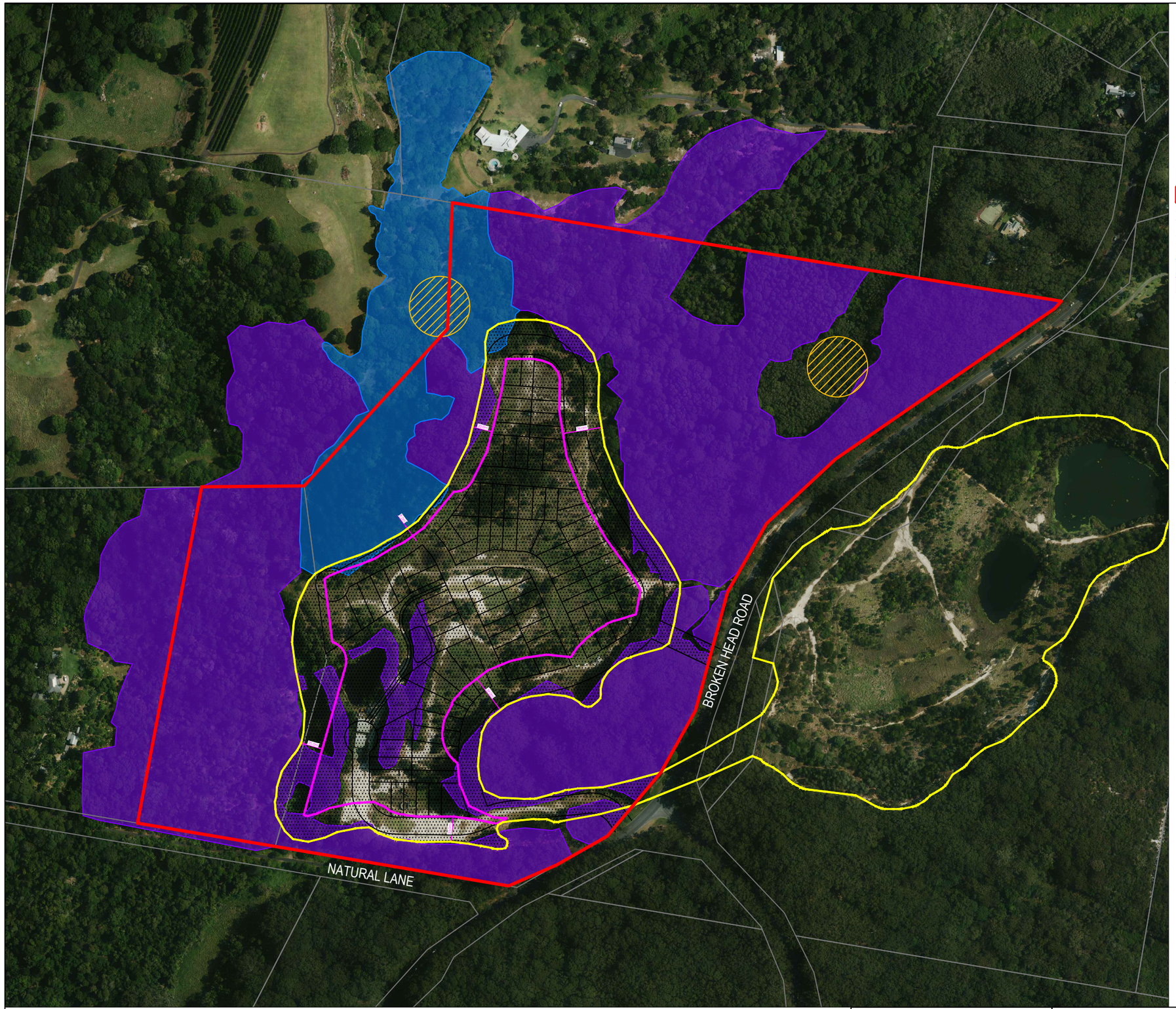
FIGURE 14A

PREPARED: BW
DATE: 8 March 2024
FILE: N202009_BDAR_20240306.dwg

TITLE
IMPACT ON THREATENED SPECIES POLYGONS



LEGEND

- Subject Site
- Proposed Impact Area

Threatened Species Polygon

- Species polygon for Scrub Turpentine (Rhodamnia rubescens)
- Species polygon for Red-flowered King of the Fairies (*Oberonia titania*)
- Species polygon for:
  - Powerful owl (*Ninox strenua*)
  - Barking owl (*Ninox connivens*)
  - Masked owl (*Tyto novaehollandiae*)

Proposed Development Layout

- Proposed Lots
- Asset Protection Zone (APZ)
- Existing Zone Boundary

N

Scale 1 : 4000

0 50m 100m 150m 200m

SOURCE: JWA Site Investigations; Winten Property Group (20230918-ACAD-240392-PSK-001 to 003[A].dwg); MetroMap Aerial dated 31/10/23

SCALE: 1 : 4000 @ A3

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FIGURE 14B

PREPARED: BW
DATE: 14 March 2024
FILE: N202009_BDAR_20240314.dwg

TITLE

IMPACT ON THREATENED SPECIES POLYGONS

6.4 Potential Indirect Impacts

The proposed development may contribute to potential indirect impacts on native vegetation and habitat beyond the subject site. A summary of indirect impacts is provided in **TABLE 8**, including a description of the nature, extent and duration of impacts, along with the threatened species, threatened ecological communities and habitats likely to be affected.

TABLE 8
SUMMARY OF INDIRECT IMPACTS

Indirect impact	Likelihood of impact occurring	Extent and nature of impact	Timing and duration of impact	Threatened species and/or ecological communities and habitats affected
Inadvertent impacts on adjacent habitat or vegetation	Low	Accidental damage to vegetation outside the proposed limit of clearing, particularly contiguous vegetation to the north of the subject site	During vegetation clearing works	Adjoining vegetation representing potential habitat for threatened fauna species
Reduced viability of adjacent habitat due to edge effects, noise, dust or light spill	Low	The viability of subject site and adjacent habitats is currently reduced due to existing levels of disturbance, fragmentation of habitat and associated edge effects	The proposed works are unlikely to represent a significant increase to the duration of this impact	n/a
Transport of weeds and pathogens from the site to adjacent vegetation	Low	There is some potential for transport of weeds to habitats occurring immediately adjacent to the site as a result of construction activities and garden escapees	There is some potential for weed material to be transported during vegetation clearing works and long-term following occupation of the subject site	Adjoining vegetation representing potential habitat for threatened fauna species
Increased risk of starvation, exposure and loss of shade or shelter	Low	Disturbance to small areas of habitat on the subject site (i.e. vegetation, logs and leaf litter) represents a minor reduction in shade and shelter sites. However, higher quality habitat will be retained in adjacent vegetation.	Permanent removal of some shade and shelter sites	Primarily ground-dwelling fauna that are able to occupy low condition, highly modified habitats
Loss of breeding habitats	Low	Disturbance to small areas of potential breeding habitat for common native species may occur. However, higher quality habitat will	During vegetation clearing works	n/a

Indirect impact	Likelihood of impact occurring	Extent and nature of impact	Timing and duration of impact	Threatened species and/or ecological communities and habitats affected
		be retained offsite in adjacent vegetation.		
Trampling of threatened flora species	Low	There is some potential for accidental trampling of threatened flora species occurring in site habitats associated with human access	Long-term following occupation of the subject site	Threatened flora seedlings potentially occurring within adjacent habitats
Inhibition of nitrogen fixation and increased soil salinity	Unlikely	The extent of this impact is expected to be negligible given the current levels of modification and disturbance	n/a	n/a
Fertiliser drift	Nil	Fertiliser spray is not proposed	n/a	n/a
Rubbish dumping	Moderate	There is some potential for rubbish dumping in habitats occurring immediately adjacent to future lots	Long-term following occupation of the subject site	Adjoining vegetation representing potential habitat for threatened fauna species
Wood collection	Moderate	There is potential for wood collection for firewood from within habitats occurring immediately adjacent to future lots	Long-term following occupation of the subject site	Logs on the ground (particularly hollow logs) represent potential habitat for ground-dwelling fauna species
Bush rock removal and disturbance	Nil	No areas containing bush rock will be disturbed as a result of the proposed development	n/a	n/a
Increase in predatory species or pest animal populations	Low-Moderate	There is some potential for a minor increase in the number of domestic animals straying in adjacent habitats. Stray dogs and cats have the potential to prey on native fauna	Long-term following occupation of the subject site	Threatened fauna species at risk of predation

Indirect impact	Likelihood of impact occurring	Extent and nature of impact	Timing and duration of impact	Threatened species and/or ecological communities and habitats affected
		species and may contribute to an increase in feral populations		
Increased risk of fire	Low	There is potential for a minor increase in the risk of fire spreading into adjacent bushland as a result of inappropriate and/or unauthorised fires	Long-term following occupation of the subject site	Adjoining vegetation representing potential habitat for threatened fauna species
Disturbance to specialist breeding and foraging habitat e.g. beach nesting for shorebirds	Nil	No specialist breeding and foraging habitat will be disturbed as a result of the proposed development	n/a	n/a
Alteration to drainage and hydrological regimes	Low	The proposed development may result in alterations to the current drainage and hydrological regimes on the subject site and adjoining areas	Long-term following occupation of the subject site	Adjoining vegetation representing potential habitat for threatened fauna species
Decline in water quality entering adjacent waterways e.g. sediment load, pH, influx of pollutants, nutrient loading	Low	There is some potential for a minor reduction in the quality of water leaving the subject site and entering adjacent waterways (e.g. sedimentation, nutrients/pollutants)	Long-term following occupation of the subject site	Threatened fauna and ecological communities associated with waterways occurring downstream of the subject land

6.5 Prescribed Biodiversity Impacts

6.5.1 Background

In accordance with Clause 6.1 of the BCR:

1) The impacts on biodiversity values of the following actions are prescribed (subject to subclause (2)) as biodiversity impacts to be assessed under the biodiversity offsets scheme:
    a. the impacts of development on the following habitat of threatened species or ecological communities:
        i. karst, caves, crevices, cliffs and other geological features of significance,
        ii. rocks,
        iii. human made structures,
        iv. non-native vegetation,
    b. the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,
    c. the impacts of development on movement of threatened species that maintains their lifecycle,
    d. the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development),
    e. the impacts of wind turbine strikes on protected animals,
    f. the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC.
2) The additional biodiversity impacts prescribed by this clause:
    a. are prescribed for the purposes of assessment and biodiversity assessment reports under the Act, but are not additional biodiversity impacts for the purposes of calculating the number and class of biodiversity credits that are required under a biodiversity assessment report to be retired to offset the residual impact on biodiversity values of proposed development, proposed clearing of native vegetation or proposed biodiversity certification of land, and
    b. may be taken into account in the determination of the biodiversity credits required to be retired (or other conservation measures required to be taken) under a planning approval or vegetation clearing approval or under a biodiversity certification of land.

6.5.2 Applicability to the Assessment Area

6.5.2.1 Habitat of Threatened Species or Ecological Communities

The removal of vegetation from the subject site is considered unlikely to impact on any TEC's or represent a long-term impact to shelter and refuge sites for threatened species. The local and bioregional persistence of any threatened species (with potential to use these areas as habitat) is unlikely to be significantly affected with consideration of the following:

- Small scale and extent of impact to this habitat feature;
- High degree of modification and disturbance levels within existing habitat;
- Sub-optimal nature of existing habitats within the impact area; and
- Relative abundance of comparable habitats in the immediate locality.

6.5.2.2 Connectivity

The subject site is located within a mapped Regional Corridor identified in the Key Habitats and Corridors mapping (DECCW) as shown in **FIGURE 8;** however, the majority of the site has been previously cleared and highly disturbed by the sites former use as a quarry. The proposed development will occur in areas that are predominantly cleared and highly disturbed. It is unlikely that this limited vegetation and degraded land would provide a significant contribution to regional or sub-regional corridors.

Following the removal of vegetation and earthworks, connectivity will be maintained (consistent with existing levels) via proposed revegetation, regeneration and managed landscape zones. It is therefore unlikely that the proposed removal of limited vegetation and disturbed land would result in adverse impacts on connectivity between meaningful habitat areas for threatened species.

6.5.2.3 Movement of Threatened Species that Maintains their Lifecycle

As discussed above, the proposed development will occur on an area that is predominantly cleared and highly disturbed. The development is therefore not considered to result in any additional impacts on the movements of threatened species that maintains their lifecycles.

6.5.2.4 Water Quality, Water Bodies and Hydrological Processes that Sustain Threatened Species and Threatened Ecological Communities

Although there are likely to be some minor alterations to the existing hydrology of the subject site, it is considered unlikely that the small-scale of proposed additional clearing would impact on water quality, water bodies and/or hydrological processes that sustain threatened species and threatened ecological communities.

6.5.2.5 Impacts of Wind Turbine Strikes

Not applicable to the proposed development.

6.5.2.6 Impacts of Vehicle Strikes

It is considered unlikely that the proposed development would increase the impact of vehicle strikes on any threatened species in the short-term. Future development and occupation of the subject site may contribute to an increase in the risk of vehicle strikes, particularly in areas where roads are proposed in close proximity to habitat edges.

6.6 Potential Serious and Irreversible Impacts

6.6.1 Background

Under clause 6.7(2) of the BCR, Serious and irreversible impacts (SAII) are those impacts that:

- Will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline; or
- Will further reduce the population of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size; or
- Are impacts on the habitat of a species or area of ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution; or
- Are impacts on a species or ecological community that is unlikely to respond to measures to improve its habitat and vegetation integrity and is therefore irreplaceable.

SAII on biodiversity values of a proposed development are the serious and irreversible impacts on biodiversity values that would remain after any proposed measures to avoid or minimise the impact on biodiversity values of the proposed development have been taken.

It is the role of the decision-maker to determine whether or not any of the residual impacts of a proposed development, activity, biodiversity certification or vegetation clearing on biodiversity values (that is, the impacts that would remain after any proposed avoid or mitigate measures have been taken) are serious and irreversible.

To assist a decision-maker with this task, the BC Act (and the BCR) provides a framework to make this determination. The framework consists of a series of principles defined in the BC Regulation and supporting guidance, provided for under section 6.5 of the BC Act, to interpret these principles.

6.6.2 Applicability to the Assessment Area

No SAII entities, as listed within Appendix 2: List of potential species (and their habitat) that meet the SAII principles and criteria within Guidance to assist a decision-maker to determine a serious and irreversible impact (the guide), occur on the subject site.

6.7 Impacts Requiring an Offset

6.7.1 Ecosystem Credits

Impacts on the following ecosystems will require offsets:

- PCT 3011-Far North Lowland Subtropical Rainforest;
- PCT 3121-Broken Head Lowland Rainforest;
- PCT 3147-Far North Brush Box-Bloodwood Wet Forest; and
- PCT 3148-Far North Brush Box-Walnut Wet Forest.

Refer to the BAM Biodiversity Credit Report (**APPENDIX 5**) for further details.

6.7.2 Species Credits

Impacts on the following species recorded from the subject site will require offsets:

- Red-flowered king of the fairies (*Oberonia titania*); and
- Common planigale (*Planigale maculata*).

A number of additional species credit species have been assumed to be present in accordance with the requirements of Section 5.3.1 of the BAM as site surveys were not completed during the specified time of year or using the appropriate survey methods:

- Black-tailed Antechinus (*Antechinus arktos*);
- Barking owl (*Ninox connivens*);
- Powerful Owl (*Ninox strenua*);
- Cryptic Forest Twiner (*Tylophora woollsii*); and
- Masked Owl (*Tyto novaehollandiae*).

Refer to the BAM Biodiversity Credit Report (**APPENDIX 5**) for further details.

7 BIODIVERSITY CREDIT REPORT

7.1 Ecosystem Credits

A total of seventy-two (72) ecosystem credits have been calculated as applicable for the unavoidable loss of native vegetation:

- PCT 3011-Far North Lowland Subtropical Rainforest = 2 credits;
- PCT 3121-Broken Head Lowland Rainforest = 2 credits;
- PCT 3147-Far North Brush Box-Bloodwood Wet Forest = 66 credits; and
- PCT 3148-Far North Brush Box-Walnut Wet Forest = 2 credits.

Refer to the BAM Biodiversity Credit Report (**APPENDIX 5**) for further details.

7.2 Species Credits

A total of three hundred and sixty-nine (369) species credits for threatened species have been calculated as applicable for the unavoidable loss of site vegetation as follows:

- Black-tailed Antechinus (*Antechinus arktos*) (**assumed present**) = 4 credits;
- Barking Owl (*Ninox connivens*) (**assumed present**) = 67 credits;
- Powerful Owl (*Ninox strenua*) (**assumed present**) = 67 credits;
- Red-flowered king of the fairies (*Oberonia titania*) = 4 credits;
- Common planigale (*Planigale maculata*) = 80 credits;
- Cryptic Forest Twiner (*Tylophora woollsii*) (**assumed present**) = 80 credits; and
- Masked Owl (*Tyto novaehollandiae*) (**assumed present**) = 67 credits.

Refer to the BAM Biodiversity Credit Report (**APPENDIX 5**) for further details.

REFERENCES

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APPENDIX 1 – ADAM MCARTHUR CV

Curriculum Vitae

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

ADAM MCARTHUR

DIRECTOR / PRINCIPAL ECOLOGIST

Biography

Adam has over 20 years experience as an ecological consultant/environmental scientist throughout NSW and Qld and is an accredited assessor to apply the Biodiversity Assessment Methodology (BAM) in accordance with the requirements of the NSW *Biodiversity Conservation Regulation 2017* (Certification No.: BAAS18069).

In addition to aptitude in a broad environmental management role, he possesses expertise in wildlife biology and is also proficient in flora and fauna assessments and vegetation mapping. He has prepared baseline ecological surveys, impact assessments, rehabilitation plans, offset assessments/offset area management plans, bushfire assessments, due diligence investigations and threatened species management plans. He has completed environmental monitoring programs and compliance audits for numerous urban development, resource extraction and linear infrastructure projects.

Adam has managed teams of scientists, coordinated numerous ecological field surveys and authored/reviewed/approved countless technical reports.

Adam is proficient in the assessment of local government planning schemes, State and Commonwealth legislation, including the preparation of referrals under the EPBC Act, responses to Information Requests, and also the preparation of court evidence.

Adam's work has contributed to several major projects including:

- Altitude Aspire – prepared ecological assessment, vegetation and rehabilitation management plans including a *Macadamia tetraphylla* translocation plan and a Biodiversity Development Assessment Report (BDAR) as part of a Master Planned Residential Community at Tweed Heads, northern NSW.
- Altitude Central - prepared an ecological assessment including detailed flora and fauna surveys, and a Biodiversity Development Assessment Report (BDAR) as part of a Master Planned Development at Tweed Heads, northern NSW.
- Kings Forest – prepared ecological assessments, EPBC referrals, targeted flora and fauna surveys and various management plans for a 10,000 dwelling Master Planned Development near Kingscliff, northern NSW.
- Cobaki Estate - prepared ecological assessments, EPBC referrals, targeted flora and fauna surveys, and various management plans for a 5,500 dwelling Master Planned Development near Tweed Heads, northern NSW.

Curriculum Vitae

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

ADAM MCARTHUR

DIRECTOR / PRINCIPAL ECOLOGIST

- Coolum Ridges – prepared ecological assessments and various management plans, and implemented a detailed monitoring program for threatened flora and fauna species for a 1,500 lot Master Planned Development on the Sunshine Coast, QLD.
- Peregian Springs - prepared and implemented a detailed monitoring program for threatened flora and fauna species for a 1,500 lot Master Planned Development on the Sunshine Coast, QLD.
- Pacific View Estate Residential Development - prepared ecological constraints assessments including targeted surveys for threatened flora and fauna species, and assisted in the identification, securing and preparation of management plans for potential vegetation offsets for a 340ha site on the Gold Coast, QLD.
- Flinders Grove – prepared ecological constraints assessments including targeted surveys for threatened flora and fauna species over a 4,000ha site within the Greater Flagstone Structure Plan Area, QLD.

Expertise

- Flora Survey, Vegetation Mapping and Conservation Assessment
- Ecological Assessment Reporting/Impact Assessment
- Licensing and Approvals (State and Federal)
- Wildlife Ecology and Management
- Threatened Species Survey and Management
- Environmental Monitoring
- Offset Management Strategies

Education

2002 Bachelor of Applied Science (Environmental Resource Management)
Southern Cross University, Lismore NSW

Short Courses and Qualifications

- Biocondition Assessment training – Determining equivalency in habitats (Queensland Herbarium)
- Regional Ecosystem training – Identification and classification of regional ecosystems in QLD and vegetation condition assessment (Queensland Herbarium)
- Advanced first aid certificate

Curriculum Vitae

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

ADAM MCARTHUR

DIRECTOR / PRINCIPAL ECOLOGIST

- 4x4 driving and recovery course
- Blue card (Course in General Safety Induction – Construction Industry)
- GIQ Coal Safety Induction – Standard 11 (Surface)
- Venomous snake handling
- Translocation of threatened plants
- Environmental Expert training course
- Chainsaw operations (Level 1)
- Occupational Health and Safety in the workplace
- Wildlife Rescue and Rehabilitation – Basic Training

Relevant Professional Experience

July 2017 – Present	Director/Principal Ecologist JWA Pty Ltd
March 2015 – June 2017	Principal Ecologist/Qld Operations Manager JWA Pty Ltd
July 2014 – March 2015	Senior Environmental Scientist DFS Group
March 2014 – June 2014	Environmental Advisor (Contract) Northern Stevedoring Services
May 2012 – March 2014	Senior Environmental Scientist RPS Group
Sept 2007 – April 2012	Senior Environmental Scientist James Warren & Associates
July 2004 – August 2007	Environmental Scientist James Warren & Associates

Professional Memberships

Member of the Ecological Society of Australia (MESA)

Department of Planning and Environment

NSW GOVERNMENT

CERTIFICATE OF ACCREDITATION AS A BIODIVERSITY ASSESSMENT METHOD ASSESSOR under the *Biodiversity Conservation Act 2016* (NSW)

BAM Assessor		
Adam Michael McArthur		
Accreditation number	**Accreditation date (Date of issue)**	**Expiry Date of**
BAAS18069	4 April 2022	4 April 2025

The person named above is accredited under section 6.10 of the *Biodiversity Conservation Act 2016* (NSW) (**BC Act**) as a Biodiversity Assessment Method Assessor to apply the Biodiversity Assessment Method in connection with the preparation of biodiversity stewardship site assessment reports, biodiversity development assessment reports and biodiversity certification assessment reports pursuant to Part 6 of the BC Act.

The accreditation is in force until and including the Expiry Date. The accreditation is subject to the conditions set out in the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*, under the BC Act, and the conditions specified on the reverse of this certificate.

TIMOTHY SIDES

Senior Team Leader, Biodiversity Offset Program Accreditation and Training
Department of Planning & Environment

NOTES

- DPE maintains a register of Accredited Biodiversity Assessment Method (BAM) Assessors accessible from the DPE website.
- The BAM Assessor's accreditation expires on the Expiry Date unless renewed in accordance with the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*. It is the BAM Assessor's responsibility to monitor the Expiry Date of their accreditation, and apply for any renewal with sufficient time for the application to be processed prior to the Expiry Date.
- Words and expressions used in this accreditation instrument and which are also used in the Act have the same meaning.

Southern Cross University

Adam Michael McArthur

having fulfilled the conditions prescribed by

the University is this day admitted to the degree of

Bachelor of Applied Science

Given under the Common Seal of
Southern Cross University on the

11th April, 2003

Chancellor

Vice-Chancellor

Council Secretary

20008696

APPENDIX 2 – PLOT SURVEY DATA

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	24 11 23	Broken Head Quarry		MJ			
Zone	Datum	Plot ID	1 (1)	Plot dimensions		Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m	15°		
558359	6825641						
Vegetation Class						Confidence: H M L	
Plant Community Type		Hoop pine		EEC:		Confidence: H M L	

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	10
	Shrubs	6
	Grasses etc.	1
	Forbs	2
	Ferns	4
	Other	3
Sum of Cover of native vascular plants by growth form group	Trees	116.4
	Shrubs	7.9
	Grasses etc.	0.2
	Forbs	3.1
	Ferns	0.4
	Other	0.3
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	✓ (2)	0
50 – 79 cm	✓ (2)	
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	15m	

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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	100 90 90 90 100			
Average of the 5 subplots	94			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 24 11 23	Broken Head	1 (1)	MJ

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
T	Araucaria cunninghamii		80			
T	Stenocarpus sinuatus		20			
T	Acronychia wilcoxiana		3	10		
S	Alyxia ruscifolia		0.5	20		
S	Exocarpos latifolius		0.1	2		
S	Ausbomyrtus dulcis		5	50		
T	Mischocarpus pyriformis		1	6		
Forb	Dianella caerulea		3	50		
T	Alphitonia australis		2	15		
T	Planchonella pohlmaniana		5	6		
O	Smilax australis		0.1	10		
T	Litsea australis		0.1	2		
T	Cupaniopsis anacardioides		0.1	3		
T	Hardwickia pendula		0.5	5		
G	Cyperus gracilis		0.2	50		
Fern	Davallia solida		0.1	10		
Fern	Pyrrosia confluens		0.1	20		
S	Ziera smithii		0.1	6		
Forb	Commelina cyanea		0.1	20		
Fern	Platycerium superbum		0.1	3		
O	Marsdenia rostrata		0.1	3		
Fern	Pteridium esculentum		0.1	2		
T	Acmena hemilampra		0.2	2		
S	Syzygium oleosum		2	2		
S	Stylobasium viridis		0.2	1		
O	Oberonia titania		0.1	1		

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 10 m*

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

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	23 11 23	Broken Head	Quarry	NJ			
Zone	Datum	Plot ID	36(1)	Plot dimensions		Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m	305°		
Vegetation Class		Rainforest				Confidence: H M L	
Plant Community Type				EEC:		Confidence: H M L	
56	558418	6825815					

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	18
	Shrubs	11
	Grasses etc.	1
	Forbs	1
	Ferns	5
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	83
	Shrubs	25.5
	Grasses etc.	40
	Forbs	0.1
	Ferns	3.4
	Other	10.6
High Threat Weed cover		15.3

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	✓ (111)	
30 – 49 cm	✓	
20 – 29 cm	✓	(1)
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2m	

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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	90 80 70 70 80			
Average of the 5 subplots	78			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 1 of 2	Survey Name	Plot Identifier	Recorders
Date 23 11 23	Broken Head	3b (1)	MJ

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
T	Endiandra globosa		1	2		
T	Litsea australis		10			
S	Eupomatia laurina		6	10		
S	Synoum glandulosum		10			
T	Dysoxylum rufum		3	6		
[illegible]	Archontophoenix alexandrae	E	5	15		
Fern	~~[illegible]~~ Asplenium sp.		0.1	1		
T	Melicope elleryana		0.2	1		
T	Cupaniopsis anacardioides		2	1		
S	Austromyrtus dulcis		1	10		
T	Endiandra muelleri subsp. muelleri		2	2		
S	Pilidiostigma glabrum		0.2	4		
T	Acmena hemilampra		5	5		
S	Wilkiea macrophylla		0.1	3		
O	Smilax australis		2	10		
O	Morinda jasminoides		0.2	20		
G	Oplismenus imbecillis		40			
S	~~[illegible]~~ Rhodamnia rubescens		2	1		
T	Syzygium luehmannii		6	8		
T	Guioa semiglauca		20			
S	Alyxia ruscifolia		5	10		
	Cinnamomum camphora	HTE	5	2		
O	Maclura cochinchinensis		2	6		
Fern	Adiantum hispidulum		0.1	5		
	Paspalum mandiocanum	HTE	10			
Fern	Hypolepis muelleri		0.1	5		
	Senna pendula var. glabrata	E	0.1	10		
	Ageratina riparia	HTE	0.1	5		
O	Archontophoenix cunninghamiana		5	10		
	Jagera pseudorhus		0.1	3		
	Clerodendrum quadriloculare	E	0.1	2		
O	Marsdenia rostrata		0.1	5		
	Passiflora suberosa	HTE	0.1	2		
	Murraya paniculata	E	0.2	1		
Fern	Pyrrosia sp.		0.1	50		
T	Neolitsea dealbata		0.1	2		
T	Glochidion sumatranum		0.1	1		
O	Stephania japonica		0.1	2		
O	Geitonoplesium cymosum		0.1	6		
S	Wilkiea huegeliana	[illegible]	0.5	10		

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 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 50, ... 100, 200, ... 1000, ...

GF Code	Species	Cover	Abund
O	Flagellaria indica	1	2
T	Euroschinus falcatus	25	
T	Cryptocarya triplinervis	5	3
Fern	Platycerium superbum	3	10
T	Mischocarpus pyriformis	0.2	2
Forb	Dianella caerulea	0.1	3

400 m² plot: Sheet 2 of 2	Survey Name	Plot Identifier	Recorders
Date 23.11.23	Broken Head	3b (1)	MJ

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
T	Ficus virens		3	1		
S	Ficus coronata		0.5	1		
	Lantana camara	HTE	0.1	1		
T	Flindersia australis		0.1	2		
T	Sarcopteryx stipata		0.1	9		
O	Cordyline sp.		0.1	1		
S	Homalanthus populifolius		0.1	1		
T	Cyclophyllum longipetalum		0.2	1		
S	~~Melodinus australis~~		0.1	1		
	Denhamia celastroides ✓					

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 10 m*

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

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	23 11 23	Broken Head	Quarry	MJ			
Zone	Datum	Plot ID	49 (1)	Plot dimensions		Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m	95°		
Vegetation Class		Wet sclerophyll				Confidence: H M L	
Plant Community Type		Blackbutt		EEC:		Confidence: H M L	

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	4
	Shrubs	8
	Grasses etc.	2
	Forbs	2
	Ferns	3
	Other	8
Sum of Cover of native vascular plants by growth form group	Trees	95.5
	Shrubs	5.9
	Grasses etc.	1
	Forbs	0.6
	Ferns	61.1
	Other	5.5
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	✓ (3)	(2)
50 – 79 cm	✓ (2)	(1)
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	65 m	

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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 90 90 80 90			
Average of the 5 subplots	86			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 23 11 23	Broken Head	49 (1)	NJ

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
T	Eucalyptus pilularis		50			
T	Litsea australis		40			
O	Archontophoenix cunninghamiana		1	4		
T	Endiandra sieberi		5	10		
Fern	Pteridium esculentum		60			
Forb	Alpinia caerulea		0.5	10		
O	Smilax australis		3	20		
O	Pandorea pandorana		0.1	5		
O	Cissus hypoglauca		1	5		
Fern	Platycerium superbum		1	6		
Forb	Dianella caerulea		0.1	5		
T	Cyclophyllum longipetalum		0.5	2		
S	Zieria smithii		0.2	5		
S	Acacia ulicifolia		0.1	1		
S	Dodonaea triquetra		0.2	6		
G	Lomandra longifolia		0.5	5		
S	Nematolepis squamea		0.1	1		
G	Ottochloa gracillima		0.5	20		
S	Homalanthus populifolius		0.1	2		
O	Stephania japonica		0.1	2		
Fern	Nephrolepis cordifolia		0.1	3		
S	Syzygium oleosum		5	6		
O	Dioscorea transversa		0.1	2		
S	Alyxia ruscifolia		0.1	2		
O	Geitonoplesium cymosum		0.1	3		
S	Pilidiostigma glabrum		0.1	2		
O	Marsdenia rostrata		0.1	1		

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 10 m*

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

A 1/1

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	24 11 23	Broken Head Quarry		MS			
Zone	Datum	Plot ID	4b (1)	Plot dimensions		Photo #	
56							
Easting	Northing	IBRA region		Midline bearing from 0 m	176°		
558616	6825730						
Vegetation Class						Confidence: H M L	
Plant Community Type		Regrowth		EEC:		Confidence: H M L	

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	5
	Grasses etc.	1
	Forbs	0
	Ferns	0
	Other	1
Sum of Cover of native vascular plants by growth form group	Trees	27.3
	Shrubs	11.4
	Grasses etc.	10
	Forbs	0
	Ferns	0
	Other	2
High Threat Weed cover		17.3

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	5m	

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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	5 5 10 10 30			
Average of the 5 subplots	14			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 24 11 23	Broken Head	4b (1)	MJ

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
T	Acacia melanoxylon		20			
T	Eucalyptus gluaris		2	2		
S	Banksia robur		0.1	2		
	Setaria sphacelata	E	30			
	Melinis minutiflora	HTE	10			
	Andropogon virginicus	HTE	0.2	20		
S	Acacia longissima		10	6		
	Ageratum houstonianum	E	2	100		
G	Cynodon dactylon		10			
	Sphagneticola trilobata	E	2	20		
	Hypochaeris radicata	E	0.1	20		
	Ambrosia artemisiifolia	E	1	50		
T	Banksia integrifolia		5	6		
	Paspalum nandiocanum	HTE	5			
	Commelina					
	Tradescantia fluminensis	HTE	0.1	10		
	Bidens pilosa	HTE	2	100		
S	Persoonia stradbrokensis		1	3		
O	Kennedia - rubicunda		2	3		
T	Allocasuarina littoralis		0.1	2		
S	Pittosporum undulatum		0.1	1		
T	~~Angophora~~ smithii		0.2	1		
	Soutellova dactyloides	E	5			
S	Phyllanthus gunnii		0.2	50		
	Conyza bonariensis	E	0.1	10		

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 10 m*

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

BAM Site – Field Survey Form

Site Sheet no:

Survey Name	Zone ID	Recorders
Broken Head Quarry		MS

Date	Zone	Datum	Plot ID	Plot dimensions		Photo #	
24 11 23	56		5 (1)				

Easting	Northing	IBRA region	Midline bearing from 0 m
558611	6825857		85°

Vegetation Class		Confidence: H M L
Plant Community Type	Brushbox	EEC: / Confidence: H M L

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	7
	Shrubs	8
	Grasses etc.	2
	Forbs	1
	Ferns	1
	Other	6
Sum of Cover of native vascular plants by growth form group	Trees	96
	Shrubs	1
	Grasses etc.	21
	Forbs	2
	Ferns	0.1
	Other	2.5
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	✓ (2)	
50 – 79 cm	✓ (2)	1
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	25m	

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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	95 90 100 90 80			
Average of the 5 subplots	91			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 24 11 23	Broken Head	5 (1)	MJ

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
T	Cophostemon confertus		75			
T	Litsea australis		20			
S	Alyxia ruscifolia		0.2	10		
S	Zieria smithii		0.1	10		
S	Wilkiea huegeliana		0.1	2		
T	Acronychia wilcoxiana		0.1	1		
T	Araucaria cunninghamii		0.2	3		
G	Lomandra longifolia		20			
O	Marsdenia rostrata		2	20		
O	Smilax australis		0.1	10		
G	Imperata cylindrica		1	30		
O	Pandorea pandorana		0.1	10		
O	Gertonoplebium cymosum		0.1	5		
S	Austromyrtus dulcis		0.2	20		
S	Pittosporum undulatum		0.1	3		
fern	Pteridium esculentum		0.1	5		
O	Hibbertia scandens		0.1	1		
S	Acacia longissima		0.1	1		
S	Bilidiostigma glabrum		0.1	5		
O	Smilax glaucophylla		0.1	10		
T	Cupaniopsis anacardioides		0.1	10		
forb	Dianella caerulea		2	20		
T	Endiandra sieberi		0.1	5		
T	Acmena hemilampra		0.5	3		
S	Acronychia imperforata		0.1	1		

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 10 m*

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

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	24 11 23	Broken Head	Quarry	MT			
Zone: 56	Datum:	Plot ID	7 (1)	Plot dimensions		Photo #	
Easting: 558809	Northing: 6825768	IBRA region		Midline bearing from 0 m	35°		
Vegetation Class						Confidence: H M L	
Plant Community Type	Paperbark			EEC:		Confidence: H M L	

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	12
	Shrubs	7
	Grasses etc.	4
	Forbs	1
	Ferns	2
	Other	8
Sum of Cover of native vascular plants by growth form group	Trees	99.3
	Shrubs	10.5
	Grasses etc.	6.2
	Forbs	0.1
	Ferns	55
	Other	17
High Threat Weed cover		0.6

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	✓ (2)	
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	32m	

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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	80 95 90 95 95			
Average of the 5 subplots	91			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 24 / 11 / 23	Broken Head	7 (1)	MJ

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
T	Melaleuca quinquenervia		70			
T	Litsea australis		20	30		
S	Pittosporum undulatum		2	3		
T	Acmena hemilampra		5	8		
O	Archontophoenix cunninghamiana		10	20		
T	Syzygium luehmannii		1	2		
O	Marsdenia rostrata		5	30		
Fern	Histiopteris incisa		5	20		
Fern	Hypolepis muelleri		50			
O	Gahnia clarkei		0.1	10		
O	Smilax australis		0.2	20		
O	Stephania japonica		0.1	6		
O	Flagellaria indica		0.1	3		
	Passiflora suberosa	HTE	0.1	1		
	Paspalum mandiocanum	HTE	0.5	20		
	Senna pendula var. glabrata	E	0.1	10		
S	Alyxia ruscifolia		0.1	5		
T	Endiandra sieberi		2	6		
T	Notelaea longifolia		0.2	3		
T	Cupaniopsis anacardioides		0.1	10		
T	Melicope elleryana		0.1	6		
Forb	Alpinia caerulea		0.1	3		
S	Synoum glandulosum		0.1	2		
O	Parsonsia straminea		1	10		
T	Endiandra sieberi		0.1	1		
G	Lomandra longifolia		1	10		
T	Polyscias elegans		0.2	3		
S	Rhodamnia rubescens		0.1	1		
T	Jagera pseudorhus		0.1	2		
S	Austromyrtus dulcis		0.1	3		
G	Oplismenus gracilimus		5	100		
S	Elaeocarpus reticulatus		8	4		
S	Breynia oblongifolia		0.1	1		
G	Cayratia clematidea		0.1	3		
T	Ficus watkinsiana		0.5	1		
G	Entolasia stricta		0.1	10		
O	Morinda jasminoides		0.5	1		

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 10 m*

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Zone ID	Recorders
Broken Head Quarry		NTS

Date	24/11/23	Plot ID	2 (1)	Plot dimensions		Photo #	
Zone 56	Datum						
Easting 558530	Northing 6825877	IBRA region		Midline bearing from 0 m	0°N		
Vegetation Class	Rainforest					Confidence: H M L	
Plant Community Type				EEC:		Confidence: H M L	

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	15
	Shrubs	7
	Grasses etc.	2
	Forbs	2
	Ferns	4
	Other	8
Sum of Cover of native vascular plants by growth form group	Trees	85.4
	Shrubs	13.8
	Grasses etc.	15.1
	Forbs	1.1
	Ferns	1.4
	Other	9.7
High Threat Weed cover		2.1

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
60 – 79 cm	✓ (1)	(1)
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	20m	

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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	95 90 80 90 90			
Average of the 5 subplots	89			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 24 11 23	Broken Head	2(1)	MJ

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
T	Elindersia schottiana		5	15		
T	Archontophoenix cunninghamiana		8	6		
S	Pittosporum undulatum		0.5	5		
T	Endiandra pubens		10	6		
T	Litsea australis		10	3		
T	Commersonia bartramia		2	1		
S	Wilkiea huegeliana		8	20		
T	Jagera pseudorhus		0.1	2		
O	Smilax australis		1	10		
T	Cupaniopsis anacardioides		0.1	2		
Fern	Hypolepis muelleri		1	50		
O	Stephania japonica		0.1	10		
Forb	Dianella caerulea		1	30		
	Paspalum mandiocanum	HTE	2	50		
O	Gerbera plesium cymosum		0.1	20		
Fern	Platycerium superbum		0.2	6		
G	Cyperus gracilis		0.1	20		
	Senna pendula var. glabrata	E	0.2	50		
	Ochna serrulata	HTE	0.1	2		
Forb	Commelina cyanea		0.1	10		
S	Synoum glandulosum		2	6		
	Syagrus romanzoffiana	E	0.1	1		
Fern	Pteridium esculentum		0.1	5		
O	Marsdenia rostrata		0.1	10		
S	Elaeocarpus reticulatus		0.1	1		
S	Persoonia stradbrokensis		2	1		
T	Acmena hemilampra		25	10		
O	Flagellaria indica		0.2	3		
T	Guioa semiglauca		2	3		
G	Oplismenus imbecillis		15			
T	Glochidion sumatranum		4	1		
O	Maclura cochinchinensis		0.1	2		
T	Notelaea longifolia		0.1	2		
T	Stenocarpus sinuatus		2	6		
T	Cryptocarya obovata		15	10		
S	Pittosporum glabrum		0.2	6		
T	Dysoxylum mollissimum		5	4		
O	Pandorea pandorana		0.1	6		
S	Alyxia ruscifolia		1	10		
Fern	Pyrrosia sp.		0.1	5		

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 10 m*

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

T	Neolitsea dealbata	0.1	1
T	Mallotus philippensis	5	1

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	23 11 23	Broken Head	Quarry	MJ			
Zone	Datum	Plot ID	Rehab(1)	Plot dimensions		Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m	59°		
Vegetation Class		Rehab plantings				Confidence: H M L	
Plant Community Type				EEC: X		Confidence: H M L	

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	7
	Shrubs	1
	Grasses etc.	1
	Forbs	3
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	21.9
	Shrubs	0.1
	Grasses etc.	20
	Forbs	0.7
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		0
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm	✓	
< 5 cm	✓	n/a
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 (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	5 5 10 5 5			
Average of the 5 subplots	6			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 23/11/23	Broken Head	Rehab 1	MJ

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
T	1	Acacia melanoxylon		8	6		
T	2	Lophostemon confertas		3	5		
T	3	Casuarina glauca		5	6		
T	4	Glochidion sumatranum		2	2		
T	5	Macaranga tanarius		1	2		
T	6	Eucalyptus pilularis		2	3		
T	7	Banksia integrifolia		0.5	2		
G	8	Common couch		20			
	9	Setaria sp.	E	5			
	10	Buffalo grass	E	60			
	11	cuphea carthagenensis	E	0.1	20		
	12	Centaurium erythraea	E	0.1	1		
	13	Ragweed	E	0.1	50		
	14	Paspalum sp	E	5			
	15	Fleabane Conyza bonariensis	E	0-5	100		
Forb	16	Commelina cyanea		0.1	5		
	17	Bidens pilosa	HTE	0.1	10		
Forb	18	Centella asiatica		0.1	10		
Forb	19	Desmodium sp.		0.5	20		
	20	Sida rhombifolia	E	0.1	20		
S	21	Callistemon salignus		0.1	1		
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

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 10 m*

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

BAM Site – Field Survey Form

Site Sheet no: 1 of

		Survey Name	Zone ID	Recorders			
Date	24 11 23	Broken Head Quarry		NTJ			
Zone	Datum	Plot ID	Rehab (2)	Plot dimensions		Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m	100°		
Vegetation Class		Early Stage plantings				Confidence: H M L	
Plant Community Type				EEC:		Confidence: H M L	

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

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	8
	Shrubs	7
	Grasses etc.	4
	Forbs	1
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	1.1
	Shrubs	3.9
	Grasses etc.	49
	Forbs	0.1
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
60 – 79 cm		
30 – 49 cm		○
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm	✓	n/a
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 (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	5	5	5	5	5	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	5																			

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 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 24/11/23	Broken Head	Rehab (2)	MJ

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
S	Acacia longifolia subsp. sophorae		3	2		
S	Pittosporum multiflorum		0.1	5		
T	Eucalyptus pilularis		0.2	5		
S	Banksia oblongifolia		0.2	8		
S	Banksia robur		0.1	2		
G	Juncus usitatus		1	50		
G	Cyperus polystachyos		3	150		
S	Austromyrtus dulcis		0.1	5		
Forb	Wahlenbergia sp.		0.1	50		
	Melinis repens	E	10			
G	Cynodon dactylon.		30			
	Paspalum urvillei	E	10			
	Hypochaeris radicata	E	2	100		
T	Allocasuarina littoralis		0.2	10		
	Ageratum houstonianum	E	5	100		
	Conyza bonariensis	E	1	50		
S	Acronychia imperforata		0.1	1		
T	Cupaniopsis anacardioides		0.1	2		
S	Archirhodomyrtus beckleri		0.2	5		
S	Acacia longissima		0.1	3		
T	Glochidion sumatranum		0.1	3		
	Setaria sphacelata	E	5			
T	Euphosternon conferta		0.1	2		
T	Araucaria heterophylla smithii		0.2	5		
T	Alphitonia excelsa.		0.1	1		
T	Araucaria cunninghamii		0.1	1		
	Senecio madagascariensis	HTE	0.1	6		
G	Imperata cylindrica		15			

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 10 m*

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

APPENDIX 3 – BAM PREDICTED SPECIES REPORT

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00043292/BAAS18069/23/00043293	Broken Head Quarry	14/03/2024
Assessor Name	Report Created	BAM Data version *
Adam Michael McArthur	14/03/2024	67
Assessor Number	Assessment Type	BAM Case Status
BAAS18069	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
1	BOS Threshold: Biodiversity Values Map and area clearing threshold	14/03/2024

* 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)
Barred Cuckoo-shrike	Coracina lineata	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Black Bittern	Ixobrychus flavicollis	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
Black-necked Stork	Ephippiorhynchus asiaticus	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
Black-striped Wallaby	Macropus dorsalis	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Common Blossom-bat	Syconycteris australis	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest

Dusky Woodswallow	Artamus cyanopterus cyanopterus	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
Eastern False Pipistrelle	Falsistrellus tasmaniensis	3011-Far North Lowland Subtropical Rainforest
Eastern Long-eared Bat	Nyctophilus bifax	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Eastern Osprey	Pandion cristatus	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Eastern Tube-nosed Bat	Nyctimene robinsoni	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Flame Robin	Petroica phoenicea	3147-Far North Brush Box-Bloodwood Wet Forest
		3148-Far North Brush Box-Walnut Wet Forest
Golden-tipped Bat	Phoniscus papuensis	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Greater Broad-nosed Bat	Scoteanax rueppellii	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
Grey-headed Flying-fox	Pteropus poliocephalus	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Hastings River Mouse	Pseudomys oralis	3147-Far North Brush Box-Bloodwood Wet Forest
Hoary Wattled Bat	Chalinolobus nigrogriseus	3147-Far North Brush Box-Bloodwood Wet Forest
		3148-Far North Brush Box-Walnut Wet Forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	3121-Broken Head Lowland Rainforest

Large Bent-winged Bat	Miniopterus orianae oceanensis	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Little Bent-winged Bat	Miniopterus australis	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Little Lorikeet	Glossopsitta pusilla	3147-Far North Brush Box-Bloodwood Wet Forest
		3148-Far North Brush Box-Walnut Wet Forest
Northern Free-tailed Bat	Ozimops lumsdenae	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Olive Whistler	Pachycephala olivacea	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Pale-vented Bush-hen	Amaurornis moluccana	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
Red-legged Pademelon	Thylogale stigmatica	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Rose-crowned Fruit-Dove	Ptilinopus regina	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Scarlet Robin	Petroica boodang	3011-Far North Lowland Subtropical Rainforest
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
Spotted-tailed Quoll	Dasyurus maculatus	3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Square-tailed Kite	Lophoictinia isura	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest

Square-tailed Kite	Lophoictinia isura	3148-Far North Brush Box-Walnut Wet Forest
Superb Fruit-Dove	Ptilinopus superbus	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Swift Parrot	Lathamus discolor	3147-Far North Brush Box-Bloodwood Wet Forest
		3148-Far North Brush Box-Walnut Wet Forest
Varied Sittella	Daphoenositta chrysoptera	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
White-throated Needletail	Hirundapus caudacutus	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Wompoo Fruit-Dove	Ptilinopus magnificus	3121-Broken Head Lowland Rainforest
		3147-Far North Brush Box-Bloodwood Wet Forest
		3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Yellow-bellied Glider	Petaurus australis	3147-Far North Brush Box-Bloodwood Wet Forest
		3148-Far North Brush Box-Walnut Wet Forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	3011-Far North Lowland Subtropical Rainforest
		3148-Far North Brush Box-Walnut Wet Forest

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Black Bittern	Ixobrychus flavicollis	3148-Far North Brush Box-Walnut Wet Forest

Black-necked Stork	Ephippiorhynchus asiaticus	3121-Broken Head Lowland Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
Black-striped Wallaby	Macropus dorsalis	3148-Far North Brush Box-Walnut Wet Forest
Hastings River Mouse	Pseudomys oralis	3148-Far North Brush Box-Walnut Wet Forest
Pale-vented Bush-hen	Amaurornis moluccana	3121-Broken Head Lowland Rainforest
		3148-Far North Brush Box-Walnut Wet Forest
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	3121-Broken Head Lowland Rainforest
		3148-Far North Brush Box-Walnut Wet Forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

APPENDIX 4 - BAM CANDIDATE SPECIES REPORT

BAM Candidate Species Report

Proposal Details

Assessment Id 00043292/BAAS18069/23/00043293	Proposal Name Broken Head Quarry	BAM data last updated * 14/03/2024
Assessor Name Adam Michael McArthur	Report Created 14/03/2024	BAM Data version * 67
Assessor Number BAAS18069	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 1	Date Finalised 14/03/2024	BOS entry trigger BOS Threshold: Biodiversity Values Map and area clearing threshold

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
Acalypha eremorum Acalypha	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Acronychia littoralis Scented Acronychia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Amyema plicatula Amyema plicatula	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Antechinus arktos Black-tailed Antechinus	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Archidendron hendersonii White Lace Flower	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Arthraxon hispidus Hairy Jointgrass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Assa darlingtoni Pouched Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Backhousia subargentea Giant Ironwood	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Baloghia marmorata Jointed Baloghia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Bosistoa transversa Yellow Satinheart	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Coatesia paniculata Axe-Breaker	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Coeranoscincus reticulatus Three-toed Snake-tooth Skink	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Corokia whiteana Corokia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Crinia tinnula Wallum Froglet	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Cryptocarya foetida Stinking Cryptocarya	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Cupaniopsis serrata Smooth Tuckeroo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Cyperus semifertilis Missionary Nutgrass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Davidsonia jerseyana Davidson's Plum	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Davidsonia johnsonii Smooth Davidson's Plum	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Dendrocnide moroides Gympie Stinger	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Diospyros mabacea Red-fruited Ebony	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Diploglottis campbellii Small-leaved Tamarind	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Dromaius novaehollandiae - endangered population Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Drynaria rigidula Basket Fern	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Elaeocarpus sedentarius Minyon Quandong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Elaeocarpus williamsianus Hairy Quandong	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Endiandra floydii Crystal Creek Walnut	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Endiandra hayesii Rusty Rose Walnut	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Endiandra muelleri subsp. bracteata Green-leaved Rose Walnut	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Erythrotriorchis radiatus Red Goshawk	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Floydia praealta Ball Nut	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Fontainea australis Southern Fontainea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Gossia fragrantissima Sweet Myrtle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Grammitis stenophylla Narrow-leaf Finger Fern	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Hibbertia hexandra Tree Guinea Flower	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Hicksbeachia pinnatifolia Red Boppel Nut	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Hoplocephalus stephensii Stephens' Banded Snake	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Isoglossa eranthemoides Isoglossa	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lindsaea brachypoda Short-footed Screw Fern	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Litoria olongburensis Olongburra Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Macadamia integrifolia Macadamia Nut	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Macadamia tetraphylla Rough-shelled Bush Nut	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Marsdenia longiloba Slender Marsdenia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Melicope vitiflora Coast Euodia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Niemeyera whitei Rusty Plum, Plum Boxwood	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Ninox connivens Barking Owl	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Notamacropus parma Parma Wallaby	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Nurus atlas Atlas Rainforest Ground-beetle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Nurus brevis Shorter Rainforest Ground-beetle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Oberonia complanata Yellow-flowered King of the Fairies	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Oberonia titania Red-flowered King of the Fairies	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Ochrosia moorei Southern Ochrosia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Owenia cepiodora Onion Cedar	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Ozothamnus vagans Wollumbin Dogwood	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Peristeranthus hillii Brown Fairy-chain Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petalura litorea Coastal Petaltail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Petauroides volans Southern Greater Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Phyllodes imperialis southern subspecies Southern Pink Underwing Moth	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Planigale maculata Common Planigale	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Plectranthus nitidus Nightcap Plectranthus	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Pomaderris notata McPherson Range Pomaderris	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Potorous tridactylus Long-nosed Potoroo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Randia moorei Spiny Gardenia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Rhodamnia rubescens Scrub Turpentine	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Rhodomyrtus psidioides Native Guava	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Rhynchosia acuminatissima Pointed Trefoil	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Senna acclinis Rainforest Cassia	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Symplocos baeuerlenii Small-leaved Hazelwood	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Syzygium hodgkinsoniae Red Lilly Pilly	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Syzygium moorei Durobby	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Thersites mitchellae Mitchell's Rainforest Snail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Tinospora tinosporoides Arrow-head Vine	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Turnix melanogaster Black-breasted Button-quail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Tylophora woollsii Cryptic Forest Twiner	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Xylosma terrae-reginae Queensland Xylosma	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Rock-wallaby	Petrogale penicillata	Refer to BAR
Cameron's Tarenna	Triflorensia cameronii	Refer to BAR
Cassia marksiana	Cassia marksiana	Refer to BAR
Eastern Osprey	Pandion cristatus	Habitat constraints

Fine-leaved Tuckeroo	Lepiderema pulchella	Refer to BAR
Giant Barred Frog	Mixophyes iteratus	Refer to BAR
Giant Fern	Angiopteris evecta	Habitat constraints
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Hartman's Sarcochilus	Sarcochilus hartmannii	Habitat constraints
Laced Fritillary	Argynnis hyperbius	Geographic limitations
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Lenwebbia sp. Main Range	Lenwebbia sp. Main Range	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Long-nosed Potoroo, Cobaki Lakes and Tweed Heads West population	Potorous tridactylus - endangered population	Refer to BAR
Loveridge's Frog	Philoria loveridgei	Refer to BAR
Marblewood	Acacia bakeri	Refer to BAR
Mountain Frog	Philoria kundagungan	Refer to BAR
Needle-leaf Fern	Belvisia mucronata	Habitat constraints
Peach Myrtle	Uromyrtus australis	Refer to BAR
Ravine Orchid	Sarcochilus fitzgeraldii	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints

APPENDIX 5 – BAM BIODIVERSITY CREDIT REPORT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00043292/BAAS18069/23/00043293

Proposal Name
Broken Head Quarry

BAM data last updated *
14/03/2024

Assessor Name
Adam Michael McArthur

Assessor Number
BAAS18069

BAM Data version *
67

Proponent Names

Report Created
14/03/2024

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Part 4 Developments (General)

Date Finalised
14/03/2024

BOS entry trigger
BOS Threshold: Biodiversity Values Map and area clearing threshold

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3121-Broken Head Lowland Rainforest	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	2	2
3147-Far North Brush Box-Bloodwood Wet Forest	Not a TEC	6.5	57	9	66
3011-Far North Lowland Subtropical Rainforest	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	0.1	2	0	2
3148-Far North Brush Box-Walnut Wet Forest	Not a TEC	0.1	2	0	2

BAM Biodiversity Credit Report (Like for like)

3011-Far North Lowland Subtropical Rainforest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions This includes PCT's: 845, 1529, 2068, 3001, 3002, 3003, 3004, 3005, 3007, 3009, 3010, 3011, 3013, 3014, 3015, 3016, 3017, 3019, 3021, 3022, 3026, 3029, 3032, 3035, 3036, 3044, 3056, 3062, 3064, 3065, 3068, 3070, 3072, 3075, 3076, 3077, 3080, 3083, 3084, 3086, 3089, 3093, 3097, 3098, 3099, 3100, 3101, 3104, 3109, 3110, 3116, 3118, 3121, 3149, 3165, 4031, 4105, 4107, 4110	-	3011_VZ3b	Yes	2	Scenic Rim, Burringbar-Conondale Ranges, Clarence Lowlands and Woodenbong. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

3121-Broken Head Lowland Rainforest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 3005, 3008, 3022, 3039, 3121, 3122, 3123, 3124, 3127, 3129, 3130, 3131, 3132, 3133, 3134, 3135, 4110, 4113, 4114, 4146	-	3121_VZ1	No	2	Scenic Rim, Burringbar-Conondale Ranges, Clarence Lowlands and Woodenbong. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

3147-Far North Brush Box-Bloodwood Wet Forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	North Coast Wet Sclerophyll Forests This includes PCT's: 3067, 3073, 3078, 3088, 3102, 3136, 3145, 3147, 3171, 3177	North Coast Wet Sclerophyll Forests >=50% and <70%	3147_VZ4a	Yes	57	Scenic Rim, Burringbar-Conondale Ranges, Clarence Lowlands and Woodenbong. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	North Coast Wet Sclerophyll Forests This includes PCT's: 3067, 3073, 3078, 3088, 3102, 3136, 3145, 3147, 3171, 3177	North Coast Wet Sclerophyll Forests >=50% and <70%	3147_VZ4b	No	9	Scenic Rim, Burringbar-Conondale Ranges, Clarence Lowlands and Woodenbong. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	North Coast Wet Sclerophyll Forests This includes PCT's: 3067, 3073, 3078, 3088, 3102, 3136, 3145, 3147, 3171, 3177	North Coast Wet Sclerophyll Forests >=50% and <70%	3147_VZ11a	No	0	Scenic Rim, Burringbar-Conondale Ranges, Clarence Lowlands and Woodenbong. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	North Coast Wet Sclerophyll Forests This includes PCT's: 3067, 3073, 3078, 3088, 3102, 3136, 3145, 3147, 3171, 3177	North Coast Wet Sclerophyll Forests >=50% and <70%	3147_VZ8b	No	0	Scenic Rim, Burringbar-Conondale Ranges, Clarence Lowlands and Woodenbong. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
3148-Far North Brush Box-Walnut Wet Forest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	North Coast Wet Sclerophyll Forests This includes PCT's: 487, 613, 1563, 1575, 3058, 3060, 3067, 3073, 3078, 3084, 3087, 3088, 3102, 3125, 3136, 3137, 3138, 3139, 3140, 3141, 3142, 3145, 3147, 3148, 3149, 3150, 3153, 3154, 3156, 3157, 3158, 3160, 3161, 3162, 3163, 3164, 3165, 3166, 3168, 3169, 3171, 3172, 3173, 3174, 3176, 3177, 3178, 3180, 4043, 4115	North Coast Wet Sclerophyll Forests <50%	3148_VZ5	Yes	2	Scenic Rim, Burringbar-Conondale Ranges, Clarence Lowlands and Woodenbong. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Antechinus arktos / Black-tailed Antechinus	**3121_VZ1, 3011_VZ3b**	0.1	4.00
Ninox connivens / Barking Owl	**3147_VZ4a, 3148_VZ5**	2.0	67.00
Ninox strenua / Powerful Owl	**3147_VZ4a, 3148_VZ5**	2.0	67.00

Oberonia titania / Red-flowered King of the Fairies	**3121_VZ1, 3011_VZ3b**	0.1	4.00
Planigale maculata / Common Planigale	**3121_VZ1, 3147_VZ4a, 3147_VZ4b, 3148_VZ5**	3.0	80.00
Tylophora woollsii / Cryptic Forest Twiner	**3121_VZ1, 3147_VZ4a, 3147_VZ4b, 3148_VZ5**	3.0	80.00
Tyto novaehollandiae / Masked Owl	**3147_VZ4a, 3148_VZ5**	2.0	67.00

Credit Retirement Options

Like-for-like credit retirement options

Antechinus arktos / Black-tailed Antechinus	Spp	IBRA subregion
	Antechinus arktos / Black-tailed Antechinus	Any in NSW
Ninox connivens / Barking Owl	Spp	IBRA subregion
	Ninox connivens / Barking Owl	Any in NSW
Ninox strenua / Powerful Owl	Spp	IBRA subregion
	Ninox strenua / Powerful Owl	Any in NSW
Oberonia titania / Red-flowered King of the Fairies	Spp	IBRA subregion
	Oberonia titania / Red-flowered King of the Fairies	Any in NSW

Planigale maculata / Common Planigale	Spp	IBRA subregion
	Planigale maculata / Common Planigale	Any in NSW
Tylophora woollsii / Cryptic Forest Twiner	Spp	IBRA subregion
	Tylophora woollsii / Cryptic Forest Twiner	Any in NSW
Tyto novaehollandiae / Masked Owl	Spp	IBRA subregion
	Tyto novaehollandiae / Masked Owl	Any in NSW