



BASELINE THREATENED SPECIES MONITORING REPORT

**Kings Forest
Precincts 1 - 5**

**A Report Prepared for
Project 28 Pty Ltd**

SEPTEMBER 2020

JWA Pty Ltd

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	Baseline Threatened Species Monitoring Report - Kings Forest Precincts 1 - 5
Job Number	N97017
File Reference	\\SERVER\data\2000 & EARLIER CLIENTS\N97017_Kings Forest\2019_Baseline Monitoring
Version and Date	RW3 22/09/20
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	02/06/20	JWA	1	word	Email
2	RW2	FINAL	12/06/20	Client	1	PDF	Email
3	RW3	FINAL	22/09/20	Client	1	PDF	Email

Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
RW1	02/06/20	Nicole Davies/ Adam McArthur	ND/ AM	Adam McArthur	AM
RW2	12/06/20	Nicole Davies/ Adam McArthur	ND/ AM	Adam McArthur	AM
RW3	22/09/20	Nicole Davies/ Adam McArthur	ND/ AM	Adam McArthur	AM

TABLE OF CONTENTS

1	INTRODUCTION	4
2	MONITORING METHODOLOGY	5
2.1	Introduction	5
2.2	Baseline Threatened Flora Monitoring	6
2.3	Baseline Threatened Fauna Monitoring	6
3	RESULTS	9
3.1	Baseline Threatened Flora Results.....	9
3.2	Baseline Threatened Fauna Results.....	9
4	ONGOING MONITORING AND REPORTING REQUIREMENTS	21
4.1	Annual Threatened Flora Monitoring	21
4.2	Annual Threatened Fauna Monitoring	21
4.3	Annual Threatened Species Monitoring Report.....	21
	REFERENCES.....	23
	APPENDIX 1 - FAUNA MONITORING LOCATIONS	24
	APPENDIX 2 - BASELINE FAUNA MONITORING RESULTS.....	26

1 INTRODUCTION

JWA Pty Ltd have been engaged by Project 28 Pty Ltd to undertake baseline monitoring for Threatened Species within the vicinity of Precincts 1 - 5 of the Kings Forest project site.

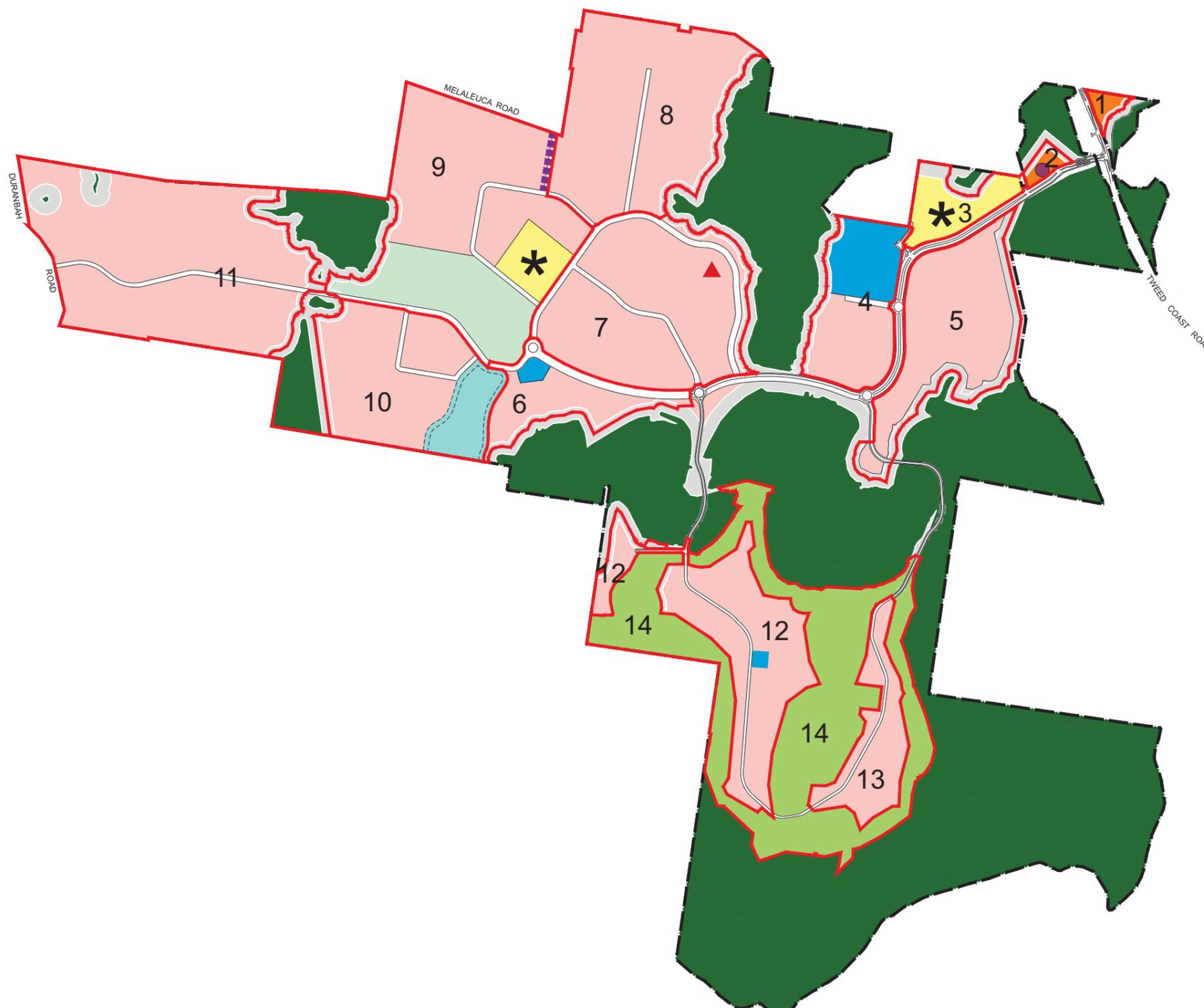
The Kings Forest site is 846 hectares in area and is located in the Tweed Shire between Bogangar (in the south) and Kingscliff (in the north). The Kings Forest project is a master planned residential community comprising a total of fourteen (14) separate precincts (**FIGURE 1**):

- Precincts 1 and 2: Employment Precincts;
- Precinct 3: Community Facility/Education Precinct;
- Precinct 4: Part Residential and Part Town Centre Precinct; and
- Precincts 5 - 14: Residential Precincts.

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 30 years including detailed flora, fauna and hydrological surveys.

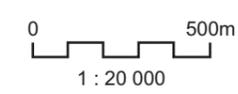
The Precincts 1 - 5 Threatened Species Management Plan (TSMP) (JWA 2020a) was prepared to guide the protection and management of Threatened flora and fauna species and Endangered Ecological Communities (EECs) known to occur, or considered to be provided with suitable habitat within Precincts 1 - 5 and associated Environmental Management Areas (EMA's), as well as the proposed East-West Corridor. The Precincts 1 - 5 TSMP contains a detailed monitoring program for Threatened flora and fauna, including baseline and ongoing monitoring and reporting. This report details the methodology and results of the baseline Threatened flora and fauna monitoring completed within the vicinity of Precincts 1 - 5 in January 2020.

It should be noted that the Threatened species monitoring program outlined in the Precincts 1 - 5 TSMP (JWA 2020a) does not include monitoring for the koala, wallum sedge frog or EECs. Monitoring programs for the koala and the wallum sedge frog are detailed separately within the Koala Plan of Management (KPoM) (JWA 2020b) and the Wallum Sedge Frog Management Plan (WSFMP) (JWA 2020c), respectively. Separate baseline monitoring reports will be prepared for these species. Furthermore, EEC monitoring programs are detailed within the Precincts 1 - 5 Vegetation Management Plan (JWA 2020d). A separate baseline report will be completed containing the results of the baseline EEC monitoring.



- LEGEND**
- 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 Baseline Threatened Species Monitoring Report Kings Forest Melaleuca Drive, Durambah, NSW Shire of Tweed	<p style="text-align: center;">FIGURE 1</p> PREPARED: BW DATE: 02 June 2020 FILE: N97017_Precinct Plan.cdr	TITLE <p style="text-align: center;">PRECINCT PLAN</p>
---	--	---	--

2 MONITORING METHODOLOGY

2.1 Introduction

In accordance with the Precincts 1-5 TSMP (JWA 2020a), baseline Threatened flora and fauna monitoring is required to be completed by suitably qualified and/or accredited persons within Precincts 1 - 5 EMAs prior to the commencement of works on the site. Ongoing monitoring will be completed on an annual basis, from the date of commencement of works, and will continue throughout construction phases and for a period of five (5) years during the operational phase.

Baseline Threatened flora and fauna monitoring was completed within Precincts 1 - 5 EMAs by two (2) - four (4) JWA ecologist between 24th - 29th January 2020. The following sections outline the methodology used for the baseline Threatened flora and fauna monitoring.

To assist in interpretation of survey results, details of the weather conditions experienced during the days leading up to and including the survey events are summarised in **TABLE 1** below. The nearest Bureau of Meteorology rainfall recording station to the site is Kingscliff (Woram Place) weather station (#058137), which is located approximately 5 km to the north of the site. The nearest Bureau of Meteorology temperature recording station to the site is Murwillumbah (Bray Park) weather station (#058158) approximately 15 km from south-west of the site.

TABLE 1
WEATHER CONDITIONS PRIOR TO AND DURING FAUNA SURVEY
(SOURCE: BOM CLIMATE DATA ONLINE)

Date	Temp (°C) [#]		Rain (mm) [*]	Wind [#]		
	Min	Max		Direction	Speed (km/hr)	Time
18 th January 2020	20.4	24.8	164	No data		
19 th January 2020	19.9	29.4	10.8	SSW	6	09:00
20 th January 2020	22.7	33.3	19.4	NE	22	15:00
21 st January 2020	22.7	33.5	0	ESE	11	15:00
22 nd January 2020	21.4	33.6	0.1	NE	17	15:00
23 rd January 2020	25.9	33.2	0	NE	7	09:00
24th January 2020	25.9	34.5	0	NE	19	15:00
25th January 2020	25.5	29.4	0	NNE	11	09:00
26th January 2020	21.1	29.3	1.0	S	7	09:00
27th January 2020	20.7	30.0	0	W	4	09:00
28th January 2020	20.7	29.4	2.0	NE	17	15:00
29th January 2020	20.5	33.8	0	NE	15	15:00

Notes:
[#] Station 058158 - Murwillumbah (Bray Park) (approx. 15 km from the site)
^{*} Station 058137 - Kingscliff (Woram Place) (approx. 5 km from the site)
 Survey dates are shown in **Bold**

2.2 Baseline Threatened Flora Monitoring

Baseline Threatened flora monitoring was completed within Precincts 1 - 5 EMAs by two (2) JWA ecologist between 24th - 29th January 2020 (i.e. prior to commencement of construction). Baseline monitoring involved identifying and clearly marking the Threatened flora specimens previously located within the Precincts 1 - 5 EMAs i.e. Stinking cryptocarya (*Cryptocarya foetida*) and White laceflower (*Archidendron hendersonii*) (FIGURE 2).

In addition, the random meander technique (Cropper 1993) was used to complete targeted searches for Threatened flora specimens that have historically been recorded within Precincts 1 - 5 EMAs but have not been able to be relocated since 2009 despite numerous targeted searches i.e. Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) and Southern swamp orchid (*Phaius australis*). These targeted surveys were completed in the vicinity of the historical records of these species within Precincts 1 - 5 EMAs.

All Threatened flora specimens located had the following details recorded:

- GPS location;
- Height;
- Diameter at breast height (DBH);
- Flowering/fruitletting status;
- Condition; and
- Potential threats (i.e. weeds).

2.3 Baseline Threatened Fauna Monitoring

A baseline fauna survey was completed by two (2) - four (4) ecologists within the Precincts 1 - 5 EMAs between 24th - 29th January 2020 (i.e. prior to commencement of construction) in order to determine species presence. The baseline fauna surveys targeted Threatened species previously recorded (FIGURE 3) or predicted to occur on the site (JWA 2020a), including:

- Black bittern (*Ixobrychus flavicollis*);
- Black-necked stork (*Ephippiorhynchus asiaticus*);
- Bush stone-curlew (*Burhinus grallarius*);
- Common blossom bat (*Syconycteris australis*);
- Common planigale (*Planigale maculata*);
- Eastern false pipistrelle (*Falsistrellus tasmaniensis*);
- Eastern osprey (*Pandion cristatus*);
- Glossy black-cockatoo (*Calyptorhynchus lathami*);
- Eastern grass owl (*Tyto longimembris*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Little bent-wing bat (*Miniopterus australis*);

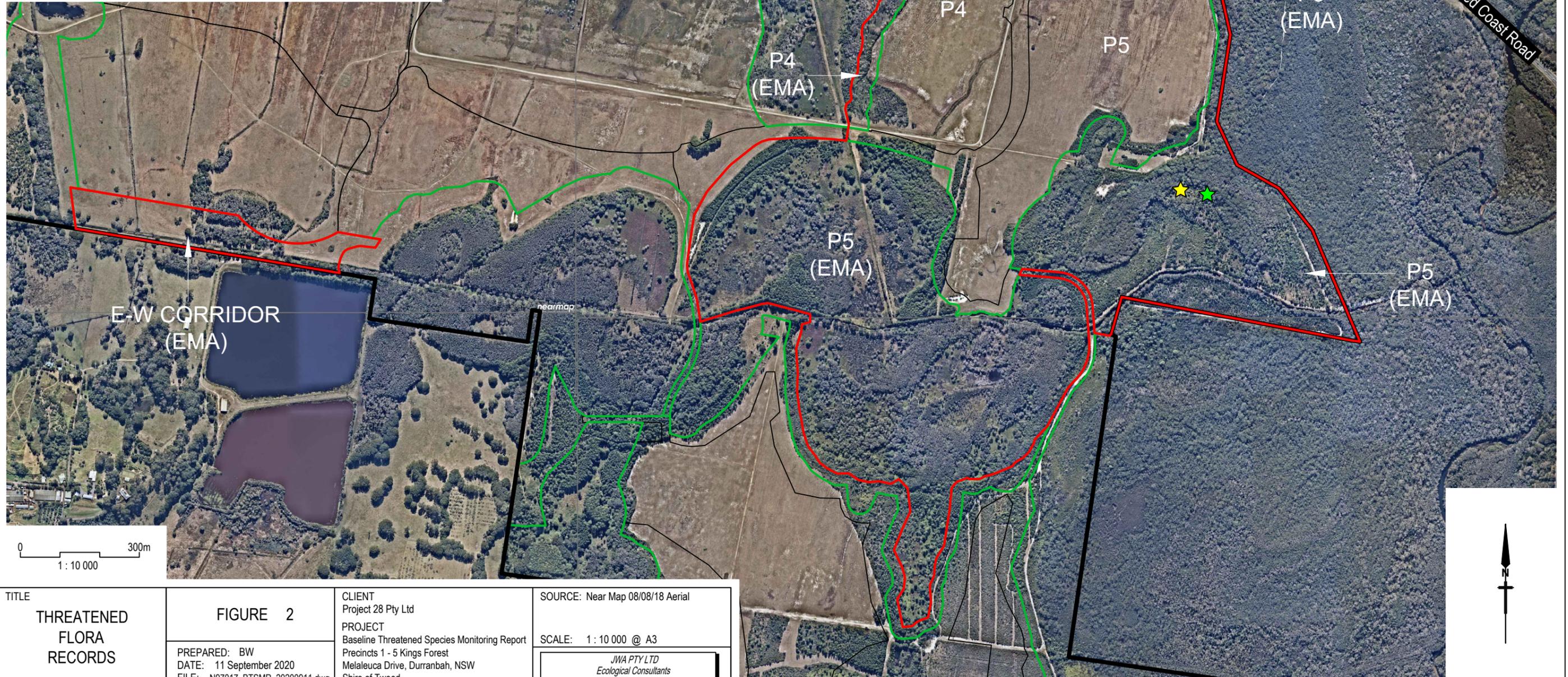
LEGEND

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

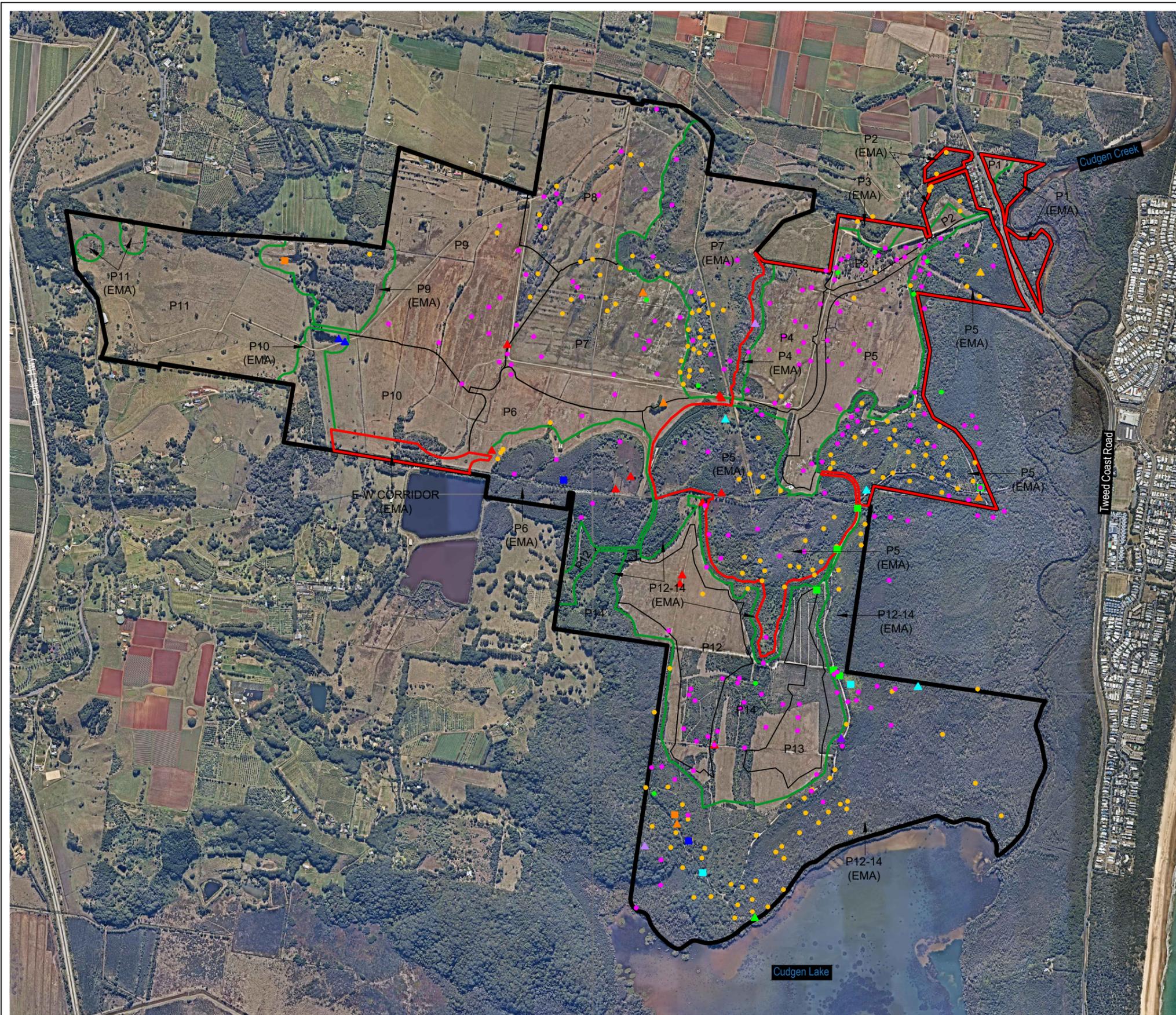
THREATENED FLORA RECORDS

- ★ 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)

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).



<p>TITLE</p> <p>THREATENED FLORA RECORDS</p>	<p>FIGURE 2</p> <p>PREPARED: BW DATE: 11 September 2020 FILE: N97017_BTSMR_20200911.dwg</p>	<p>CLIENT Project 28 Pty Ltd</p> <p>PROJECT Baseline Threatened Species Monitoring Report Precincts 1 - 5 Kings Forest Melaleuca Drive, Durranbah, NSW Shire of Tweed</p>	<p>SOURCE: Near Map 08/08/18 Aerial</p> <p>SCALE: 1 : 10 000 @ A3</p> <p style="text-align: center; font-size: small;">JWA PTY LTD Ecological Consultants</p>
---	--	---	---



LEGEND

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

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)

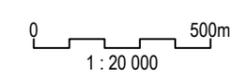
Mammals

- 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 sheath-tail bat (*Saccolaimus flaviventris*) - Vulnerable (BC Act 2016)

Amphibians

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

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).



<p>SOURCE: JWA Site Investigations; Landpartners Revised TSMP & VMP (July Near Map 08/08/18 Aerial) SCALE: 1 : 20 000 @ A3</p> <p style="text-align: center;">JWA PTY LTD Ecological Consultants</p>	<p>CLIENT Project 28 Pty Ltd</p> <p>PROJECT Baseline Threatened Species Monitoring Report Precincts 1 - 5 Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed</p>	<p>FIGURE 3</p> <p>PREPARED: BW DATE: 15 September 2020 FILE: N97017_BTSMR_20200915.dwg</p>	<p>TITLE</p> <p>HISTORICAL THREATENED FAUNA RECORDS</p>
---	--	--	--

- Masked owl (*Tyto novaehollandiae*);
- Pale-vented bush hen (*Amaurornis moluccana*);
- Rose-crowned fruit-dove (*Ptilinopus regina*);
- Southern myotis (*Myotis macropus*);
- Wallum froglet (*Crinia tinnula*); and
- Yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*).

A total of eight (8) field sites were selected and permanently marked in the field (**FIGURE 4**). At each survey site an approximately 100 m transect line has been setup. Transect lines have been permanently marked (i.e. star pickets or wooden stakes) and the end positions located using a handheld Global Positioning System (GPS). Five (5) trap stations were installed approximately 20 m apart along each transect line for four (4) consecutive nights with each trap station containing:

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

All traps were baited with the universal mixture of peanut butter, honey and rolled oats.

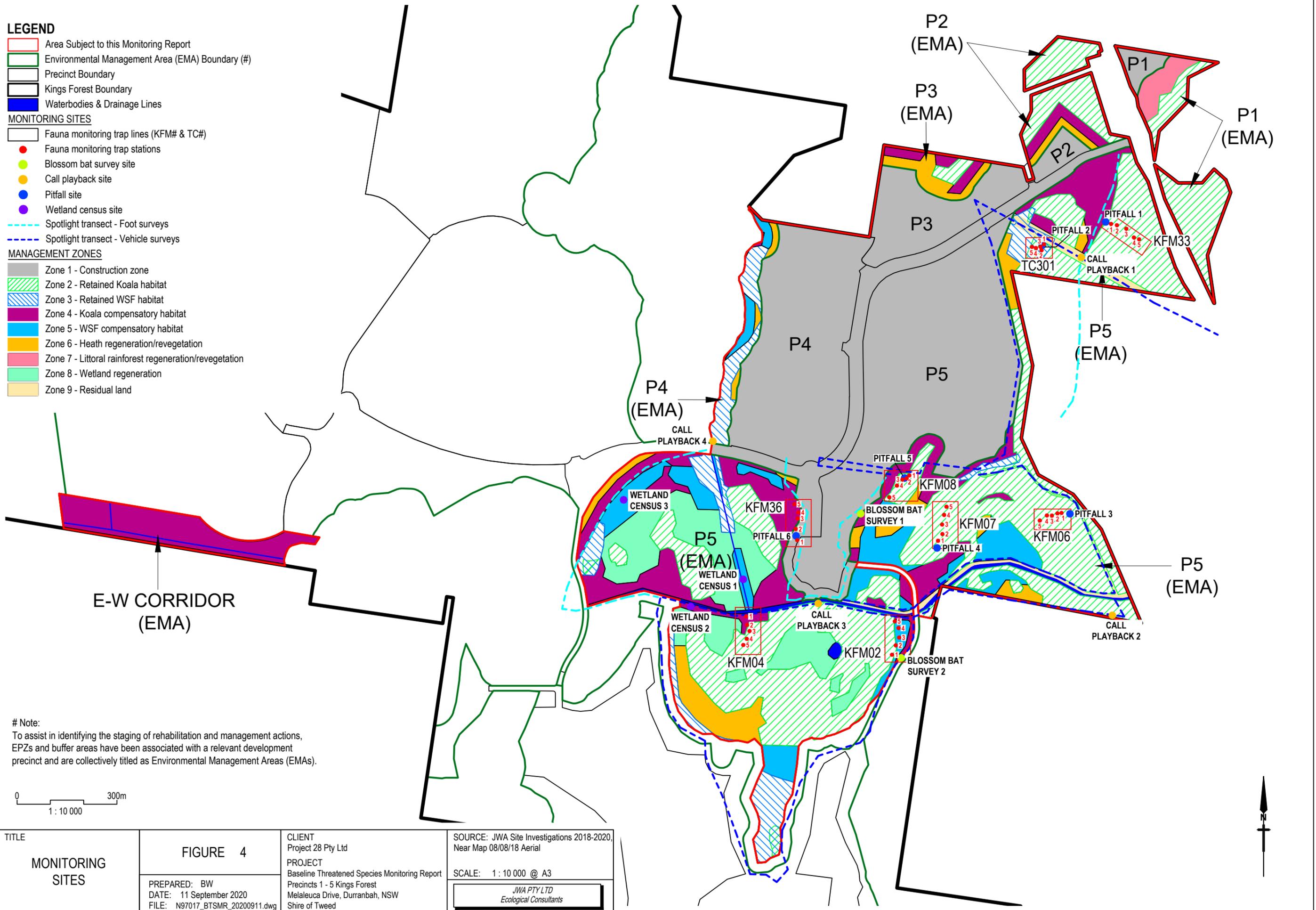
FIGURE 4 shows the locations of field sites and **APPENDIX 1** provides details of the trap stations at each survey transect.

The following additional survey techniques were also employed at each survey transect line (where appropriate) (**FIGURE 4**):

- Pitfall trap lines: A pitfall trap line incorporating three (3) 20L buckets and four (4) funnel traps (installed only where ground/water table conditions are appropriate).
- Camera traps: Three (3) remote infrared motion detector cameras were installed on trees located along each Elliott transect line at a height of approximately 1 m above the ground. Oats, peanut butter and honey bait was positioned to draw animals into the range of the camera.
- Opportunistic sightings: All incidental records of fauna utilising the study area were recorded. Discoveries of scratch marks on trees, scats, footprints, diggings, bones and other animal traces were noted.
- Active searching: Any logs, sheets of tin, cardboard, bark and leaves were overturned in search of reptiles and amphibians while traversing the site. Searches were undertaken for diggings, scats, and bones. Eucalypt trees were inspected for signs of koala activity such as scratch marks and scats. Active observation of bird and amphibian activity, both aurally and visually, was undertaken during the site visit.
- Bat echolocation call detection: An ANABAT® (Titley Electronics, Ballina, NSW) or Songmeter (Wildlife Acoustics, Massachusetts, USA) ultrasonic bat detector unit was

LEGEND

- Area Subject to this Monitoring Report
 - Environmental Management Area (EMA) Boundary (#)
 - Precinct Boundary
 - Kings Forest Boundary
 - Waterbodies & Drainage Lines
- MONITORING SITES**
- Fauna monitoring trap lines (KFM# & TC#)
 - Fauna monitoring trap stations
 - Blossom bat survey site
 - Call playback site
 - Pitfall site
 - Wetland census site
 - Spotlight transect - Foot surveys
 - Spotlight transect - Vehicle surveys
- 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 7 - Littoral rainforest regeneration/revegetation
 - Zone 8 - Wetland regeneration
 - 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

<p>TITLE</p> <p style="text-align: center;">MONITORING SITES</p>	<p style="text-align: center;">FIGURE 4</p> <p>PREPARED: BW DATE: 11 September 2020 FILE: N97017_BTSMR_20200911.dwg</p>	<p>CLIENT Project 28 Pty Ltd</p> <p>PROJECT Baseline Threatened Species Monitoring Report Precincts 1 - 5 Kings Forest Melaleuca Drive, Durranbah, NSW Shire of Tweed</p>	<p>SOURCE: JWA Site Investigations 2018-2020, Near Map 08/08/18 Aerial</p> <p>SCALE: 1 : 10 000 @ A3</p> <div style="border: 1px solid black; padding: 2px; text-align: center; font-size: small;"> <p>JWA PTY LTD Ecological Consultants</p> </div>
---	--	---	--



deployed to record microbat calls. The data from these recordings were analysed by an expert in echolocation call identification.

- Dawn and dusk bird surveys.

In addition to the above transect surveys:

- Spotlighting transects (both foot and vehicle-based) were identified (**FIGURE 4**) and spotlighting surveys were completed along these transects over a minimum of four (4) consecutive nights. The site was either traversed on foot or within a vehicle with a large spotlight used to detect 'eye-shine' from nocturnal fauna. During foot spotlighting the observer walked at approximately 1 km/h, allowing intensive listening as an adjunct to visual detection.
- Call playback locations were identified (**FIGURE 4**) and call playback for target species were undertaken at these locations over a minimum of four (4) consecutive nights. On commencement of each playback session, pre-recorded calls of targeted fauna species were broadcast from a CD player through a speaker at locations in habitat suitable for the target species. The calls were played for five (5) minutes, followed by a five (5) minute listening period.
- Wetland census locations were identified (**FIGURE 4**) and a one-hour (1 hr) census at dawn and dusk was completed at each location.
- Specific locations to complete targeted surveys for the Common blossom bat (*Syconycteris australis*) (i.e. mature flowering Banksias in readily accessible locations) were identified (**FIGURE 4**) and a one-hour (1 hr) survey was completed at dusk at each location over a minimum of four (4) consecutive nights.

3 RESULTS

3.1 Baseline Threatened Flora Results

Surveys for the Stinking Cryptocarya (*Cryptocarya foetida*) and White laceflower (*Archidendron hendersonii*) located these specimens (**FIGURE 2**). Each specimen was clearly marked in the field. Targeted searches for Threatened flora specimens that have not been able to be located since 2009 i.e. Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) and Southern swamp orchid (*Phaius australis*) failed to detect these species. Details of the Threatened flora specimens located within Precincts 1 - 5 EMAs are provided in **APPENDIX 2**.

3.2 Baseline Threatened Fauna Results

3.2.1 Amphibians

The surveys recorded a total of nine (9) native and one (1) introduced amphibian species. One (1) Threatened species was recorded (**FIGURE 5**) - Wallum froglet (*Crinia tinnula*).

A full list of amphibian species recorded during the surveys, method/s of observation and details of the record locations is provided in **APPENDIX 3**.

3.2.2 Reptiles

The surveys recorded a total of eleven (11) native reptile species. No Threatened reptile species were recorded.

A full list of reptile species recorded during the surveys, method/s of observation and details of the record locations is provided in **APPENDIX 3**.

3.2.3 Birds

The surveys recorded a total of eighty-six (86) native and one (1) introduced bird species. Five (5) Threatened species were recorded (**FIGURE 5**):

- Glossy black cockatoo (*Calyptorhynchus lathami*);
- Masked owl (*Tyto novaehollandiae*);
- Rose-crowned fruit-dove (*Ptilinopus regina*);
- Varied sittella (*Daphoenositta chrysoptera*); and
- White-bellied sea-eagle (*Haliaeetus leucogaster*).

A full list of bird species recorded during the surveys, method/s of observation and details of the record locations is provided in **APPENDIX 3**.

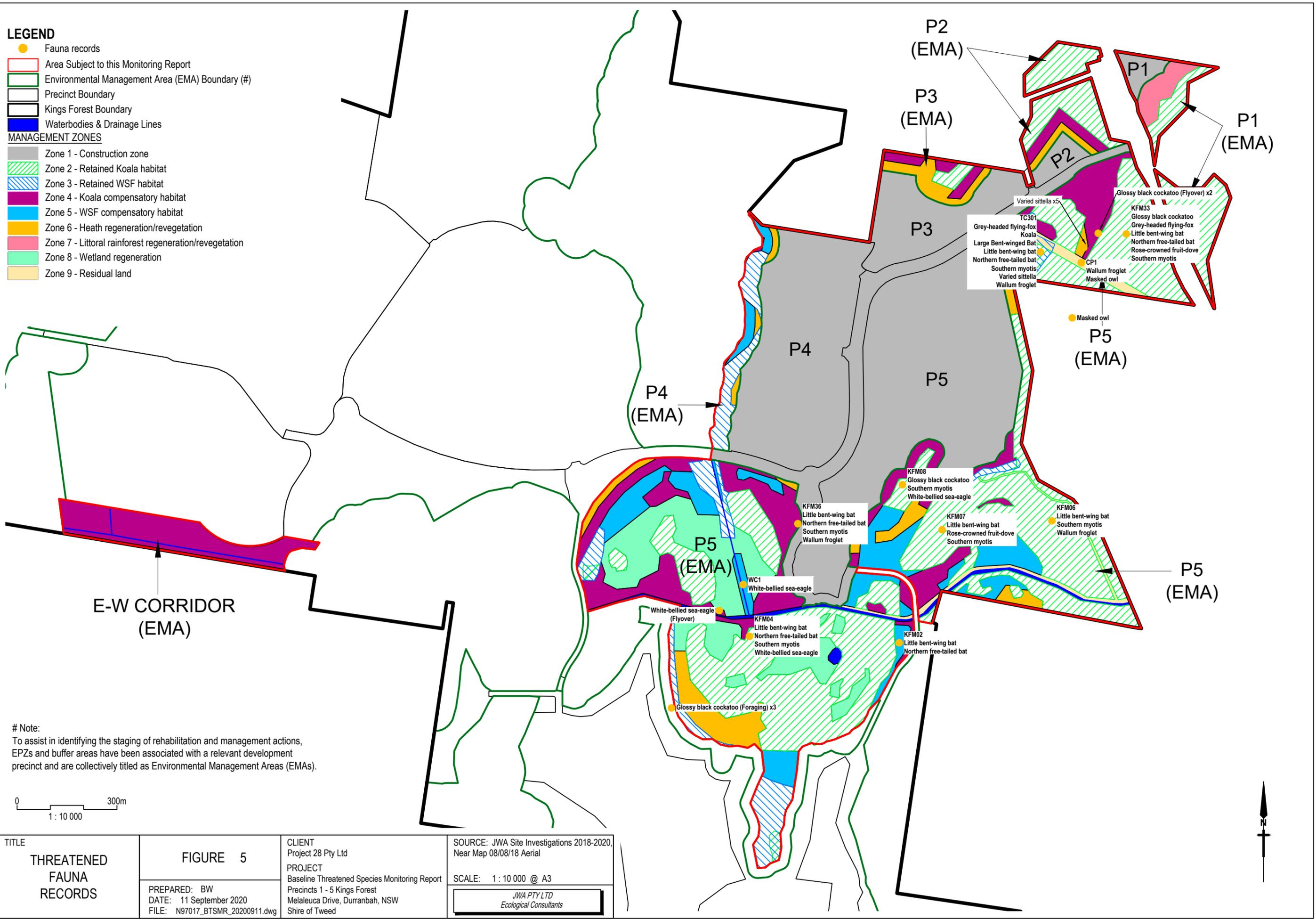
3.2.4 Mammals

The surveys recorded a total of twenty (20) native and four (4) introduced species of mammal. Six (6) Threatened species were recorded (**FIGURE 5**):

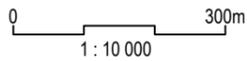
- Grey-headed flying-fox (*Pteropus poliocephalus*);

LEGEND

- Fauna records
 - Area Subject to this Monitoring Report
 - Environmental Management Area (EMA) Boundary (#)
 - Precinct Boundary
 - Kings Forest Boundary
 - Waterbodies & 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 7 - Littoral rainforest regeneration/revegetation
 - Zone 8 - Wetland regeneration
 - 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).



<p>TITLE</p> <p style="text-align: center;">THREATENED FAUNA RECORDS</p>	<p style="text-align: center;">FIGURE 5</p> <p>PREPARED: BW DATE: 11 September 2020 FILE: N97017_BTSMR_20200911.dwg</p>	<p>CLIENT Project 28 Pty Ltd</p> <p>PROJECT Baseline Threatened Species Monitoring Report Precincts 1 - 5 Kings Forest Melaleuca Drive, Durranbah, NSW Shire of Tweed</p>	<p>SOURCE: JWA Site Investigations 2018-2020, Near Map 08/08/18 Aerial</p> <p>SCALE: 1 : 10 000 @ A3</p> <div style="border: 1px solid black; padding: 2px; text-align: center;"> <p>JWA PTY LTD Ecological Consultants</p> </div>
---	---	---	--

- Koala (*Phascolarctos cinereus*);
- Little bent-wing bat (*Miniopterus australis*);
- Large bent-winged bat (*Miniopterus orianae oceanensis*);
- Northern free-tailed bat (*Ozimops lumsdenae*); and
- Southern myotis (*Myotis macropus*).

It should be noted that Large bent-winged bat, Northern free-tailed bat and Southern myotis have not been previously recorded on the site.

A full list of mammal species recorded during the surveys, method/s of observation and details of the record locations is provided in **APPENDIX 3**.

4 DISCUSSION

4.1 Threatened Flora Species

In total, two (2) threatened flora species were recorded from within the Precincts 1 - 5 EMAs - Stinking Cryptocarya (*Cryptocarya foetida*) and White laceflower (*Archidendron hendersonii*) were recorded from previously known locations. No new Threatened flora species were identified within Precincts 1 - 5 EMAs during the baseline surveys.

It was noted during the surveys that weeds (i.e. Happy plant and Lantana) were present within the vicinity of the mature Stinking cryptocarya and associated seedlings. Species specific management measures detailed in Section 7.12.2 of the Precincts 1 - 5 TSMP (JWA 2020a) should be implemented as soon as possible.

It was also noted that the two (2) mature White laceflower specimens are currently being smothered by weeds (i.e. Lantana) and native vines. Species specific management measures detailed in Section 7.12.3 of the Precincts 1 - 5 TSMP (JWA 2020a) should be implemented as soon as possible.

4.2 Threatened Fauna Species

4.2.1 Recorded Species

In total, twelve (12) threatened fauna species were recorded from the Precincts 1 - 5 EMAs including:

- Wallum froglet (*Crinia tinnula*);
- Glossy black cockatoo (*Calyptorhynchus lathami*);
- Masked owl (*Tyto novaehollandiae*);
- Rose-crowned fruit-dove (*Ptilinopus regina*);
- Varied sittella (*Daphoenositta chrysoptera*);
- White-bellied sea-eagle (*Haliaeetus leucogaster*);
- Grey-headed flying-fox (*Pteropus poliocephalus*);
- Koala (*Phascolarctos cinereus*);
- Little bent-wing bat (*Miniopterus australis*);
- Large bent-winged bat (*Miniopterus orianae oceanensis*);
- Northern free-tailed bat (*Ozimops lumsdenae*); and
- Southern myotis (*Myotis macropus*).

Of particular note are the records of the Varied sittella (*Daphoenositta chrysoptera*), Large bent-winged bat (*Miniopterus orianae oceanensis*) and Northern free-tailed bat (*Ozimops lumsdenae*) which have not previously been recorded from the Kings Forest site. These species will be targeted in ongoing/future monitoring to determine if they continue to utilise the Precinct 1 - 5 EMAs as habitat. A brief discussion of the threatened species recorded from the site is provided below.

Wallum froglet (*Crinia tinnula*)

The Wallum froglet has historically been recorded throughout the Precincts 1 - 5 EMAs (FIGURE 3) and was recorded from several locations during the baseline monitoring (FIGURE 5).

Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgeland and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months but can occur throughout the year following rain.

Suitable forage and breeding habitat occur throughout the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Glossy black cockatoo (*Calyptorhynchus lathami*)

The Glossy black cockatoo has historically been recorded in the southern portion of the Kings Forest site, where scattered *Allocasuarina* sp. occurs within mature Blackbutt forest, and from the western margins of Precinct 4 (FIGURE 3). During the baseline monitoring Glossy black cockatoos were observed foraging on *Allocasuarina* sp. to the south of Precinct 5 and were observed flying-over the site to the south of Precinct 2 (FIGURE 5). Evidence of foraging activity was also noted at several other locations within the Precincts 1 - 5 EMAs.

Glossy black cockatoos inhabit open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black sheoak (*Allocasuarina littoralis*) and Forest sheoak (*A. torulosa*) are important foods. The species is dependent on large hollow-bearing eucalypts for nest sites where a single egg is laid between March and May.

Suitable forage habitat occurs throughout the Precincts 1 - 5 EMAs however no known breeding sites occur. The species will continue to be targeted during ongoing/future monitoring.

Masked owl (*Tyto novaehollandiae*)

The Masked owl has historically been recorded within grazing land and wetlands in the north of the Kings Forest site, forest ecotones within the Cudgen Paddock and on the margins of Cudgen Nature Reserve to the south-east of Precinct 5 (FIGURE 3). During the baseline monitoring call responses were heard during targeted call playback surveys to the north-east of Precinct 5 (FIGURE 5).

The Masked owl is forest owl that inhabits dry eucalypt forests and woodlands from sea level to 1100 m, but often hunts along the edges of forests, including roadsides. Prey consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1,000 hectares where they roost and breed in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

Suitable forage habitat occurs throughout the Precincts 1 - 5 EMAs however no known breeding sites occur. The species will continue to be targeted during ongoing/future monitoring.

Rose-crowned fruit-dove (*Ptilinopus regina*)

The Rose-crowned fruit dove has historically been recorded in a small patch of rainforest in the far west of the site and is likely to forage widely within fragmented rainforest (including disturbed Camphor Laurel forest), wet sclerophyll forest and swamp sclerophyll forest in the locality. During the baseline monitoring this species was heard calling within Swamp sclerophyll forest to the east and south of Precinct 5 on several occasions (**FIGURE 5**).

Rose-crowned fruit doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where they feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits. They are also known to use Camphor laurel as a food source. The species typically breeds in rainforests within a dense growth of vines.

Suitable forage habitat occurs throughout the Precincts 1 - 5 EMAs however no known breeding sites occur. The species will continue to be targeted during ongoing/future monitoring.

Varied sittella (*Daphoenositta chrysoptera*)

The Varied sittella has not historically been recorded from the Kings Forest site. This species is a rare visitor to the Tweed LGA with only 10 records in total on the BioNET Atlas of NSW Wildlife. During the baseline monitoring a small group of Varied sittellas was observed foraging within Dry sclerophyll forest to the north-east of Precinct 5 (**FIGURE 5**).

The Varied sittella inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. The species feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.

Suitable forage habitat is considered to occur throughout the Precincts 1 - 5 EMAs however no known breeding sites occur. The species will continue to be targeted during ongoing/future monitoring.

White-bellied sea-eagle (*Haliaeetus leucogaster*)

The White-bellied sea-eagle has historically been recorded flying over the site on several occasions. During the baseline monitoring this species was observed flying over the central wetlands, to the south-west of Precinct 5, on several occasions (**FIGURE 5**).

In NSW the White-bellied sea-eagle it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea where it feeds mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.

Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts

and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. the species typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.

Suitable forage habitat occurs to the south of Kings Forest, within Cudgen Lake, and to the east within Cudgen Creek and the Pacific Ocean. No known breeding sites occur within the Precincts 1 - 5 EMAs however the species will continue to be targeted during ongoing/future monitoring.

Grey-headed flying-fox (*Pteropus poliocephalus*)

The Grey-headed flying-fox has historically been recorded throughout the Kings Forest site favouring areas with flowering Paperbark, Banksia sp., and eucalypt forest (Blackbutt, Swamp mahogany, Scribbly gum) (FIGURE 3). During the baseline monitoring this species was observed foraging on flowering Paperbarks to the north-east of Precinct 5 on several occasions (FIGURE 5).

Grey-headed flying-foxes occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops, where they feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines as well as cultivated gardens and fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Active flying-fox camps are known to occur approx. 2 km south-east of Kings Forest (near Clothiers Creek Rd, Bogangar) and approx. 3 km north (near Cudgen Rd, Kingscliff). Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May, and a single young is born in October or November.

Suitable forage habitat occurs throughout the Precincts 1 - 5 EMAs however no known roosting or breeding camps occur. The species will continue to be targeted during ongoing/future monitoring.

Koala (*Phascolarctos cinereus*)

The Koala has historically been recorded throughout the Kings Forest site favouring areas with preferred food tree (i.e. Swamp Mahogany) (FIGURE 3). During the baseline monitoring a single male koala was observed within Swamp mahogany forest to the north-east of Precinct (FIGURE 5).

Koala habitat in the Tweed LGA has been categorised by Phillips *et al.* (2011) into three (3) habitat categories - Primary, Secondary (class A) and secondary (Class B) habitat. The Preferred koala food trees or Primary food trees in the Tweed region have been identified in the Tweed Coast Comprehensive Koala Plan of Management (TCCKPoM) (Tweed Shire Council 2015) as the following tree species:

- Swamp mahogany (*Eucalyptus robusta*) (including any hybrids);

- Forest red gum (*Eucalyptus tereticornis*);
- Small-fruited grey gum (*Eucalyptus propinqua*); and
- Tallowwood (*Eucalyptus microcorys*).

Habitat mapping on the Kings Forest site has been refined during the recent assessments by JWA between 2015 - 2019 and covers a total area of approximately 214.49 ha (JWA 2020b). Suitable habitat occurs throughout the Precincts 1 - 5 EMAs. A separate and targeted monitoring program for the koala has commenced and will continue within the Precinct 1 - 5 EMAs in accordance with the requirements of the approved Kings Forest Koala Plan of Management (JWA 2020b).

Little bent-wing bat (*Miniopterus australis*)

The Little bent-wing bat was recorded on the Kings Forest site during the preparation of a Species Impact Statement (SIS) in 2000 (JWA 2000) and has not been recorded since. The SIS does not indicate where the species was recorded however the species was considered likely to forage widely throughout the locality including within urban and rural areas, however better quality forage habitat is likely to be within and adjacent to intact vegetation. During the baseline monitoring ultrasonic calls of this species were recorded at several locations through the Precincts 1 - 5 EMAs (FIGURE 5).

The Little bent-wing bat inhabits moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub, and is generally found in well-timbered areas. They are known to roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Maternity colonies form in caves in spring and birthing occurs in early summer. Only five nursery sites/maternity colonies are known in Australia.

Suitable forage habitat and potential non-breeding roosting habitat occurs throughout the Precincts 1 - 5 EMAs however no known nursery sites/maternity colonies occur. The species will continue to be targeted during ongoing/future monitoring.

Large bent-winged bat (*Miniopterus orianae oceanensis*)

The Large bent-wing bat has not historically been recorded from the Kings Forest site. During the baseline monitoring ultrasonic calls of this species were recorded to the north-east of Precinct 5 (FIGURE 5).

The Large bent-wing bat inhabits forested areas, where it hunts for moths and other flying insects above the treetops. Caves are the primary roosting habitat, but the species also uses derelict mines, storm-water tunnels, buildings and other man-made structures. Large bent-wing bats form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves.

Suitable forage habitat and potential non-breeding roosting habitat occurs throughout the Precincts 1 - 5 EMAs however no known nursery sites/maternity colonies occur. The species will continue to be targeted during ongoing/future monitoring.

Northern free-tailed bat (*Ozimops lumsdenae*)

The Northern free-tail bat has not historically been recorded from the Kings Forest site. According to the OEH online species profile (<https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10543>) the only confirmed record in NSW is of a colony found in the roof of a house in Murwillumbah, however, calls have been detected from a few other locations in the far north east of the State. During the baseline monitoring ultrasonic calls of this species were recorded to the north-east and to the south-west of Precinct 5 (FIGURE 5).

The Northern free-tail bat inhabits a range of vegetation types in northern Australia, from rainforests to open forests and woodlands, and is often recorded along watercourses. They can also occur in towns and cities. The species roosts mainly in tree hollows but relatively large colonies have been found under house roofs in urban areas in Queensland.

Suitable forage habitat and potential roosting habitat occurs throughout the Precincts 1 - 5 EMAs. The species will continue to be targeted during ongoing/future monitoring.

Southern myotis (*Myotis macropus*)

The Southern myotis was recorded on the Kings Forest site during the preparation of a Species Impact Statement (SIS) in 2000 (JWA 2000) and has not been recorded since. The SIS does not indicate where the species was recorded. During the baseline monitoring ultrasonic calls of this species were recorded at several locations through the Precincts 1 - 5 EMAs (FIGURE 5).

The Southern myotis forage over streams and pools within both forested and open country catching insects and small fish by raking their feet across the water surface. The species generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. In NSW females have one young each year usually in November or December.

Suitable forage habitat and potential roosting and breeding habitat occurs throughout the Precincts 1 - 5 EMAs. The species will continue to be targeted during ongoing/future monitoring.

4.2.2 Predicted Species Not Recorded

Also, of note are the threatened fauna species that have previously been recorded, or were predicted to potentially occur, within the Precinct 1 - 5 EMAs but were not recorded during the baseline surveys. Each of these species are discussed briefly below.

Black bittern (*Ixobrychus flavicollis*)

The Black bittern has historically been recorded on the margins of wetlands/within drainage lines and along Black's Creek within the Precincts 1 - 5 EMAs (**FIGURE 3**) however has not been recorded from the site since prior to 2009.

The species inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Black bitterns are generally solitary, but occur in pairs during the breeding season, from December to March when the species characteristic booming call can be heard during the day or night.

The baseline surveys included targeted surveys for the Black bittern and occurred during the breeding season but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Black-necked stork (*Ephippiorhynchus asiaticus*)

The Black-necked stork has not historically been recorded within the Precincts 1 - 5 EMAs however suitable habitat is considered to be present. There are records of this species from the western portion of the Kings Forest site, in the vicinity of farm dams, from as recently as 2016 (**FIGURE 3**).

The species inhabits swamps, mangroves, mudflats, floodplains and irrigated land, and will occasionally forage in open grassy woodland. In NSW breeding activity occurs May - January in large nests high in tall trees close to water. Incubation occurs during May - October, and nestlings July - January fledging from September.

The baseline surveys included targeted surveys for the Black-necked stork and occurred during the breeding season but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Bush stone-curlew (*Burhinus grallarius*)

The Bush stone-curlew has not historically been recorded within the Precincts 1 - 5 EMAs however suitable habitat is considered to be present. There are records of this species from the southern portion of the Kings Forest site (on the eastern margins of the 'Cudgen Paddock') from as recently as 2016 (**FIGURE 3**).

The species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber and is largely nocturnal, being especially active on moonlit nights. It emerges from cover at dusk and walks or flies out to foraging grounds sometime travelling 20 km or more. In NSW breeding activity begins with a noisy courtship around August - September and has generally finished by March. Eggs are laid directly on bare ground, with grass and leaves scraped away, typically in or near the edge of open grassy woodland or within a cleared paddock where there is good visibility across the surrounding lands. The Bush Stone-curlew is territorial, particularly during the breeding season, and a pair will often return to the same nest site year after year.

The baseline surveys included targeted surveys for the Bush stone-curlew and occurred during the breeding season but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Common blossom bat (*Syconycteris australis*)

The Common blossom bat has not historically been recorded within the Precincts 1 - 5 EMAs however suitable habitat is considered to be present. There are records of this species foraging on flowering Broad-leaved paperbarks in wetlands on the site, an in ecotonal forest in the south of 'Cudgen Paddock' (**FIGURE 3**) however these records occur prior to 2009.

Common blossom-bats often roost individually in dense foliage and vine thickets of the sub-canopy of littoral rainforests staying in the same general area for a season. They change roost sites daily, but each roost site is generally only 50 m or so away from other recent roosts. They feed on nectar and pollen from flowers in adjacent heathland and paperbark swamps. Favoured feeding sites are repeatedly visited on consecutive nights within a flowering season and revisited over several years.

The baseline surveys included targeted surveys for the Common blossom-bat and occurred during a period when Broad-leaved paperbark and Coast banksia in particular were flowering profusely on the site but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Common planigale (*Planigale maculata*)

The Common planigale has not historically been recorded within the Precincts 1 - 5 EMAs however suitable habitat is considered to be present. There are records of this species from regrowth heath and the ecotone of sclerophyll forest in the southern portion of the Kings Forest site (on the eastern and southern margins of the 'Cudgen Paddock') (**FIGURE 3**) prior to 2009, however the species has not been recorded from the site since.

The species occurs in a wide range of habitats from rainforest, sclerophyll forest, grasslands, marshlands, rocky areas and even some suburban areas, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. Breeding occurs from October to January.

The baseline surveys included targeted surveys for the Common planigale but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Eastern false pipistrelle (*Falsistrellus tasmaniensis*)

The Eastern false pipistrelle was recorded on the Kings Forest site during the preparation of a Species Impact Statement (SIS) in 2000 (JWA 2000) and has not been recorded since. The SIS

does not indicate where the species was recorded however suitable habitat is considered to be present within the Precincts 1 - 5 EMAs.

The Eastern false pipistrelle prefers moist habitats of tall wet forests and coastal mallee. They generally roost in hollows of large eucalypts in colonies of three to 80 individuals but have also been found under loose bark on trees or in buildings. They hunt for beetles, moths, weevils and other flying insects above or just below the tree canopy. Females are pregnant in late spring to early summer and a single young is born in December.

The baseline surveys included targeted surveys for the Eastern false pipistrelle but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Eastern osprey (*Pandion cristatus*)

The Eastern osprey has historically been recorded flying over the Precincts 1 - 5 EMAs (**FIGURE 3**) as recently as 2018, however no known nesting sites occur on or immediately adjacent to the site. The nearest known active nest site occurs approximately 1.5 km to the north near Tamara Drive, Kingscliff.

Eastern ospreys are found right around the Australian coastline, except for Victoria and Tasmania. They are common around the mouths of large rivers, lagoons and lakes where they feed on fish over clear, open water. In NSW they breed from July to September in nests made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.

The baseline surveys included targeted surveys for the Eastern osprey, including searches for any potential nest sites, but failed to record the species. The species is known to breed and forage in the general vicinity of the site and will continue to be targeted during ongoing/future monitoring.

Eastern grass owl (*Tyto longimembris*)

The Grass owl has historically been recorded in association with rank grass habitats in wetlands within the Precincts 1 - 5 EMAs (**FIGURE 3**), and elsewhere on the site in association with rank grassland and regrowth heath in the 'Cudgen Paddock', however has not been recorded from the site since 2005.

The species inhabits areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' - a trampled platform in a large tussock or other heavy vegetative growth. Nests are found in trodden grass, and often accessed by tunnels through vegetation. Breeding season is highly variable and dependent on environmental conditions, but in NSW nesting most typically occurs in autumn or winter.

The baseline surveys included targeted surveys for the Eastern grass owl but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Pale-vented bush hen (*Amaurornis moluccana*)

The Pale-vented bush hen has not historically been recorded within the Precincts 1 - 5 EMAs however suitable habitat is considered to be present. There are records of this species from the margins of Cudgen Lake in the southern portion of the Kings Forest site prior to 2005 (**FIGURE 3**) however the species has not been recorded from the site since.

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. The breeding season is from spring to early autumn (i.e. October to April) during which time loud and distinctive shrieking calls or wailing duets can be heard.

The baseline surveys included targeted surveys for the Pale-vented bush hen and occurred during the breeding season but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

Yellow-bellied sheathtail bat (*Saccolaimus flaviventris*)

The Yellow-bellied sheathtail bat has not historically been recorded within the Precincts 1 - 5 EMAs however suitable habitat is considered to be present. There are records of this species from ecotone forest adjacent to heathland communities in the southern portion of the Kings Forest site (on the southern margins of the 'Cudgen Paddock') (**FIGURE 3**) from 2013, however the species has not been recorded from the site since.

The species forages in most habitats across its very wide range, with and without trees, and appears to defend an aerial territory. It roosts singly or in groups of up to six, in tree hollows and buildings and in treeless areas they are known to utilise mammal burrows. When foraging for insects, Yellow-bellied sheathtail bats fly high and fast over the forest canopy, but lower in more open country. Breeding has been recorded from December to mid-March, when a single young is born.

The baseline surveys included targeted surveys for the Yellow-bellied sheathtail bat and occurred during the breeding season but failed to record the species. Suitable habitat is considered to be present within the Precincts 1 - 5 EMAs and the species will continue to be targeted during ongoing/future monitoring.

5 ONGOING MONITORING AND REPORTING REQUIREMENTS

5.1 Annual Threatened Flora Monitoring

Threatened flora specimens identified within the Precincts 1 - 5 EMAs 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) throughout construction phases and for a period of five (5) years during the operational phase. All threatened flora specimens will be monitored as follows:

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

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

5.2 Annual Threatened Fauna Monitoring

Threatened fauna within Precincts 1 - 5 EMAs 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) throughout construction phases and for a period of five (5) years during the operational phase. The methodology used for the Baseline monitoring will be utilised for the annual Threatened fauna monitoring.

5.3 Annual Threatened Species Monitoring Report

An annual Threatened Species Monitoring Report will be prepared which discusses the results of the monitoring. The information provided in the report will 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 (i.e. additional nest boxes etc.);
- A detailed comparison with the baseline parameters and with previous survey data, as appropriate;
- A statement of compliance with the Performance Criteria identified in the Precincts 1 - 5 TSMP (JWA 2020a);
- 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.

REFERENCES

Cropper S.C. (1993) Management of Endangered Plants. CSIRO, East Melbourne, Victoria.

JWA (2000) Species Impact Statement for the Proposed Kings Forest Development. James Warren and Associates. A report to Narui Gold Coast.

JWA (2020a) Kings Forest Proposed Precinct 1 - 5 Threatened Species Management Plan. Report prepared for Project 28 Pty Ltd.

JWA (2020b) Kings Forest Koala Plan of Management. Report prepared for Project 28 Pty Ltd.

JWA (2020c) Kings Forest Wallum Sedge Frog Management Plan. Report prepared for Project 28 Pty Ltd.

JWA (2020d) Kings Forest Proposed Precinct 1 - 5 Vegetation Management Plan. Report prepared for Project 28 Pty Ltd.

Phillips, S., Hopkins, M., and Shelton, M. (2011) Tweed Coast Koala Habitat Study. Report to Tweed Shire Council. Biolink Ecological Consultants.

Tweed Shire Council (2015) Tweed Coast Comprehensive Koala Plan of Management. Tweed Shire Council, Murwillumbah, NSW.

APPENDIX 1 - FAUNA MONITORING LOCATIONS

Trap ID		Easting	Northing
Transect Lines			
KFM02	Trap station 1	554524	6869192
	Trap station 2	554535	6869220
	Trap station 3	554545	6869243
	Trap station 4	554544	6869272
	Trap station 5	554532	6869292
KFM04	Trap station 1	554085	6869307
	Trap station 2	554088	6869281
	Trap station 3	554095	6869263
	Trap station 4	554087	6869240
	Trap station 5	554077	6869221
KFM06	Trap station 1	555033	6869617
	Trap station 2	555021	6869616
	Trap station 3	555004	6869610
	Trap station 4	554989	6869610
	Trap station 5	554968	6869595
KFM07	Trap station 1	554662	6869534
	Trap station 2	554675	6869554
	Trap station 3	554674	6869583
	Trap station 4	554680	6869612
	Trap station 5	554688	6869636
KFM08	Trap station 1	554576	6869730
	Trap station 2	554568	6869721
	Trap station 3	554555	6869718
	Trap station 4	554539	6869700
	Trap station 5	554516	6869665
KFM33	Trap station 1	555182	6870485
	Trap station 2	555200	6870482
	Trap station 3	555228	6870471
	Trap station 4	555251	6870445
	Trap station 5	555267	6870439
KFM36	Trap station 1	554239	6869536
	Trap station 2	554234	6869570
	Trap station 3	554240	6869601
	Trap station 4	554242	6869619
	Trap station 5	554231	6869644
TC301	Trap station 1	554981	6870424
	Trap station 2	554973	6870406
	Trap station 3	554970	6870417
	Trap station 4	554957	6870413
	Trap station 5	554944	6870416

Trap ID	Easting	Northing
Blossom Bat Survey		
Blossom bat survey site 1 (Bbs1)	554430	6869615
Blossom bat survey site 2 (Bbs2)	554551	6869182
Call Playback		
Call playback site 1 (Cp1)	555093	6870385
Call playback site 2 (Cp2)	555186	6869310
Call playback site 3 (Cp3)	554302	6869346
Call playback site 4 (Cp4)	553985	6869833
Pitfall Locations		
Pitfall site 1	555166	6870492
Pitfall site 2	554976	6870421
Pitfall site 3	555059	6869615
Pitfall site 4	554659	6869512
Pitfall site 5	554562	6869722
Wetland Census		
Wetland census site 1 (Wc1)	554076	6869418
Wetland census site 2 (Wc2)	553918	6869337
Wetland census site 3 (Wc3)	553717	6869657

APPENDIX 2 - THREATENED FLORA DETAILS

Species	GPS Location		Height (m)	DBH (cm)	Flowering/ Fruiting	Condition	Potential Threats
	Easting	Northing					
Stinking cryptocarya (<i>Cryptocarya foetida</i>)	554871	6869743	10m (+ 13 seedlings around the base of the parent plant)	20cm	No	Healthy	<ul style="list-style-type: none"> Weeds nearby (i.e. Happy plant, Lantana, Slash pine) Vehicle access track within approx. 5m
White laceflower (<i>Archidendron hendersonii</i>)	555204	6870605	10m	22cm	Yes - fruiting	Healthy	<ul style="list-style-type: none"> Weeds nearby (i.e. Lantana, Slash pine) Trees are also smothered by native vine species.
	555209	6870597	12m	25cm	Yes - fruiting	Healthy	

APPENDIX 3 - BASELINE FAUNA MONITORING RESULTS

Common Name	Species Name	Mode of Observation#	Survey Location								
			KFM02	KFM04	KFM06	KFM07	KFM08	KFM33	KFM36	TC301	Other
Amphibians											
Cane toad	<i>Rhinella marina*</i>	Cpt, Sp	✓	✓	✓	✓	✓	✓	✓		
Common eastern froglet	<i>Crinia signifera</i>	lo, Wc			✓						Wc1, Wc3
Dusky toadlet	<i>Uperoleia fusca</i>	Wc									Wc1
Eastern dwarf tree frog	<i>Litoria fallax</i>	lo									
Green tree frog	<i>Litoria caerulea</i>	lo, Sp									
Red-backed toadlet	<i>Pseudophryne coriacea</i>	lo									
Rocket frog	<i>Litoria nasuta</i>	lo, Sp						✓	✓		
Striped marsh frog	<i>Limnodynastes peronii</i>	lo, Wc		✓							Wc1
Tusked frog	<i>Adelotus brevis</i>	Wc									Wc1
Wallum froglet	<i>Crinia tinnula</i>	lo, Cp			✓				✓	✓	Cp1
Reptiles											
Cream-striped Shinning-skink	<i>Cryptoblepharus virgatus</i>	lo									
Dark-flecked garden sunskink	<i>Lampropholis delicata</i>	Cpt							✓		
Eastern carpet python	<i>Morelia spilota mcdowelli</i>	Sp									
Eastern water dragon	<i>Intellagama lesueurii</i>	lo, Wc			✓						Wc2
Green tree snake	<i>Dendrelaphis punctulatus</i>	lo			✓						
Lace monitor	<i>Varanus varius</i>	Ct, lo						✓	✓	✓	
Land mullet	<i>Egernia major</i>	Cct			✓						
Pink-tongued lizard	<i>Cyclodomorphus gerrardii</i>	Cpt						✓	✓		
Red-bellied black snake	<i>Pseudechis porphyriacus</i>	lo									
Robust Ctenotus	<i>Ctenotus robustus</i>	lo									
Three-toed skink	<i>Saiphos equalis</i>	Cpt								✓	
Birds											
Australasian figbird	<i>Sphecotheres vieilloti</i>	Bs, Wc					✓	✓			Wc3
Australian brush turkey	<i>Alectura lathamii</i>	Cct, Ct, lo	✓				✓	✓			
Australian magpie	<i>Cracticus tibicen</i>	Bs, Wc	✓	✓	✓						Wc1, Wc2
Australian owl-nightjar	<i>Aegotheles cristatus</i>	Sp				✓					

Baseline Threatened Species Monitoring Report - Kings Forest Precincts 1 - 5

Common Name	Species Name	Mode of Observation#	Survey Location								
			KFM02	KFM04	KFM06	KFM07	KFM08	KFM33	KFM36	TC301	Other
Australian pipit	<i>Anthus novaeseelandiae</i>	lo					✓				
Australian reed-warbler	<i>Acrocephalus australis</i>	Wc									Wc1
Australian spotted crake	<i>Porzana fluminea</i>	Wc									Wc1
Australian white ibis	<i>Threskiornis molucca</i>	lo, Wc							✓		Wc3
Azure kingfisher	<i>Ceyx azureus</i>	lo, Wc		✓							Wc1
Bar-shouldered dove	<i>Geopelia humeralis</i>	Bs, lo, Wc	✓		✓		✓			✓	Wc1, Wc2
Black-faced cuckoo-shrike	<i>Coracina novaehollandiae</i>	Bs, lo		✓	✓		✓	✓			
Black-shouldered kite	<i>Elanus axillaris</i>	Bs, Wc							✓		Wc3
Blue-faced honeyeater	<i>Entomyzon cyanotis</i>	lo									
Brown cuckoo-dove	<i>Macropygia amboinensis</i>	Bs, lo				✓		✓		✓	
Brown falcon	<i>Falco berigora</i>	lo	✓			✓					
Brown Gerygone	<i>Gerygone mouki</i>	Wc									Wc1, Wc2
Brown honeyeater	<i>Lichmera indistincta</i>	Bs, Wc					✓				Wc3
Brown quail	<i>Coturnix ypsilophora</i>	lo				✓					
Brown thornbill	<i>Acanthiza pusilla</i>	Bs, Wc		✓					✓		Wc1
Cattle egret	<i>Ardea ibis</i>	Bs					✓				
Channel-billed cuckoo	<i>Scythrops novaehollandiae</i>	lo		✓		✓					
Cicadabird	<i>Coracina tenuirostris</i>	lo, Wc	✓								Wc1, Wc3
Crested pigeon	<i>Ocyphaps lophotes</i>	lo	✓						✓	✓	
Dollarbird	<i>Eurystomus orientalis</i>	lo, Wc	✓								Wc1
Eastern spinebill	<i>Acanthorhynchus tenuirostris</i>	Bs, lo			✓			✓			
Eastern whipbird	<i>Psophodes olivaceus</i>	lo, Wc	✓								Wc1, Wc2
Eastern yellow robin	<i>Eopsaltria australis</i>	lo, Wc	✓								Wc3
Emerald dove	<i>Chalcophaps indica</i>	Bs, lo, Ct			✓	✓				✓	
Fairy martin	<i>Petrochelidon ariel</i>	lo, Wc				✓			✓	✓	Wc1
Forest kingfisher	<i>Todiramphus macleayii</i>	Bs, Wc									Wc1
Glossy black cockatoo	<i>Calyptrorhynchus lathami</i>	lo					✓	✓			
Golden-headed Cisticola	<i>Cisticola exilis</i>	Cr					✓				
Grey fantail	<i>Rhipidura albiscapa</i>	Bs, lo	✓			✓				✓	

Baseline Threatened Species Monitoring Report - Kings Forest Precincts 1 - 5

Common Name	Species Name	Mode of Observation#	Survey Location								
			KFM02	KFM04	KFM06	KFM07	KFM08	KFM33	KFM36	TC301	Other
Grey shrike-thrush	<i>Colluricincla harmonica</i>	Wc									Wc1, Wc3
Large-billed scrubwren	<i>Sericornis magnirostra</i>	lo						✓			
Laughing kookaburra	<i>Dacelo novaeguineae</i>	lo, Wc			✓						Wc1, Wc2
Leaden flycatcher	<i>Myiagra rubecula</i>	lo	✓								
Lewin's honeyeater	<i>Meliphaga lewinii</i>	Bs, Wc	✓	✓			✓	✓			Wc1, Wc2
Little corella	<i>Cacatua sanguinea</i>	lo	✓								
Little wattlebird	<i>Anthochaera chrysoptera</i>	Bs, Wc						✓			Wc1, Wc3
Magpie-lark	<i>Grallina cyanoleuca</i>	lo									
Masked lapwing	<i>Vanellus miles</i>	lo									
Masked owl	<i>Tyto novaehollandiae</i>	Cp									Cp1
Mistletoebird	<i>Dicaeum hirundinaceum</i>	lo									
Noisy friarbird	<i>Philemon corniculatus</i>	lo, Wc			✓						Wc1
Noisy miner	<i>Manorina melanocephala</i>	Bs, lo	✓	✓						✓	
Pacific baza	<i>Aviceda subcristata</i>	lo						✓			
Pacific black duck	<i>Anas superciliosa</i>	lo, Wc	✓								Wc1, Wc2
Peaceful dove	<i>Geopelia striata</i>	Bs, lo			✓					✓	
Pheasant coucal	<i>Centropus phasianinus</i>	Bs, Wc						✓			Wc1
Pied butcherbird	<i>Cracticus nigrogularis</i>	Bs, Wc					✓				Wc1
Pied currawong	<i>Strepera graculina</i>	Bs, lo, Wc		✓				✓			Wc1, Wc2, Wc3
Purple swamphen	<i>Porphyrio porphyrio</i>	Wc									Wc1
Rainbow bee-eater	<i>Merops ornatus</i>	lo		✓							
Rainbow lorikeet	<i>Trichoglossus haematodus</i>	Bs, Wc			✓	✓				✓	Wc2, Wc3
Red-backed fairy-wren	<i>Malurus melanocephalus</i>	lo, Wc	✓			✓		✓			Wc1
Red-browed finch	<i>Neochmia temporalis</i>	Bs, Wc	✓				✓	✓			Wc1, Wc2
Rose-crowned fruit-dove	<i>Ptilinopus regina</i>	lo				✓		✓			
Rufous whistler	<i>Pachycephala rufiventris</i>	Wc									Wc1, Wc2
Scaly-breasted lorikeet	<i>Trichoglossus chlorolepidotus</i>	lo				✓		✓		✓	
Scarlet honeyeater	<i>Myzomela sanguinolenta</i>	Bs, Wc		✓	✓		✓				Wc1

Baseline Threatened Species Monitoring Report - Kings Forest Precincts 1 - 5

Common Name	Species Name	Mode of Observation#	Survey Location								
			KFM02	KFM04	KFM06	KFM07	KFM08	KFM33	KFM36	TC301	Other
Silvereye	<i>Zosterops lateralis</i>	Bs, Wc						✓			Wc1, Wc2
Southern boobook	<i>Ninox novaeseelandiae</i>	Cr			✓			✓			
Spangled drongo	<i>Dicrurus bracteatus</i>	lo								✓	
Spotted turtle-dove	<i>Streptopelia chinensis*</i>	lo									
Straw-necked ibis	<i>Threskiornis spinicollis</i>	lo							✓		
Striated pardalote	<i>Pardalotus striatus</i>	Bs, Wc	✓			✓			✓	✓	Wc3
Swamp harrier	<i>Circus approximans</i>	Wc									Wc1
Tawny frogmouth	<i>Podargus strigoides</i>	Sp			✓		✓			✓	
Tawny grassbird	<i>Megalurus timoriensis</i>	lo									
Torresian crow	<i>Corvus orru</i>	Bs, Wc	✓	✓		✓	✓			✓	Wc1, Wc3
Varied triller	<i>Lalage leucomela</i>	Bs, lo		✓				✓	✓		
Varied sittella	<i>Daphoenositta chrysoptera</i>	lo								✓	
Variegated fairy-wren	<i>Malurus lamberti</i>	Bs, Wc					✓				Wc1, Wc2
Welcome swallow	<i>Hirundo neoxena</i>	Wc									Wc3
Whistling kite	<i>Haliastur sphenurus</i>	lo			✓						
White-bellied sea-eagle	<i>Haliaeetus leucogaster</i>	lo, Wc		✓			✓				Wc1
White-browed scrub-wren	<i>Sericornis frontalis</i>	Bs, Ct, lo				✓	✓	✓			
White-cheeked honeyeater	<i>Phylidonyris niger</i>	Bs, Wc				✓	✓			✓	Wc1, Wc2
White-faced heron	<i>Egretta novaehollandiae</i>	lo, Wc									Wc3
White-headed pigeon	<i>Columba leucomela</i>	Bs, Wc		✓				✓	✓		Wc1
White-throated Gerygone	<i>Gerygone olivacea</i>	lo									
White-throated needletail	<i>Hirundapus caudacutus</i>	lo								✓	
White-throated nightjar	<i>Eurostopodus mystacalis</i>	Sp, Cr					✓				
Willie wagtail	<i>Rhipidura leucophrys</i>	Bs	✓	✓			✓				
Wonga pigeon	<i>Leucosarcia melanoleuca</i>	Bs						✓			
Yellow-tailed black cockatoo	<i>Calyptorhynchus funereus</i>	Bs, Wc						✓			Wc2
Mammals											
A broad-nosed bat	<i>Scotorepens sp.</i> (<i>sensu Parnaby 1992</i>)	An								✓	

Baseline Threatened Species Monitoring Report - Kings Forest Precincts 1 - 5

Common Name	Species Name	Mode of Observation#	Survey Location								
			KFM02	KFM04	KFM06	KFM07	KFM08	KFM33	KFM36	TC301	Other
Northern brown bandicoot	<i>Isoodon macrourus</i>	Ct, Sp				✓		✓			
Black flying-fox	<i>Pteropus alecto</i>	Sp									
Brown hare	<i>Lepus capensis*</i>	lo					✓			✓	
Bush rat	<i>Rattus fuscipes</i>	Ht, Ct, CEt	✓				✓	✓	✓	✓	
Common brushtail possum	<i>Trichosurus vulpecula</i>	Ht						✓			
Common ring-tail possum	<i>Pseudocheirus peregrinus</i>	Sp			✓						
Dog	<i>Canis lupus familiaris*</i>	Asi					✓				
Eastern broad-nosed bat	<i>Scotorepens orion</i>	An	✓	✓				✓	✓	✓	
Eastern forest bat	<i>Vespadelus pumilus</i>	An	✓	✓		✓		✓		✓	
Gould's wattled bat	<i>Chalinolobus gouldii</i>	An	✓	✓	✓		✓	✓	✓	✓	
Grey-headed flying-fox	<i>Pteropus poliocephalus</i>	Sp						✓		✓	
House mouse	<i>Mus musculus*</i>	Spt					✓				
Koala	<i>Phascolarctos cinereus</i>	lo								✓	
Large bent-winged bat	<i>Miniopterus orianae oceanensis</i>	An								✓	
Little bent-wing bat	<i>Miniopterus australis</i>	An	✓	✓	✓	✓		✓	✓	✓	
Northern free-tailed bat	<i>Ozimops lumsdenae</i>	An	✓	✓				✓	✓	✓	
Red fox	<i>Vulpes Vulpes*</i>	Ct, Sp			✓	✓		✓			
Ride's free-tailed bat	<i>Ozimops ridei</i>	An	✓	✓	✓			✓	✓	✓	
Smaller horseshoe bat	<i>Rhinolophus megaphyllus</i>	An	✓				✓	✓		✓	
Southern myotis	<i>Myotis macropus</i>	An		✓	✓	✓	✓	✓	✓	✓	
Swamp rat	<i>Rattus lutreolus</i>	CEt	✓			✓	✓				
Swamp wallaby	<i>Wallabia bicolor</i>	lo									
White-striped free-tailed bat	<i>Austronomus australis</i>	An	✓	✓		✓		✓	✓	✓	

Notes:

Sp = Spotlighting; Cp = Call playback; As = Active searches; Ch = Capture – hand; CEt = Capture - Elliott trap; Cpt = Capture - pitfall trap; Cct = Capture – cage trap; Ct = Camera trap; An = Anabat Express; Ht = Hair tube; Bs = Bird survey; Wc = Wetland census; lo = Incidental observation; Cr = Call recognition; Asi = Animal sign (scats, tracks, bones, feathers etc.)

Threatened species are shown in bold

* Indicates an introduced species

