



KINGS FOREST

PRECINCTS 12 - 14

THREATENED SPECIES MANAGEMENT PLAN

A Report Prepared for
Project 28 Pty Ltd

MARCH 2021

NEW SOUTH WALES

8/48 Tamar Street (PO Box 1465) Ballina NSW 2478
p 02 6686 3858 • f 02 6681 1659 • e ballina@jwaec.com.au

QUEENSLAND

Suite C, Building 21 Garden City Office Park, 2404 Logan Road, Eight Mile Plains QLD 4113
p 07 3219 9436 • f 07 3423 2076 • e brisbane@jwaec.com.au

www.jwaec.com.au

DOCUMENT CONTROL

Document

Title	Precincts 12 - 14 Threatened Species Management Plan
Job Number	N97017
File Reference	N97017_Kings Forest\Management Plans (2020)\Precinct 12 - 14
Version and Date	RW6 11/03/21
Client	Project 28 Pty Ltd

Revision History (office use only)

Issue	Version	Draft /Final	Date Sent	Distributed To	No. Copies	Media	Delivery Method
1	RW1	DRAFT	01/05/20	JWA	1	word	Email
2	RW2	FINAL	07/05/20	Client	1	PDF	Email
3	RW3	FINAL	18/11/20	Client	1	PDF	Email
4	RW4	FINAL	04/12/20	Client	1	PDF	Email
5	RW5	FINAL	15/12/20	Client	1	PDF	Email
6	RW6	FINAL	11/03/20	Client	1	PDF	Email

Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
RW2	07/05/20	Phoebe Chapman/ Adam McArthur	PC/ AM	Adam McArthur	AM
RW3	18/11/20	Phoebe Chapman/ Adam McArthur	PC/ AM	Adam McArthur	AM
RW4	04/12/20	Phoebe Chapman/ Adam McArthur	PC/ AM	Adam McArthur	AM
RW5	15/12/20	Phoebe Chapman/ Adam McArthur	PC/ AM	Adam McArthur	AM
RW6	11/03/21	Adam McArthur	AM	Adam McArthur	AM

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1 INTRODUCTION

1.1 Background

JWA Pty Ltd have been engaged by Project 28 Pty Ltd (Project 28) to prepare a Threatened Species Management Plan (TSMP) for Precincts 12 - 14 of the Kings Forest project site. The Kings Forest site is 846 hectares in area and is located in the coastal zone of the Tweed Shire Local Government Area (LGA). The site was zoned for residential and commercial development in the early 1990's and has been subject to a lengthy Commonwealth, State and Council approval process. Numerous ecological studies have been completed on the site over the last 20 years including detailed flora, fauna and hydrological surveys.

The protection of Threatened flora and fauna species and Endangered Ecological Communities (EECs) known to occur, or considered to be provided with suitable habitat, within the Precincts 12 - 14 and associated Environmental Management Areas (EMAs) are the subject of this TSMP. This TSMP provides specific measures for mitigating and/or minimising the potential impacts on Threatened flora and fauna species and EECs within these areas as a result of development activities. Specific management actions discussed in this TSMP will be triggered and completed on a pre-construction, construction and operational phase basis. Due to the uncertainty of the timing of commencement of construction works within Precincts 12 - 14, it is also proposed to undertake pre-commencement monitoring and maintenance works within the Precinct 12 - 14 EMAs to ensure that relevant ecological values of these areas are not compromised.

This TSMP should be read in conjunction with the Precincts 12 - 14 VWMP (JWA 2020a) which provides general vegetation and fauna management strategies applicable to all species on site, as well as details of proposed protection and restoration works such as fencing and revegetation works.

In addition, it should be noted that specific management strategies for the koala and the wallum sedge frog are included separately within the Koala Plan of Management (KPOM) (JWA 2019) and the Wallum Sedge Frog Management Plan (WSFMP) (JWA 2020b) respectively and these documents should therefore also be read in conjunction with this TSMP.

It is also noted that Concept Plan (06_0318) Approval Condition C2 requires management plan updates (where necessary) to accompany future development applications. As a consequence, there may be changes arising from these updates to specific management provisions contained in this plan.

1.2 Aim and Objectives

The aim of this TSMP is to provide guidelines, strategies and methods for the management of the threatened flora and fauna species and EECs recorded within Precincts 12 - 14 EMAs, such that species and ecological communities continue to persist and reproduce.

Specific objectives of the Precinct 12 - 14 TSMP include:

- Provide a summary of the EECs and threatened flora and fauna species occurring within Precincts 12 - 14 and associated EMAs;

- Provide a profile for each EEC and threatened flora and fauna species occurring which includes:
 - A list of overall threats to the EEC/threatened species;
 - Potential threats from the development of Precincts 12 - 14;
 - Recovery strategies for the EEC/threatened species including details of Approved Recovery Plans and/or Priority Actions;
- Devise management strategies to be implemented including:
 - Strategies for the protection of EEC/threatened species during the construction and operation stage of the development;
 - Weed control measures specific to areas containing listed threatened flora and fauna species;
 - Guidelines for the control of human and animal access to areas containing EECs/threatened species;
 - Strategies for the embellishment of threatened species habitat through revegetation works and/or the creation of compensatory habitat areas where required;
 - A monitoring and reporting program.

Implementation of this TSMP will ensure ongoing sustainable management of threatened species and EECs within Precincts 12 - 14 EMAs, and that land clearing and land modification activities associated with the development are effectively remediated.

1.3 Compliance with Relevant Approval Conditions

On the 19th January 2007, the NSW Minister for Planning authorised a Concept Plan (06_0318) for a proposed residential community at Kings Forest. The Minister for Planning granted part 3A approval (with conditions) for the Concept Plan for Kings Forest in August 2010. A Precinct 12 - 14 TSMP was prepared in accordance with the Concept Plan approval conditions.

The Kings Forest Stage 1 Project Application (MP 08_0194) was lodged in November 2011. The Project Application was approved (with conditions) on the 11th August 2013. Conditions of this approval required that all environmental management plans be revised.

On the 21st May 2015 the Commonwealth Department of Environment approved (with conditions) the Kings Forest residential development (EPBC 2012/6328). The Commonwealth approval is confined to the mitigation of impacts of the proposed development on the koala and wallum sedge frog, both of which are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Species specific Management Plans have been prepared for the EPBC Act listed koala (*Phascolarctos cinereus*) and wallum sedge frog (*Litoria olongburrensis*) i.e. the Kings Forest KPOM (JWA 2019) and the Kings Forest WSFMP (JWA 2020b), and these documents should be read in conjunction with this TSMP. There are no additional specific EPBC Act approval conditions relating to other threatened species on the Kings Forest development site.

Since the Commonwealth approval decision Project 28 have been liaising with Tweed Shire Council (TSC) and the NSW Department of Planning, Industry and Environment (DPI&E) to reconcile all approval conditions.

This Precinct 12 - 14 TSMP has been amended to comply with all relevant Commonwealth, State and Local Government approval conditions.

APPENDIX 1 contains the details of the following relevant Consolidated Approval Conditions and also notes where they are addressed in this TSMP:

- Concept Plan 06_0318 Consolidated Approval Conditions incorporating the following:
 - Modification No. 1, approved on 22 December 2010;
 - Modification No. 2, approved on 11 August 2013;
 - Modification No. 3, approved on 16 May 2014;
 - Modification No. 4, approved on 20 November 2014;
 - Modification No. 5, approved on 10 November 2015;
 - Modification No. 8, approved on 24 May 2018;
- Project Approval 08_0194 Consolidated Approval Conditions incorporating the following:
 - Modification No. 1, approved on 16 May 2014;
 - Modification No. 2, approved on 20 November 2014;
 - Modification No. 3, approved on 20 February 2017;
 - Modification No. 6, approved on 21 December 2017;
 - Modification No. 7, approved 24 May 2018;
 - Modification No. 8, approved 26 November 2019; and
 - Modification No. 10, approved 7 October 2020.

JWA hereby certify that this TSMP has been prepared in accordance with the requirements of Condition C2 of Concept Plan Approval No. CP06_0318 (as modified) and generally in accordance with the requirements of Conditions 39 and 43 of Major Project Approval No. MP08_0194 (as modified) for Kings Forest Stage 1.

1.4 Related Management Plans Prepared for the Kings Forest Site

A number of management plans were completed for the Kings Forest Stage 1 Project Application and approved under Project Approval 08_0194. Subsequent to their approval, significant work has been completed on the site. Several of these management plans have therefore been amended (and others will need to be amended) as required by Condition 39 of MP 08_0194.

This TSMP should be read in conjunction with the following documents prepared for the Kings Forest development:

- Kings Forest Koala Plan of Management (KPoM) (JWA 2019);
- Kings Forest Wallum Sedge Frog Management Plan (WSFMP) (JWA 2020b);
- Kings Forest Precincts 6 - 14 Buffer Management Plan (BMP) (JWA 2020c);
- Kings Forest Precincts 12 - 14 Vegetation and Weed Management Plan (VWMP) (JWA 2020a);
- Kings Forest Flora and Fauna Monitoring Report (FFMR) (JWA 2020d);
- Kings Forest Feral Animal Management Plan (FAMP) (JWA 2020e);
- Kings Forest Stage 1 Bushfire Risk Management Plan (BushfireSafe 2020);
- Kings Forest Koala Fire Management Plan (Wildsite 2020);
- Construction Environmental Management Plan (CEMP) (MUS 2020);
- Kings Forest Summary of Management Plans (SOMP) (G&S 2020a);
- Kings Forest Overall Water Management Plan (OWMP) (G&S 2020b); and
- Kings Forest Drainage Maintenance Management Plan (DMMP) (G&S 2020c).

APPENDIX 2 provides further details of these management plans and details of their relationship to the TSMP.

1.5 Amendment History

1.5.1 Background

SECTION 7.3 of this TSMP contains guidelines for the adaptive management of this plan including conflicts between management plans and changes to management strategies over time. This Adaptive Management Approach has been endorsed by NSW DPI&E, BCD and TSC.

This TSMP has been amended in accordance with the endorsed Adaptive Management Approach in response to conditions of approval received from the NSW DPI&E on the 11th January 2021. Amendments to the TSMP relate to condition wording.

1.5.2 Condition Wording

The NSW DPI&E conditions of approval received on the 11th January 2021 identified that the wording of the relevant approval conditions listed in **APPENDIX 1** were inconsistent with the current wording of the approval conditions due to the modifications made since the original approvals. Minor amendments have been made to **APPENDIX 1** to update the relevant condition wording.

2 SITE DESCRIPTION

2.1 Location

Kings Forest is located on the far north coast of NSW in the Tweed local government area (LGA) approximately 20 km south of the Queensland/NSW border, 5 km north-west of the village of Bogangar and 4 km south-west of Kingscliff (**FIGURE 1**).

2.2 Site Description

The Kings Forest site is comprised of fourteen (14) land parcels with a total area of 846 hectares:

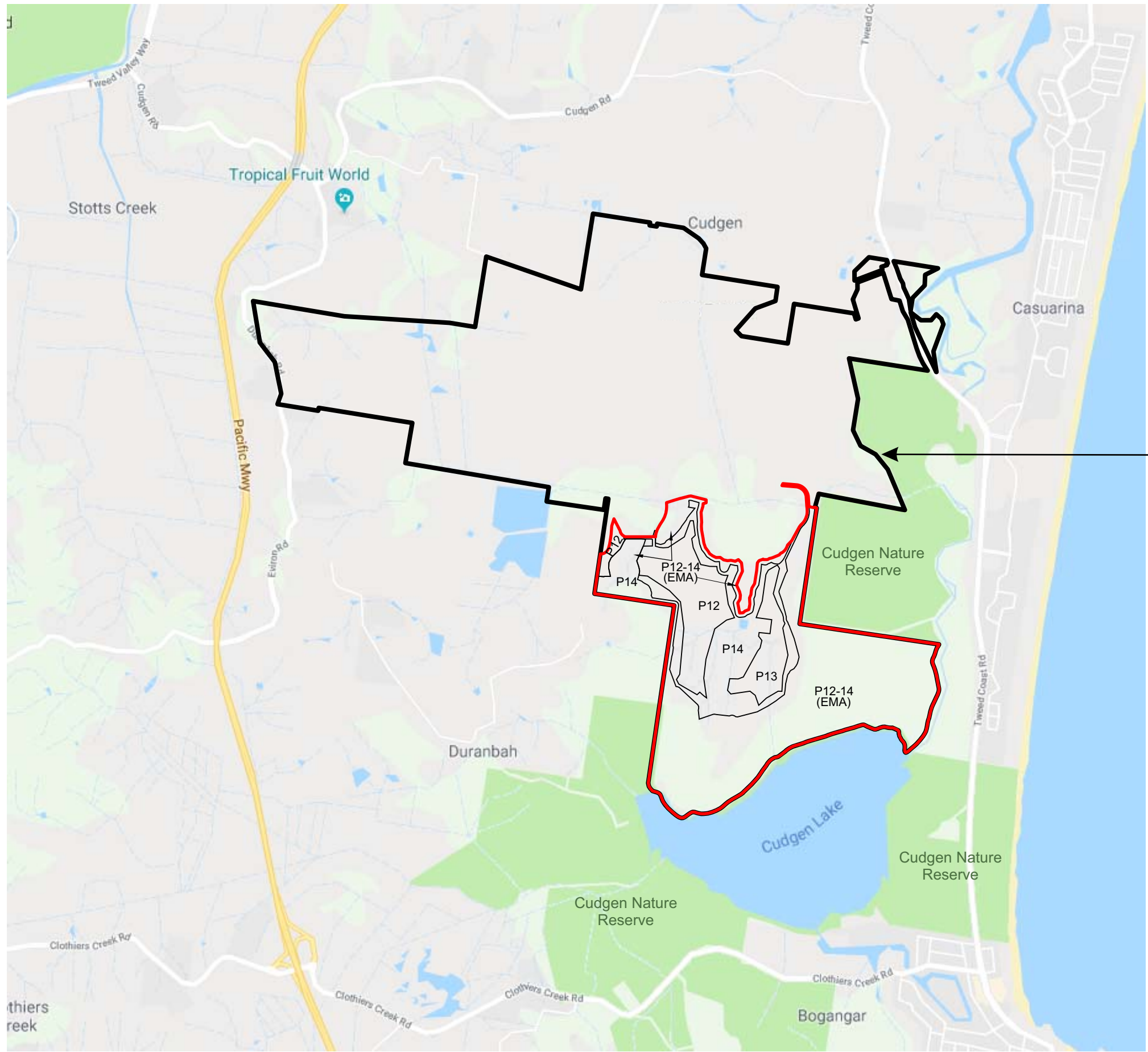
- Lot 76, 272, 323 and 326 in DP 755701;
- Lot 6 in DP 875446;
- Lot 2 in DP 819015;
- Lot 1 in DP 706497;
- Lot 40 in DP 7482;
- Lot 37A in DP 13727;
- Lot 38A in DP 13727;
- Lot 38B in DP 13727;
- Lot 1 in DP 129737;
- Lot 1 in DP 781633; and
- Lot 7 in DP 875447.

Project 28 Pty Ltd owns and manages the site which is currently used for cattle grazing and silviculture. The site consists of a mosaic of natural, partially natural, modified and regenerating plant communities including Heathland, Swamp sclerophyll (Paperbark) forest, Woodland, Pine plantation, Freshwater wetland and Pasture. The majority of the site is maintained as pasture for cattle grazing.

The Kings Forest site abuts agricultural and rural lands to the north, west and south west. Cudgen Nature Reserve (including Cudgen Lake and Cudgen Creek) abuts the site boundaries to the south and east. There are a small number of residential properties along Tweed Coast Road to the north of the site.

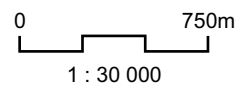
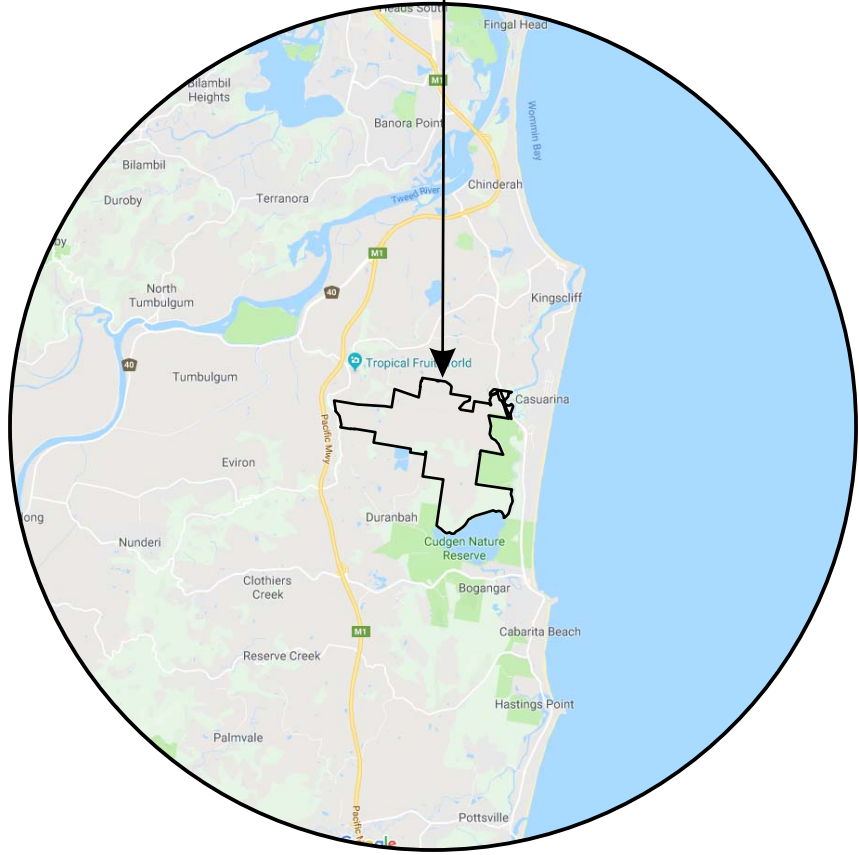
2.3 Conservation Reserves/Ecologically Significant Areas in the Locality

The Cudgen Nature Reserve adjoins the southern and (in part) eastern boundaries of the subject site (**FIGURE 2**). Stotts Island Nature Reserve is situated approximately 2 km to the north-west of the site.



- LEGEND**
- Area Subject to this Management Plan
 - Kings Forest Boundary

SUBJECT SITE



SOURCE: Google Maps

SCALE: 1 : 30 000 @ A3

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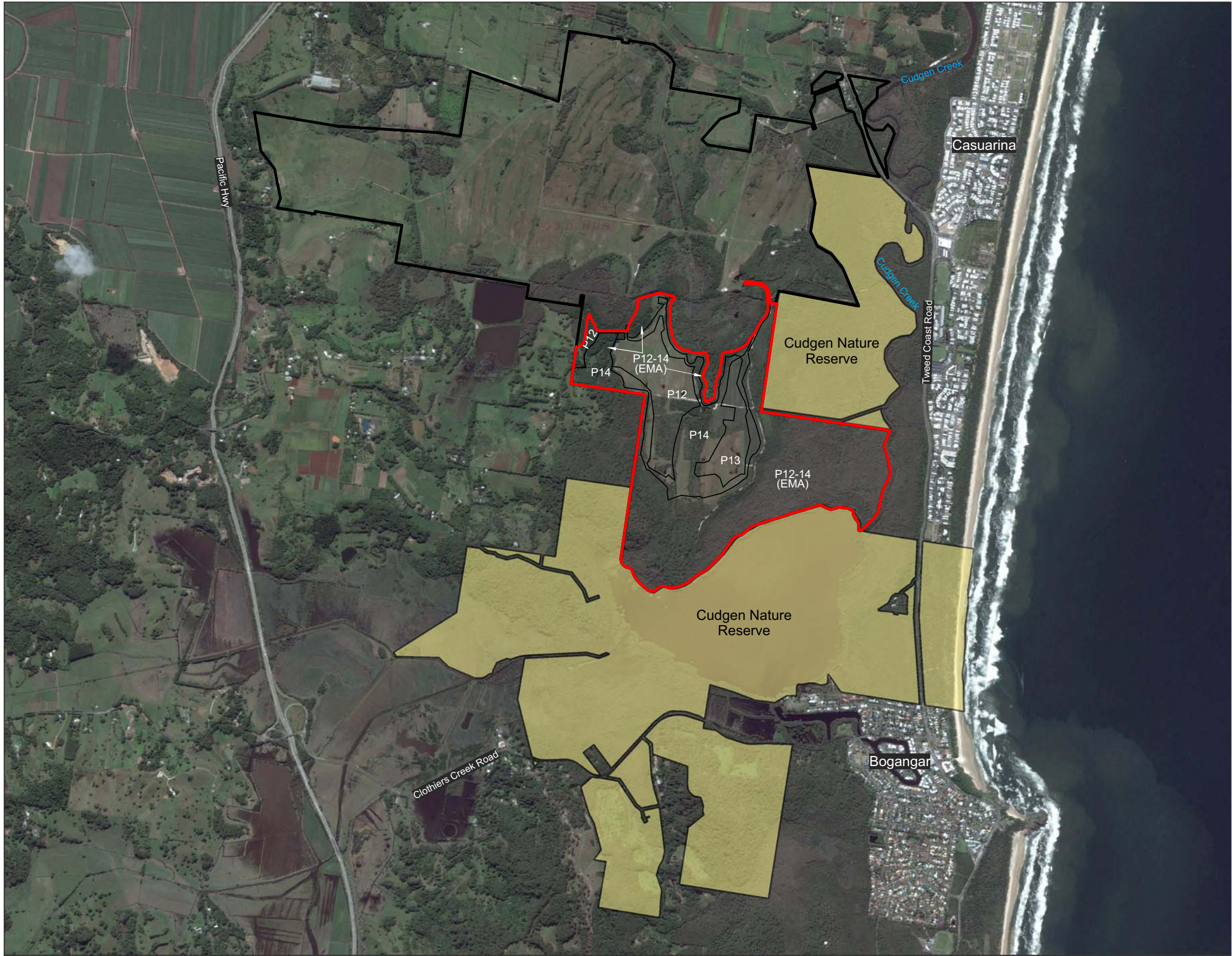
PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 1

PREPARED: BW
DATE: 16 November 2020
FILE: N97017_Locality.cdr

TITLE

LOCALITY PLAN



- LEGEND**
- Cudgen Nature Reserve
 - Area Subject to this Management Plan
 - Kings Forest Boundary

0 750m
1 : 30 000

SOURCE: NSW DPI Cadastre
Google Earth Apr 2017 Aerial
SCALE: 1 : 30 000 @ A3
JWA PTY LTD
Ecological Consultants

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Project 28 Pty Ltd
PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

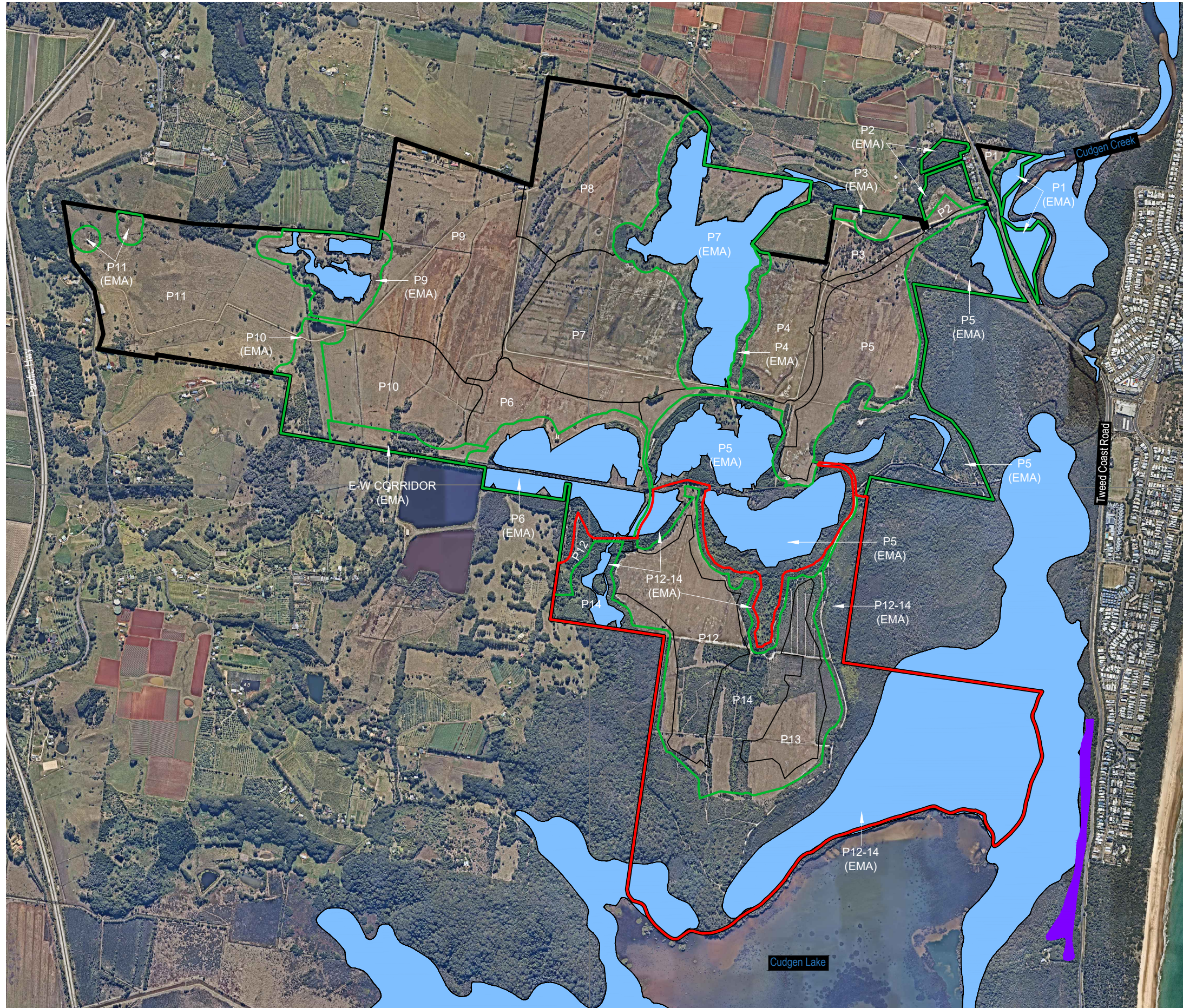
FIGURE 2
PREPARED: BW
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FILE: N97017_Cudgen NR.cdr

TITLE
**CUDGEN
NATURE
RESERVE**

Several Freshwater wetland and Littoral Rainforest areas protected under the (superseded) State Environmental Planning Policy (SEPP) 14 (Coastal Wetlands) and SEPP26 (Littoral Rainforests) exist within and near the site (**FIGURE 3**). These SEPP's have been superseded by State Environmental Planning Policy (SEPP) Coastal Management (2018). Whilst there are areas of discrepancy between the superseded and current SEPP wetland mapping on site, the wetlands generally occur in areas zoned for Environmental Protection on the NSW Planning SEPP Major Development 2005 - Kings Forest land zoning map (**FIGURE 4**). As all relevant approvals were granted prior to the gazettal of the Coastal Management SEPP reference to this mapping has not been shown to avoid confusion.

2.4 Land Use Zones

Land use zones over the Kings Forest development site are identified on the NSW Planning SEPP Major Development 2005 - Kings Forest land zoning map (**FIGURE 4**). SEPP 14 wetland areas, as well as a number of smaller wetland and Littoral rainforest parcels have been designated Environmental Protection (Wetlands and Littoral Rainforests) (7a) zones. Substantial buffer zones occur wherever the 2(c) lands abut neighbouring agricultural land (150 metres) and Environmental Protection zones (50 metre). Lands in the far south of the property are subject to clause 50b of the Tweed LEP, committing them to conservation. Apart from other smaller areas of Environmental Protection (Habitat) (7I), the remainder of the property is zoned Urban Expansion (2c).

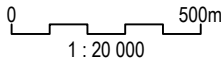


LEGEND

- SEPP 14 Coastal Wetlands (#1)
- SEPP 26 Littoral Rainforest (#1)
- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#2)
- Precinct Boundary
- Kings Forest Boundary

Note 1:
These SEPP's have been superseded by State Environmental Planning Policy (SEPP) Coastal Management (2018). As all relevant approvals were granted prior to the gazettal of the Coastal Management SEPP, reference to the revised mapping has not been shown to avoid confusion.

Note 2:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).



SOURCE: Landpartners - SEPP14 Wetlands (Amendment 15) & SEPP26 Littoral Rainforest; Near Map 08/08/18 Aerial

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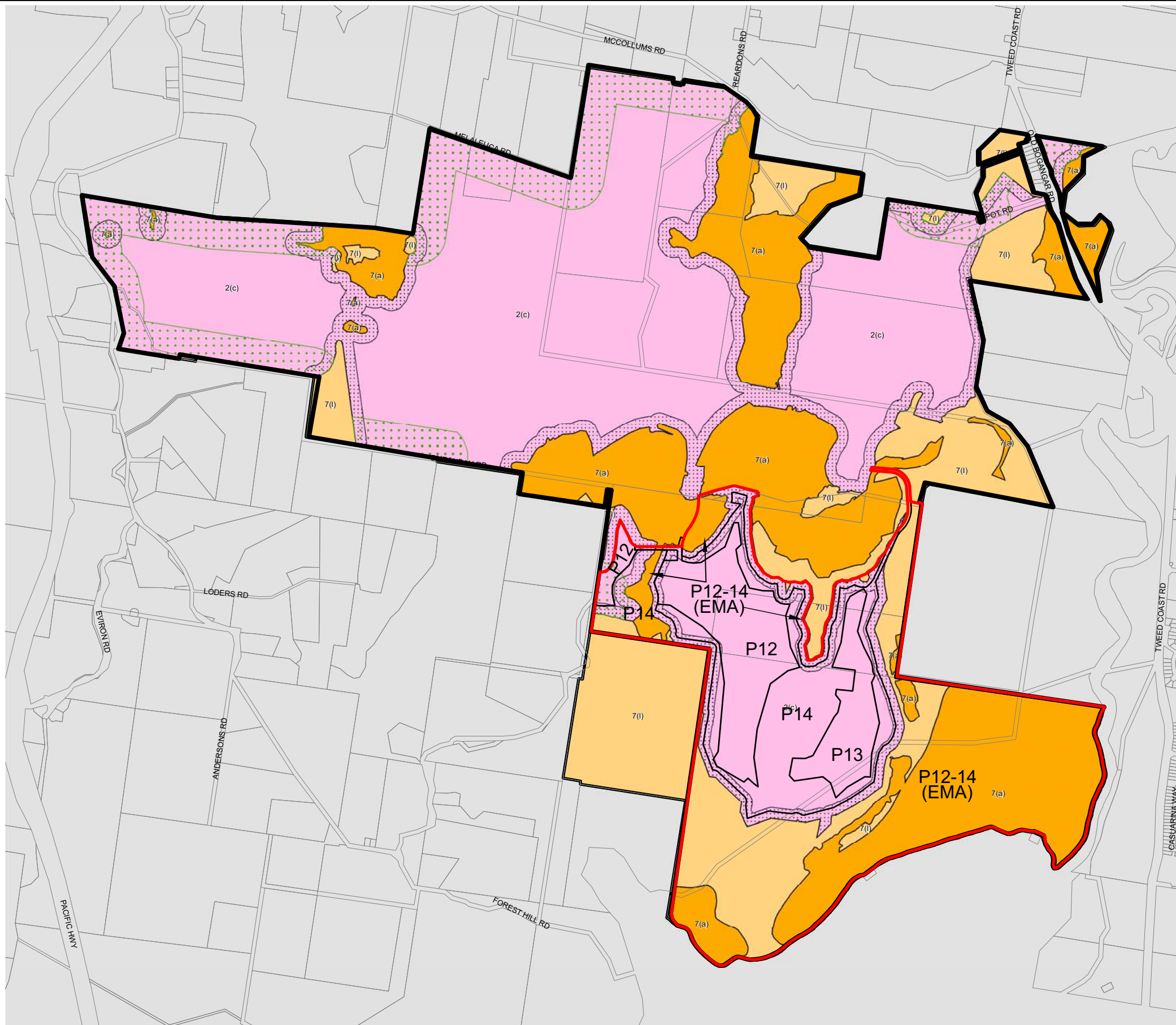
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Shire of Tweed

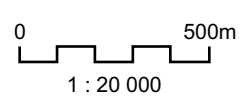
FIGURE 3

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TITLE
SEPP No. 14
COASTAL WETLANDS
& SEPP No. 26
LITTORAL RAINFOREST



- LEGEND**
- Area Subject to this Management Plan
 - Kings Forest Boundary
- ZONING**
- 2(c) Urban Expansion
 - 7(a) Environmental Protection (Wetlands & Littoral Rainforests)
 - 7(l) Environmental Protection (Habitat)
 - Agricultural Buffer (150m)
 - Ecological Buffer (50m)



SOURCE: NSW Planning SEPP (Major Development) 2005 - Kings Forest Land Zoning Map (Ref: SEPP_MD_KIF_LZN_001_20100201)
SCALE: 1 : 20 000 @ A3
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Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 4
PREPARED: BW
DATE: 16 November 2020
FILE: N97017_Zoning.cdr

TITLE
ZONING PLAN

3 PROPOSED DEVELOPMENT

3.1 Background

The Kings Forest project is a master planned residential community. The total area of the proposed development is 422.32 ha and will include the following in accordance with the Concept Plan Approval (as modified Mods 1 to 5):

- Residential development for approximately 4500 dwellings;
- Town centre and neighbourhood centre for future retail and commercial uses;
- Community and education facilities;
- Employment land;
- 18 hole Golf Course;
- Open space;
- Wildlife corridors;
- Protection and rehabilitation of environmentally sensitive land;
- Utility services infrastructure;
- Water management areas and lake; and
- Roads and pedestrian and bicycle paths.

The proposed development comprises a total of fourteen (14) separate precincts (**FIGURE 5**) and development of the site will be completed on a precinct-by-precinct basis.

Retained vegetation and habitat areas across the site generally occur within Environmental Protection Zones (EPZs) and associated buffers. To assist in identifying the staging of rehabilitation and management actions, these EPZ and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs). Works within EMAs will be completed in accordance with the staging of the associated Precinct.

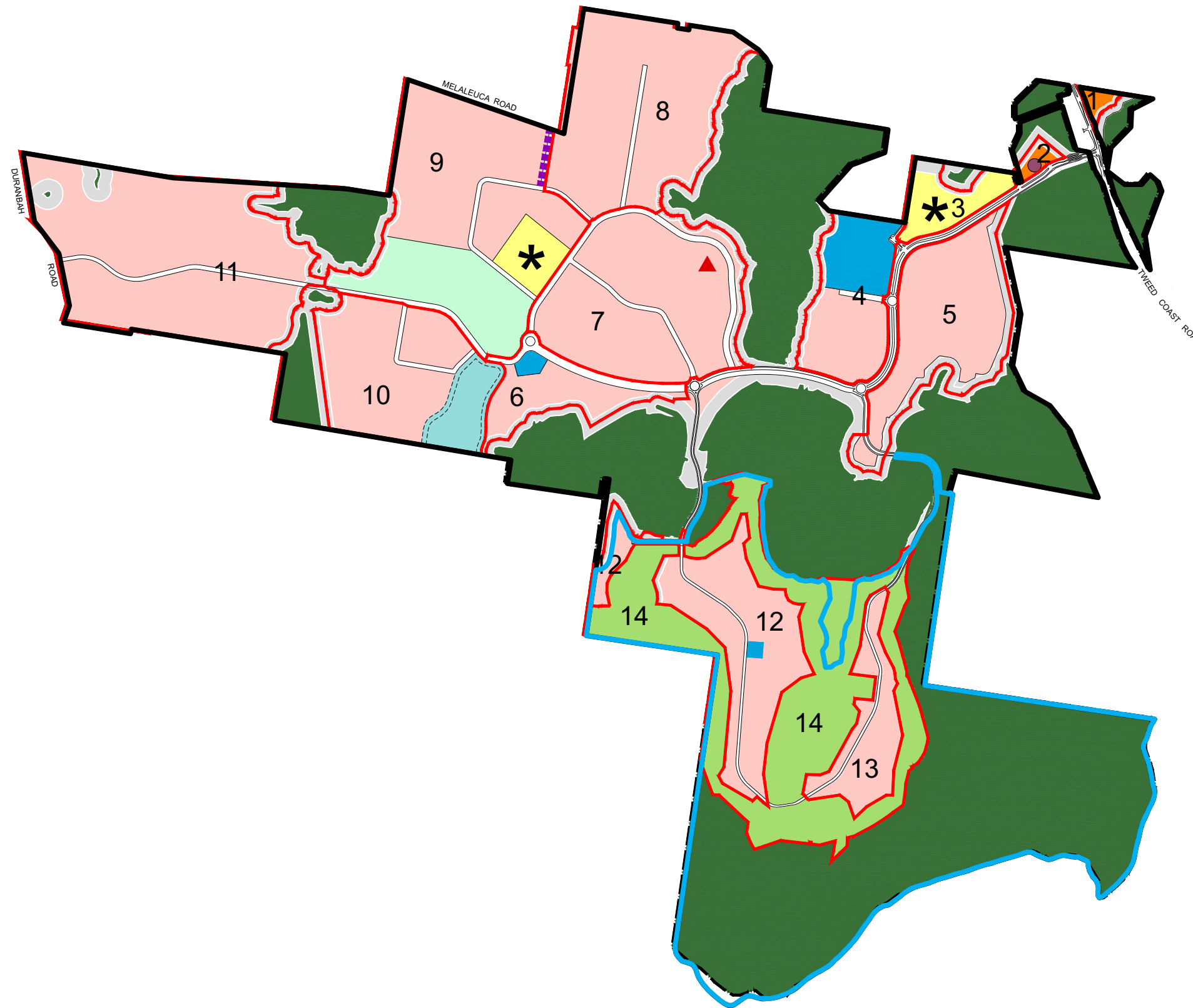
Precincts 12 - 14 are the subject of this TSMP and occur in the southern portions of the Kings Forest development site.

3.2 Precinct Descriptions

Precincts 12 - 14 occur in the southern portion of the Kings Forest site. Precincts 12 and 13 and are proposed to be developed as residential precincts. Precinct 14 contains the proposed Golf Course and will also act as an ecological buffer (minimum 50 m in width) between the residential precincts and retained and compensatory habitat areas.

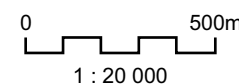
3.3 Development Staging

The Kings Forest project will likely proceed over many years. The length of time will be dependent, to a certain degree, on the demand for land over time. The development of the



- LEGEND**
- Area Subject to this Management Plan
 - Precinct Boundary
 - Kings Forest Boundary
- PRECINCT PLAN**
- Town Centre / Neighbourhood Centre
 - Residential
 - Community Facilities / Education
 - Employment Land
 - Structured Open Space (Active)
(Passive open space to council standards, location subject to urban design)
 - Environmental Protection Area
 - 50m Ecological Buffer
(Includes APZs & roads where approved)
 - * State School Site
 - Proposed Zone Substation
(Subject to Country Energy final approval)
 - ▲ Potential Affordable Housing Location
 - Potential Road Connection to Melaleuca Road
 - Private Open Space
 - Golf Course Area
(Encompassing ecological buffers where indicated)
 - Private Open Space including lake

IMPORTANT NOTE
 This plan was prepared as a preliminary concept plan for planning purposes only. As such all particulars, including lot design, areas and densities, are subject to detailed survey, site investigations and to the requirements of council and any other authority which may have requirements under any relevant legislation.
 This note is an integral part of this plan.



SOURCE: RPS Precinct Plan Rev B dated 05/12/13 (Ref: 113691-PSP-4b(PRECINCT PLAN).dwg) SCALE: 1 : 20 000 @ A3 JWA PTY LTD <i>Ecological Consultants</i>	CLIENT Project 28 Pty Ltd PROJECT Threatened Species Management Plan Precincts 12 - 14 Kings Forest Melaleuca Drive, Durambah, NSW Shire of Tweed	FIGURE 5 PREPARED: BW DATE: 16 November 2020 FILE: N97017_Precinct Plan.cdr	TITLE PRECINCT PLAN
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site will be completed on a precinct-by-precinct basis in accordance with approved Precinct Plan (**FIGURE 5**), however this may be subject change. Precincts 12 - 14 (i.e. the subject of this TSMP) are proposed to be developed during the final stage (Stage 9) of the Kings Forest development.

4 EXISTING SITE VALUES

4.1 Introduction

The following sections detail the existing ecological values contained within Precincts 12 - 14 and associated EMAs. An aerial photograph of Precincts 12 - 14 and associated EMAs is shown in **FIGURE 6**.

4.2 Vegetation

The Kings Forest site has a decades-long history of various land uses and land management practices, including pine plantation, sand mining, pasture improvement and turf production, dairy farming, small cropping and sugar cane production. It is presently used generally for cattle grazing. Over many years the land has been extensively cleared for these activities. There remain, however, large areas of undisturbed vegetation in the eastern and south-eastern portions of the property and within wetland areas throughout. These areas of the site are generally zoned for Environment Protection.

Vegetation at the subject site has been described in varying degrees of detail (Warren 2000, Kingston *et al.* 2004, Callaghan *et al.* 2005). The most comprehensive vegetation mapping over the Kings Forest site was completed by the Australian Koala Foundation (Callaghan *et al.* 2005). However, harvesting of areas of pine plantation, continued infestation of native vegetation with Slash pine (*Pinus elliottii*) wildings and areas of natural heath regeneration has occurred since the preparation of this map.

FIGURE 7 shows the vegetation communities occurring over Precincts 12 - 14 and associated EMAs (as at July 2019) and has been adapted from the Callaghan *et al.* (2005) mapping combined with detailed remapping/ ground-truthing surveys completed by JWA between 2010 - 2019. In total, five (5) broad vegetation types have been mapped within Precincts 12 - 14 and associated EMAs:

- Highly modified vegetation communities;
- Freshwater wetlands;
- Heathland and shrublands;
- Swamp sclerophyll floodplain forests; and
- Dry to moist open forests.

Vegetation community descriptions in this TSMP, including proposed offset/compensatory habitat areas, are discussed in relation to their closest Plant Community Type (PCT) descriptions which were accessed via the Biodiversity and Conservation Division (BCD) (formerly OEH) of the Environment, Energy and Science Group in the NSW DPI&E database (i.e. the BioNet Vegetation Classification System). PCTs are classified based on vegetation types occurring within the Interim Biogeographic Regionalisation for Australia (IBRA) subregions, as developed by the Commonwealth government. The IBRA framework divides Australia landscapes into bioregions and subsequently subregions based on common features such as climate, geology, landform, and vegetation.



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: Near Map 08/08/18 Aerial

SCALE: 1 : 10 000 @ A3

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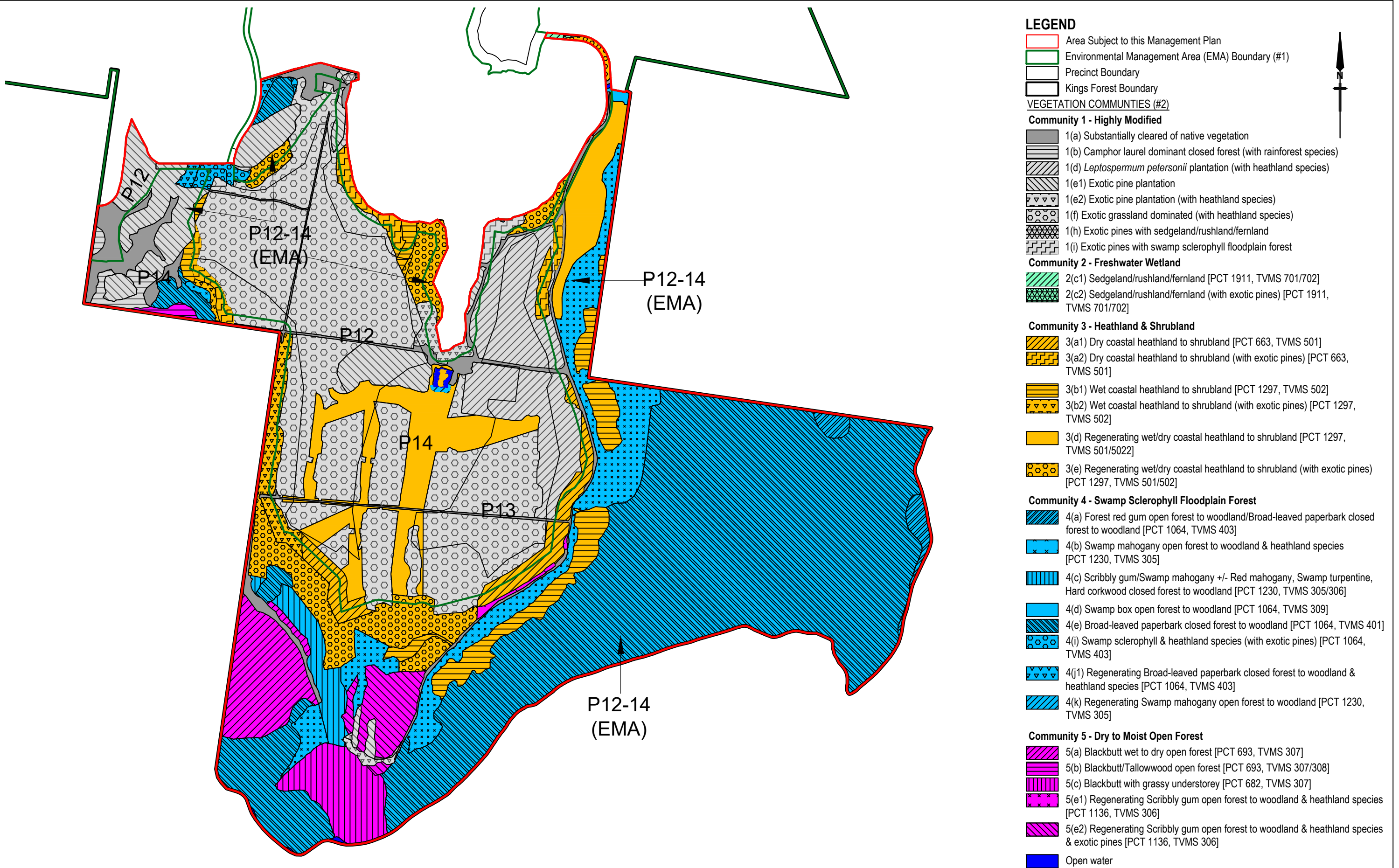
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Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 6

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DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE

AERIAL
PHOTOGRAPH



#1 Note: To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

#2 Note: Vegetation mapping has been adapted from the Australian Koala Foundation (Callaghan *et al.* 2005) mapping combined with detailed re-mapping/ground-truthing surveys completed by JWA between 2010 - 2018.

SOURCE: JWA Site Investigations 2018; Near Map 08/08/18 Aerial	CLIENT Project 28 Pty Ltd	FIGURE 7	TITLE VEGETATION COMMUNITIES
SCALE: 1 : 10 000 @ A3	PROJECT Threatened Species Management Plan Precincts 12 - 14 Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed		
JWA PTY LTD Ecological Consultants	PREPARED: BW DATE: 17 November 2020 FILE: N97017_MP12-14_20201116.dwg		

It is noted however that PCT descriptions are still undergoing revision and many remain undescribed for the SEQ03 - Burringbar-Conondale Ranges IBRA subregion. Therefore, corresponding Tweed Vegetation Management Strategy 2004 (TVMS) codes have also been provided.

4.3 Endangered Ecological Communities

Two (2) Endangered Ecological Communities (EECs) as defined by the NSW *Biodiversity Conservation Act 2016* (BC Act) have been mapped within Precincts 12 - 14 and associated EMAs (**FIGURE 8**):

- Freshwater wetlands on coastal floodplains of the NSW North Coast; and
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast.

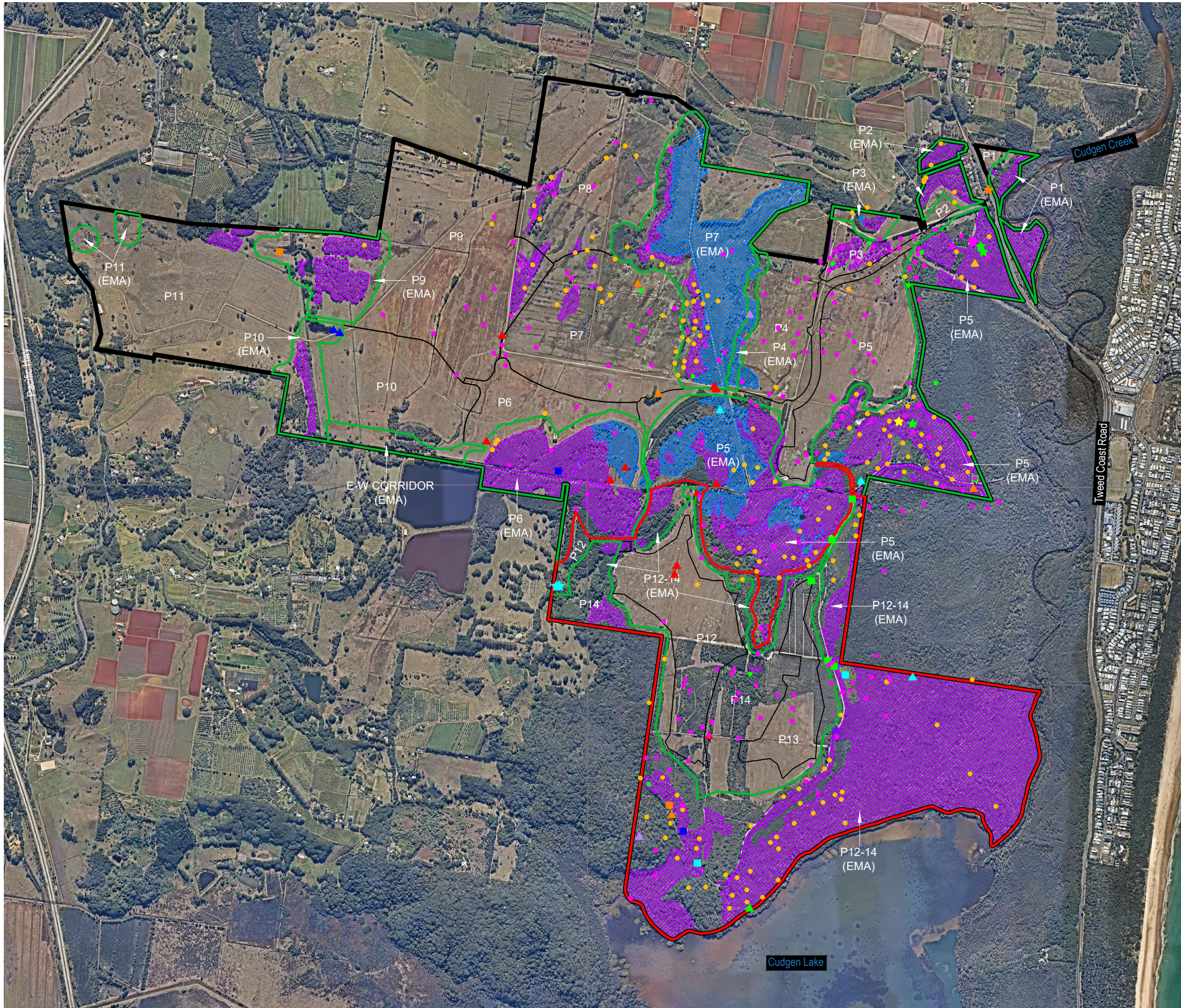
Descriptions of these EECs are provided in **APPENDIX 3**.

4.4 Threatened Flora and Fauna

A number of threatened flora and fauna species have been recorded across the Kings Forest site over the last 30 years. Current and historical records of these threatened species are shown in **FIGURE 8**.

TABLE 1 lists the threatened flora and fauna species which have been recorded within Precincts 12 - 14 and associated EMAs. Also included in **TABLE 1** are species which are known to occur within the wider Kings Forest site and are considered to be provided with suitable habitat within the Precincts 12 - 14 and associated EMAs. The conservation status of each species listed in **TABLE 1** is shown in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW BC Act.

TABLE 1 also summarises the suitable habitat occurring within Precincts 12 - 14 and associated EMAs for each species. These habitat areas are depicted in **FIGURES 9 - 17**. Species profiles for the threatened flora and fauna species listed in **TABLE 1** including description, habitat requirements, status, existing and potential threats, recovery strategies are provided in **APPENDICES 4 and 5** respectively.



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary

THREATENED FLORA RECORDS

- Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) - Endangered (BC Act 2016)
- Southern swamp orchid (*Phaius australis*) - Endangered (BC Act 2016 & EPBC Act 1999)
- Stinking cryptocarya (*Cryptocarya foetida*) - Vulnerable (BC Act 2016 & EPBC Act 1999)
- White laceflower (*Archidendron hendersonii*) - Vulnerable (BC Act 2016)
- White yiel yiel (*Grevillea hilliana*) - Endangered (EPBC Act 1999)

THREATENED FAUNA RECORDS

Birds

- Black bittern (*Ixobrychus flavicollis*) - Vulnerable (BC Act 2016)
- Black-necked stork (*Ephippiorhynchus asiaticus*) - Endangered (BC Act 2016)
- Bush stone-curlew (*Burhinus grallarius*) - Endangered (BC Act 2016)
- Glossy-black cockatoo (*Calyptorhynchus lathami*) - Vulnerable (BC Act 2016)
- Grass owl (*Tyto longimembris*) - Vulnerable (BC Act 2016)
- Masked owl (*Tyto novaehollandiae*) - Vulnerable (BC Act 2016)
- Osprey (*Pandion haliaetus*) - Vulnerable (BC Act 2016)
- Pale-vented bush hen (*Amouronis moluccana*) - Vulnerable (BC Act 2016)

Mammals

- Common blossom bat (*Syconycteris australis*) - Vulnerable (BC Act 2016)
- Common planigale (*Planigale maculata*) - Vulnerable (BC Act 2016)
- Grey-headed flying-fox (*Pteropus poliocephalus*) - Vulnerable (BC Act 2016 & EPBC Act 1999)
- Koala (*Phascolarctos cinereus*) - Vulnerable (BC Act 2016 & EPBC Act 1999)
- Yellow-bellied sheathail bat (*Saccolaimus flaviventris*) - Vulnerable (BC Act 2016)

Amphibians

- Wallum froglet (*Crinia tinnula*) - Vulnerable (BC Act 2016)
- Wallum sedge frog (*Litoria longburnensis*) - Vulnerable (BC Act 2016 & EPBC Act 1999)

ENDANGERED ECOLOGICAL COMMUNITIES

- Freshwater wetlands on coastal floodplains of the NSW North Coast
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast

Note:

To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 500m
1 : 20 000

SOURCE: Landpartners - SEPP14 Wetlands (Amendment 15) & SEPP26 Littoral Rainforest; Near Map 08/08/18 Aerial

SCALE: 1 : 20 000 @ A3

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Ecological Consultants

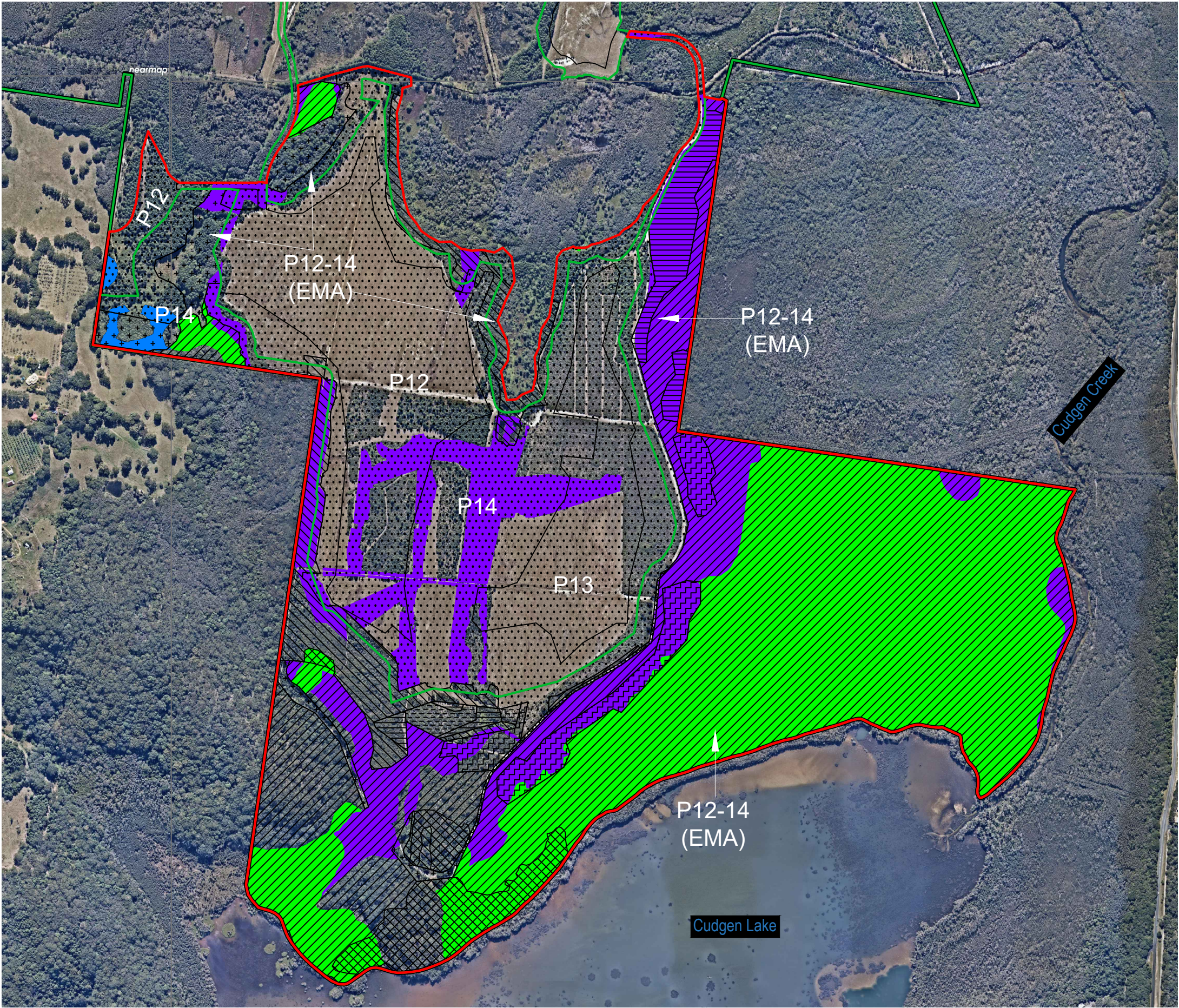
CLIENT
Project 28 Pty Ltd

PROJECT
Threatened Species Management Plan
Precincts 1 - 5 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 8

PREPARED: BW
DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE
THREATENED
FLORA & FAUNA RECORDS
& ENDANGERED
ECOLOGICAL
COMMUNITIES



LEGEND

- Area Subject to this Management Plan
 - Environmental Management Area (EMA) Boundary (#)
 - Precinct Boundary
 - Kings Forest Boundary
 - Cobaki Scribbly gum offset area
- FLORA & FAUNA HABITAT**
- Available habitat for:
 - Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*);
 - Stinking cryptocarya (*Cryptocarya foetida*);
 - White laceflower (*Archidendron hendersonii*);
 - White yiel yiel (*Grevillea hilliana*); and
 - Rose-crowned fruit-dove (*Ptilinopus regina*).
 - Available habitat for Southern swamp orchid (*Phaius australis*)
 - Available habitat for Black-necked stork (*Ephippiorhynchus asiaticus*)
- MANAGEMENT ZONES**
- Zone 1 - Construction zone
 - Zone 2 - Retained Koala habitat
 - Zone 3 - Retained WSF habitat
 - Zone 4 - Koala compensatory habitat
 - Zone 5 - WSF compensatory habitat
 - Zone 6 - Heath regeneration/revegetation
 - Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018
Near Map 08/08/18 Aerial

SCALE: 1 : 10 000 @ A3

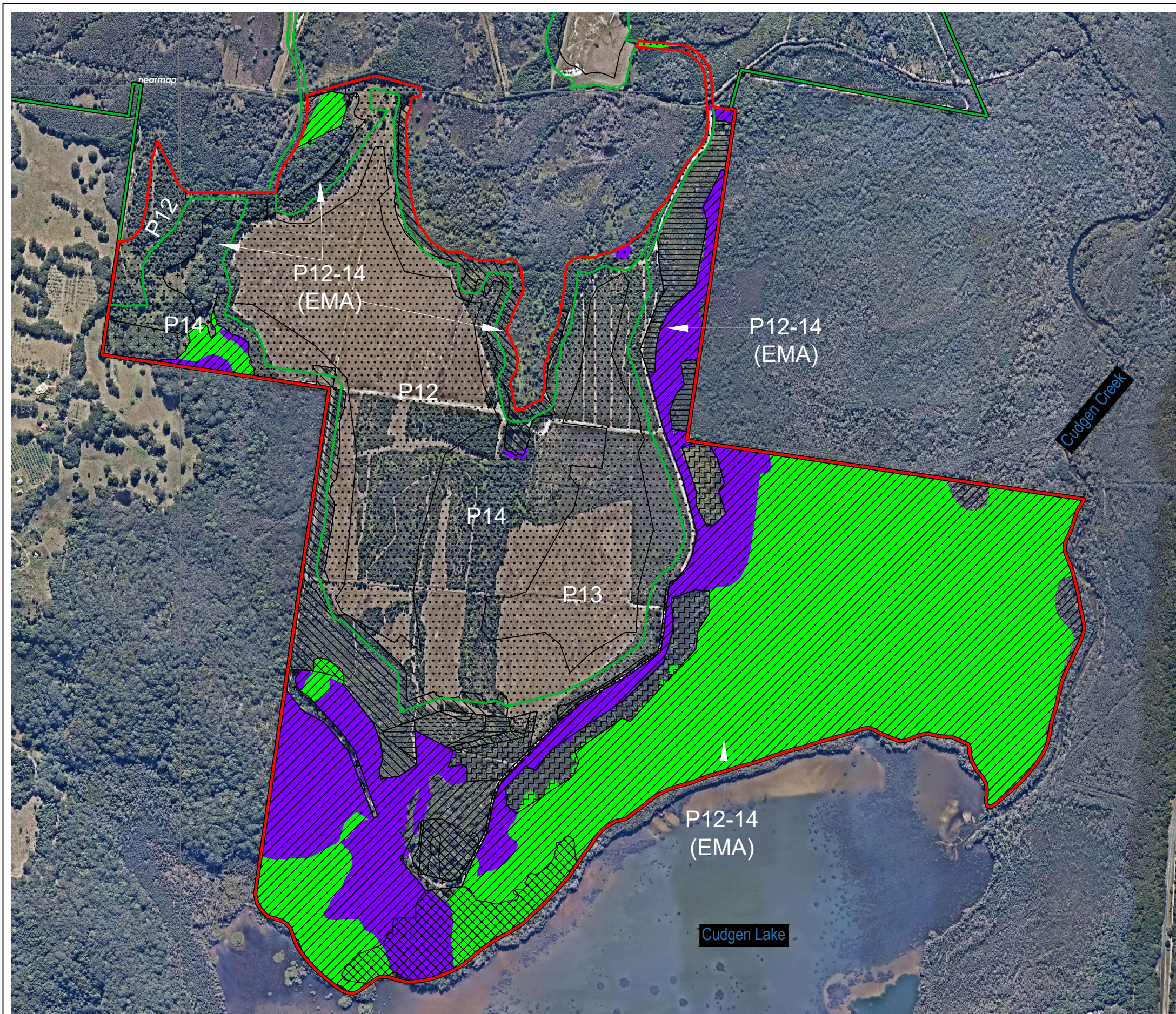
JWA PTY LTD
Ecological Consultants

CLIENT
Project 28 Pty Ltd
PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 9

PREPARED: BW
DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE
HABITAT FOR
BLACK-NECKED STORK
& SOUTHERN SWAMP
ORCHID



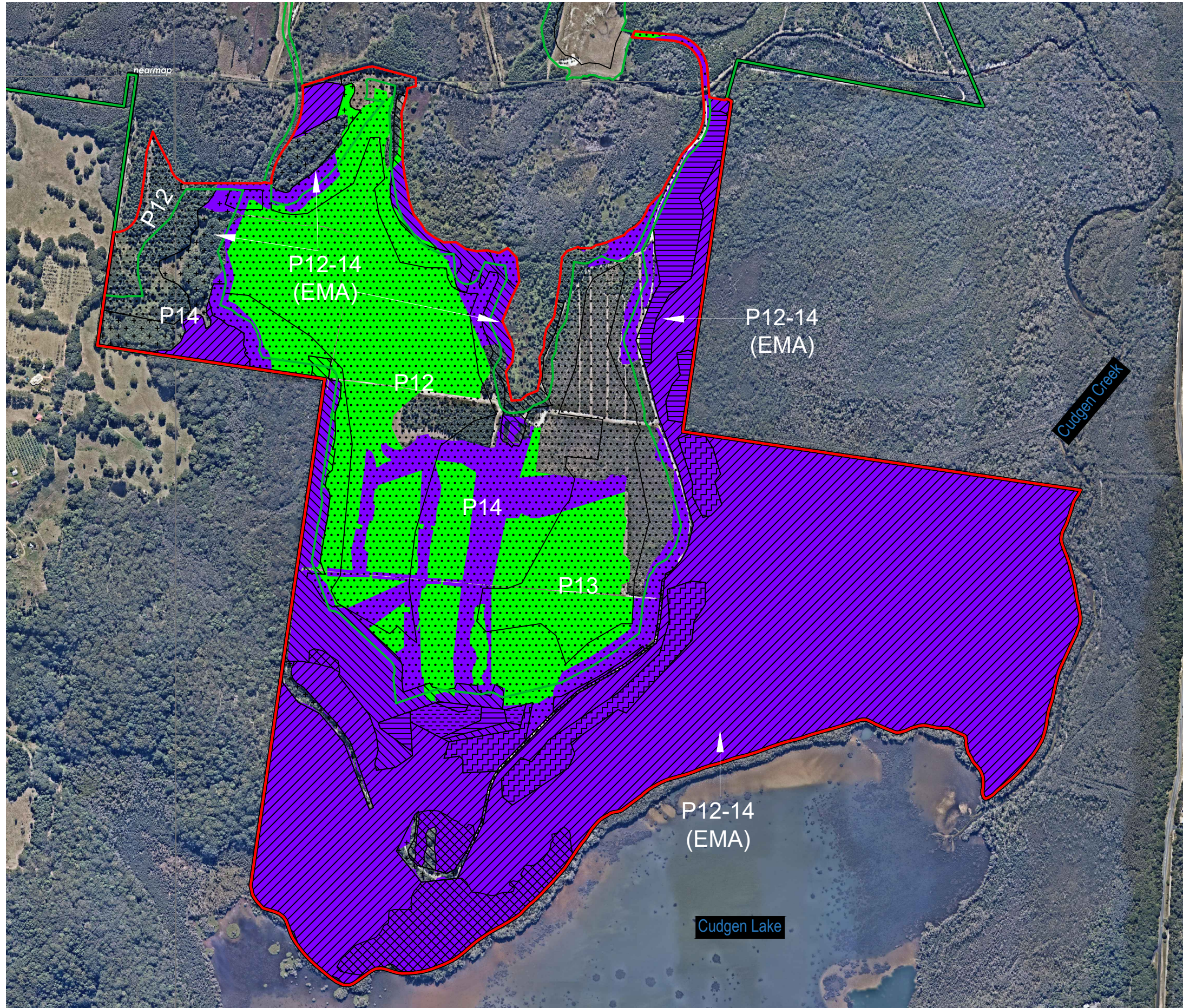
LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area
- FLORA & FAUNA HABITAT**
- Available habitat for Black bittern (*Ixobrychus flavicollis*)
- Available habitat for Bush stone-curlew (*Burhinus grallarius*)
- MANAGEMENT ZONES**
- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018 Near Map 08/08/18 Aerial SCALE: 1 : 10 000 @ A3 JWA PTY LTD Ecological Consultants	CLIENT Project 28 Pty Ltd PROJECT Threatened Species Management Plan Precincts 12 - 14 Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed	FIGURE 10	TITLE HABITAT FOR BLACK BITTERN & BUSH STONE-CURLEW
		PREPARED: BW DATE: 17 November 2020 FILE: N97017_MP12-14_20201116.dwg	



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area

FLORA & FAUNA HABITAT

- Available habitat for:
 - Common blossom bat (*Syconycteris australis*);
 - Eastern false pipistrelle (*Falsistrellus tasmaniensis*);
 - Grey-headed flying-fox (*Pteropus poliocephalus*);
 - Little bent-wing bat (*Miniopterus australis*); and
 - Southern myotis (*Myotis macropus*).

- Available habitat for Grass owl (*Tyto longimembris*)

MANAGEMENT ZONES

- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018
Near Map 08/08/18 Aerial

SCALE: 1 : 10 000 @ A3

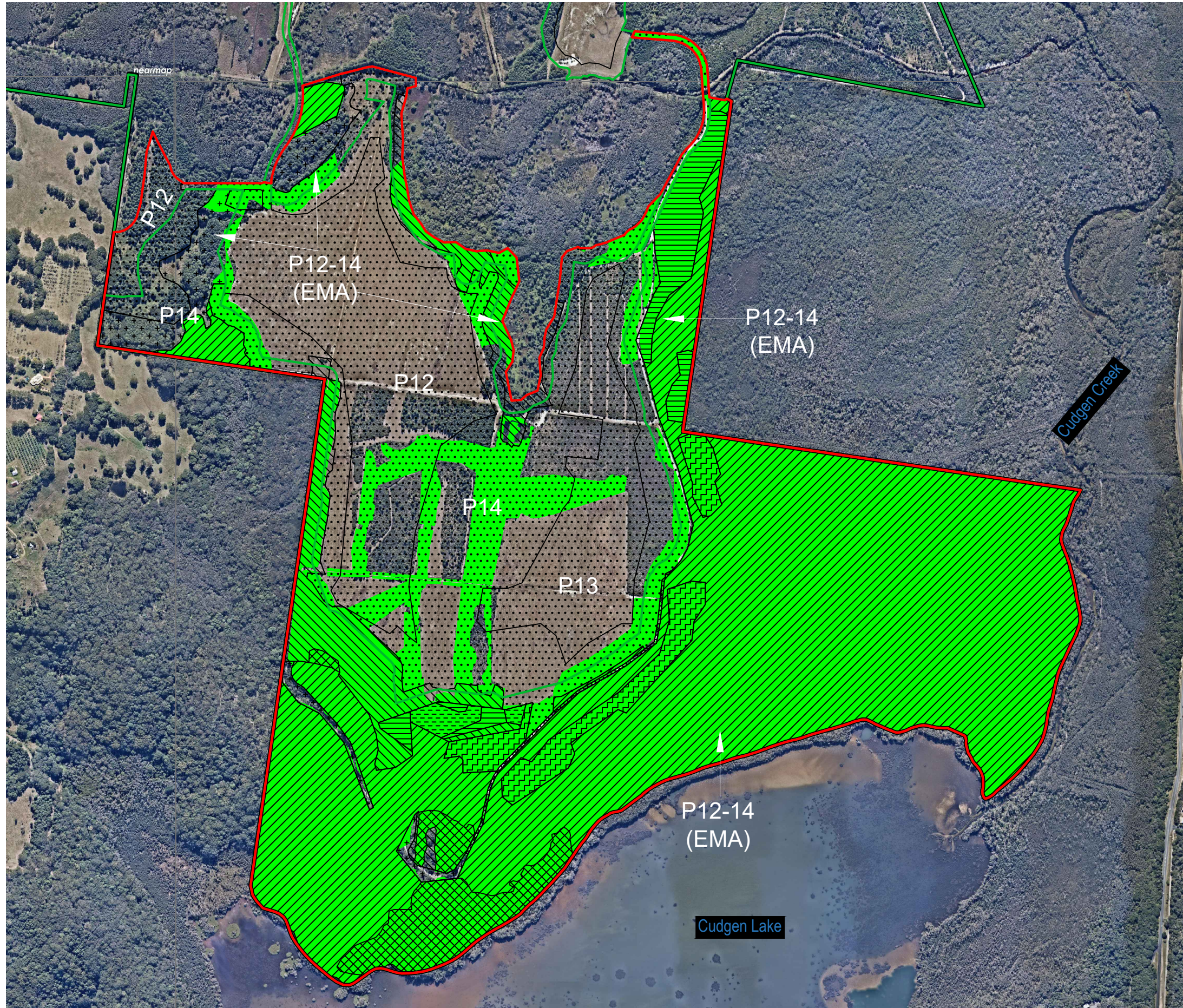
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PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 11

PREPARED: BW
DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE
HABITAT FOR
COMMON BLOSSOM BAT, EASTERN
FALSE PIPISTRELLE, GRASS OWL,
GREY-HEADED FLYING-FOX, LITTLE
BENT-WING BAT & SOUTHERN
MYOTIS



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area

FLORA & FAUNA HABITAT

- Available habitat for Common planigale (*Planigale maculata*)

MANAGEMENT ZONES

- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018
Near Map 08/08/18 Aerial

SCALE: 1 : 10 000 @ A3

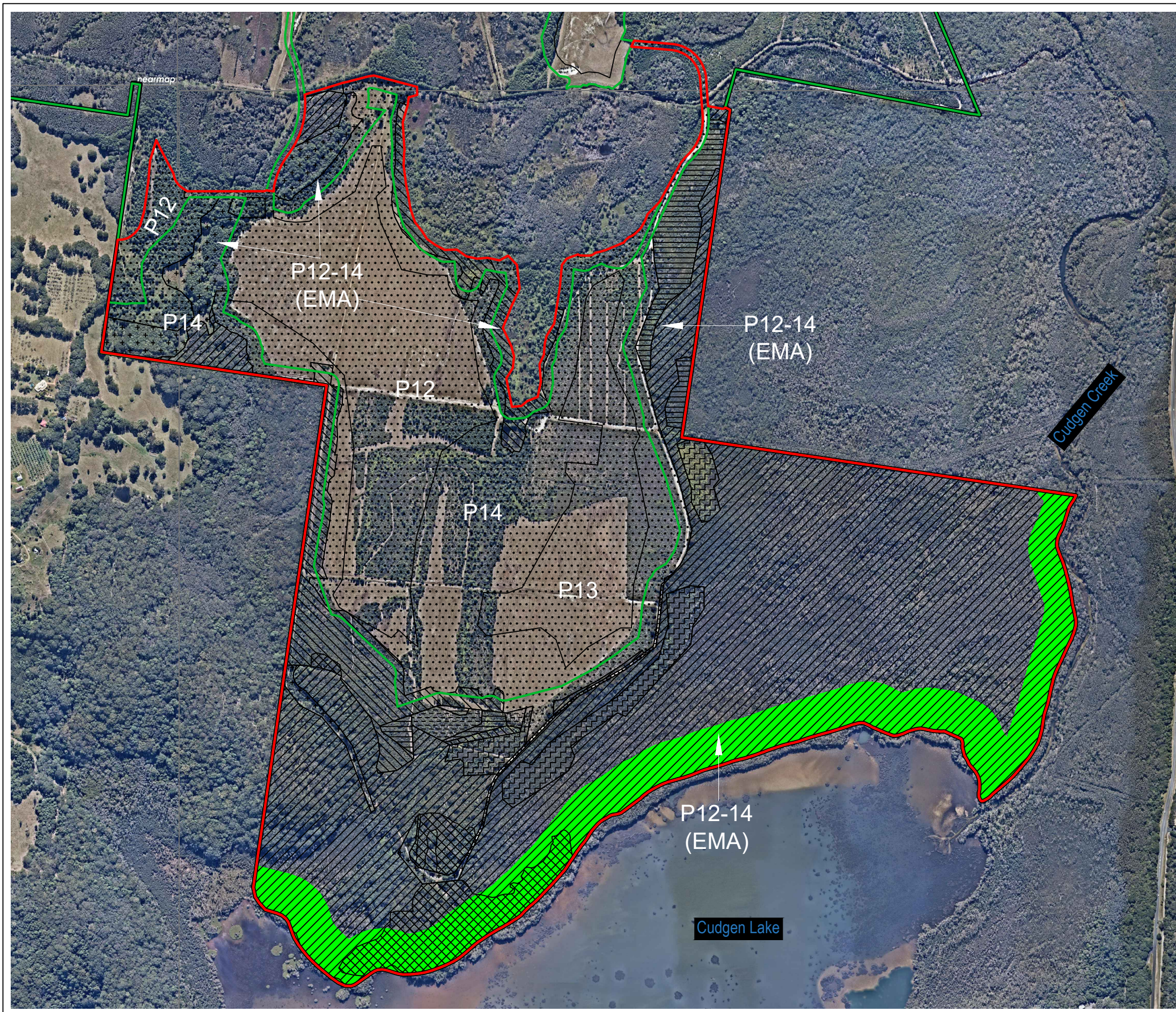
JWA PTY LTD
Ecological Consultants

CLIENT
Project 28 Pty Ltd
PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 12

PREPARED: BW
DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE
HABITAT FOR
COMMON PLANIGALE



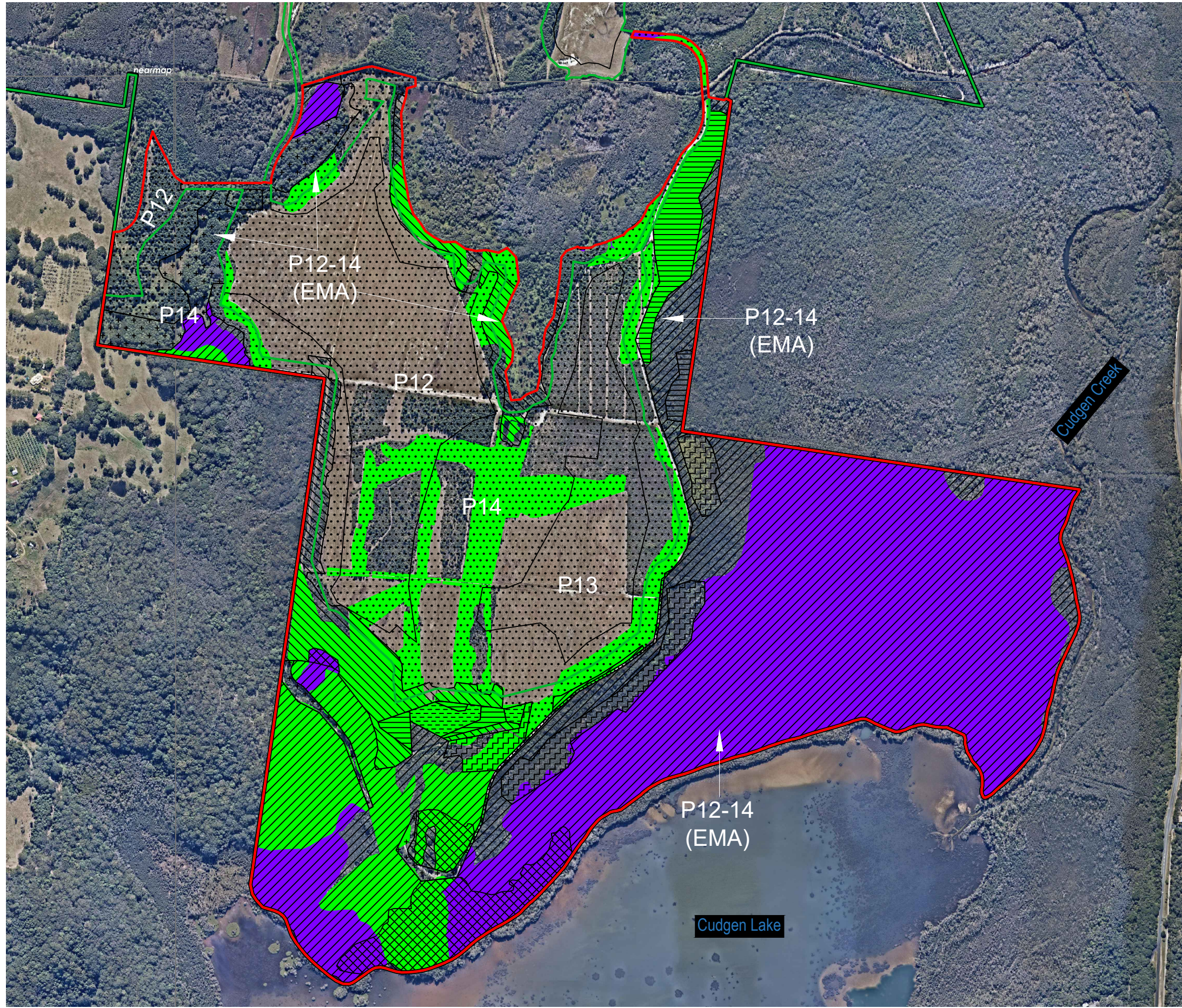
LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area
- FLORA & FAUNA HABITAT
- Available habitat for Eastern osprey (*Pandion cristatus*)
- MANAGEMENT ZONES
- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018 Near Map 08/08/18 Aerial	CLIENT Project 28 Pty Ltd	FIGURE 13	TITLE HABITAT FOR EASTERN OSPREY
SCALE: 1 : 10 000 @ A3	PROJECT Threatened Species Management Plan Precincts 12 - 14 Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed		
JWA PTY LTD Ecological Consultants		PREPARED: BW DATE: 17 November 2020 FILE: N97017_MP12-14_20201116.dwg	



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area

FLORA & FAUNA HABITAT

- Available habitat for Glossy-black cockatoo (*Calyptrorhynchus lathami*)
- Available habitat for Pale-vented bush hen (*Amouronis moluccana*)

MANAGEMENT ZONES

- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:

To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018
Near Map 08/08/18 Aerial

SCALE: 1 : 10 000 @ A3

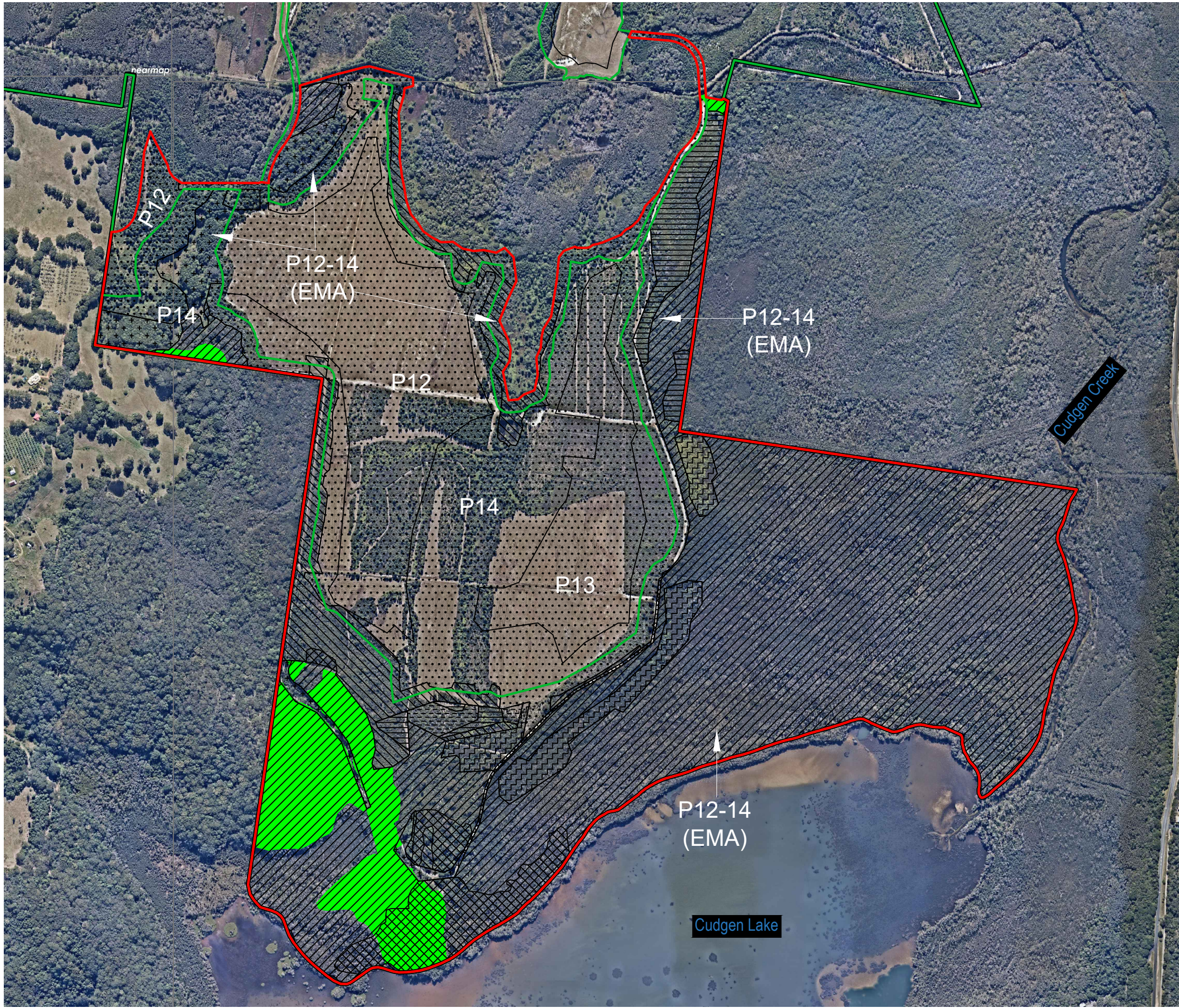
JWA PTY LTD
Ecological Consultants

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Project 28 Pty Ltd
PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 14

PREPARED: BW
DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE HABITAT FOR
GLOSSY-BLACK
COCKATOO &
PALE-VENTED
BUSH HEN



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area

FLORA & FAUNA HABITAT

- Available habitat for Masked owl (*Tyto novaehollandiae*)

MANAGEMENT ZONES

- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018
Near Map 08/08/18 Aerial

SCALE: 1 : 10 000 @ A3

JWA PTY LTD
Ecological Consultants

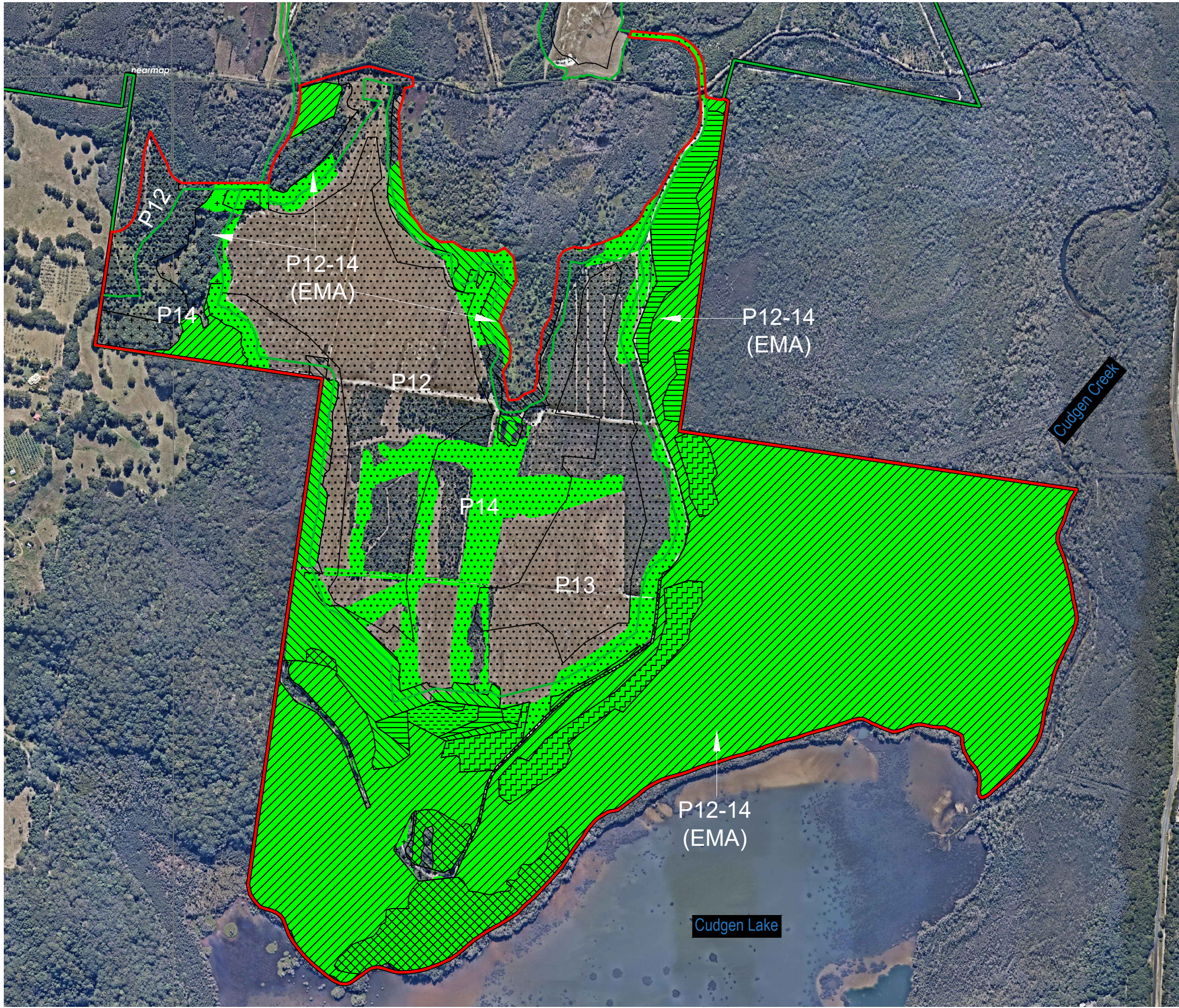
CLIENT
Project 28 Pty Ltd
PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 15

PREPARED: BW
DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE

HABITAT FOR
MASKED OWL



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area

FLORA & FAUNA HABITAT

- Available habitat for Yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*)

MANAGEMENT ZONES

- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018
Near Map 08/08/18 Aerial

SCALE: 1 : 10 000 @ A3

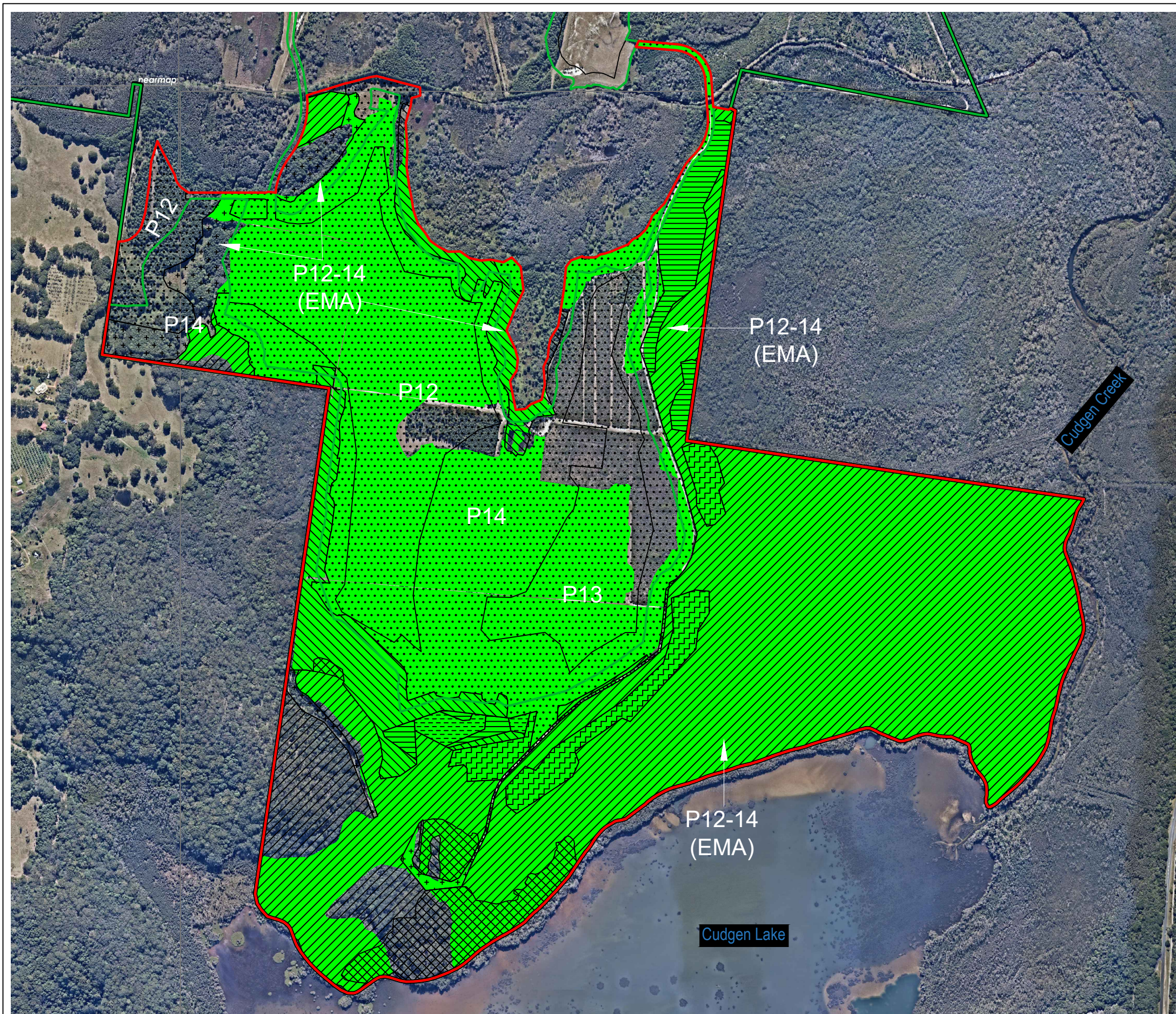
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PROJECT
Threatened Species Management Plan
Precincts 12 - 14 Kings Forest
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 16

PREPARED: BW
DATE: 17 November 2020
FILE: N97017_MP12-14_20201116.dwg

TITLE
HABITAT FOR
YELLOW-BELLIED
SHEATHTAIL BAT



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area
- FLORA & FAUNA HABITAT
 - Available habitat for Wallum froglet (*Crinia tinnula*)
- MANAGEMENT ZONES
 - Zone 1 - Construction zone
 - Zone 2 - Retained Koala habitat
 - Zone 3 - Retained WSF habitat
 - Zone 4 - Koala compensatory habitat
 - Zone 5 - WSF compensatory habitat
 - Zone 6 - Heath regeneration/revegetation
 - Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 300m
1 : 10 000

SOURCE: JWA Site Investigations 2018 Near Map 08/08/18 Aerial	CLIENT Project 28 Pty Ltd	FIGURE 17	TITLE HABITAT FOR WALLUM FROGLET
SCALE: 1 : 10 000 @ A3	PROJECT Threatened Species Management Plan Precincts 12 - 14 Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed		
JWA PTY LTD Ecological Consultants		PREPARED: BW DATE: 17 November 2020 FILE: N97017_MP12-14_20201116.dwg	

TABLE 1
THREATENED SPECIES RECORDED OR CONSIDERED TO HAVE SUITABLE HABITAT WITHIN PRECINCTS 12 - 14 AND ASSOCIATED EMAS

Common Name	Scientific Name	BC Act*	EPBC Act#	Recorded within P12-14 & EMAs	Suitable Habitat	
					Vegetation Communities	Total Area
Threatened flora species						
Green-leaved rose walnut	<i>Endiandra muelleri</i> subsp. <i>bracteata</i>	E	-	No	1(b)	1.17 ha
Southern swamp orchid	<i>Phaius australis</i>	E	E	No	1(b)	1.17 ha
Stinking cryptocarya	<i>Cryptocarya foetida</i>	V	V	No	1(b)	1.17 ha
White laceflower	<i>Archidendron hendersonii</i>	V	-	No	1(b)	1.17 ha
White yiel yiel	<i>Grevillea hilliana</i>	E	-	Yes	1(b)	1.17 ha
Threatened fauna species						
Black bittern	<i>Ixobrychus flavicollis</i>	V	-	Yes	2(c1), 2(c2), 4(e)	80.82 ha
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>	E	-	No	2(c1), 2(c2), 3(b1), 3(b2), 3(d), 4(a), 4(b), 4(c), 4(d), 4(i), 4(k)	46.58 ha
Bush stone-curlew	<i>Burhinus grallarius</i>	E	-	Yes	4(b), 4(c), 4(d), 4(k), 5(a), 5(b), 5(c)	29.95 ha
Common blossom bat	<i>Syconycteris australis</i>	V	-	Yes	3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k), 5(a), 5(b), 5(c), 5(e1), 5(e2)	163.03 ha
Common planigale	<i>Planigale maculata</i>	V	-	Yes	2(c1), 2(c2), 3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k), 5(a), 5(b), 5(c), 5(e1), 5(e2)	163.14 ha

Common Name	Scientific Name	BC Act*	EPBC Act#	Recorded within P12-14 & EMAs	Suitable Habitat	
					Vegetation Communities	Total Area
Eastern false pipistrelle**	<i>Falsistrellus tasmaniensis</i>	V	-	No	3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k), 5(a), 5(b), 5(c), 5(e1), 5(e2)	163.03 ha
Eastern osprey	<i>Pandion cristatus</i>	V	M	Yes	Forest/woodland vegetation within 100m of Cudgen Lake & Cudgen Creek	27.17 ha
Glossy-black cockatoo	<i>Calyptorhynchus lathami</i>	V	-	Yes	3(a1), 3(a2), 3(d), 3(e), 4(c), 5(a), 5(b), 5(c), 5(e1), 5(e2)	55.10 ha
Grass owl	<i>Tyto longimembris</i>	V	-	Yes	1(f), 2(c1), 2(c2)	54.48 ha
Grey-headed flying fox	<i>Pteropus poliocephalus</i>	V	V	Yes	3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k), 5(a), 5(b), 5(c), 5(e1), 5(e2)	163.03 ha
Koala ¹	<i>Phascolarctos cinerues</i>	V	V	Yes	Refer to the Kings Forest KPOM (JWA 2019)	
Little bent-wing bat**	<i>Miniopterus australis</i>	V	-	No	3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k), 5(a), 5(b), 5(c), 5(e1), 5(e2)	163.03 ha
Masked owl	<i>Tyto novaehollandiae</i>	V	-	No	4(c), 4(d), 5(a), 5(b), 5(c)	15.89 ha
Pale-vented bush hen	<i>Amauronis moluccana</i>	V	-	Yes	2(c1), 2(c2), 4(e)	80.83 ha
Rose-crowned fruit-dove**	<i>Ptilinopus regina</i>	V	-	No	1(b)	1.17 ha
Southern myotis**	<i>Myotis macropus</i>	V	-	No	3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k), 5(a), 5(b), 5(c), 5(e1), 5(e2)	163.03 ha

Common Name	Scientific Name	BC Act*	EPBC Act#	Recorded within P12-14 & EMAs	Suitable Habitat	
					Vegetation Communities	Total Area
Wallum froglet	<i>Crinia tinnula</i>	V	-	Yes	1(e2), 1(f), 1(h), 1(i), 2(c1), 2(c2), 3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k)	207.65 ha
Wallum sedge frog ²	<i>Litoria olongburrensis</i>	V	V	Yes	Refer to the Kings Forest WSFMP (JWA 2020b)	
Yellow-bellied sheath-tail bat**	<i>Saccolaimus flaviventris</i>	V	-	Yes	2(c1), 2(c2), 3(a1), 3(a2), 3(b1), 3(b2), 3(d), 3(e), 4(a), 4(b), 4(c), 4(d), 4(e), 4(i), 4(k), 5(a), 5(b), 5(c), 5(e1), 5(e2)	163.14 ha

* E - Endangered and V - Vulnerable as listed within schedules of the NSW *BC Act* (2016).

E - Endangered and V - Vulnerable as listed within schedules of the Commonwealth *EPBC Act* (1999).

** These species are highly mobile and were recorded foraging opportunistically over the site and are not included in **FIGURE 8**.

¹ A species specific Management Plan have been prepared for the EPBC Act listed koala (*Phascolarctos cinereus*) i.e. the Kings Forest KPOM (JWA 2019).

² A species specific Management Plan have been prepared for the EPBC Act listed wallum sedge frog (*Litoria olongburrensis*) i.e. the Kings Forest WSFMP (JWA 2020b).

5 IMPACT ASSESSMENT

5.1 Introduction

The following sections discuss the impacts on the threatened flora, fauna and EECs and their habitat resulting from the development of Precincts 12 - 14 of the Kings Forest project. These impacts can be described as either direct or indirect. Direct impacts are those which can be attributable to an action which will have an immediate effect (e.g. removal of habitat or the death of a threatened species during habitat removal or during operational works). Indirect impacts are those which do not affect a threatened species or EEC immediately, but which can be linked to the development in a tangible sense and may interfere with the recovery of the local threatened species population or EEC (e.g. an increased risk of vehicle strike).

As previously discussed, species specific Management Plans have been prepared for the EPBC Act listed koala (*Phascolarctos cinereus*) and wallum sedge frog (*Litoria longburrensis*) i.e. the Kings Forest KPOM (JWA 2019) and the Kings Forest WSFMP (JWA 2020b). These species and their habitats have therefore not been addressed in this TSMP.

5.2 Direct Impacts

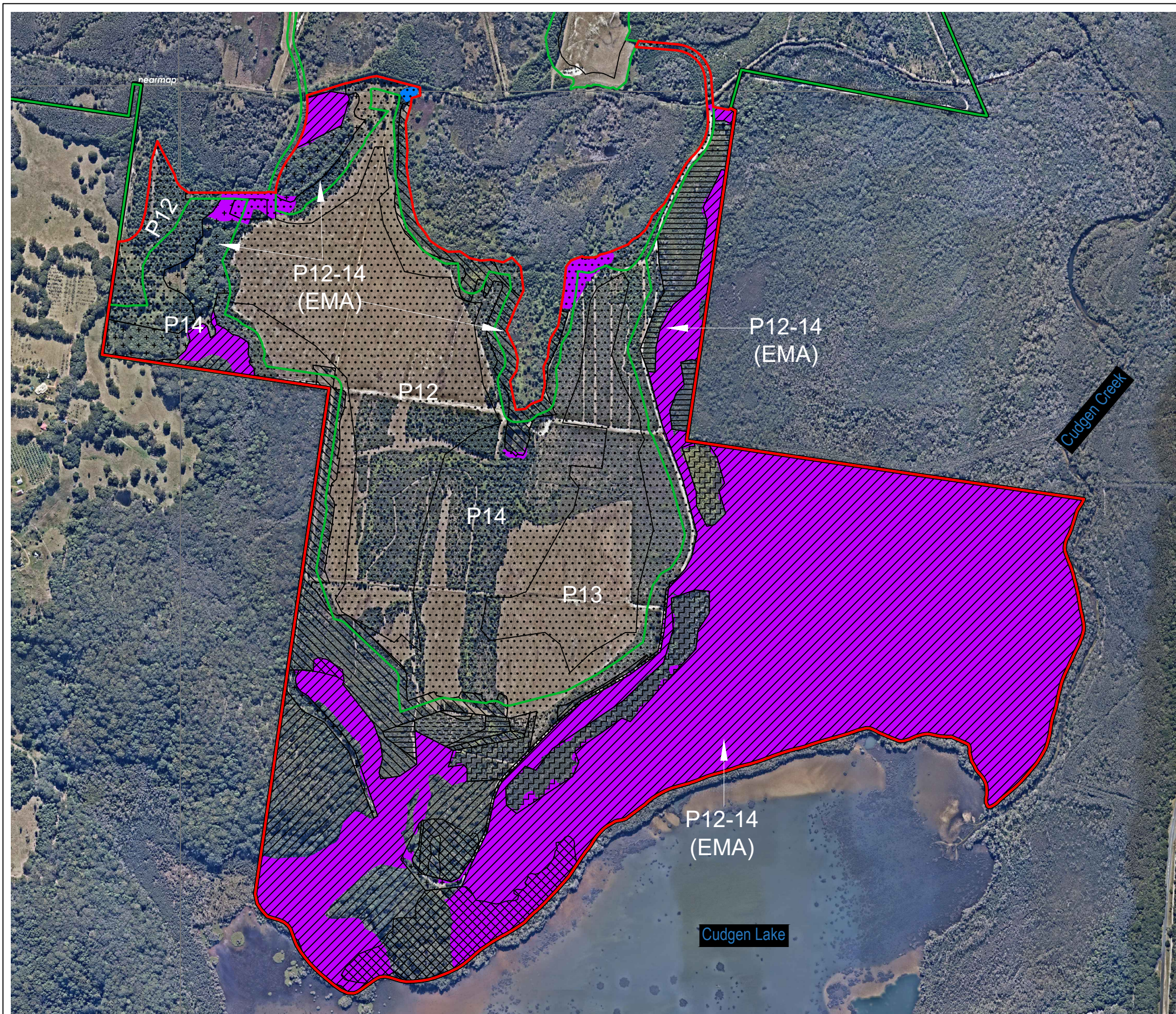
5.2.1 Habitat Loss

Impacts on existing areas of EECs are shown in **FIGURE 18** and details are provided in **TABLE 2**. Existing habitat for threatened species on the subject site and associated impacts are shown in **FIGURES 9 - 17** and detailed in **TABLE 3**.

It should be noted that habitat for threatened species on the Kings Forest site is generally in poor or poor/moderate condition due the level of past disturbance and relative isolation from areas of quality habitat. Disturbances include stock grazing, slashing and weed infestation (Camphor laurel and Slash pine). Furthermore, a large portion of the northern SEPP 14 wetland on the Kings Forest site, including areas of threatened species habitat proposed to be retained, was burnt by a high-intensity fire in January 2019. These areas are not considered likely to regenerate as habitat without considerable intervention.

TABLE 2
DIRECT IMPACTS ON ENDANGERED ECOLOGICAL COMMUNITY

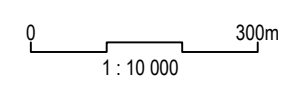
Endangered Ecological Community	Existing Area	Area to be Removed	Area Remaining After Development
Freshwater wetlands on coastal floodplains of the NSW North Coast	0.09 ha	0.09 ha (100%)	0.00 ha (0%)
Swamp sclerophyll forest on coastal floodplains of the NSW North Coast	101.55 ha	1.62 ha (2%)	99.93 ha (98%)



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area
- ENDANGERED ECOLOGICAL COMMUNITIES**
- Freshwater wetlands on coastal floodplains of the NSW North Coast
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast
- MANAGEMENT ZONES**
- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).



SOURCE: JWA Site Investigations 2018 Near Map 08/08/18 Aerial	CLIENT Project 28 Pty Ltd PROJECT Threatened Species Management Plan Precincts 12 - 14 Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed	FIGURE 18	TITLE IMPACTS ON ENDANGERED ECOLOGICAL COMMUNITIES
SCALE: 1 : 10 000 @ A3			
JWA PTY LTD Ecological Consultants			

TABLE 3
DIRECT IMPACTS ON THREATENED SPECIES HABITAT

Species	Existing Habitat Area	Habitat Area to be Removed	Habitat Area Remaining After Development
Threatened flora species			
Green-leaved rose walnut (<i>Endiandra muelleri</i> subsp. <i>bracteata</i>)	1.17 ha	0.50 ha (43%)	0.68 ha (57%)
Southern swamp orchid (<i>Phaius australis</i>)	1.17 ha	0.50 ha (43%)	0.68 ha (57%)
Stinking Cryptocarya (<i>Cryptocarya foetida</i>)	1.17 ha	0.50 ha (43%)	0.68 ha (57%)
White laceflower (<i>Archidendron hendersonii</i>)	1.17 ha	0.50 ha (43%)	0.68 ha (57%)
White yiel yiel (<i>Grevillea hilliana</i>)	1.17 ha	0.50 ha (43%)	0.68 ha (57%)
Threatened fauna species			
Black bittern (<i>Ixobrychus flavicollis</i>)	80.82 ha	0.11 ha (<1%)	80.70 ha (>99%)
Black-necked stork (<i>Ephippiorhynchus asiaticus</i>)	46.58 ha	13.68 ha (29%)	32.90 ha (71%)
Bush stone-curlew (<i>Burhinus grallarius</i>)	29.95 ha	0.15 ha (1%)	29.80 ha (99%)
Common blossom bat** (<i>Syconycteris australis</i>)	163.03 ha	21.78 ha (13%)	141.25 ha (87%)
Common planigale <i>Planigale maculata</i>)	163.14 ha	21.83 ha (13%)	141.31 ha (87%)
Eastern false pipistrelle** (<i>Falsistrellus tasmaniensis</i>)	163.03 ha	21.78 ha (13%)	141.25 ha (87%)
Eastern osprey (<i>Pandion cristatus</i>)	27.17 ha	0 ha (0%)	27.17 ha (100%)
Glossy-black cockatoo (<i>Calyptorhynchus lathami</i>)	55.10 ha	19.92 ha (36%)	35.18 ha (64%)
Grass owl (<i>Tyto longimembris</i>)	54.48 ha	53.33 ha (98%)	1.16 ha (2%)
Grey-headed flying fox (<i>Pteropus poliocephalus</i>)	163.03 ha	21.78 ha (13%)	141.25 ha (87%)
Koala ¹ (<i>Phascolarctos cinereus</i>)	Refer to the Kings Forest KPoM (JWA 2019)		
Little bent-wing bat** (<i>Miniopterus australis</i>)	163.03 ha	21.78 ha (13%)	141.25 ha (87%)
Masked owl (<i>Tyto novaehollandiae</i>)	15.89 ha	0.02 ha (<1%)	15.87 (>99%)
Pale-vented bush hen (<i>Amaurionis moluccana</i>)	80.83 ha	0.13 ha (<1%)	80.70 ha (>99%)

Species	Existing Habitat Area	Habitat Area to be Removed	Habitat Area Remaining After Development
Rose-crowned fruit-dove** (<i>Ptilinopus regina</i>)	1.17 ha	0.50 ha (43%)	0.68 ha (57%)
Southern myotis** (<i>Myotis macropus</i>)	163.03 ha	21.78 ha (13%)	141.25 ha (87%)
Wallum froglet (<i>Crinia tinnula</i>)	207.65 ha	76.22 ha (37%)	131.43 ha (63%)
Wallum sedge frog ² (<i>Litoria onlongburrensis</i>)	Refer to the Kings Forest WSFMP (JWA 2020b)		
Yellow-bellied sheath-tail bat** (<i>Saccolaimus flaviventris</i>)	163.14 ha	21.87 ha (13%)	141.28 ha (87%)

** These species are highly mobile and were recorded foraging opportunistically over the site and are not included in **FIGURE 8**. **Bold** indicates species which have been recorded within Precincts 12 - 14 and associated EMAs.

¹ A species specific Management Plan have been prepared for the EPBC Act listed koala (*Phascolarctos cinereus*) i.e. the Kings Forest KPOM (JWA 2019).

² A species specific Management Plan have been prepared for the EPBC Act listed wallum sedge frog (*Litoria onlongburrensis*) i.e. the Kings Forest WSFMP (JWA 2020b).

5.2.2 Habitat Fragmentation

Fragmentation of existing habitat can cause stress to affected animals until a new home range is established either before or after new habitat is created.

5.2.3 Accidental Death of Animals During Tree Removal or During Operational Works

There is a risk of animal mortality during the clearing of habitat and also during the construction stages of the development. This is, obviously, a short-term risk and is associated only with the land clearing activities and use of heavy vehicles/ machinery during the bulk earthworks phase.

5.3 Indirect Impacts

5.3.1 Introduction

Indirect impacts on EEC's, threatened species and their habitat may result from the initial habitat removal, construction activities and resultant fragmentation. These indirect impacts can be linked to the:

- Increased risk of vehicle strike as there is a large increase in vehicle numbers after development;
- Increased risk of fire due to human carelessness, accident or vandalism;
- Increased risk of dog attack with the introduction of a large number of pets into Kings Forest;
- Increased risk of retained habitat degradation; and
- Creation of a barrier to movement to, between or within habitat.

The indirect impacts (as listed above) are discussed in the following sections.

5.3.2 Increased Risk of Vehicle Strike

The proposed development may result in the injury/death of threatened fauna species due to vehicle strike. These impacts are likely to be most significant in areas where proposed roadways pass through retained habitat and those areas which are extensively forested.

5.3.3 Increased Risk of Fire

The proposed development may potentially result in an increased risk of wildfires through accidental ignitions and/or inappropriate or inadequate bushfire hazard management. As previously noted, continued infestation of native vegetation with Slash pine wildings is occurring over the Kings Forest site (**SECTION 4.2**). As well as decreasing the diversity and competing with native species, pine invasions can also lead to altered fire regimes. There is often a complete absence of fire where pine plantations occur due to the need to maintain the plantation as an economic resource. However, when fires do occur, they are of high intensity due to the highly flammable nature of pine trees and accumulated leaf litter (Skull 1995, 1998).

The control of Slash pine wildings at the Kings Forest site is therefore a key consideration for the control of any future wildfires. Other factors which affect the risk of fire to threatened species and their habitat at Kings Forest include:

- Build-up of ground fuel in retained and compensatory habitat on Kings Forest and surrounding areas;
- Availability of access for fire control and hazard reduction;
- Location and management of Asset Protection Zones (APZs) and fire breaks;
- Community preparedness and education; and
- Managing fire dependent native vegetation close to an urban population.

The ongoing risk of fire to EECs, threatened species and their habitat has been considered in the preparation of this TSMP. Additionally, the Kings Forest Koala Fire Management Plan (Wildsite 2020) which accompanies the Kings Forest Stage 1 Bushfire Management Plan (BushfireSafe 2020) seeks to minimise the potential for wildfires and re-establish naturally occurring fire frequencies for the site.

5.3.4 Increased Risk of Dog Attack

The proposed development has the potential to result in threatened fauna fatalities due to dog attacks including the potential for multiple, ongoing mortalities.

5.3.5 Increased Risk of Habitat Degradation

Apart from the loss of habitat and fragmentation degrading processes including edge effects, elevation of water table and salinity levels and fluctuation of water table levels can occur as a result of habitat loss.

The Kings Forest development will lead to the loss of habitat (**TABLE 3**) and create new edges to vegetation and habitat patches that will be subject to edge effects. The newly created edges of habitat as well as the older edges will be subjected to the influence of incursions of weeds, and light as the construction proceeds.

A wide variety of weed species have been recorded on the Kings Forest site including highly invasive species such as Lantana (*Lantana camara*), Groundsel (*Baccharis halimifolia*), Broad-leaved paspalum (*Paspalum wettsteinii*), Winter senna (*Senna coluteoides*), Blue billygoat weed (*Ageratum houstonianum*) and Bitou Bush (*Chrysanthemoides monilifera*). These weed species have the potential to further impact on EECs and retained habitat due to creation of new/disturbance of existing habitat edges.

The development has the potential to increase the level of artificial light in the nearby habitats. Increased night light levels may adversely impact wildlife by direct glare, chronic or periodic increased illumination and temporary unexpected fluctuations in light levels (Saleh 2007, Longcore and Rich 2010). The construction activities will provide very little light spill into retained habitat areas. It is highly unlikely that there will be any work at night. There may be lighting in some areas as security for vehicle compounds. Light spill into nearby habitats at night are likely to occur during the occupational phase of the development.

Altered groundwater regimes (e.g. reduced groundwater flows, changes in groundwater levels etc.) can also result in impacts on the location, extent and quality retained habitat. The proposed development will likely result in changes to site hydrology which has the potential to degrade retained habitat. These impacts may continue to operate/occur in the long term during the occupational phase of the subdivision.

5.3.6 Barriers to Movement or Dispersal

The Kings Forest development will create a substantial barrier to the movements of some threatened fauna species. The construction of the entry road to Kings Forest from Tweed Coast Road and proposed internal roads which will be constructed through conserved habitats within the site, will create barriers to movements. The main dangers in these circumstances will be vehicle strike and dog attack.

6 MANAGEMENT ZONES

6.1 Identification of Management Zones

The Kings Forest site has been divided into nine (9) zones based on the management intent for each area. These management zones are:

- Zone 1 - Construction zone;
- Zone 2 - Retained Koala habitat;
- Zone 3 - Retained Wallum Sedge Frog (WSF) habitat;
- Zone 4 - Koala compensatory habitat;
- Zone 5 - WSF compensatory habitat;
- Zone 6 - Heath regeneration/revegetation;
- Zone 7 - Littoral rainforest regeneration/revegetation (Precinct 1);
- Zone 8 - Wetland regeneration; and
- Zone 9 - Residual lands e.g. tracks and easements.

FIGURE 19 shows the location of management zones applicable to this TSMP. A brief description of each management zone and details of the proposed management intent is provided in the sections below. Specific management actions for each zone are addressed in **SECTION 7**. Monitoring and reporting requirements are detailed in **SECTION 8**.

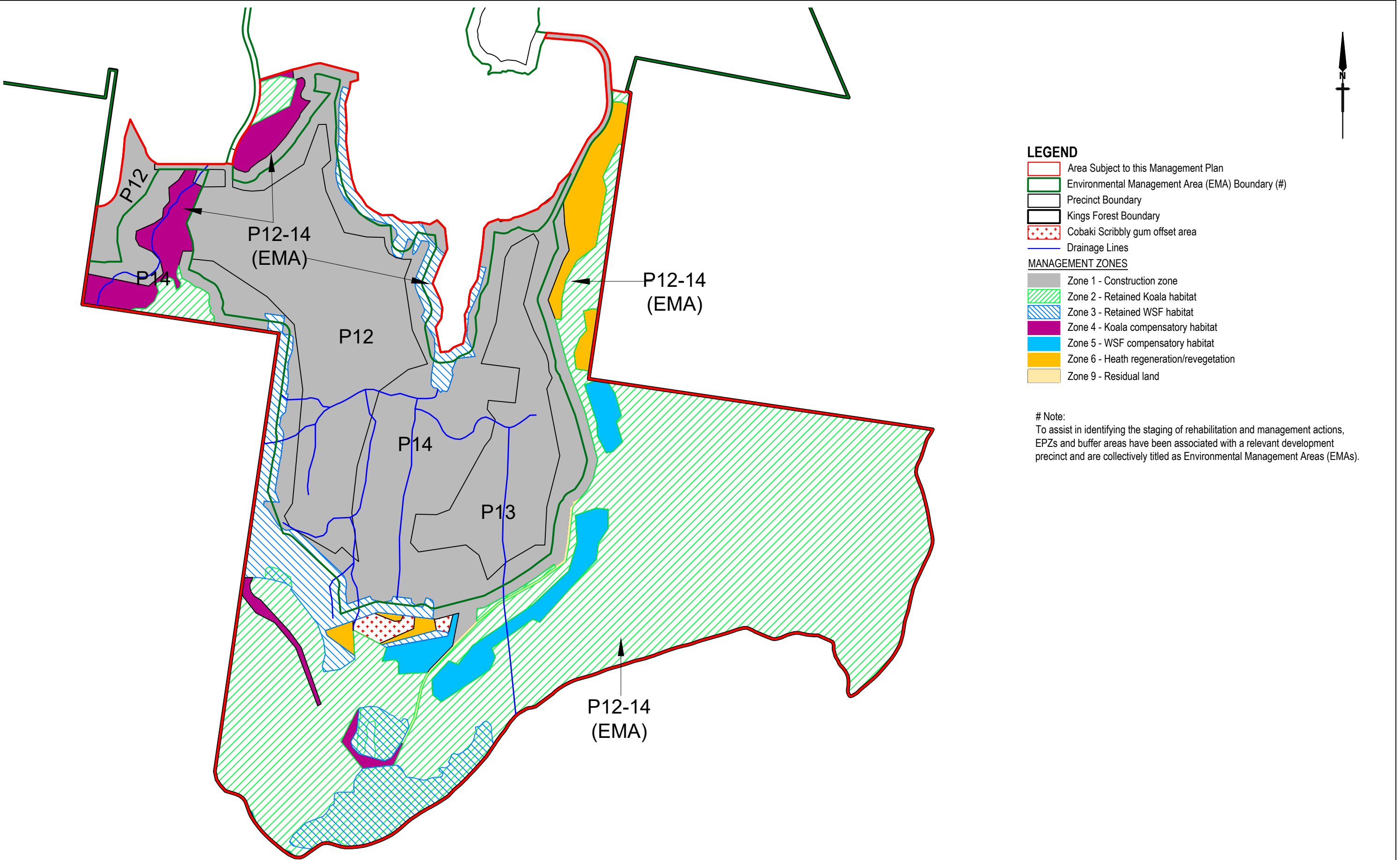
6.2 Zone 1 - Construction Zone

The construction zone consists of the development footprint of Precincts 12-14 (**FIGURE 19**). The management intent of this zone is:

- To remove all existing vegetation within the Construction Zone (consistent with the conditions of approval) prior to bulk earthworks and disposal of cleared vegetation in an environmentally responsible manner;
- To undertake vegetation removal operations in a manner that provides maximum protection of the health and livelihood of native fauna;
- To limit human impacts on retained and compensatory habitat, threatened flora and fauna species or ecological communities; and
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable.

6.3 Zone 2 - Retained Koala Habitat

Management Zone 2 consists of existing Koala habitat to be retained within the Precincts 12-14 EMAs in accordance with the Kings Forest KPOM (JWA 2019) (**FIGURE 19**). The management intent of this zone is:



LEGEND

- Area Subject to this Management Plan
- Environmental Management Area (EMA) Boundary (#)
- Precinct Boundary
- Kings Forest Boundary
- Cobaki Scribbly gum offset area
- Drainage Lines

MANAGEMENT ZONES

- Zone 1 - Construction zone
- Zone 2 - Retained Koala habitat
- Zone 3 - Retained WSF habitat
- Zone 4 - Koala compensatory habitat
- Zone 5 - WSF compensatory habitat
- Zone 6 - Heath regeneration/revegetation
- Zone 9 - Residual land

Note:
To assist in identifying the staging of rehabilitation and management actions, EPZs and buffer areas have been associated with a relevant development precinct and are collectively titled as Environmental Management Areas (EMAs).

0 1 : 10 000 300m

SOURCE: JWA Site Investigations 2018, Near Map 08/08/18 Aerial	CLIENT Project 28 Pty Ltd	FIGURE 19		TITLE MANAGEMENT ZONES
SCALE: 1 : 10 000 @ A3		PROJECT Threatened Species Management Plan Precincts 12 - 14 Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed		
JWA PTY LTD Ecological Consultants		PREPARED: BW DATE: 17 November 2020 FILE: N97017_MP12-14_20201116.dwg		

- To protect, restore (through assisted natural regeneration) and provide for the ongoing maintenance of retained koala habitat;
- To limit human impacts on retained Koala habitat; and
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable.

6.4 Zone 3 - Retained WSF Habitat

Management Zone 3 consists of existing WSF habitat to be retained within the Precincts 12 - 14 EMAs in accordance with the Kings Forest WSFMP (JWA 2020b) (**FIGURE 19**). The management intent of this zone is:

- To protect, restore (through assisted natural regeneration) and provide for ongoing maintenance of retained WSF habitat;
- To limit human impacts on retained WSF habitat;
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable; and
- To ensure the ongoing protection of water quality within retained WSF habitat.

6.5 Zone 4 - Koala Compensatory Habitat

Management Zone 4 consists of Koala compensatory habitat areas within Precincts 12 - 14 EMAs in accordance with the Kings Forest KPOM (JWA 2019) (**FIGURE 19**). The management intent of this zone is:

- To create additional Koala habitat through assisted regeneration and revegetation works;
- To limit human impacts on future Koala habitat; and
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable.

6.6 Zone 5 - WSF Compensatory Habitat

Management Zone 5 consists of WSF compensatory habitat areas within Precincts 12 - 14 EMAs in accordance with the Kings Forest WSFMP (JWA 2020b) (**FIGURE 19**). The management intent of this zone is:

- To create additional WSF habitat through assisted regeneration and revegetation works;
- To limit human impacts on future WSF habitat; and
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable.

6.7 Zone 6 - Heath Regeneration/Revegetation

Management Zone 6 consists of heath regeneration areas within the Precincts 12 - 14 EMAs in accordance with the Precincts 12 - 14 VWMP (JWA 2020a) (**FIGURE 19**). The management intent of this zone is:

- To protect and provide for ongoing maintenance of retained heath;
- To restore existing heath areas through assisted natural regeneration works;
- Revegetation utilising heath species;
- To limit human impacts on retained and restored heath areas; and
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable.

6.8 Zone 7 - Littoral Rainforest Regeneration/Revegetation

Management Zone 7 consists of a littoral rainforest regeneration and revegetation area within the Precinct 1 EMAs in accordance with the Precincts 1 - 5 VWMP (JWA 2020g). The management intent of this zone is:

- To protect, restore (through assisted natural regeneration) and provide for ongoing maintenance of retained littoral rainforest;
- To create additional littoral rainforest areas through assisted regeneration and revegetation works;
- To limit human impacts on retained and future littoral rainforest areas; and
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable.

There are no areas designated as Management Zone 7 within Precincts 12 - 14.

6.9 Zone 8 - Wetland Regeneration

Management Zone 8 consists of areas of wetland vegetation to be retained and restored within relevant EMAs. The management intent of this zone is:

- To protect, restore (through assisted natural regeneration) and provide for ongoing maintenance of retained wetlands;
- To limit human impacts on retained wetlands;
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable; and
- To ensure the ongoing protection of water quality within retained wetlands.

There are no areas designated as Management Zone 8 within Precincts 12 - 14.

6.10 Zone 9 - Residual Lands

Management Zone 9 consists of residual lands including fire trails and power line easements. The management intent of this zone is:

- To maintain the areas in a serviceable condition for their intended purpose; and
- To remove all noxious and environmental weeds in a manner that is environmentally sustainable.

7 MANAGEMENT STRATEGIES

7.1 Introduction

General vegetation and fauna management strategies for the construction and operational stages of the development applicable to all species on site, including threatened species and EECs, as well as details of proposed protection and restoration works such as fencing and revegetation works are detailed in a number of other management plans. Relevant management strategies for threatened flora and fauna species and EECs include:

- Education of site personnel - Section 6.2 of the Precinct 12 - 14 VWMP (JWA 2020a);
- Construction phase management measures - Section 6.3 of the Precinct 12 - 14 VWMP (JWA 2020a);
- Pre-clearing fauna trapping and fauna spotter catcher - Section 6.4 of the Precinct 12 - 14 VWMP (JWA 2020a);
- Exclusion fencing and other infrastructure:
 - Section 7.3 of the Kings Forest KPoM (JWA 2019);
 - Section 7.6 of the Kings Forest WSFMP (JWA 2020b); and
 - Section 6.5 of the Precinct 12 - 14 VWMP (JWA 2020a).
- Preventing Fauna Contact with Dogs - Section 7.4 of the Kings Forest KPoM (JWA 2019);
- Management of retained vegetation - Section 6.6 of the Precinct 12 - 14 VWMP (JWA 2020a);
- Weed control strategies - Section 6.7 of the Precincts 12 - 14 VWMP (JWA 2020a);
- Regeneration and revegetation - Section 6.8 of the Precinct 12 - 14 VWMP (JWA 2020a);
- Feral animal management - Kings Forest FAMP (JWA 2020e);
- Transfer of land to public ownership - Section 6.9 of the Precinct 12 - 14 VWMP (JWA 2020a); and
- Fire management - Kings Forest Stage 1 Bushfire Management Plan (BushfireSafe 2020) and associated Kings Forest Koala Fire Management Plan (Wildsite 2020).

In addition, the following additional management strategies applicable to threatened flora and fauna species and EEC's are to be implemented as part of this TSMP and are detailed in the following sections:

- Species-specific management strategies for the following species:
 - Black bittern (*Ixobrychus flavicollis*);
 - Bush stone-curlew (*Burhinus grallarius*);
 - Wallum froglet (*Crinia tinnula*);
 - Koala (*Phascolarctos cinereus*) - refer to the Kings Forest KPoM (JWA 2019);
 - Wallum sedge frog (*Litoria olongburrensis*) - refer to the Kings Kings Forest WSFMP (JWA 2020b); and

- Adaptive management.

It should be noted that specific management strategies for the koala and the wallum sedge frog are included separately within the Kings Forest KPOM (JWA 2019) and the Kings Forest WSFMP (JWA 2020b) respectively and these documents should therefore also be read in conjunction with this TSMP.

7.2 Additional Species-specific Management Strategies

7.2.1 Introduction

In addition to the general vegetation and fauna management measures detailed in other management plans, specific management measures have been developed for a number of threatened flora and fauna species recorded from, or considered a possible occurrence within, Precincts 12 - 14 and associated EMAs. These species-specific management measures are detailed in the following sections.

7.2.2 Black bittern (*Ixobrychus flavicollis*)

1. Section 8 of the Precincts 12 - 14 VWMP (JWA 2020a) details vegetation management and monitoring programs that will be implemented and should ensure suitable habitat remains viable.
2. Extensive rehabilitation works within Management Zones 2 and 5 will be completed in accordance with Section 6.8 of the Precincts 12 - 14 VWMP (JWA 2020a). These works will improve the quality of existing habitat and create new habitat for the Black bittern.
3. Erosion and sediment control devices shall be installed prior to commencement of bulk earthworks within Precincts 12 - 14 in accordance with the Erosion and Sediment Control Plan (G&S 2020d) to prevent the movement of sediment into ecologically sensitive areas as well prevent the dispersal of weed seeds and vegetative material.
4. A detailed water quality monitoring regime is included in the Overall Water Management Plan (G&S 2020b) and will ensure that significant impacts on wetland habitats are avoided.

7.2.3 Bush stone-curlew (*Burhinus grallarius*)

1. Extensive rehabilitation works within Management Zones 2 and 6 will be completed in accordance with Section 6.8 of the Precincts 12 - 14 VWMP (JWA 2020a). These works will create new habitat for the Bush stone-curlew.
2. Bush stone-curlews are commonly observed and nest in urban areas. Post-construction, if Bush stone curlews are observed or reported to be nesting within developed portions of Precincts 12 - 14, appropriate temporary measures such as signage, fencing and protection from roadway hazards will be implemented to minimise the risks to nest sites, adult birds, their eggs and offspring.

7.2.4 Wallum froglet (*Crinia tinnula*)

1. As habitat requirements for the Wallum froglet are similar to the Wallum sedge frog, new habitat areas will be created within Management Zones 4 and 5 in accordance with Section 7.8 of the Kings Forest WSFMP (JWA 2020b) and will include core breeding habitat and forage habitat areas.
2. In addition to the creation of new habitat, extensive areas currently weed infested and supporting pine plantations will be rehabilitated (Management Zones 2, 3 and 7) to extend habitat areas in accordance with Sections 6.7 and 6.8 of the Precincts 12 - 14 VWMP (JWA 2020a) (**FIGURE 19**).
3. Core habitat areas will be densely planted with sedges etc. to deter Cane toads from entering these areas.
4. A detailed water quality monitoring regime is included in the Overall Water Management Plan (G&S 2020b) and will ensure that significant impacts on Wallum froglet habitats are avoided.
5. Erosion and sediment control devices shall be installed prior to commencement of bulk earthworks within Precincts 12 - 14 in accordance with the Erosion and Sediment Control Plan (G&S 2020d) to prevent the movement of sediment into ecologically sensitive areas as well prevent the dispersal of weed seeds and vegetative material.
6. To minimise the spread of the disease chytridiomycosis to and between habitats, all contractors undertaking work in both wetland construction and vegetation rehabilitation must follow the protocol set out within the publication *Hygiene protocol for the control of disease in frogs* (NSW DECC 2008) in accordance with Section 7.10 of the Kings Forest WSFMP (JWA 2020b).
7. The existence of the Wallum froglet must be considered in the development of any program using pesticides and herbicides for weed and/or mosquito and/or feral animal control.

7.3 Adaptive Management

7.3.1 Introduction

Adaptive management is an approach that involves continually monitoring a process to evaluate its effectiveness, an improving the process based on this evaluation. It requires transparent planning systems and implementation strategies, and a strong emphasis on monitoring and reviewing to ensure emerging information is reflected in future planning. The principles of adaptive management have been incorporated into the administration of restoration projects within a variety of governmental authorities and programs (Thom 1997).

The Kings Forest site is a large and complex project with interrelated management plans and conditions and is expected to be carried out over many years. As the project evolves, it has been acknowledged by NSW DPI&E, NSW BCD and TSC that conflicts between management plans may be identified during the management plan approval process. In addition, changes to site conditions and the results of monitoring (i.e. rehabilitation monitoring) may require amendments to the management actions anticipated in this TSMP and other environmental management plans.

The following sections outline the adaptive management approaches to be utilised to manage conflicts between management plans and to respond to issues identified during routine monitoring.

7.3.2 Management Plan Conflicts

Issues related to conflicts between management plans will be addressed using the following adaptive management approach:

1. Issues of concern will be identified as they are detected during the management plan review and approval process.
2. Approved management plans can only be updated using the adaptive management approach where the inconsistency:
 - results following the approval of an associated management plan, and;
 - is in response to advice from, or acknowledged in writing by TSC or a relevant State agency, and
 - is genuinely minor and/or administrative in nature, and
 - results in no additional environmental impact.

Discretion as to whether approved management plans may be updated using the adaptive management approach (or may require re-satisfaction or a modification of the Project Approval) rests with the NSW DPI&E, in consultation with TSC, NSW BCD and any other relevant agencies.

3. The management plan under review will be amended to acknowledge the issue(s) of concern and how the issue(s) will be addressed through the adaptive management provisions. Updates must be consistent with the rationale, aims, objectives and expected outcomes of the relevant management plan (e.g. the principles of the Koala Plan of Management) and continue to comply with the relevant conditions of the Project Approval and any relevant benchmarks. For example, where proposed offset plantings conflict with other uses an alternative offset site will need to be located elsewhere to satisfy the overall offset commitment.
4. Once the plans commence implementation, the recommended adaptive management issues and the relevant management response should be implemented and included in the annual reporting for the affected management plan.
5. When management plans are updated (which is required for each new stage of the development) any changes made to the plan because of adaptive management are to be included in the updated plan and adaptive management log (**SECTION 7.3.4**). A copy of all management plans will be kept on the project website, clearly indicating current and archived versions.

7.3.3 TSMP Adaptive Management

Once the Precincts 12 - 14 TSMP commences implementation, it is possible that routine monitoring will identify issues with the strategies outlined in this report, in particular the status of the weed infestation and alteration of weed control methods or timing. Alteration to the

design and maintenance of works may be required to ensure the objectives of the TSMP are achieved and will be addressed through the adaptive management provisions.

Before the implementation of any adaptive management strategy a brief report is to be provided to Project 28 Pty Ltd and other relevant agencies detailing the proposed management actions and the predicted outcomes. The implementation must be approved by the relevant authority prior to implementation.

When management plans are updated (which is required for each new stage of the development) any changes made to the plan because of adaptive management are to be included in the updated plan and adaptive management log (**SECTION 7.3.4**). A copy of all management plans will be kept on the project website, clearly indicating current and archived versions.

7.3.4 Adaptive Management Log

A log of changes to each management plan will be updated monthly and published on the project website. In addition, a copy of the adaptive management log will be included in the Annual Threatened Species Monitoring Report (**SECTION 8**). The log shall include (as a minimum), the date, the title of the plan affected, an explanation of the inconsistency and update made, and confirmation that TSC, BCD or any relevant agencies support the amendment.

No issues have been identified to date within this Precincts 12 - 14 TSMP during the management plan review. An adaptive management log is provided in **TABLE 4** and will be updated as necessary.

TABLE 4
ADAPTIVE MANAGEMENT LOG

Date	Affected Management Plans	Conflict	Description of Issue	Proposed Adaptive Management Response	Confirmation of TSC, BCD or Any Relevant Agencies Support the Amendment	Success of Adaptive Management Response
No issues identified to date.						

8 MONITORING AND REPORTING

8.1 Introduction

Monitoring will be undertaken to determine the effectiveness of mitigation measures implemented. Monitoring will be required during the ‘establishment period¹’ and ‘maintenance period²’ of the project as defined within the Project approval (MP08_0194). Monitoring of Threatened flora and fauna species and EECs within Precincts 12 - 14 EMAs has been separated into the following two (2) types:

- Baseline monitoring; and
- Annual monitoring.

Due to the uncertainty of the timing of commencement of construction works within Precincts 12 - 14, it is also proposed to undertake pre-commencement monitoring and maintenance works within the Precinct 12 - 14 EMAs to ensure that relevant ecological values of these areas are not compromised.

8.2 Key Monitoring Objectives

The key objectives of the EEC and threatened flora and fauna monitoring are to ensure:

- Manage and protect existing threatened flora species from site activities (i.e. mitigation measures are effective in minimising impacts to Threatened flora);
- Manage and protect existing threatened fauna species from site activities (i.e. mitigation measures are effective in minimising impacts to Threatened fauna);
- Manage and protect EECs from site activities;
- Manage and protect potential habitat for threatened flora and fauna species; and
- Maintain and increase presence of threatened flora and fauna species over time.

8.3 Threatened Flora Monitoring

8.3.1 Baseline Monitoring

Baseline threatened flora monitoring will be completed across Precincts 12 - 14 EMAs prior to the commencement of works on the site by suitably qualified and/or accredited persons³. Baseline monitoring will involve identifying and clearly marking any threatened flora specimens located within the Precincts 12 - 14 EMAs. The random meander technique (Cropper 1993) will

¹ means the period commencing with the implementation of the relevant approved environmental management plan(s) and ending when the works specified in that plan meet the establishment period performance criteria (as defined by the relevant approved environmental management plan) to the satisfaction of the Secretary. The establishment period represents the time necessary to carry out initial environmental repair, restoration and monitoring prior to ongoing maintenance.

² means the period commencing immediately after the end of the establishment period during which environmental management and monitoring works specified in the relevant approved environmental management plan(s) are to be carried out in accordance with the maintenance period performance criteria (as defined by the relevant approved environmental management plan) to the satisfaction of the Secretary.

³ Means a qualified ecologist with appropriate training and at least five years of experience in undertaking surveys in relation to the relevant EPBC Act listed threatened species.

be used to complete targeted searches for threatened flora specimens in Precincts 12 - 14 EMAs where historical records and/or suitable habitat occurs.

All threatened flora specimens located will have the following details recorded:

- GPS location;
- Height;
- Diameter at breast height (DBH);
- Flowering/fruiting status;
- Condition; and
- Potential threats (i.e. weeds, recent bushfires etc.).

The survey data collected will be used to compile a Baseline Monitoring Report (**SECTION 8.7.1**). As it is likely that the development of Precincts 12 - 14 will not commence for 10 - 15 years, baseline monitoring and reporting will be repeated every five (5) years.

8.3.2 Pre-commencement Annual Threatened Flora Monitoring

Due to the uncertainty of the timing of commencement of construction works within Precincts 12 - 14, it is proposed to undertake annual monitoring inspections until construction commences. Annual pre-commencement monitoring will consist of brief visual inspections of the Precinct 12 - 14 EMAs to identify any new and significant issues for threatened flora species requiring intervention and associated annual reporting (**SECTION 8.7.2**).

8.3.3 Ongoing Annual Threatened Flora Monitoring

Once construction works commence within Precincts 12 - 14, Threatened flora within the Management Zones of Precincts 12 - 14 will be monitored on an annual basis by the proponent and then by Council pending the proposed dedication of land under Concept Plan 06_0318 Condition B7. All threatened plant species will be monitored as follows:

- Survival;
- Height;
- Flowering;
- Fruiting;
- Signs of natural recruitment; and
- Potential threats (i.e. weeds, recent bushfires etc.).

Any additional threatened flora species located during monitoring surveys will be marked and monitored as part of an adaptive management strategy.

8.4 Threatened Fauna Monitoring

8.4.1 Baseline Monitoring

A baseline fauna survey will be completed within the Precincts 12 - 14 EMAs (Management Zones 2 - 6 and 8) prior to commencement of construction in order to determine species presence. The baseline fauna surveys will target threatened species previously recorded or predicted to occur on the site.

In addition, it should be noted that baseline koala monitoring will be completed over the Kings Forest site following the methodology described in Section 8.2 of the KPOM (JWA 2019), and baseline Wallum sedge frog monitoring will be completed over the Kings Forest site following the methodology described in the WSFMP (JWA 2020b).

The locations of survey sites within the Precincts 12 - 14 EMAs will utilise the field sites sampled in 2010 during the Tweed Coast Koala Habitat Study (Phillips *et al.* 2011) where appropriate (FIGURE 20).

At each survey site an approximately 100 m transect line will be setup. Transect lines will be permanently marked (i.e. star pickets or wooden stakes) and the end positions located using a hand held Global Positioning System (GPS). Five (5) trap stations will be installed approx. 20m apart along each transect line for four (4) consecutive nights with each trap station containing:

- An Elliott trap on the ground;
- An arboreal Elliott trap on a permanently installed wooden platform attached to a suitable tree; and
- A hair tube.

The following additional survey techniques will also be employed at each survey transect line (where appropriate):

- A pitfall trap line incorporating three (3) 20L buckets and four (4) funnel traps (installed only where ground/water table conditions are appropriate);
- Installation of three (3) remote camera traps;
- Active searching;
- Bat echolocation call detection; and
- Dawn and dusk bird surveys.

In addition to the above transect surveys:

- Spotlighting surveys (both foot and vehicle-based) will be completed over a minimum of four (4) consecutive nights;
- Call playback for target species will be undertaken over a minimum of four (4) consecutive nights;
- Wetland census will be completed for one-hour (1 hr) census at dawn and dusk; and

- Targeted one-hour (1 hr) surveys for the Common blossom bat (*Syconycteris australis*) will be completed at dusk at specific locations (i.e. mature flowering Banksias in readily accessible locations) over a minimum of four (4) consecutive nights.

The survey data collected using the above methodologies will be used to compile a Baseline Monitoring Report (**SECTION 8.7.1**). As it is likely that the development of Precincts 12 - 14 will not commence for 10 - 15 years, baseline monitoring and reporting will be repeated every five (5) years.

8.4.2 Pre-commencement Annual Threatened Fauna Monitoring

Due to the uncertainty of the timing of commencement of construction works within Precincts 12 - 14, it is proposed to undertake annual monitoring inspections until construction commences. Annual pre-commencement monitoring will consist of brief visual inspections of the Precinct 12 - 14 EMAs to identify any new and significant issues for threatened fauna species requiring intervention and associated annual reporting (**SECTION 8.7.2**).

8.4.3 Ongoing Annual Threatened Fauna Monitoring

Once construction works commence within Precincts 12 - 14, Threatened fauna within Precincts 12 - 14 EMAs will be monitored on a biennial basis, by the proponent and then by Council pending the proposed dedication of land under Concept Plan 06_0318 Condition B7. The methodology used for the Baseline monitoring (**SECTION 8.4.1**) will be utilised for the biennial fauna monitoring.

It should be noted that, in addition to the threatened fauna monitoring discussed in this TSMP, ongoing koala monitoring will be completed over the Kings Forest site following the methodology described in Section 8.2 of the Kings Forest KPOM (JWA 2019), and ongoing wallum sedge frog monitoring will be completed over the Kings Forest site following the methodology described in Section 8.3 of the Kings Forest WSFMP (JWA 2020b).

8.5 EEC Monitoring

Baseline, pre-commencement and ongoing annual vegetation monitoring will be completed within areas of retained vegetation/EECs within the Precincts 12 - 14 EMAs (**FIGURE 20**) as follows:

Baseline monitoring will also be completed within Management Zones Management Zones 2 - 5 as follows:

- Management Zone 2 - Retained koala habitat: monitored in accordance with the Precincts 12 - 14 VWMP (JWA 2020a); and
- Management Zone 3 - Retained WSF habitat: monitored in accordance with the Precincts 12 - 14 VWMP (JWA 2020a).

The above documents contain detailed monitoring programs respectively including monitoring methodologies, locations, timing of monitoring events, performance targets and corrective actions.

8.6 Performance Targets and Corrective Actions

The success of the TSMP will be regularly evaluated by measurement of impacts and monitoring results. A number of criteria will indicate successful management of threatened species and EEC vegetation. **TABLES 5 - 7** provide the performance indicators and targets for this plan. Corrective actions are provided that are to be implemented if performance targets are not met.

TABLE 5
PERFORMANCE TARGETS AND CORRECTIVE ACTIONS - EECS

Performance Indicator	Target - Establishment Period ¹	Target - Maintenance Period ²	Corrective Actions
Natural recruitment of native species throughout retained vegetation areas.	Evidence of natural recruitment occurring in all rehabilitation areas.	Increasing natural recruitment occurring in all rehabilitation areas.	Where natural recruitment fails to meet performance targets discussions with BCD and TSC shall be initiated by the proponent or their consultants to consider adjustments to the assisted regeneration strategy being used to improve natural recruitment.
All identified weeds controlled to an acceptable level within retained vegetation areas in accordance with the Precincts 12 - 14 VWMP (JWA 2020a).	Foliage Projective Cover (FPC) (%) assessed using eye estimates or photo points reduced to <10% within first year.	Foliage Projective Cover (FPC) (%) assessed using eye estimates or photo points: - reduced to <10% within first year; <10% in second year; <5% in the third year and consecutive years.	Weed control as necessary.
Infrastructure (e.g. protection fencing, signage, erosion and sediment control devices) functional and well-maintained.	Relevant infrastructure maintained.	Relevant infrastructure in condition suitable for hand over to TSC.	Maintenance as necessary.

Notes:

¹ “Establishment period” means the period during which initial environmental repair, restoration and monitoring works required by the relevant approved environmental management plan(s) are undertaken. The establishment period ends when the works meet the establishment period performance criteria, as defined by the relevant approved environmental management plans, to the satisfaction of the Secretary.

² “Maintenance period” means the period of environmental management and monitoring works commencing immediately after the end of the establishment period. Maintenance period works are to be carried out in accordance with the relevant performance criteria (as defined by the relevant approved environmental management plan) to the satisfaction of the Secretary.

TABLE 6
PERFORMANCE TARGETS AND CORRECTIVE ACTIONS - THREATENED FLORA

Performance Indicator	Target - Establishment Period¹	Target - Maintenance Period²	Corrective Actions
Erect protective and high visibility temporary fencing.	No disturbance to existing threatened plant species.	No disturbance to existing threatened plant species.	Maintenance as necessary.
No detrimental impacts to existing threatened plant species from spraying/ weeding.	Protection from management activities.	Protection from management activities.	Weed control in accordance with Precincts 12 - 14 VWMP (JWA 2020a).
No disturbance to existing threatened species from fire.	Protection from wildfires. Bushfire management carried out in accordance with the Kings Forest Koala Fire Management Plan (Wildsite 2020).	Protection from wildfires. Bushfire management carried out in accordance with the Kings Forest Koala Fire Management Plan (Wildsite 2020).	Review approach to fire management.
All identified weeds controlled to an acceptable level within retained vegetation areas in accordance with the Precincts 12 - 14 VWMP (JWA 2020a).	Foliage Projective Cover (%) assessed using eye estimates or photo points reduced to <10% within first year.	Foliage Projective Cover (%) assessed using eye estimates or photo points: • reduced to <10% within first year; • <10% in second year; and • <5% in the third year and consecutive years.	Weed control as necessary.
Natural recruitment occurring (Species composition targets, based on accepted benchmarks for the specific vegetation communities are met)	Evidence of natural recruitment occurring.	Increasing natural recruitment occurring.	Habitat enhancement.
Regular (annual) searches of any threatened plant species occurring on the site indicates	Protection of naturally regenerating threatened flora species.	Protection of naturally regenerating threatened flora species.	Habitat enhancement.

Performance Indicator	Target - Establishment Period ¹	Target - Maintenance Period ²	Corrective Actions
the continued presence of threatened plant species.			
Successful propagation and establishment of cuttings/ seedlings of threatened flora.	Propagate seeds and/or cuttings from threatened plant species for use in rehabilitation plantings.	Propagated and planted specimens substantially established ³ .	Supplementary planting.
Notes: ¹ “Establishment period” means the period during which initial environmental repair, restoration and monitoring works required by the relevant approved environmental management plan(s) are undertaken. The establishment period ends when the works meet the establishment period performance criteria, as defined by the relevant approved environmental management plans, to the satisfaction of the Secretary. ² “Maintenance period” means the period of environmental management and monitoring works commencing immediately after the end of the establishment period. Maintenance period works are to be carried out in accordance with the relevant performance criteria (as defined by the relevant approved environmental management plan) to the satisfaction of the Secretary. ³ “Substantial establishment” of the koala habitat plantings means “the plantings have progressed beyond the need for intensive maintenance e.g. weed control, watering etc. and are clearly established by way of persisting through a recognised growth period and a suitably qualified horticultural/environmental specialist has provided a short report confirming that the plantings are established.”			

TABLE 7
PERFORMANCE TARGETS AND CORRECTIVE ACTIONS - THREATENED FAUNA

Performance Indicator	Target - Establishment period ¹	Target - Maintenance period ²	Corrective Actions
No sightings of threatened fauna species within development footprint.	Exclude threatened species from potential impacts by way of exclusion fencing.	Exclusion fencing suitably maintained.	Review effectiveness of fencing and amend/maintain where necessary. Where mobile species such as the Bush stone-curlew are observed within development footprint, signage and temporary fencing provided where necessary. Review management strategies for these species and amend as required.
No significant decrease in numbers, range or abundance estimates from baseline data resulting from site activities.	Ensure buffers to threatened species and/or their habitats are implemented.	Buffers to threatened species and/or their habitats are maintained.	Habitat enhancement (e.g. nest boxes etc.).
No threatened species decline as a result of feral animal predation.	Feral animal control and monitoring and control is completed in accordance with the Kings Forest FAMP (JWA 2020e).	Feral animal control and monitoring is completed in accordance with the Kings Forest FAMP (JWA 2020e).	Review feral animal control in accordance with the Kings Forest FAMP (JWA 2020e).
No threatened species decline as a result of planned or unplanned bushfire.	Bushfire management carried out in accordance with the Kings Forest Koala Fire Management Plan (Wildsite 2020).	Bushfire management carried out in accordance with the Kings Forest Koala Fire Management Plan (Wildsite 2020).	Review approach to fire management.

Performance Indicator	Target - Establishment period ¹	Target - Maintenance period ²	Corrective Actions
Threatened fauna habitat values are improved as a result of the rehabilitation of existing habitat.	Existing habitat areas are rehabilitated in accordance with the Precincts 12 - 14 VWMP (JWA 2020a).	Existing habitat areas are maintained in accordance with the Precincts 12 - 14 VWMP (JWA 2020a).	Habitat enhancement.
Notes: ¹ “Establishment period” means the period during which initial environmental repair, restoration and monitoring works required by the relevant approved environmental management plan(s) are undertaken. The establishment period ends when the works meet the establishment period performance criteria, as defined by the relevant approved environmental management plans, to the satisfaction of the Secretary. ² “Maintenance period” means the period of environmental management and monitoring works commencing immediately after the end of the establishment period. Maintenance period works are to be carried out in accordance with the relevant performance criteria (as defined by the relevant approved environmental management plan) to the satisfaction of the Secretary.			

8.7 Reporting

8.7.1 Baseline Threatened Species Monitoring Report

Subsequent to the completion of baseline monitoring, a report will be prepared outlining the results. The report will be provided to the Commonwealth DoE NSW DPI&E, NSW BCD and TSC and form the baseline for future monitoring. The baseline monitoring report will be available on the JWA website for twelve (12) months (www.jwaec.com.au/).

8.7.2 Pre-commencement Inspection Report

Subsequent to each annual pre-commencement inspection, a brief report will be prepared and will include:

- A log of any new and significant issues for threatened species (including a GPS location where appropriate); and
- Recommendations as to remedial actions (e.g. priority control of highly invasive or noxious weeds, targeted control of feral animals etc.).

Each annual Pre-commencement Inspection Report will be submitted to NSW DPI&E, NSW BCD and TSC within two (2) months of completion of the relevant monitoring.

8.7.3 Annual Threatened Species Monitoring Report

After commencement of construction within Precincts 12 - 14, an annual Threatened Species Monitoring Report will be prepared which discusses the results of the monitoring against the Monitoring Performance Criteria identified in **SECTION 8.6**. The information provided in the report should include, but not necessarily be limited to:

- Results of the flora and fauna surveys;
- Discussion regarding the absence of previous species/occurrence of new species;
- Any habitat maintenance recommendations;
- A detailed comparison with the baseline parameters and with previous survey data, as appropriate;
- Consideration of any relevant pre and post bushfire comparisons of threatened species occurrence and/or abundance;
- A statement of compliance with the Performance Criteria identified in **SECTION 8.6**;
- Any problems since the previous inspection and what effects these issues have had;
- Success or failure of measures implemented to rectify previously identified problems;
- Measures to be taken to rectify new problems; and
- Adaptive management procedures to ensure that the management plan remains relevant and effective.

Each Annual Threatened Species Monitoring Report will be submitted to NSW DPI&E, NSW BCD and TSC within two (2) months of completion of the relevant monitoring. The Annual

Threatened Species Monitoring Report will be available on the JWA website for twelve (12) months (www.jwaec.com.au/).

9 IMPLEMENTATION SCHEDULES

9.1 Introduction

Specific management actions discussed in **SECTION 7** will be triggered and completed within Precincts 12 - 14 and associated EMAs on a pre-construction, construction and operational phase basis. The implementation schedules provided in **TABLES 8 - 10** below summarise all pre-construction, construction and operational phase management strategies and identify the associated management actions, timing, responsibilities and performance measures.

SECTION 7.1 outlines relevant management strategies for threatened flora and fauna species and EECs that are contained in other management plans. These management plans and their associated implementation schedules should be read in conjunction with this TSMP.

In accordance with Project Approval (MP08_0194) Condition 72, evidence of commencement of implementation of this TSMP shall be provided to the Secretary prior to commencement of bulk earthworks.

Performance indicators and targets to be achieved during the 'establishment period' and 'maintenance period' of the project (as defined within the Project approval MP08_0194) are contained in **SECTION 8.6**. Corrective actions are also provided that are to be implemented if performance targets are not met.

9.2 Development Phases

Management actions outlined in this TSMP will be implemented in three (3) phases:

- Pre-construction Phase - The pre-construction phase of the development refers to all preliminary works required to be completed prior to commencement of construction e.g. preliminary survey work, baseline monitoring and commencement of compensatory habitat rehabilitation works.
- Construction Phase - The construction phase of the development refers to works completed to construct the development and includes clearing vegetation, bulk earthworks and the construction of infrastructure.
- Operational Phase - The operational phase of the development will commence postconstruction and after registration of the plan/s of subdivision for each precinct.

Commencement of construction is defined under Concept Plan Approval Condition B7 and Major Project Approval A13 as any physical works including clearing vegetation, the use of heavy duty equipment for the purpose of breaking ground for bulk earthworks, or infrastructure for the proposed project.

TABLES 8 - 10 detail the specific management actions that will be implemented within each development precinct during the pre-construction phase, construction phase and operational phases respectively.

9.3 Roles and Responsibilities

The successful implementation of this TSMP requires a number of key personnel to complete various roles. As many of the contractors for the project are yet to be appointed, these will be specified and list of key contacts for the project contained in revised versions of the TSMP (in accordance with Conditions B1 and C2 of the Concept Plan Approval 06_0318, MOD 6). A summary of key roles/personnel responsible for the management strategies identified in TABLES 8 - 10 below includes:

Proponent

Project 28 Pty Ltd is the Proponent for the works as the approval holder.

Construction/Site Manager

The Construction/Site Manager (to be appointed) is a representative of the project team (typically the project engineer) and is responsible for coordinating the project consultants and construction contractor.

Principal Contractor

The Principal contractor (to be appointed) is responsible for the management of all activities involved in the construction phase of the development.

Site Supervisor

The Site Supervisor is a representative of the Principal Contractor (to be appointed) and responsible for overseeing all pre-clearing, clearing and construction activities are undertaken in accordance with this TSMP and subsequent environmental management documentation.

Ecologist

For the purposes of this TSMP means a qualified ecologist with appropriate training and at least five (5) years of experience in undertaking flora and fauna surveys.

Fauna Spotter Catcher

For the purposes of this TSMP means a suitably qualified ecologist/fauna handler agreed to by the Department. It is noted that the Fauna Spotter Catcher must hold a relevant scientific license and ethics approvals and a copy of these permits along with their contact details will be passed on to the Site Supervisor. The engaged Fauna Spotter Catcher will be responsible for the management/relocation of native fauna during any clearing activities.

Bush Regeneration Company

For the purposes of this TSMP means a suitably qualified Bush Regeneration Company that has demonstrable experience in the rehabilitation or revegetation of native vegetation communities in the Tweed region. It is noted that the Bush Regeneration Company must hold the necessary license and approvals. The engaged Bush Regeneration Company will be responsible for rehabilitation and weed management works on the site.

9.4 Implementation Table - Pre-construction Phase

TABLE 8
THREATENED SPECIES MANAGEMENT STRATEGIES - PRE-CONSTRUCTION PHASE

Management Strategy	Management Zone	Management Action	Responsibility	Performance Measure
Baseline threatened flora surveys and report	Zones 2 - 6 and 8	Baseline threatened flora monitoring program to be completed within Precincts 12 -14 in accordance with MP08_0194 Condition 37 .	Qualified Ecologist	Baseline threatened flora surveys and reports completed in accordance with SECTION 8 . Reports provided to relevant government agencies.
Pre-commencement threatened flora inspections and reporting	All	Undertake annual monitoring inspections and reporting until construction commences.	Qualified Ecologist	Annual pre-commencement monitoring completed consisting of brief visual inspections of the Precinct 12 -14 EMAs to identify any new and significant issues for threatened flora species requiring intervention and associated annual reporting (SECTION 8.7.2). Each annual Pre-commencement Inspection Report will be submitted to NSW DPI&E, NSW BCD and TSC within two (2) months of completion of the relevant monitoring.
Baseline threatened fauna surveys and report	Zones 2 - 6 and 8	Baseline threatened fauna monitoring program to be completed within Precincts 12 -14 in accordance with MP08_0194 Condition 37 .	Qualified Ecologist	Baseline threatened fauna surveys and reports completed in accordance with SECTION 8 . Reports provided to relevant government agencies.
Pre-commencement threatened fauna inspections and reporting	All	Undertake annual monitoring inspections and reporting until construction commences.	Qualified Ecologist	Annual pre-commencement monitoring completed consisting of brief visual inspections of the Precinct 12 - 14 EMAs to identify any new and significant issues for threatened fauna requiring intervention and associated annual reporting (SECTION 8.7.2). Each annual Pre-commencement Inspection Report will be submitted to NSW DPI&E, NSW BCD and TSC within two (2) months of completion of the relevant monitoring.
Baseline EEC surveys, pre-commencement inspections and reporting	Zones 2 - 6 and 8	Baseline EEC monitoring program to be completed within Precincts 12 - 14 in accordance with MP08_0194 Condition 37 .	Qualified Ecologist	Baseline EEC surveys, pre-commencement inspections and reports completed in accordance with the Precincts 12 - 14 VWMP (JWA 2020a). Reports provided to relevant government agencies.
Adaptive management	All Zones	Adaptive Management strategies implemented as required.	Proponent	Adaptive Management Log detailing issues raised and any changes made to this management plan to be updated as monthly and included in the Annual Threatened Species Monitoring Report and published on the project website in accordance with SECTION 7.3 .

9.5 Implementation Table - Construction Phase

TABLE 9
THREATENED SPECIES MANAGEMENT STRATEGIES - CONSTRUCTION PHASE

Management Strategy	Management Zone	Management Action	Responsibility	Performance Measure
Species Specific Threatened Fauna Management Measures	Zones 1 - 6	Disease control procedures.	All Contractors	All contractors undertaking work in both wetland construction and vegetation rehabilitation must follow the protocol set out within the publication <i>Hygiene protocol for the control of disease in frogs</i> (NSW DECC 2008) in accordance with SECTION 7.2.4 and Section 7.10 of the Kings Forest WSFMP (JWA 2020b).
	Zones 2 - 6	Existence of the threatened fauna species considered in the development of any program using pesticides and herbicides for weed and/or mosquito and/or feral animal control.	Construction Manager	Contractors made aware of threatened fauna species and their need for protection, and consider species in the selection of pesticides and herbicides as required in accordance with SECTIONS 7.2.
Monitoring and Reporting	Zones 2 - 6	Retained vegetation monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37. Rehabilitation monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37. Threatened flora monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37. Threatened fauna monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37. Water quality monitoring in accordance with the Overall Water Management Plan (G&S 2020b)	Qualified Ecologist	Ongoing monitoring programs and reporting completed in accordance with SECTION 8 and the following management plans: - Precincts 12 - 14 VWMP (JWA 2020a): - Section 8.4 - Monitoring of retained vegetation; and - Section 8.5 - Rehabilitation monitoring. - Kings Forest KPOM (JWA 2019): - Section 8.2 - Koala activity monitoring; - Section 8.4 - Compensatory koala habitat monitoring; and - Section 8.5 - Koala infrastructure, construction and operational management monitoring. - Kings Forest WSFMP (JWA 2020b): - Section 8.3 - WSF monitoring; and - Section 8.5 - Compensatory WSF habitat monitoring. - Kings Forest Overall Water Management Plan (G&S 2020b) - water quality monitoring. Reports provided to relevant government agencies.
Adaptive management	All Zones	Adaptive Management strategies implemented as required.	Proponent	Adaptive Management Log detailing issues raised and any changes made to this management plan to be updated as monthly and included in the Annual Vegetation Monitoring Report and published on the project website in accordance with SECTION 7.3.

9.6 Implementation Table - Operational Phase

TABLE 10
THREATENED SPECIES MANAGEMENT STRATEGIES - OPERATIONAL PHASE

Management Strategy	Management Zone	Management Action	Responsibility	Performance Measure
Species Specific Threatened Fauna Management Measures	Zone 1	Protection of Bush stone-curlew hatchlings and nest sites where necessary.	Proponent (until ownership is transferred)	If Bush stone-curlews are observed or reported to be nesting within developed portions of Precincts 1 - 5, nest sites will be protected through signage and temporary fencing where necessary in accordance with SECTION 7.2.3 .
Monitoring and Reporting	Zones 2 - 6	Retained vegetation monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37. Rehabilitation monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37. Threatened flora monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37. Threatened fauna monitoring program to be completed across the entire site in accordance with MP08_0194 Condition 37.	Qualified Ecologist	Ongoing monitoring programs and reporting completed in accordance with SECTION 8 and the following management plans: • Precincts 12 - 14 VWMP (JWA 2020a): – Section 8.4 - Monitoring of retained vegetation; and – Section 8.5 - Rehabilitation monitoring. • Kings Forest KPoM (JWA 2019): – Section 8.2 - Koala activity monitoring; – Section 8.4 - Compensatory koala habitat monitoring; and – Section 8.5 - Koala infrastructure, construction and operational management monitoring. • Kings Forest WSFMP (JWA 2020b): – Section 8.3 - WSF monitoring; and – Section 8.5 - Compensatory WSF habitat monitoring. Reports provided to relevant government agencies.
Adaptive management	All Zones	Adaptive Management strategies implemented as required.	Proponent	Adaptive Management Log detailing issues raised and any changes made to this management plan to be updated as monthly and included in the Annual Threatened Species Monitoring Report and published on the project website in accordance with SECTION 7.3 .

10 INDICATIVE COSTINGS

TABLE 11 contains an indicative costing for the implementation of mitigation measures within Precincts 12 - 14.

It is noted that additional costings for management actions outside the scope of this TSMP (i.e. associated with compensatory koala and WSF habitat, feral animal management, bushfire management etc.) are provided in the relevant management plans.

TABLE 11
INDICATIVE COSTINGS

Management Action/Item	Cost (\$) * Establishment Phase	Cost (\$) * Maintenance Phase
Construction phase management measures	Subject to arrangements with Principal Contractor	N/A
Baseline vegetation surveys and report	Consult approved Precincts 12 - 14 VWMP (JWA 2020a)	N/A
Baseline threatened flora surveys and report	\$7,500	N/A
Baseline threatened fauna surveys and report	\$37,500	N/A
Monitoring and Reporting	\$50,000/year	
* Proposed to be funded from the proponents ongoing cash flow during the development		

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APPENDIX 1 - COMPLIANCE WITH RELEVANT APPROVAL CONDITIONS

CONDITION	SECTION OF TSMP
Concept Plan Approval - Condition C2 Threatened Species Management Plan Each Threatened Species Management Plan update is to provide further details on specific habitat management measures to safeguard existing populations of the two threatened Wallum frog species that occur within the Environmental Protection zones, Ecological buffers and the golf course. These measures are to be determined with reference to contemporary scientific literature and current best practice.	The separate WSFMP (JWA 2020b) provides specific habitat management measures to safeguard existing populations of Wallum sedge frogs. The WSFMP (JWA 2020b) is also applicable to the Wallum froglet. This TSMP is accordance with the WSFMP (JWA 2020b).
Major Project Approval - Condition 39 <i>“1) All Environmental Management Plans shall be revised to address management actions to be undertaken throughout the life of the project as relevant to the development precincts that the plan covers. This includes a detailed set of agreed establishment and maintenance phase performance completion criteria, ongoing monitoring and an annual maintenance schedule of works following the initial establishment period.</i> <i>2. Performance criteria for all management plans are reviewed to ensure they are specific to each precinct and action, measurable, achievable, relevant and timely.</i> <i>3) The implementation schedule of all Environmental Management Plans shall be revised to include the following details as relevant to the precincts that the plan covers:</i> <i>a. Actions that are specific to the precinct for which they are addressing</i> <i>b. Specific map references to identify locations of works for all actions</i>	1) All Environmental Management Plans have been updated as required. 2) SECTION 8.6 details the performance criteria. 3) a. The Implementation and Summary tables in SECTION 9 identify actions related to Precincts 12-14.

CONDITION	SECTION OF TSMP
<i>c. Total areas to be planted (m2)</i> <i>d. Planting density (per m2)</i> <i>e. Number of permanent signs to be erected and maintained</i> <i>f. Total areas for weed management activities (m2)</i> <i>g. Length of any fencing (temporary and permanent)</i> <i>h. Total areas for heath regeneration and revegetation (m2)</i> <i>i. Locations and areas (m2) of proposed threatened species habitat</i> <i>j. Timing and frequency of actions</i> <i>k. Monitoring requirements (frequency) that are specific to the action”.</i>	b. Locations applicable to the actions within this TSMP are shown in FIGURE 19. c. Areas to be planted are detailed in the Precincts 12 - 14 VWMP (JWA 2020a). d. Planting densities are detailed in the Precincts 12 - 14 VWMP (JWA 2020a). e. Refer Precinct 6 - 14 BMP (JWA 2020c). f. Refer to Precincts 12 - 14 VWMP (JWA 2020a). g. Refer to KPoM (JWA 2019). h. Refer to Precincts 12 - 14 VWMP (JWA 2020a). i. Locations and areas of proposed threatened species habitat are included in SECTION 4.4. j. Timing and frequency of actions are detailed in SECTION 9. k. Monitoring requirements and frequency are discussed in SECTION 8.

CONDITION	SECTION OF TSMP
Major Project Approval - Condition 43 1) Proposed “melon hole” creation shall not be permitted in Acid Frog Compensatory Areas 5, 6, 7 and 8. Details of alternative offsetting arrangements for the loss of Wallum Froglet Habitat across the site must be included in the final Threatened Species Management Plan.	1) A Kings Forest WSFMP (JWA 2020b) has been prepared and contains details of the offsetting arrangements. Melon hole creation has been excluded from current management plans.
2) Tree plantings are to be minimised in areas that are identified as naturally regenerating.	2) Details of the tree plantings for the rehabilitation works are provided in the Precincts 12 - 14 VWMP (JWA 2020a).
3) The species list in Appendix 3 of the Threatened Species Management Plan - Precincts 1 and 5, James Warren & Associates, August 2012, for restoration works within the Precinct 1 ecological buffer shall be revised to demonstrate that species used in restoration works within and adjacent to the Littoral Rainforest within Precinct 1 to include only those species known from the patch or other locally-occurring rainforest species.	3) The species list for restoration works within the Precinct 1 ecological buffer has been updated to include only locally-occurring rainforest species. This list is addressed in the Precincts 1 - 5 VWMP (JWA 2020f).
4) Details of whether and how the proposed removal of sediment from Blacks Creek may impact upon threatened wetland bird species (black necked stork, black bittern) must be included in the Plan, including any proposed mitigation measures.	4) Threats and mitigation measures to wetland bird species are provided in APPENDIX 5 and SECTION 7.
5) The final Threatened Species Management Plans shall be prepared in consultation with Council and submitted to the Secretary for approval prior to the issue of a Construction Certificate for Stage 1 bulk earthworks.	5) Noted.

APPENDIX 2 - ADDITIONAL KINGS FOREST MANAGEMENT PLANS AND THEIR RELATIONSHIP TO THE PRECINCTS 12-14 TSMP

Management Plan	Relationship to the Precincts 12-14 TSMP
Kings Forest Koala Plan of Management (JWA 2019)	The aim of the Kings Forest KPoM is to protect and conserve the Koala population in the Kings Forest area to ensure its ongoing survival through appropriate management of project impacts. The objectives are: • To ensure that the proposed development does not remove significant areas of habitat known, or likely to be important for the local Koala population; • To ensure that movement corridors for the local Koala population are maintained and/or improved; • To protect individual Koalas from injury or other adverse impacts during the development phase; • To embellish the habitat values of the site, including the creation of Koala habitat as part of a comprehensive offset strategy; • To protect, restore and provide for ongoing maintenance of existing koala habitat; • To ensure that changes in the local environment resulting from the proposed development (e.g. additional traffic, introduction of dogs) do not significantly impact on the local Koala population; • To ensure that Koalas continue to utilise habitat at Kings Forest; • To ensure appropriate monitoring and management programs are undertaken; • To raise awareness and promote community ownership of environmental management (including the conservation of the local Koala population); • Compliance with relevant conditions; and • Further revision of the KPoM as appropriate.

Management Plan	Relationship to the Precincts 12-14 TSMP
Kings Forest Wallum Sedge Frog Management Plan (JWA 2020b)	The aim of the Kings Forest WSFMP is to protect and conserve the WSF population in the Kings Forest area to ensure the ongoing survival of the population through appropriate management of project impacts. The objectives are: • To ensure that the proposed development does not remove areas of habitat outside of approved clearing areas; • To ensure that movement corridors for the local WSF population are maintained and/or improved; • To protect WSF from injury or other adverse impacts associated with the construction phase of the development through the implementation of appropriate management actions; • To improve the habitat values of the site, including the creation of WSF habitat as part of a comprehensive and staged offset strategy; • To protect WSF from injury or other adverse impacts associated with the operational (post-construction) phase of the development through the implementation of appropriate management actions; • To ensure that WSF continue to utilise habitat at Kings Forest by way of providing for effective monitoring of performance in relation to the provisions of this WSFMP; • To raise awareness and promote community ownership of environmental management (including the conservation of the local WSF population); • Compliance with relevant conditions; and • Revision of the WSFMP as appropriate.
Kings Forest Precincts 6 - 14 Buffer Management Plan (JWA 2020c)	The aim of the BMP is to provide guidelines, strategies and methods for the treatment and management of ecological buffers to Cudgen Nature Reserve and EPZs. The BMP provides details of the protection of retained and compensatory habitat where these areas occur within ecological buffers within Precincts 6 - 14.

Management Plan	Relationship to the Precincts 12-14 TSMP
Kings Forest Precincts 12-14 Vegetation and Weed Management Plan (JWA 2020a)	The VWMP is intended to assist Project 28 in managing existing native vegetation and other environmentally sensitive areas within buffers and Environmental Protection Zones (EPZs) associated with development Precincts 12 - 14 on the Kings Forest site before, during and after development. The aim of the VWMP is to develop a comprehensive and integrated approach to guide the immediate and long-term management of retained and compensatory native vegetation within EMAs and to ensure its protection and enhancement. Specific objectives of the VWMP are to: • Protect the environmentally significant site values within buffers and EPZs from bulk earthworks and construction activities; • Remove vegetation from the development footprint in a controlled and an environmentally sustainable way; • Provide permanent protection for the environmentally significant values EMAs associated with Precincts 12 - 14 (i.e. threatened flora and fauna species, endangered ecological communities, and wetlands); • Manage noxious and environmental weeds in an environmentally sustainable manner and prevent the further spread of weeds resulting from the development of Precincts 12 - 14; • Utilise assisted natural regeneration where appropriate; • Restore, enhance and manage the retained and protected vegetation including providing guidelines for the revegetation of EMAs and the Cudgen Nature Reserve where required; and • Monitor the condition of retained and rehabilitated vegetation to assess if the project completion criteria have been met and report where appropriate.
Kings Forest Flora and Fauna Monitoring Report (JWA 2020d)	The Kings Forest Flora and Fauna Monitoring Report summarises all flora and fauna monitoring requirements of the development including the Koala monitoring program.

Management Plan	Relationship to the Precincts 12-14 TSMP
Kings Forest Feral Animal Management Plan (JWA 2020e)	The aim of the FAMP is to develop a comprehensive and integrated approach to guide the immediate and long-term management of feral animals within buffers and EPZs associated with the development of the Kings Forest site and to ensure the protection of native fauna species, with a primary focus on threatened species. Specific objectives of the FAMP are to: • Review relevant literature on feral animal control; • Identify feral animals which have been recorded at the site; • Prioritise species considered to warrant priority management; • Examine control and/or eradication methods for ‘high priority’ feral animals; and • Recommend long-term control methods, including monitoring and reporting.
Kings Forest Stage 1 Bushfire Management Plan (BushfireSafe 2020)	A fundamental strategy of the Kings Forest Stage 1 Bushfire Management Plan is to assess and manage fuel loads within the Kings Forest site. The risk of high intensity fires will be reduced through controlled low intensity burns or mechanical means if and where appropriate. High-intensity hazard reduction burns and wildfires that result in crown scorch or crown fires should be avoided.
Kings Forest Koala Fire Management Plan (Wildsite 2020)	The Kings Forest Koala Fire Management Plan details fire management strategies for koala habitat areas on the Kings Forest site. The aim of this plan is to protect and conserve the population and habitat of koalas and other associated biodiversity values in the Kings Forest area through the restoration and maintenance of appropriate fire regimes.
Construction Environmental Management Plan (MUS 2020)	The Construction Environmental Management Plan provides details sufficient to understand and avoid, mitigate and remedy all potential environmental impacts of the project during construction and should be read in conjunction with this TSMP.
Kings Forest Summary of Management Plans (G&S 2020a)	The Kings Forest SOMP has been prepared to summarise all of the management requirements of the various management plans including this TSMP.

APPENDIX 3 - ENDANGERED ECOLOGICAL COMMUNITIES

1 BACKGROUND

Two (2) EEC's⁴ occur within Precincts 12 - 14 EMAs:

- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast; and
- Freshwater wetlands on coastal floodplains of the NSW North Coast.

FIGURE 8 shows the extent of these EECs within Precincts 12 - 14.

2 SWAMP SCLEROPHYLL FOREST ON COASTAL FLOODPLAINS OF THE NSW NORTH COAST

This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The trees may exceed 25 m in height but can be considerably shorter in regrowth stands or under conditions of lower site quality where the tree stratum is low and dense.

3 FRESHWATER WETLANDS ON COASTAL FLOODPLAINS OF THE NSW NORTH COAST

Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains. Generally occur below 20 m elevation on level areas. They are dominated by herbaceous plants and have very few woody species.

4 THREATS

Potential threats to the EEC's are listed as follows:

- Clearing of vegetation;
- Competition from weeds and native vines;
- Fire and fire control methods;
- Grazing; and
- Disturbance by cattle.

⁴ As listed within schedules of the BC Act (2016).

APPENDIX 4 - THREATENED FLORA SPECIES PROFILES

1 GREEN-LEAVED ROSE WALNUT (*ENDIANDRA MUELLERI* SUBSP. *BRACTEATA*)

1.1 Description and Habitat

The Green-leaved rose walnut is a tree up to 30 m tall with brown bark, often in loose round plates. Twigs and branchlets are covered in hairs. The leaves are moderately glossy and are oval or drawn out towards the tips, and measure 6 - 12 cm long and 3 - 5 cm wide, with three to five pairs of side veins. Flushes of new growth are pinkish-green. Flowers are small, yellowish and hairless, and are held in small clusters. The fleshy fruits are egg-shaped, 2.5 - 3 cm long and black when ripe (NSW OEH 2018).

The Green-leaved rose walnut occurs in subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats (NSW OEH 2018).

1.2 Status

The Green-leaved rose walnut is listed as an endangered species within schedules of the *BC Act (2016)*.

1.3 Occurrence and Threats on Site

There is a historic record of a single stem of the Threatened species Green-leaved rose walnut within the road reserve of Tweed Coast Road (**FIGURE 8**). However, this tree has not been located despite several surveys since 2006 and could not be located during recent site investigations. It is considered likely that it has been removed during roadside maintenance works. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 9**.

Potential threats to this species include:

- Clearing and fragmentation of habitat;
- Infestation of habitat by weeds;
- Frequent fire; and
- Damage from domestic stock.

1.4 Recovery of the Species

An Approved Recovery Plan outlines specific objectives to facilitate the recovery of the Green-leaved rose walnut in the wild (DEC 2004). Objectives of this plan are as follows:

- To co-ordinate the recovery of the Green-leaved rose walnut;
- To resolve taxonomic difficulties in the separation of the Green-leaved rose walnut and Rusty rose walnut and other closely related taxa and conduct field surveys where necessary to fill information gaps;
- To re-assess background information for the newly resolved taxa;

- To improve the consideration of the Green-leaved rose walnut in environmental impact assessments for developments and activities;
- To manage and protect the Green-leaved rose walnut and associated habitat from threatening processes;
- Fire-planning and management;
- To improve knowledge of distribution, regeneration and genetics;
- To integrate the recovery of the Green-leaved rose walnut with the recovery of other biota; and
- To involve the community in the recovery of the Green-leaved rose walnut.

2 SOUTHERN SWAMP ORCHID (*PHAIUS AUSTRALIS*)

2.1 Description and Habitat Requirements

The Southern swamp orchid has flower stems up to 2 m tall and large broad leaves with a pleated appearance, both arising from a fleshy bulb near ground level. The large, showy flowers, with up to 20 per stem, have four petals which are white on the outside and brown with white or yellow veins on the inside. The central tongue of the flower is pink and yellow with lobes slightly curved inwards (NSW OEH 2017).

The Southern swamp orchid occurs in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.

2.2 Status

The Southern swamp orchid is listed as an endangered species within schedules of both the *BC Act (2016)* and *EPBC Act (1999)*.

2.3 Occurrence and Threat on the Site

The Southern swamp orchid was originally recorded within Paperbark forest in the mid-eastern portion of the Kings Forest site. A separate colony of several individuals was recorded within Paperbark forest in the north-eastern portion of the Precinct 5 EMA (**FIGURE 8**). Further searches have failed to find any current occurrence of this species. It has been suggested that this species is browsed by Swamp wallabies and plants may have been reduced to bulbs or small leaves which are not easily seen (LandPartners 2009). Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 9**.

Potential threats to this species include:

- Illegal collection for horticulture or cut flowers;
- Small population size;
- Drainage of swamps, or pollution from nutrient run-off;
- Frequent fire;

- Grazing and trampling by domestic stock and feral pigs;
- Invasion of habitat by introduced weeds;
- Rubbish dumping and other disturbance due vehicles and/or people; and
- Clearing and fragmentation of habitat.

2.4 Recovery of the Species

No recovery plan or Priority Action Statement (PAS) has been prepared for this species. The following list of recovery strategies is derived from the Revised Threatened Species Management Plan (LandPartners 2009) and the NSW threatened species profile website (NSW OEH 2017):

- View, photograph, catalogue and monitor any present populations;
- Report any records to the DECCW;
- Propagate and replant keeping meticulous records of origins and planting locations;
- Protect areas of habitat from clearing, draining or development;
- Provide further habitat opportunities;
- Protect areas of habitat from frequent fire. Consideration of the potential occurrence of this species in any Fire Management Plan (i.e. exclusion of area from fire regime);
- Fence swampy areas to exclude stock, and if population(s) regenerate maintain fencing;
- Protect areas of habitat from pollution;
- Provide weed control;
- Annual monitoring;
- Buy plants only from licensed nurseries;
- Assist with the control of feral pigs; and
- Involve local residents by education; facilitation of Landcare or community groups.

3 STINKING CRYPTOCARYA (*CRYPTOCARYA FOETIDA*)

3.1 Description and Habitat

The Stinking cryptocarya is a small to medium-sized tree growing to 20 m tall, with a dark green crown, and brown, slightly fissured bark. The leaves are oval-shaped with a bluntly pointed tip, 5 - 12 cm long and 2 - 6 cm wide, dark green on the upper surface and paler below. The main leaf vein is prominent, yellow and characteristically crooked. The species has small creamy flowers, which are borne in small clusters. The purplish to black, fleshy, globular fruits are approximately 1 cm in diameter and enclose a single round seed (NSW OEH 2018).

The Stinking cryptocarya is found in littoral, warm temperate and subtropical rainforest, wet sclerophyll forest and Camphor laurel forest usually on sandy soils, but mature trees are also known on basalt soils (NSW OEH 2018).

3.2 Status

The Stinking cryptocarya is listed as a vulnerable species within schedules of both the *BC Act (2016)* and *EPBC Act (1999)*.

3.3 Occurrence and Threats on Site

A single Stinking Cryptocarya, approximately 10 metres high, occurs within the Precinct 5 EMA (**FIGURE 8**). Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 9**. This tree occurs in the company of a single Beach acronychia (*Acronychia imperforata*) and a mature Corkwood (*Duboisia myoporoides*) within a narrow strip of vegetation adjacent to Swamp mahogany/Paperbark swamp forest. A vehicle access track occurs approximately 5 metres from the subject tree. There are very few weed species within a 10 metres perimeter of this tree, although a single Happy plant⁵ (*Dracaena sp.*) occurs, and Slash pine* (*Pinus elliottii*) wildings occur on the north side of the access track. Some dumped rubbish occurs immediately adjacent.

Potential threats to this species include;

- Small population size;
- Clearing and fragmentation of habitat;
- Infestation of habitat by weeds;
- Trampling by domestic stock; and
- Inappropriate fire regime altering habitat and destroying individuals.

3.4 Recovery of the Species

No recovery plan exists for this species however a PAS has been prepared. The following list of recovery strategies is derived from the PAS and includes strategies that are relevant to the proposed Precincts 12 - 14 development:

- Ensure that land managers and other stakeholders are aware of populations and habitat, identify information and resource needs;
- Encourage community awareness to assist in detecting new locations, and with habitat rehabilitation projects;
- Ensure that managers are aware of populations and habitat and that fire plans, pest management plans take account of requirements for the recovery of Stinking Cryptocarya;
- Develop and implement site management plans for important Stinking Cryptocarya sites;
- Ensure regional fire plans, hazard reduction burn guidelines include protocols for protecting rainforest habitats;

⁵ Weed species are indicated by the use of an asterisk*

- Protect rainforest habitats from fire;
- Protect areas of rainforest habitat from clearing, degradation and fragmentation;
- Survey before road and track maintenance in the habitat of the species, protect road and trackside plants;
- Assess weed threats to populations, manage as necessary. Implement Bitou bush* (*Chrysanthemoides monilifera*) control as described in the approved Threat Abatement Plan;
- Monitor populations at key sites and address threats;
- Undertake habitat assessments at known sites and ascertain threats; and
- Determine current population size and demography.

4 WHITE LACEFLOWER (*ARCHIDENDRON HENDERSONII*)

4.1 Description and Habitat

The White laceflower is a tree to 18 m tall, with light-brown bark. Its leaves are divided twice, into glossy hairless leaflets separated unequally by the midvein. The species produces up to ten fragrant, fluffy creamy-white flowers that are bunched in heads. Woody orange pods also develop (NSW OEH 2017).

White laceflower occurs in riverine and lowland subtropical rainforest, littoral rainforest, coastal cypress pine forest and their ecotones (NSW OEH 2017).

4.2 Status

The White lace flower is listed as a vulnerable species within schedules of the *BC Act (2016)*.

4.3 Occurrence and Threats on the Site

Two (2) mature White laceflower of approximately 10 and 12 metres high have been recorded within the north eastern portion of the Precinct 5 EMA (**FIGURE 8**). One of the trees is smothered by native vines (Native burny vine - *Mucuna gigantea*; Native water vine - *Cissus antarctica*) and has a dense thicket of Lantana* (*Lantana camara*) around the base. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 9**.

Potential threats to these trees include:

- Fragmentation and loss of habitat;
- Habitat degradation through weed invasion and disturbance;
- Illegal collection of seeds for horticulture;
- Trampling by domestic stock; and
- Inappropriate fire regimes.

4.4 Recovery of the Species

No recovery plan exists for this species however, a PAS has been prepared. The following list of recovery strategies is derived from the PAS and includes strategies that are relevant to the proposed Precincts 12 - 14 development:

- Facilitate community and land-holder liaison, awareness and education programs;
- Encourage the community to participate in the detection of White laceflower at new locations, and encourage their participation in habitat rehabilitation projects;
- Protect areas of habitat from frequent fire. Consideration of the potential occurrence of this species in any Fire Management Plan (i.e. exclusion of area from fire regime);
- Ensure that managers are aware of populations and habitat, and that fire plans and pest management plans take account of requirements for the recovery of White laceflower;
- Survey before road and track maintenance in the habitat of the species, protect road and trackside plants; and
- Assess weed threats to populations, manage as necessary. Implement Bitou bush* control as described in the approved Threat Abatement Plan.

5 WHITE YIEL YIEL (*GREVILLEA HILLIANA*)

5.1 Description and Habitat

The White yiel yiel is a rainforest tree that grows between 8-30 m tall. Young leaves are deeply lobed and between 25-40 cm long and 15-60 mm wide, while adult leaves are often without lobes (NSW OEH 2018). The lower surface of both the young and the adult leaves is silvery and silky. The white to pale-green flower heads are cylindrical, 8-22 cm long and sometimes branched (NSW OEH 2018).

The White yiel yiel grows in subtropical rainforest, often on basalt-derived soils (NSW OEH 2018).

5.2 Status

The White yiel yiel is listed as an endangered species within schedules of the *BC Act (2016)*.

5.3 Occurrence and Threats on the Site

Two (2) stems of White yiel yiel have been recorded in the western portion of Precinct 12 in an area of Camphor laurel (*Cinnamomum camphora*) dominated closed forest (**FIGURE 8**). Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 9**.

Potential threats to this species include:

- Small population size and restricted geographic range;
- Fragmentation and loss of habitat;
- Habitat degradation through weed invasion and disturbance;

- Illegal collection of seeds for horticulture; and
- Inappropriate fire regimes.

5.4 Recovery of the Species

There is no approved Recovery Plan for this species or a Priority Action Statement (PAS), however, the following actions are listed on the NSW threatened species profile website (NSW OEH 2018) as actions to be undertaken to recover the species:

- Buy plants only from licensed nurseries;
- Prevent weeds and garden plants from invading habitat;
- Protect remnant rainforest areas from development;
- Seek a permit from the DEC before collecting seed from wild plants; and
- Report new occurrences to the DEC.

APPENDIX 5 - THREATENED FAUNA SPECIES PROFILES

6 BLACK BITTERN (*IXOBRYCHUS FLAVICOLLIS*)

6.1 Description and Habitat

The Black bittern is a heron, dark grey to black in colour, with buff streaks on the throat and a characteristic yellow streak on the sides of the head and down the neck (NSW OEH 2018).

The Black bittern inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, this species may occur in flooded grassland, forest, woodland, rainforest and mangroves (NSW OEH 2018).

6.2 Status

The Black bittern is listed as a vulnerable species within schedules of the *BC Act (2016)*.

6.3 Occurrence and Threats on the Site

The Black bittern has historically been recorded within eastern portions of the Kings Forest site (**FIGURE 8**). Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 10**.

Potential threats to this species include:

- Clearing of riparian vegetation;
- Predation by foxes and feral cats on eggs and juveniles; and
- Grazing and trampling of riparian vegetation by stock.

6.4 Recovery of the Species

No recovery plan exists for this species however a PAS has been prepared. The following list of recovery strategies relevant to the proposed development of Precincts 12 - 14 is derived from the PAS:

- In areas of suitable breeding habitat, seek to retain and manage riparian vegetation; and
- Enhance knowledge of the breeding locations of this species. Survey suitable habitat e.g. vegetated wetlands during the breeding season. Investigate habitat usage particularly in Swamp Oak Forest.

7 BLACK-NECKED STORK (*EPHIPPIORHYNCHUS ASIATICUS*)

7.1 Description and Habitat

The Black-necked stork is a distinctive black-and-white waterbird that stands approximately 1.3m tall. The head and neck are black with an iridescent green and purple sheen. It has a massive black bill and orange-red to bright red long legs (NSW OEH 2017).

The Black-necked stork inhabits floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries (NSW OEH 2017).

7.2 Status

The Black-necked stork is listed as an endangered species within schedules of the *BC Act (2016)*.

7.3 Occurrence and Threats on the Site

Black-necked storks have historically been recorded in conjunction with constructed dams in the far west of the Kings Forest site. The species may utilise periodically inundated areas of pasture adjacent or within wetland environments. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 10**.

Potential threats to the species include:

- Minor loss of habitat within low-lying pasture;
- Human disturbance to areas of forage habitat; and
- Disturbance from straying domestic dogs.

7.4 Recovery of the Species

No recovery plan exists for this species however a PAS has been prepared. The following list of recovery strategies relevant to the proposed development of Precincts 12 - 14 is derived from the PAS:

- Improve the protection of Black-necked stork habitat by excluding stock, reducing grazing pressure and controlling weed species at important sites.
- Reduce nutrient runoff into wetlands known to be used by the species. Avoid the use of pesticides and herbicides near or in wetlands.
- Restore and maintain natural hydrological regimes in freshwater wetlands.

8 BUSH STONE-CURLEW (*BURHINUS GRALLARIUS*)

8.1 Description and Habitat

The Bush stone-curlew has a grey to light brown back, marked with black blotches, and a streaked rump. It has buff and white underparts with dark streaks and a black band that runs from near its eye down its neck. The Bush stone-curlew has large, bright yellow eyes (NSW OEH 2017).

The Bush stone-curlew inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber (NSW OEH 2017).

8.2 Status

The Bush stone-curlew is listed as an endangered species within schedules of the *BC Act (2016)*.

8.3 Occurrence and Threats on the Site

A single historical record for the Bush Stone-curlew occurs in the south-eastern part of Kings Forest, adjacent to Cudgen Paddock. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 10**.

Potential threats to this species include:

- Predation by foxes and cats;
- Trampling of eggs by cattle;
- Clearance of woodland habitat for agricultural and residential development;
- Modification and destruction of ground habitat through removal of litter and fallen timber, introduction of exotic pasture grasses, grazing and frequent fires; and
- Disturbance in the vicinity of nest sites.

8.4 Recovery of the Species

No recovery plan exists for this species however a PAS has been prepared. The following list of recovery strategies is derived from the PAS and includes strategies that are relevant to the proposed development of Precincts 12 - 14:

- Keep domestic dogs and cats indoors at night;
- Desex domestic dogs and cats;
- Undertake fox and feral cat control programs;
- Assess the appropriateness of dog and cat ownership in new subdivisions;
- Remove cattle from paddocks containing nesting areas at least during breeding season or while eggs and chicks are in nest;
- Retain existing vegetation along roadsides, in paddocks and remnant stands of native trees;
- Retain dead timber on the ground in open woodland areas;
- Fence off suitable woodland habitats, particularly those with unimproved pasture and an intact native ground plant layer;
- Fence off nesting sites;
- Increase the size of existing remnants, planting trees and establishing buffer zones of unimproved uncultivated pasture around woodland remnants; and
- Assess the importance of the site to the species' survival, including the linkages the site provides for the species between ecological resources across the broader landscape.

9 COMMON BLOSSOM BAT (*SYCONYCTERIS AUSTRALIS*)

9.2 Description and Habitat

Common blossom bats are small nectar-eating bats with large eyes. They are approximately 6 cm long and have fawn to reddish fur. They have very pointed muzzles and long, thin brush-like tongues for a highly specialised diet of nectar and pollen (NSW OEH 2018).

Common blossom bats often roost in littoral rainforest and feed on nectar and pollen from flowers in adjacent heathland and paperbark swamps (NSW OEH 2018). They have also been recorded in a range of other vegetation communities, including subtropical rainforest, wet sclerophyll forest and other coastal forests (NSW OEH 2018).

9.3 Status

The Common blossom bat is listed as a vulnerable species within schedules of the *BC Act (2016)*.

9.4 Occurrence and Threats on the Site

This species has historically been recorded feeding on flowering Broad-leaved paperbarks in SEPP 14 wetlands on the Kings Forest site, and in ecotonal forest in the south of the Cudgen Paddock. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 11**.

Potential threats to this species include:

- Clearing of coastal habitat for urban development or sandmining;
- Weeds, such as Bitou Bush, that suppress the regeneration of key food trees, such as Coastal Banksia;
- Predation by foxes and feral cats may occur whilst the bat is feeding on low hanging flowers and fruit; and
- Inappropriate fire regimes applied in heathland habitats leading to reduced flowering of Banksia, Callistemon and Melaleuca species.

9.5 Recovery of the Species

No recovery plan exists for the Common blossom bat however a PAS has been prepared. The following list of recovery strategies relevant to the proposed development is derived from the PAS:

- Ensure a mosaic of nectar-producing trees and shrubs, especially in coastal heath paperbark swamp as well as rainforest roost habitat. Give high priority in PVP assessments, or other assessment tools;
- Prepare EIA guidelines which address the retention of a mosaic of nectar-producing trees and rainforest roost habitat;
- Determine the effectiveness of PVP assessment, offsets and actions for bats;

- Control coastal weed species e.g. Bitou Bush, but avoid aerial spraying during the flowering season of important heath species as herbicides can directly collect in flowers that are fed upon at night;
- Initiate and support rainforest and heath regeneration projects where coastal habitat has been cleared and fragmented;
- Determine the extent of use of revegetation in development areas that are subject to high ambient light levels;
- Identify critical foraging habitat in November when bats are breeding, but when few heath species are flowering;
- Develop burning strategies that reduce impacts on preferred habitat in known foraging areas; and
- Undertake long-term monitoring of select populations cross tenure.

10 COMMON PLANIGALE (*PLANIGALE MACULATA*)

10.1 Description and Habitat

Common planigale are small marsupials with a body length approximately 8 cm and a tail as long again. They have 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 (NSW OEH 2018).

Common planigale inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water (NSW OEH 2018).

10.2 Status

The Common planigale is listed as a vulnerable species within schedules of the *BC Act (2016)*.

10.3 Occurrence and Threats on the Site

The Common planigale has historically been recorded in the south-eastern portion of the Kings Forest site. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 12**.

Potential threats to this species include:

- Predation by foxes, cats and cane toads;
- Loss and fragmentation of habitat through clearing for agriculture and development in coastal areas;
- Frequent burning and grazing that reduces ground cover such as hollow logs and bark; and
- Disturbance of vegetation surrounding water bodies.

10.4 Recovery of the Species

No recovery plan exists for this species however a PAS has been prepared. The following list of recovery strategies is derived from the PAS and includes strategies that are relevant to the proposed development of Precincts 12 - 14:

- Control foxes, feral cats and cane toads;
- Reduce the impact of burning to retain diverse understorey species and cover, such as hollow logs and bark;
- Maintain adequate ground cover, especially near water;
- Control cattle access to reduce grazing and trampling of waterside vegetation; and
- Protect areas of habitat from clearing and development.

11 EASTERN OSPREY (*PANDION CRISTATUS*)

11.1 Description and Habitat

The Eastern osprey is a large, water-dependent bird of prey. In flight it can be recognised by its distinctly bowed wings that are dark brown above, and barred underneath, and with white underwing coverts. Perched, the upperparts are dark brown, and the underparts are white. The female has a dark streaky collar. The head is mainly white with a blackish stripe through the eye (NSW OEH 2018).

The Eastern ospreys require adequate supplies of fish, expanses of open water, tall trees for use as feeding bases, nest sites and vantage points. It favours coastal areas, especially the mouths of large rivers, lagoons and lakes (NSW OEH 2018). Offshore islands are utilised, and this species may range inland along large rivers, particularly in the northern part of the country. Extensive sheets of clear open water, fresh, brackish or saline are needed for fishing.

11.2 Status

The Eastern osprey is listed as a vulnerable species within schedules of the *BC Act (2016)*.

11.3 Occurrence and Threats on the Site

The Eastern osprey has historically been recorded in the north-eastern portion of the Kings Forest site (**FIGURE 8**). Suitable habitat is considered to occur in the eastern portion of the site, in the vicinity of Cudgen Creek and Cudgen Lake. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 13**.

Potential threats to this species include:

- Reduction of suitable habitat (feeding, nesting and roosting) through clearing;
- Disturbance of nest sites by human activity; and
- Pollution of foraging habitat.

11.4 Recovery of the Species

The NSW Office of Environment and Heritage has identified nine (9) priority actions to help recover this species:

- Protect nest sites (usually large dead trees) and surrounding vegetation using appropriate buffer zones (suggest 100 metres). Preservation of the existing nest and structure is a priority and relocation should only be considered a last resort.
- Work with managers of infrastructure to manage or translocate nests if site selection puts Osprey at risk.
- Identify and protect regular feeding areas, perch (feeding) trees and nest material collection sites, particularly vegetation surrounding nest tree.
- Consider direct and indirect impacts on the species and its habitat in planning processes including adequate field survey to identify nest tree, buffer protection zone, perch trees and feeding areas. Nesting season is from June to October.
- Continue programs monitoring the breeding status of the species in NSW incorporating surveys of the number of active nest trees, breeding success at nests and protection of buffer zones and roost trees.
- Undertake community awareness initiatives such as media campaigns, brochures and interpretive signs. These should cover issues such as the threat of discarding fish with fishing tackle attached, protection of potential and future nest trees.
- Investigate the effectiveness of ameliorative management actions on the species including effectiveness of artificial nest structures.
- Continue ecological research to determine whether availability of potential nest trees and/or food resources are limiting to the species as well as potential impacts of pesticides and pollutants on species breeding success.
- Continue to consult with Aboriginal communities to determine cultural significance of the osprey.

12 GLOSSY BLACK-COCKATOO (*CALYPTORHYNCHUS LATHAMI*)

12.1 Description and Habitat

The Glossy black-cockatoo is a small brown-black cockatoo. Males have a prominent red tail panel, while females have yellow to orange-red tail panel (NSW OEH 2017). The coloured tail panel in juvenile birds are barred black. Females usually have irregular pale-yellow markings on the head and neck, and may have yellow flecks on the underparts and underwing (NSW OEH 2017).

The Glossy black-cockatoo 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 (*Allocasuarina torulosa*) are important food trees (NSW OEH 2017).

12.2 Status

The Glossy black-cockatoo is listed as a vulnerable species within schedules of the *BC Act (2016)*.

12.3 Occurrence and Threats on the Site

The Glossy black cockatoo has historically been recorded in the southern portion of the Kings Forest site and adjacent to the northern SEPP wetland. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 14**.

Potential threats to this species include:

- Reduction of suitable habitat through clearing for development;
- Loss of tree hollows;
- Excessively frequent fire which reduces the abundance and recovery of she-oaks and also may destroy nest trees; and
- Illegal bird smuggling and egg-collecting.

12.4 Recovery of the Species

No recovery plan exists for this species however a PAS has been prepared. The following list of recovery strategies is derived from the PAS and includes strategies that are relevant to the proposed development of Precincts 12 - 14:

- Increase landholder and public awareness and interest in Glossy Black Cockatoo conservation and habitat management;
- Utilise the Glossy Black Cockatoo as a flagship threatened species for woodland and forest conservation education and awareness programs;
- Encourage the restoration of foraging habitat that has been cleared or degraded by previous impacts;
- Continue existing monitoring programs and encourage other community groups to develop a monitoring program of local populations; and
- Identify and map key breeding and foraging habitat.

13 GRASS OWL (*TYTO LONGIMEMBRIS*)

13.1 Description and Habitat

The Eastern grass owl is a medium-sized, ground-dwelling bird (35 cm) with a facial disc typical of the *Tyto* owls. The upperparts are dark brown, buff and yellow-orange, with fine silvery spots. Underparts are white in the male, and buff in the larger female, with sparse dark spots. The long legs are mostly bare and in flight protrude well beyond the tail, distinguishing this species from the similar Barn Owl (NSW OEH 2018).

The Eastern grass owl inhabits areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains (NSW OEH 2018).

13.2 Status

The Eastern grass owl is listed as a vulnerable species within schedules of the *BC Act (2016)*.

13.3 Occurrence and Threats on the Site

The Grass owl has historically been recorded within the central and southern portions of the Kings Forest and are likely to forage widely across the site. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 11**.

Potential threats to this species include:

- Fragmentation and loss of habitat;
- Alteration of habitat from weed invasion, colonisation by woody heathland species;
- Injury/death from vehicle strike;
- Fire;
- Human disturbance;
- Injury/death from domestic animals;
- Increased risk of fire;
- Disturbance from light spill from houses and roads; and
- Secondary poisoning from rodenticides.

13.4 Recovery of the Species

No recovery plan exists for the Grass owl however a PAS has been prepared. The following list of recovery strategies relevant to the proposed development of Precincts 12 - 14 is derived from the PAS:

- Secure sympathetic management of the Grass Owl, particularly in regard to minimising secondary poisoning from pesticides such as brodifacoum based rodenticides;
- Control pest animals throughout the species range where nesting is known or strongly suspected;
- Where Grass Owl records occur on private land encourage landholders to undertake management to conserve and actively manage habitat; and
- Compile and assess opportunistically gathered records of the species in NSW toward developing a model of distribution, habitat use and management.

14 GREY-HEADED FLYING-FOX (*PTEROPUS POLIOCEPHALUS*)

14.1 Description and Habitat

The Grey-headed flying-fox has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black, and the wingspan can be up to 1 m (NSW OEH 2017).

The Grey-headed flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (NSW OEH 2017).

14.2 Status

The Grey-headed flying-fox is listed as a vulnerable species within schedules of both the *BC Act (2016)* and *EPBC Act (1999)*.

14.3 Occurrence and Threats on the Site

The Grey-headed flying fox has been recorded (including incidental recent records within the last 12-24 months) in the eastern portion of the Kings Forest site, adjacent to Cudgen Nature Reserve (**FIGURE 8**). Although there are no camp sites within the Kings Forest site, this species forages widely, (i.e. up to 50 km from camps) and is considered likely to utilise the Kings Forest site on a seasonal basis (i.e. when feed trees such as Swamp Mahogany, Swamp Box, Scribbly Gum, Broad-leaved Paperbark, Figs etc. are flowering). Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 11**.

Potential threats to this species include:

- Loss of roosting and foraging sites;
- Electrocution on powerlines, entanglement in netting and on barbed-wire;
- Heat stress; and
- Conflict with humans.

14.4 Recovery of the Species

No recovery plan exists for the Grey-headed flying-fox however a PAS has been prepared. The following list of recovery strategies relevant to the proposed development of Precincts 12 - 14 are derived from the PAS:

- Provide educational resources to improve public attitudes towards Grey-headed Flying Foxes;
- Protect and enhance priority foraging habitat;
- Protect roosting habitat critical to the survival of Grey-headed Flying Foxes;
- Increase the extent and viability of foraging habitat for Grey-headed Flying Foxes that is productive during winter and spring, including habitat; and

- Set priorities for protecting foraging habitat critical to the survival of the species and generate maps of priority foraging habitat.

15 MASKED OWL (*TYTO NOVAEHOLLANDIAE*)

15.1 Description and Habitat

The Masked owl is a medium-sized owl to 40 - 50 cm long, with dark eyes set in a prominent flat, heart-shaped facial disc that is encircled by a dark border. The feet are large, with fully feathered legs down to the toes. The upperparts are grey to dark brown with buff to rufous mottling and fine, pale spots. The wings and tail are barred. The underparts are white to rufous-brown with variable dark spotting (NSW OEH 2017).

The Masked owl lives in dry eucalypt forests and woodlands from sea level to 1100 m (NSW OEH 2017).

15.2 Status

The Masked owl is listed as a vulnerable species within schedules of the *BC Act (2016)*.

15.3 Occurrence and Threats on the Site

Masked owl has historically been recorded in the eastern, central and southern portions of the Kings Forest site (**FIGURE 8**). Masked owls are likely to forage widely over the Kings Forest site as the mosaic of vegetation types provides habitat for a variety of prey species. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 15**.

Potential threats to this species include:

- Loss of tree hollows and alterations to forest and woodland structure which leads to fewer such trees in the future;
- Reduction of suitable habitat through clearing for grazing, agriculture, forestry or other development;
- Excessively frequent fire which reduces the quality of ground cover for mammal prey, particularly in open, grassy forests.
- Secondary poisoning from rodenticides; and
- Injury/death from vehicle strike.

15.4 Recovery of the Species

An approved Recovery Plans has been prepared for the Masked owl (as part of the 'Recovery Plan for the Large Forest Owls' - DEC 2006). The Recovery Plan lists the following relevant proposed recovery objectives:

- Assess the distribution and amount of high quality habitat for the Masked owl across public and private lands to get an estimate of the number and proportion of occupied territories that are/are not protected;

- To monitor trends in population parameters (numbers, distribution, territory fidelity and breeding success) across the range of the species and across different land tenures and disturbance histories;
- To assess the implementation and effectiveness of forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the species and, (if necessary), to use this information to refine the prescriptions so that forestry activities on state forests are not resulting in adverse changes in species abundance and breeding success;
- Ensure the impacts on the species and its habitat are adequately assessed during planning and environmental assessment processes;
- Minimise further loss and fragmentation of habitat by protection and more informed management of significant owl habitat (including protection of individual nest sites);
- To improve the recovery and management of the species based on an improved understanding of key areas of its biology and ecology;
- To raise awareness of the conservation requirements of the species amongst the broader community, to involve the community in owl conservation efforts and in doing so increase the information base about owl habitats and biology; and
- To co-ordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives.

A Priority Action Statement (PAS) has also been prepared however none of the recovery strategies within the PAS are considered to be relevant to the proposed development of Precincts 12 - 14.

16 MICROCHIROPTERAN BATS

16.1 Background

Several threatened species of microchiropteran bat have historically been recorded at the Kings Forest site and are likely to forage widely, depending on specific species requirements. Threatened species of microchiropteran bat recorded, or considered to be provided with suitable habitat, within Precincts 12 - 14 and associated EMAs include:

- Eastern false pipistrelle (*Falsistrellus tasmaniensis*);
- Little bent-wing bat (*Miniopterus australis*);
- Southern myotis (*Myotis macropus*); and
- Yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*).

Records for these species are shown in **FIGURE 8**. Current available habitat for these species within Precincts 12 - 14 are shown in **FIGURES 11 and 16**.

16.2 Eastern false pipistrelle (*Falsistrellus tasmaniensis*)

16.2.1 Description and Habitat

The Eastern false pipistrelle has a head-body length of approximately 65 mm (NSW OEH 2017). The species is dark to reddish-brown above and paler grey on its underside. It has long slender ears set well back on the head and some sparse hair on the nose (NSW OEH 2017).

The Eastern false pipistrelle prefers moist habitats, with trees taller than 20 m (NSW OEH 2017). They generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings (NSW OEH 2017).

16.2.2 Status

The Eastern false pipistrelle is listed as a vulnerable species within schedules of the *BC Act (2016)*.

16.2.3 Threats

Potential threats to this species include:

- Disturbance to winter roosting and breeding sites;
- Loss of roosting habitat, primarily hollow-bearing eucalypts; and
- Loss and fragmentation of foraging habitat, particularly extensive areas of continuous forest and areas of high productivity.

16.2.4 Recovery of the Species

No recovery plan exists for this species. However, PAS have been prepared. The following lists of recovery strategies relevant to the proposed development of Precincts 12 - 14 are derived from the PAS:

- Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees;
- Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value (HCV) planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.
- Identify important foraging range and key habitat components for this species.
- Research the roosting ecology of tree-roosting bats; and
- Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal;

16.3 Little bent-wing bat (*Miniopterus australis*)

16.3.1 Description and Habitat

The Little bent-wing bat is a small, dark chocolate brown, insectivorous bat with a body length of about 45 mm. The tip of the wing is formed by a particularly long joint of the third finger, folded back and bent under the wing while the bat is at rest (NSW OEH 2018).

Little bent-wing bats occur in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. They are generally found in well-timbered areas (NSW OEH 2018).

16.3.2 Status

The Little bent-wing bat is listed as a vulnerable species within schedules of the *BC Act (2016)*.

16.3.3 Threats

Potential threats to this species include:

- Disturbance of colonies, especially in nursery or hibernating caves;
- Loss or disturbance of roosting sites;
- Loss and disturbance of foraging habitat;
- Application of pesticides in or adjacent to foraging areas;
- Predation from foxes and feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges;
- Introduction of exotic pathogens such as the White-nosed fungus;
- Inappropriate fires regimes in foraging habitat and during the breeding season.

16.3.4 Recovery of the Species

No recovery plan exists for this species. However, PAS have been prepared. The following lists of recovery strategies relevant to the proposed development of Precincts 12 - 14 are derived from the PAS:

- Provide map of known occurrences to Rural Fire service and seek inclusion of mitigation measures on Bushfire Risk Management Plans; and
- Identify types of winter roosts (suspected to be banana palms and tree hollows) used by the species.

16.4 Southern myotis (*Myotis macropus*)

16.4.1 Description and Habitat

The Southern myotis has dark-grey to reddish brown fur above and is paler below. This species has disproportionately large feet, more than 8 mm long, with widely-spaced toes which are hairy and with long, curved claws (NSW OEH 2017).

Southern myotis generally roost close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage (NSW OEH 2017). They forage over streams and pools catching insects and small fish by raking their feet across the water surface (NSW OEH 2017).

16.4.2 Status

The Southern myotis is listed as a vulnerable species within schedules of the *BC Act (2016)*.

16.4.3 Threats

Potential threats to this species include:

- Loss or disturbance of roosting sites;
- Loss and fragmentation of foraging habitat;
- Application of pesticides in or adjacent to foraging areas; and
- Reduction in stream water quality affecting food resources.

16.4.4 Recovery of the Species

No recovery plan exists for this species. However, PAS have been prepared. The following lists of recovery strategies relevant to the proposed development of Precincts 12 - 14 are derived from the PAS:

- Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees;
- Ensure the largest hollow bearing trees (including dead trees and paddock trees) are given highest priority for retention in Property Vegetation Plan (PVP) assessments and other land assessment tools;
- Promote roosting habitat in new artificial structures within the species range; and
- Encourage recovery of natural hydrological regimes, including retention and rehabilitation of riparian vegetation.

16.5 Yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*)

16.5.1 Description and Habitat

The Yellow-bellied sheath-tail-bat is a large, insectivorous bat up to 87 mm long. It has long, narrow wings, a glossy, jet-black back, and a white to yellow belly extending to the shoulders and just behind the ear. It has a flattened head and a sharply-pointed muzzle. The tail is covered with an extremely elastic sheath that allows variation in the tail-membrane area. Males have a prominent throat pouch; females have a patch of bare skin in the same place (NSW OEH 2017).

The Yellow-bellied sheath-tail-bat forages in most habitats across its very wide range, with and without trees. They roost singly or in groups of up to six, in tree hollows and buildings (NSW OEH 2017).

16.5.2 Status

The Yellow-bellied sheath-tail-bat is listed as a vulnerable species within schedules of the *BC Act (2016)*.

16.5.3 Threats

Potential threats to this species include:

- Loss or disturbance to roosting and summer breeding sites;
- Loss and fragmentation of foraging habitats;
- Application of pesticides in or adjacent to foraging areas.

16.5.4 Recovery of the Species

No recovery plan exists for this species. However, PAS have been prepared. The following lists of recovery strategies relevant to the proposed development of Precincts 12 - 14 are derived from the PAS:

- Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees;
- Ensure the largest hollow bearing trees (including dead trees and paddock trees) are given highest priority for retention in Property Vegetation Plan (PVP) assessments and other land assessment tools;
- Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal;
- Research the roosting ecology of tree-roosting bats; and
- Use radio-tracking to identify important foraging range and help interpret density of records.

17 PALE-VENTED BUSH HEN (*AMAURORNIS MOLUCCANA*)

17.1 Description and Habitat

The Pale-vented Bush-hen is a medium-sized (body length 25-30 cm) waterbird, that is dark olive-brown above, with a dark-grey face, usually merging to a paler off-white chin. They are dark-grey on the lower throat, breast and belly and rufous-brown on the lower underbody. The bill is lime-green with an orange-red base to the upper mandible during the breeding season, and paler green without orange when not breeding. The legs are greenish-yellow (NSW OEH 2018).

The Pale-vented Bush-hen inhabits tall dense understorey or ground-layer vegetation on the margins of freshwater streams and natural or artificial wetlands, usually within or bordering rainforest, rainforest remnants or forests. Pale-vented bush-hens also occur in secondary forest growth, rank grass or reeds, thickets of weeds, such as Lantana (*Lantana camara*), and pastures, crops or other farmland, such as crops of sugar cane, and grassy or weedy fields, or urban gardens where they border forest and streams or wetlands, such as farm dams (NSW OEH 2017).

17.2 Status

The Pale-vented bush-hen is listed as a vulnerable species within schedules of the *BC Act (2016)*.

17.3 Occurrence and Threats on the Site

The Bush hen has historically been recorded in the far south of the Kings Forest site in rank sedges in the understorey of Swamp sclerophyll forest adjacent to the Cudgen Lake (**FIGURE 8**). This species may occur in forest growth and pastures within close proximity to permanent water. Current available habitat within Precincts 12 - 14 for this species is shown in **FIGURE 14**.

Potential threats to this species include:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands.
- Loss of dense and rank understorey vegetation near streams and wetlands with clearing associated with urban and semi-rural developments.
- Clearing, filling and draining of wetlands for agricultural, residential and industrial development.
- Pollution of wetlands from agricultural, urban and industrial run-off, including herbicides and pesticides.
- Changes to wetlands caused by weed invasion, often associated with sedimentation or grazing.
- Predation by introduced, feral and domestic predators, particularly Red Foxes (*Vulpes vulpes*) and Cats.
- Destruction of habitat and predation by feral Pigs (*Sus scrofa*).

17.4 Recovery of the Species

No recovery plan exists for this species, however a Priority Action Statement has been prepared. The following list of recovery strategies is derived from the PAS and includes strategies that are relevant to the proposed development of Precincts 12 - 14:

- Increase community awareness regarding the biodiversity values of vegetated freshwater wetlands on floodplains in northern NSW through educational programs.

- Control pest species in conservation reserves and other areas of public land known to support Bush-hens.
- Reduce grazing and drainage of vegetated floodplain wetlands through the implementation of targeted programs such as landholder education, fencing of reserve boundaries, weed control programs and wetland restoration programs.
- Reduce nutrient runoff into freshwater wetlands known to be used by Bush-hens.
- Restore natural hydrological regimes to freshwater wetlands and maintain existing hydrological regimes; do not fill or drain wetlands; retain and protect native vegetation in and around wetlands and restore degraded wetlands.
- Ensure that Bush-hens are considered in the preparation of weed management plans. Specifically, it must be recognised that Bush-hens readily utilise thickets of exotic species, such as *Lantana camara*.
- Weed control programs must ensure that suitable roosting sites in the form of dense vegetation are retained or replaced with native plants that provide a similar structure.

18 ROSE-CROWNED FRUIT-DOVE (*PTILINOPUS REGINA*)

18.1 Description and Habitat

The Rose-crowned fruit-dove is a small, colourful rainforest pigeon to 24 cm in length. Males have a rose crown edged with yellow, and the head and breast are blue-grey, spotted white. The upper parts are grey-green, the tail-tip yellow and the abdomen are orange. Females are mostly grey-green (NSW OEH 2018).

Rose-crowned fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful (NSW OEH 2018).

18.2 Status

The Rose-crowned fruit-dove is listed as a vulnerable species within schedules of the *BC Act (2016)*.

18.3 Occurrence and Threats on the Site

Rose-crowned fruit-doves may be seasonal visitors to the Kings Forest site when suitable resources are available. Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 9**.

Potential threats to this species include:

- Clearing and fragmentation of low to mid-elevation rainforest;
- Logging and roading in moist eucalypt forest with well-developed rainforest understorey;
- Burning of remnant rainforest habitat;
- Invasion of habitat by introduced weed species; and

- Removal of Camphor Laurel food source without appropriate mitigation measures.

18.4 Recovery of the Species

No recovery plan exists for the Rose-crowned fruit-dove, however a PAS has been prepared. The following list of recovery strategies relevant to the proposed development of Precincts 12 - 14 is derived from the PAS:

- Raise awareness of threats of window strike and ways to reduce threat;
- Ensure species ecological requirements are considered in fire planning and hazard reduction guidelines; and
- Prevent rainforest loss and fragmentation and expand and reconnect habitat. Measures include excluding grazing and protecting paddock fig trees.

19 WALLUM FROGLET (*CRINIA TINNULA*)

19.1 Description and Habitat

Wallum froglets are small (to about 20 mm) 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. They have no webbing on their feet and toe pads are absent (NSW OEH 2017).

Wallum froglets are found in a wide range of habitats, and are 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 (NSW OEH 2017).

19.2 Status

The Wallum froglet is listed as a vulnerable species within schedules of the *BC Act (2016)*.

19.3 Occurrence and Threats on the Site

Wallum froglet have been recorded extensively throughout the Kings Forest site (including incidental recent records within the last 12-24 months), generally in association with constructed drainage lines within the development area as well as inhabiting depressions formed during Slash pine* stump removal (**FIGURE 8**). The majority of these records are from areas of forage habitat (i.e. land inundated after heavy rain) rather than core habitat. Low lying wet heath and drainage line communities and adjacent areas prone to frequent inundation are considered to provide core habitat for this species (**FIGURE 8**). Current available habitat for this species within Precincts 12 - 14 is shown in **FIGURE 17**.

Potential threats to this species include:

- Loss of habitat from habitat removal and fragmentation;
- Changes in hydrology;

- Water pollution;
- Injury/death from vehicle strike; and
- Contamination of habitat by herbicides, pesticides and fertiliser as part of landscaping maintenance.

19.4 Recovery of the Species

An approved Recovery Plan has been prepared for the Wallum froglet and the Wallum sedge frog i.e. as part of the 'National recovery plan for the Wallum sedgefrog and other wallum-dependent frog species' (Meyer *et al.* 2006). The Recovery Plan lists the following relevant proposed recovery objectives:

- Identify and assess essential habitat;
- Protect wallum frog populations and manage habitat;
- Acquire information on threats to inform management;
- Engage stakeholders and the broader community in recovery of wallum frog species;
- Rehabilitate degraded wallum frog habitat; and
- Monitor frog numbers and distribution.