Coffs Harbour LGA Flying-fox Camps

Strategic Camp Management Plan

Prepared for
Coffs Harbour City Council

August 2017

DOCUMENT TRACKING

Item	Detail
Project Name	Coffs Harbour Flying-fox Camps Strategic Management Plan
Project Number	16COF-5593
Project Manager	Alicia Scanlon (02) 6651 5484 35 Orlando Street, Coffs Harbour Jetty, NSW, 2450
Prepared by	Alicia Scanlon, Liz Brown
Reviewed by	Beth Medway
Approved by	Martin Stuart
Status	FINAL
Version Number	6
Last saved on	7 August 2017
Cover photos	Top left: Woolgoolga camp (LB). Top right: Grey-headed Flying-fox (LC). Bottom right: Toormina flyway (LB). Bottom left: Grey-headed Flying-foxes (LB). 2nd December 2016.

This report should be cited as 'Eco Logical Australia August 2017. *Coffs Harbour Flying-fox Camps Strategic Management Plan*. Prepared for Coffs Harbour City Council.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Sally Whitelaw and Sue Stewart (Coffs Harbour City Council), Jenny Beatson and Judi Wood (Mid North Coast WIRES, current and past Flying-fox Co-ordinators), Rachel Binskin (OEH) and Martin Smith (NPWS).

It follows the format of the Flying-fox Camp Management Plan Template developed by NSW Office of Environment and Heritage, Ecosure and Dr Peggy Eby in 2016.

Template 29/9/2015

Contents

List of figures

List of tables

Abbreviations

Abbreviation	Description
ABLV	Australian bat Lyssavirus
BFF	Black flying-fox (*Pteropus alecto*)
CASR	Australian Civil Aviation Safety Regulations
CHCC	Coffs Harbour City Council
CHRA	Coffs Harbour Regional Airport
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DoE	Commonwealth Department of the Environment
DPI	Department of Primary Industries (NSW)
ELA	Eco Logical Australia
EEC	endangered ecological community
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	Environment Protection Authority (NSW)

Abbreviation	Description
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
ERSA	En Route Supplement Australia
GHFF	Grey-headed flying-fox (*Pteropus poliocephalus*)
the Guideline	Referral guideline for management actions in grey-headed and spectacled flying-fox camps 2015 (Commonwealth)
HeV	Hendra virus
ICAO	International Civil Aviation Organisation
LGA	local government area
LGNSW	Local Government NSW
LRFF	Little red flying-fox (*Pteropus scapulatus*)
MNES	matters of national environmental significance
NFFMP	National Flying-fox Monitoring Program (CSIRO)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPWS	National Parks and Wildlife Service (NSW)
NOTAM	Notice to Airman
OEH	Office of Environment and Heritage (NSW)
PEPs	protection of the environment policies
the Plan	Camp Management Plan
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PoM	Plan of Management
the Policy	Flying-fox Camp Management Policy 2015 (NSW)
SEPPs	State Environmental Planning Policies
SIS	Species Impact Statement
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
VMP	Vegetation Management Plan

Executive summary

This document presents a Strategic Flying-fox Camp Management Plan (the Plan) for the Coffs Harbour Local Government Area (LGA). Coffs Harbour City Council (CHCC) will use this Plan to strategically manage three permanent flying-fox camps and provide direction for the management of temporary camps within the LGA. The three permanent camps within Coffs Harbour LGA that are the focus of this Plan are Coffs Creek, Woolgoolga Lake and Barcoo Court, Toormina. The Plan complies with the New South Wales (NSW) Office of Environment and Heritage (OEH) Flying-fox Management Policy 2015 and follows the format of the OEH Flying-fox Camp Management Plan Template 2016. The Plan allows a consistent approach to management of flying-fox camps that recognises the ecological values of flying-foxes while minimising community impacts.

The Plan is a strategic and adaptive document that will be reviewed and updated by Council as situations change or further research improves the understanding of flying-foxes and effective management options (**Section 11**).

CHCC identified five main goals for the Plan:

1. enable land managers and other stakeholders to use a range of suitable management responses to sustainably manage flying-foxes across the LGA
2. ensure camp management is consistent with broader conservation strategies that may be developed to protect threatened species/communities
3. minimise impacts to the community, while conserving flying-foxes and their habitat
4. clearly outline the camp management actions that have been approved and will be utilised across the LGA
5. effectively communicate with stakeholders during planning and implementation of management activities

The Plan begins by describing the location, tenure and history of the three camps with associated mapping of historical (where known) and current camp extent (**Section 2**). It also briefly outlines what is known about the temporary camps within the LGA and provides a regional context for flying-fox camps within and immediately surrounding the LGA with associated mapping.

An outline of the reasons for conflict and review of management actions undertaken to date at each of the three camps is then provided. Much of this detail was gained from the community workshop held in February 2017, CHCC staff and a progress report on the existing Coffs Creek Flying-fox Camp Strategy produced by CHCC in 2007 and reviewed in 2015 (**Section 2**). Management actions undertaken at Coffs Creek have had some success in reducing conflict between residents and flying-foxes. Outstanding management actions from the Coffs Creek Strategy and Vegetation Management Plan (VMP) are provided with recommendations for continued implementation.

Stakeholder and community consultation is an important part of the development of the Plan and will be continued by CHCC during adoption and implementation of the plan. Neighbouring residents of the three permanent camps, key stakeholders and the wider community were invited to attend a community workshop on the management of flying-fox camps during February 2017. **Section 3** lists and summarises actions taken to engage the community and responses received from the community in the development of this Plan.

Section 4 outlines the Federal, State and local legislation and policies relevant to the management of flying-fox camps within the Coffs LGA.

The ecological values associated with each of the three flying-fox camps are described, summarised and mapped in **Section 5**. Detailed vegetation community descriptions, location of primary and secondary koala habitat and wildlife corridors with corresponding maps for each of the three camps are provided. Identification of other threatened species, populations or Threatened Ecological Communities occurring, or potentially occurring within the flying-fox camps, are provided in a tabular format in **Appendix A**.

Section 6 of the Plan contains information on the three species of flying-fox known to occur in the LGA; Black flying-fox (*Pteropus alecto*), Grey-headed Flying-fox (*Pteropus poliocephalus*) and Little Red Flying-fox (*Pteropus scapulatus*). Detailed information on the ecology and behaviour of each species, the conservation status of each species, threatening processes, and key impacts to flying-foxes is provided, along with a general description of preferred camp characteristics. The latest information and guidance relating to human and flying-fox health and disease management is summarised in **Section 7**.

The recommended management actions for each of the three camps are listed in **Section 8**. The entire suite of flying-fox camp management actions available to land managers is presented in **Appendix D**. An evaluation of the full suite of management options is provided for each of the three camps with justification based upon council officers and community feedback, and the knowledge gained from management of flying-fox camps elsewhere. Actions are arranged in a hierarchy from Level 1 -3, where evaluation of success at each level must occur before progression to a higher level action can take place. Level 1 actions include those relating to offsite interventions at the neighbouring property level (amongst other things) and are considered to have little impact upon flying-foxes. Level 2 actions include those requiring manipulation of vegetation/habitat on the edges of a camp and may require licensing from OEH prior to implementation. Level 3 actions relate to attempts to shift, move or disperse the colony and require rigorous impact assessment and state and federal approvals and licensing. Level 3 actions are very costly, and highly disruptive over the medium to long term to both nearby residents and flying-foxes and do not have a guaranteed successful outcome.

This Plan includes both long-term and short-term strategies for management of the three permanent flying-fox camps and relies heavily upon Level 1 actions and maintenance of existing Level 2 actions. Planned actions include establishment of a complaints tracking database within CHCC, ongoing community education and communication with neighbouring residents prior to, during and following implementation of management actions, property modifications, investigation of service subsidies (related to water usage), identification, rehabilitation and protection of flying-fox habitat in suitable locations across the LGA, ongoing maintenance of existing buffers at Coffs Creek and Woolgoolga Lake, the production of a detailed VMP for Barcoo Court and subsequent management of vegetation within the Council easement on the northern boundary of residences on the northern side of Barcoo Court.

Sections 9 and **10** look at the impact of planned management actions on flying-foxes and other ecological values and provide detailed protocols for work in and around flying-fox camps to ensure the safety of workers, neighbouring residents and flying-foxes. Given most of the actions recommended are Level 1, or a continuation of previously assessed Level 2 actions (Coffs Creek), the only impact assessment included is for implementation of works at the Barcoo Court Camp which will be the subject of a future VMP, based upon the actions discussed in **Section 8** and shown in **Figure 10**. The Plan includes a flow-chart to identify when specific management options will be considered based on the

measure of success of management actions, and includes triggers for further community or agency consultation.

Details of the Plans administration, roles and responsibilities for implementation of management actions and estimates of costs associated with management actions are outlined in **Section 12**.

1 Overview

1.1 Objectives

This Coffs Harbour Flying-fox Camp Management Plan (the Plan) has been prepared for Coffs Harbour City Council (CHCC) by Eco Logical Australia in consultation with the community and government agencies. It examines the following flying-fox camps:

- Coffs Creek
- Barcoo Court, Toormina, (hereafter referred to as Barcoo)
- Woolgoolga Lake.

Additional known flying-fox camps throughout the region (within 25 – 50km) of the Coffs Harbour Local Government Area (LGA) have also been considered as part of this Plan (**Map 1, Appendix C**).

The objectives of the Plan are to:

1. **Address community concerns regarding flying-foxes**
- minimise impacts to the community, while conserving flying-foxes and their habitat
- provide a reasonable level of amenity for the surrounding community
- manage public health and safety risks
- improve community understanding and appreciation of flying-foxes, including their critical ecological role
- effectively communicate with the community and stakeholders during planning and implementation of management activities

2. **Protect and conserve flying-foxes and other ecological values**
- ensure flying-fox welfare is a priority during all works
- ensure camp management does not contribute to loss of biodiversity or increase threats to threatened species/communities
- enable long-term conservation of flying-foxes in appropriate locations
- ensure management is sympathetic to flying-fox behaviours and requirements
- clearly outline the camp management actions that have been approved and will be utilised at the camp

3. **Ensure compliance with a suite of legislative requirements**
- ensure management activities are consistent with the NSW Flying-fox Camp Management Policy (OEH 2015b)
- ensure camp management is consistent with broader conservation management strategies that may be developed to protect threatened species/communities
- facilitate licence approval (where required) for actions at the camp
- implement an adaptive management approach to camp management based on evidence collected
- clearly define roles and responsibilities
- enable land managers and other stakeholders to use a range of suitable management responses to sustainably manage flying-foxes.

2 Context

2.1 Camp areas

It is important to note that flying-foxes shift and change their roosting location within permanent camps over time and for this reason the Plan has included detail on the amount of suitable contiguous roosting habitat available at each location.

2.1.1 Coffs Creek

The Coffs Creek camp is located at the southerly end of Oriana and Wills Streets in the suburb of Coffs Harbour. The confluence of the north-westerly and westerly tributaries of Coffs Creek bisect the camp (**Map 2, Appendix C**).

The camp extent during 2000, 2005-06 (peak occupancy), 2013, 2014 and December 2016 (recent and current occupancy) are shown in **Map 2**, **Appendix C**. The camp covered approximately 1.4 ha in December 2016, with approximately 30 ha of contiguous vegetation and potential flying-fox habitat available. Of this, approximately 7.9 ha would be considered suitable habitat (Zoned E2), accounting for a minimal buffer of 50m between neighbouring dwellings and flying-fox habitat. At peak occupancy in 2005-06, the camp covered 20.6 ha and extended upstream along Coffs Creek in riparian vegetation on the northern side of Donn Paterson Drive behind Vera Drive (Robvale Reserve). At this time flying-foxes were also roosting in remnant riparian vegetation behind Baringa Private Hospital on Treefern Creek, a tributary of Coffs Creek.

2.1.2 Barcoo Court, Toormina

The Barcoo camp is located north-east of the junction of Hogbin Drive and Barcoo Court in the suburb of Toormina. A tributary of Boambee Creek occurs to the north of the camp (**Map 3, Appendix C**).

The camp extents as at 2013, 2014, 2015 and December 2016 are shown in **Map 3, Appendix C**. The camp covered approximately 2.1 ha in December 2016, with approximately 10.2 ha of suitable contiguous camp habitat available. At peak occupancy the camp spills over into privately owned vegetation surrounding a dam that forms part of the old Sawtell nursery site on the western side of Hogbin Drive (**Map 3, Appendix C**).

2.1.3 Woolgoolga

The Woolgoolga camp is located at the northerly end of Lakes Road in the suburb of Woolgoolga. Woolgoolga Creek and Woolgoolga Lake extend along the westerly and north-westerly boundary of the camp, which abuts the Woolgoolga Lakeside Holiday Park (**Map 4, Appendix C**).

The camp extents in 2013, May 2015 and December 2016 are shown in **Map 4, Appendix C**. The camp covered approximately 1.6 ha in December 2016, with approximately 11 ha of suitable contiguous camp habitat available (**Map 4, Appendix C**). By June 2017, the camp had shifted and was located further south within Woolgoolga Beach Reserve, opposite Melaleuca Ave. At peak occupancy the camp is estimated to cover approximately 9.9 ha.

2.1.4 Other camps

Other known occasional flying-fox roost camp locations within Coffs LGA include (**Map 1, Appendix C**);

- Bark Hut Creek Road – Small number of GHFF roosting here in vegetation adjacent to the Corindi River in 2011. No records of occupation in the CSIRO's National Flying- fox Monitoring Program (NFFMP) web viewer between 2012 and 2017.

- Boambee (England's Rd) – immediately west of the Resource Recovery Park. Appears to be used during winters when local swamp forests are in flower and during years when food resources are not available elsewhere (CHCC, 2007). No records of occupation in the NFFMP web viewer between 2012 and 2017.
- Bonville Creek – Located in Bongil Bongil National Park, adjacent to Pine Creek. No records of occupation in the NFFMP web viewer between 2012 and 2017.
- Bruxner Park – described as a temporary camp and located within Ulidarra National Park on a tributary of Bucca Bucca Creek. Counts exceeded 20,000 animals on one occasion, but the site does not appear to have been used in the recent past (CHCC, 2007).No records of occupation in the NFFMP web viewer between 2012 and 2017.
- Bundagaree Creek – Located in Bongil Bongil National Park. Mentioned in the Coffs Creek Flying-fox Camp Strategy (the Strategy) and Vegetation Management Plan (VMP) (CHCC, 2007) but no further information available. Site not monitored in the NFFMP between 2012 and 2107.
- Coramba Nature Reserve - No records of occupation in the NFFMP web viewer between 2012 and 2017.
- Coramba – Located at the junction of Star Creek and the Orara River on the western edge of town. First recorded March 2017 by ELA (no previous history of occupation known, local resident pers.comm.). Inhabited by between 500 and 2500 GHFFs, small numbers of BFFs may also be present. May be a splinter camp from the Glenreagh camp, following recent heat stress events (February 2017).
- Fig Tree near the existing Coffs Creek camp –only used for short periods around 1996-1997 and likely only in response to disturbance at Coffs Creek camp. Site not monitored in the NFFMP between 2012 and 2017.
- Moonee Beach – Located within privately owned vegetation along Sugar Mill Creek between the Pacific Highway and Green Bluff. No records of occupation in the NFFMP web viewer between 2012 and 2017.
- North Coast Regional Botanic Gardens and Grey Mangrove (*Avicennia marina*) forest – flying-foxes are known to have periodically occupied this area since the 1960's with the most recent occurrence on a temporary basis between October 1993 and August 1995 (CHCC, 2007). Site not monitored in the NFFMP between 2012 and 2017.
- Pine Creek – Located within Pine Creek State Forest on a tributary of Pine Creek. No records of occupation in the NFFMP web viewer between 2012 and 2017.
- Sandy Beach – Located on Council owned community land adjacent to Moonee Beach Nature Reserve. Recorded as a semi-permanent / satellite GHFF camp in the 1970's (Judi Wood pers.comm.). No records of occupation in the NFFMP web viewer between 2012 and 2017.

To the best of the authors knowledge, none of these locations (except Bruxner Park) have served as a roost for more than small numbers of flying-foxes at any one time, nor have they ever been permanently or seasonally occupied by flying-foxes in the recent past (2007-2017). There are no records of flying-foxes roosting at any of the monitored temporary camps between 2012 and 2017 as part of the NFMMP, however not all listed known flying-fox camp locations are monitored quarterly each year, and many of the temporary camps are not monitored at all.

2.2 History of the camps

2.2.1 Coffs Creek

The Coffs Creek camp was first recorded during the 1960's but it is likely to have been used by flying-foxes for many years prior to that (Smith, 2002). There are anecdotal historical records from dairy farmers in the area of Robin Street (southern end of current camp location) indicating the presence of a flying-fox camp along Coffs Creek in the 1920's (Judi Wood, pers. comm.). Anecdotal information also indicates that GHFF used the campsite on Coffs Creek on a temporary basis throughout the 1960's, 70's, 80's and 90's. There were periods (e.g.1989 – 1992) when flying-foxes were not present for years at a time (CHCC, 2007). There are reports that flying-foxes once roosted closer to Coffs Harbour showground but were moved on by shotgun in the 1970's (pers. comm., community consultation).

The Coffs Creek camp became permanently occupied in the mid-1990's as a maternity site by *Pteropus poliocephalus* (Grey-headed Flying-fox) (GHFF) and is recognised as an important maternity camp (Smith, 2002, OEH GHFF camp data). Both *Pteropus alecto* (Black Flying-fox) (BFF) and *Pteropus scapulatus* (Little Red Flying-fox) (LRFF) are also known to utilise the camp (CHCC, 2007).

As the urban area of Coffs Harbour has expanded, sub-urban housing has moved ever closer to the camp. In the early 1990's a major new housing development was approved that abuts the camp on its southern and western sides. This development was responsible for a significant reduction of vegetation surrounding Coffs Creek east of Shepherds Lane in the early 1990's. The Fauna Impact Statement for the housing development was prepared in June 1992 when a much lower pattern of use of the Coffs Creek camp by flying-foxes was recorded (CHCC, 2007). A Habitat Improvement Program was prepared as a condition of consent for the residential development. The program involved the removal of exotic species such as Camphor Laurel (*Cinnamomum camphora*), from the canopy along Coffs Creek without due consideration of the flying-fox camp (CHCC, 2007). The result was a further reduction in available roosting habitat for flying-foxes and concentration of flying-foxes in the remaining habitat, putting pressure on the remaining vegetation and magnifying resulting impacts on neighbouring residents each time an influx of flying-foxes occurred.

As house construction accelerated in the mid-late 1990's, increasing community disquiet arose over the flying-fox camp which up until the mid-1990's had not been permanently inhabited. The issue was not helped by the fact that many of the new home buyers, some of whom objected to the flying-foxes, claimed they were not informed about the proximity of their new home to the camp prior to purchase.

In response to the escalating community concern and the ongoing threats identified to the GHFF across Australia, the species was listed as vulnerable under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and state *Threatened Species Conservation Act, 1995* (TSC Act) in 2001; Council produced a Coffs Creek Flying-fox Camp Strategy (the Strategy) and Vegetation Management Plan (VMP) in consultation with the community and the National Parks and Wildlife Service (NPWS) (CHCC, 2007). In 2015 an updated version of this strategy was released which contained progress on actions outlined in the Strategy (CHCC, 2015) and more detail on this can be found in **Section 2.5.1**.

Council became the legal owner and land manager of the area containing the Coffs Creek camp in 2007. It is now known as Red Cedar Drive Reserve and covers an areas of approximately 15.9 ha, and includes all of the riparian vegetation surrounding Coffs Creek between Dunn Place in the north, Adelines Way in the north-west, extends west along the tributary of Coffs Creek to Donn Paterson Drive, bordered along this extension in the north by Moreton Bay Ave and in the south by Flintwood Ave and extends as far south as Robin Street (**Map 2, Appendix C**). The information contained within the Strategy and VMP has been updated and incorporated within the current document.

There is some discrepancy between estimates for the maximum total number of flying-foxes recorded at the camp. One author reports 50, 000 Grey-headed Flying-foxes at peak occupancy during early 2003 with GHFF, BFF and LRFF present (CHCC, 2007), another suggests 50, 000 – 60, 000 flying-foxes (no detail on species) were present during 2005 – 2006 (Rachel Binskin pers. comm.), 2007 – 2008 (Sue Stewart pers. comm), and a long-term WIRES flying-fox carer and co-ordinator has reported up to 80,000 flying-foxes present at the Coffs Creek camp during some summer maternity seasons in the 2000's. It appears that at peak occupancy the camp contains tens of thousands of GHFF and several hundred BFF during the summer maternity season. In some years a large influx of LRFF occurs and if this coincides with the summer peak of GHFF and BFF, total numbers can total above 50, 000. Adverse effects on adjacent residents from noise, odour and droppings are highest when this occurs (CHCC, 2007). Flying-foxes have been known to occupy land adjacent to Coffs Creek both upstream (west) and downstream (south) of its present location when a large influx of animals occurs (**Map 2, Appendix C**) (CHCC, 2007, Judi Wood pers. comm, Smith 2002). The maximum camp extent occurred in 2005 – 2006 when flying foxes were roosting in vegetation surrounding Coffs Creek as far upstream as Vera Drive, and were also roosting in the remnant vegetation surrounding Treefern Creek between Dutton Crescent and Baringa Private Hospital (Rachel Binskin pers. comm.).

Large influxes of flying-foxes in the tens of thousands as recorded in the 2000's have not been repeated at this camp since that time and co-incidentally many of the large Camphor Laurels which were providing roosting habitat for flying-foxes have suffered significant dieback over the same time period (Martin Smith and Sue Stewart, CHCC pers. comm). During 2007 – 08 there was some illegal clearing of Camphor Laurels at the southern end of the camp around Gundagai and Robin Streets by neighbouring residents and the flying-foxes (numbering 50,000 - 60,000 at the time) migrated further upstream, towards Oriana Street and Adelines Way (Sue Stewart CHCC pers. comm.).

In recent times (2012 – 2017), total flying-fox numbers at the camp are more commonly in the order of several hundred to several thousand (**Figure 1)** as recorded in the National Flying-fox Monitoring Program (NFFMP) web viewer. Camp counts conducted in December 2016 by ELA indicated between 5,000 and 10,000 GHFF were present with an estimated 5 -10% being mothers with pups.

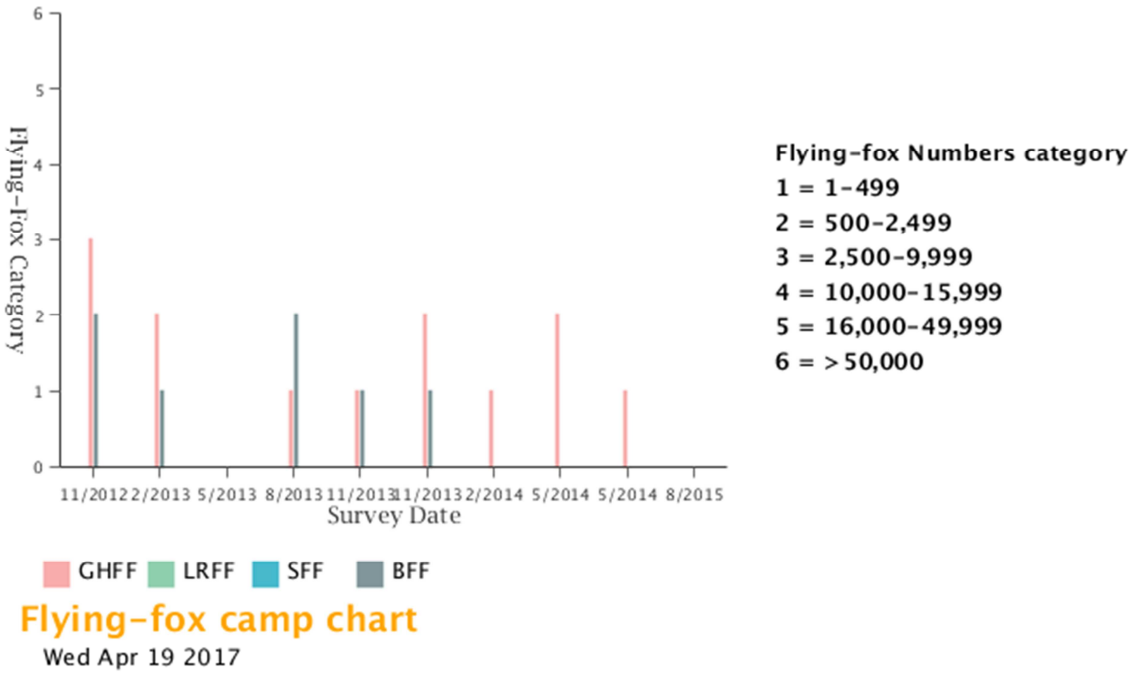


Figure 1: Number of flying-foxes by species present at the Coffs Creek camp 2012 – 2015 (NFFMP web viewer, accessed April 2017).

Nationally-important GHFF camps are those that have contained ≥ 10,000 GHFF in more than one year in the last 10 years, or have been occupied by more than 2,500 GHFF permanently or seasonally every year for the last 10 years (Referral guidelines for management actions in Grey-headed and Spectacled flying-fox camps, DoE 2015). Coffs Creek camp is a nationally important GHFF camp.

The general pattern of occupation of the Coffs Creek camp is for a gradual increase in GHFF numbers from mid-late spring, to peak occupancy with birthing and lactation over summer and early autumn with numbers generally declining over the winter months. GHFF are present in the camp year round, except in times of extreme drought as occurred between August and October 2002 (CHCC, 2007). BFF are generally present over the warmer months and LRFF may be present at any time of year. Large numbers of flying-foxes have often been reported roosting at camps in the Coffs LGA in association with heavy flowering of Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Swamp Mahogany (*Eucalyptus robusta*), particularly when there are food shortages elsewhere across the east-coast of NSW (CHCC, 2007).

2.2.2 Barcoo Court, Toormina

The camp was first recorded in the late 2000's (2009 – 2010) with flying-foxes present for part of the year (generally through summer) in some years and not in others (Martin Smith pers.comm, Judi Wood pers.comm.). It is likely that flying-foxes have utilised the resources at this site over many years prior to the first documented records. Since 2012, the camp has been occupied most of the year and has become a maternity site for the GHFF. BFF and LRFF are also known to utilise this camp, with BFF often present during NFFMP counts in February, May, and November over the period 2012 – 2017 (**Figure 2**). The maximum total number of flying-foxes recorded at the camp as part of the NFFMP was 18, 500 comprising 16, 000 GHFF and 2, 500 BFF in May 2106 (NFFMP web viewer, accessed March 2017). However there have been reports from Judi Wood, a retired WIRES flying-fox co-ordinator of up

to 30, 000 bats in this camp at peak occupancy over the last 5 years (2012 – 2017). The maximum number of flying-foxes recorded for each species to date courtesy of the NFFMP has been approximately;

- 16, 000 GHFF (May 2016);
- 2, 500 BFF (November 2014, August and November 2015 and May 2016), generally recorded in numbers between 1 and 500;
- 10, 000 LRFF (February 2016).

Barcoo is a nationally important GHFF camp having contained greater than 10, 000 GHFF at least once in the last 10 years (DoE, 2015).

At peak occupancy the camp extends throughout the swamp forest behind Barcoo Court and spills over into privately owned vegetation on the opposite side of Hogbin Drive, at the northern end of Sawtell Fire Station. The camp also spills over into trees within the easement and backyards of residents on the northern side of Barcoo Court, and extends east as far as the swamp forest allows adjacent to Boambee Creek. The fly-out tends to be towards the south and west of the camp towards Pine Creek and Bongil Bongil National Park (Judi Wood and Martin Smith pers. comm.). Judi Wood has also reported that there has been a decline in the number of juveniles present at this camp over time. Camp counts conducted in December 2016 by ELA indicated up to 1, 000 GHFF present with an estimated 5% being mothers with pups.

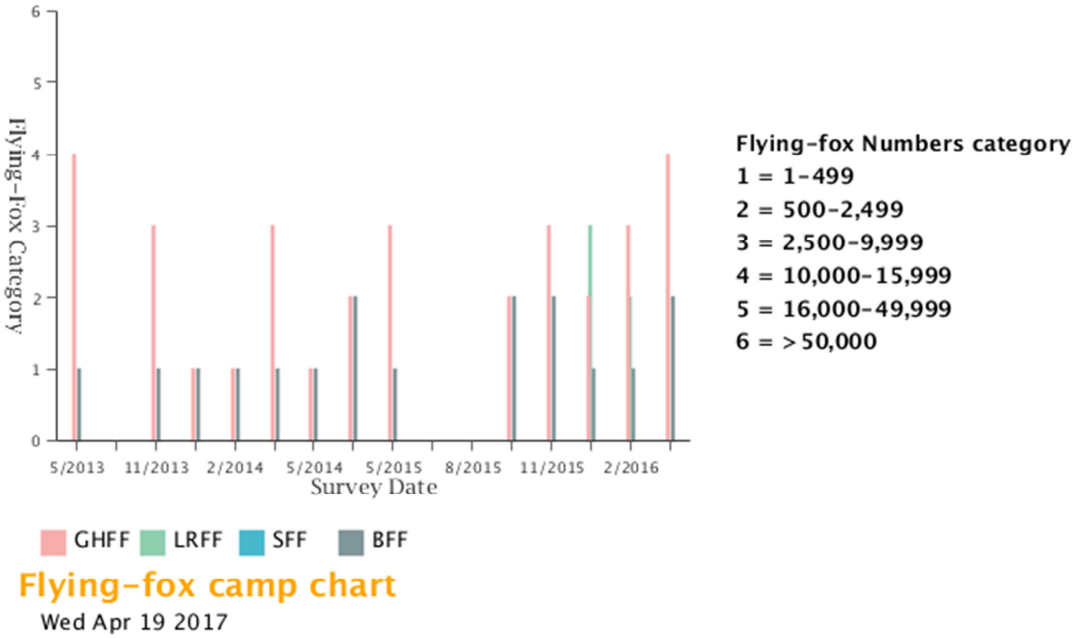


Figure 2: Number of flying-foxes by species present at the Barcoo Court camp 2012 – 2016 (NFFMP web viewer, accessed April 2017).

2.2.3 Woolgoolga

It is likely that flying-foxes have utilised the resources at this site over many years prior to the first documented records. It was recognised by OEH in late 1990's to early 2000's as a permanently occupied maternity site for the GHFF, with the birth of the first GHFF pup in 1999 (Judi Wood

pers.comm.). BFF were first recorded at this camp in 2005 and gradually increased in numbers to the point where they are present all year in most years (Judi Wood pers.comm, **Figure 3**). LRFF are occasional visitors and often arrive in large numbers with the most recent influx occurring in February 2016. The camp has occasionally emptied during winter as it did in 2013 and 2016 (Jenny Beatson, pers.comm.). The maximum total number of flying-foxes ever recorded at the camp was about 60, 000, comprising 50, 000 grey-headed flying-foxes and 10, 000 black flying-foxes in May 2104 (**Figure 3**). The maximum recorded for each species to date has been approximately;

- 50, 000 grey-headed flying-foxes (November 2012, May 2014, November 2014, May 2016);
- 10, 000 black flying-foxes (May 2014), generally recorded in numbers between 1 and 500;
- 10, 000 little red flying-foxes (February 2016)

Woolgoolga Lake is also a nationally important GHFF camp having contained greater than 10, 000 GHFF at least once in the last 10 years (DoE, 2015).

At peak occupancy the camp fills the western portion of the Council owned Woolgoolga Beach Reserve almost as far south as Sunset Caravan Park and spills over into trees in the carpark and picnic area on the northern boundary of the Reserve. It also spills over into Woolgoolga Beach Reserve vegetation on the eastern side of Lakes Road bordering Woolgoolga Lakeside Caravan Park and extending as far south on this seaward side of Lakes Road as the most northerly beach car park on the eastern side of Lakes Road (**Map 4, Appendix C**). Camp counts conducted in December 2016 by ELA indicated between 5, 000 and 10, 000 GHFF were present with an estimated 15% being mothers with pups.

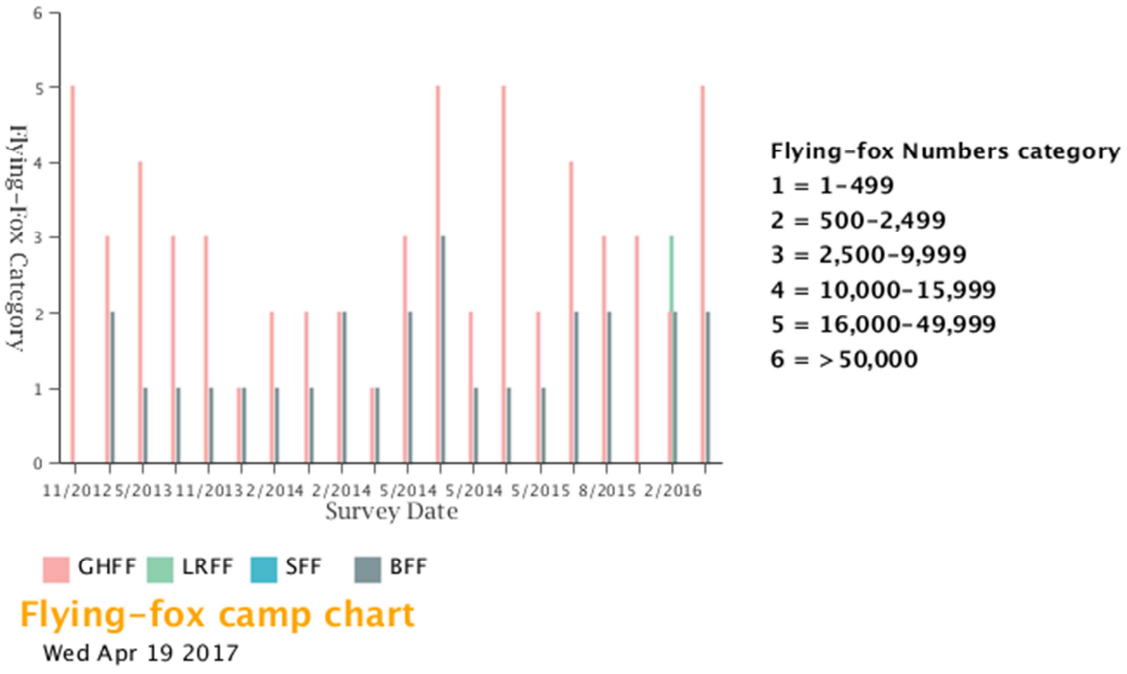


Figure 3: Number of flying-foxes by species present at the Barcoo Court camp 2012 – 2016 (NFFMP web viewer, accessed April 2017).

2.3 Land tenure

2.3.1 Coffs Creek

The Coffs Creek camp occurs on a mixture of tenured land; residential, easement and Public Reserve, and is covered by Low Density Residential (R2), Environmental Conservation (E2) and Public Recreation (RE1) zones under the *Coffs Harbour Local Environmental Plan 2013* (**Map 5, Appendix C**).

Land bordering the camp is largely Low Density Residential (R2). Vegetated land upstream of Red Cedar Reserve and the camp used as flying-fox roosting habitat in 2005 – 2006 during peak occupancy is zoned as Public Recreation (RE1) and is known as Robvale Reserve. The main camp area in Red Cedar Reserve used by flying-foxes since 2009 is zoned Environmental Protection (E2). The number of low density residential properties neighbouring the camp in 2007 (CHCC, 2007) was reported to be:

- 32 properties within 50m
- 165 properties within 50 - 100m
- 579 properties within 100 - 200m

The number of low density residential properties neighbouring the camp is not likely to have increased significantly because there has been no additional residential development within 300m of the camp since 2007. There will be no significant increase in the number of properties in the future, provided current land zoning remains in place, because there is no undeveloped land remaining within 300m of the camp. It is important to note that a number of residential properties on Gundagai Street have centre title to the mid-point of Coffs Creek and that Council approved vegetation removal (Camphor Laurels) and creation of a buffer between the flying-fox camp and residential dwellings as part of the Strategy in 2007. Residents were provided with advice and training on vegetation maintenance to minimise interactions with flying foxes by Council staff during 2009. This buffer does not form part of the VMP for Red Cedar Reserve because it lies on privately owned land and is the responsibility of individual land owners to maintain.

Lilly Pilly Early Learning Centre is located on Gundagai Street, within 90m of the camp (**Map 5, Appendix C**). It is a privately operated pre-school / long day care centre catering to children between the ages of 2 and 6. It has a large outdoor play area, mostly covered by shade sails. There are no trees or overhanging trees in the outdoor area. The owner of the business attended the community workshop in February 2017.

There are a number of family day carers (currently less than 15) operating in the locality of Coffs Creek. These businesses are privately operated and generally provide childcare for small numbers of children (4 - 5) between the ages of 0 and 6 years old. Each business is run from a private residence under the same strict health and hygiene regulations as child care centres. It is beyond the scope of the Plan to list and describe details of each operator and their proximity to the camp. The number of these businesses changes regularly as operators move in and out of the childcare sector. A number of organisations are responsible for managing the family day care sector and several were contacted in consultation for the Plan. All had an opportunity to participate in the community workshop.

Narranga Public School on Robin Street lies across the road from the southern end of the camp, currently approximately 250m from roosting flying-foxes **(Map 5, Appendix C)** Coffs Creek flows under Robin Street, forming the northern and eastern boundary of the school. Narranga Public School have had no issues with the camp and have had no reported incidences regarding flying-foxes (Sally Whitelaw pers.comm).

The Red Cedar Drive Reserve is actively managed by Council under the Coffs Creek Flying-fox Camp Strategy and VMP produced by CHCC in 2007 and updated in 2015.

Land identified as Primary Koala Habitat has been mapped within Red Cedar Reserve (**Map 6, Appendix C**) and any operations undertaken within the Reserve must also comply with the Coffs Harbour City Council Koala Plan of Management (CHCC KPoM) (Lunney, Moon, Matthews and Turbill, 1999). The plan lists Koala feed tree species that must be protected across the LGA.

A local wildlife corridor has been identified (Scotts, 2003) and mapped across the reserve which assists in facilitating movement of fauna through the area along Coffs Creek connecting the ranges to the floodplain (**Map 6, Appendix C**).

Coffs Harbour Biodiversity Action Strategy (2015) and the Coffs Harbour Open Space Strategy (under review) both apply to the land upon which the Coffs Creek camp is located. This Plan is one of the key documents that will underpin the Biodiversity Action Strategy. Red Cedar Reserve forms part of Councils Open Space network and is required to have a Plan of Management (PoM) to guide actions and activities in the Reserve. A PoM would address issues such as bushfire risk and regulations, fire protection, consideration of Aboriginal and cultural heritage, vertebrate pest issues, flood and storm mitigation planning, consolidation of and mapping of access routes for services such as water and sewer infrastructure, authorised and unauthorised activities such as motorbike and bicycle riding, dog walking and the creation of trails and access points. Preparation of a PoM and updates and amendments to the Coffs Creek VMP are required to ensure management of Red Cedar Reserve is strategically planned and includes consideration of such matters and how they interact with flying-foxes and camp management actions.

2.3.2 Barcoo Court, Toormina

The Barcoo camp occurs on community tenured land (Council Reserve), and is covered by Public Recreation (RE1) and Environmental Conservation (E2) zones under the *Coffs Harbour Local Environmental Plan 2013* (**Map 7, Appendix C**). Land bordering the camp includes that listed as Low Density Residential (R2) and Environmental Conservation (E2) in Barcoo Court, with Private Recreation Sporting Fields (RE2) on the northern boundary and Low Density Residential (R2), General Industrial (IN1), Public Recreation (RE1) and Environmental Conservation (E2) to the west on Hogbin Drive and Marion Drive. There is some Medium Density Housing (R3) located several blocks south of the camp on the ridge, as well as Toormina Shopping Centre and Service Station (B2) several blocks south on the other side of the ridge. Land west of the camp on Hogbin Drive includes a council owned vegetation buffer on the southern boundary of the Hi Tech Drive industrial estate.

The number of low density residential properties neighbouring the camp is:

- 23 properties within 50m
- 27 properties within 50 - 100m
- 60 properties within 100 - 200m

A VMP for the management of the Barcoo Court camp is yet to be produced and there are no volunteer groups working to restore native vegetation in or around the camp.

The Rugby Park on Hogbin Drive adjoins the Barcoo Court camp and at peak occupancy is within 50m of the camp edge at maximum occupancy. Consultation with staff at the Rugby Park has indicated that there have been no issues with flying-foxes in the recent past (Secretary and Caretaker pers.comm.).

Sawtell Fire Station on the corner of Hogbin Drive and Sawtell Road is located approximately 80m from the south western corner of the maximum camp extent.

There is an early childhood day care centre, Goodstart Early Learning located within 80 m of the maximum camp extent, on the opposite side of Hogbin Drive, along with a number of other businesses. Goodstart Early Learning Centre does not have any large trees where flying-foxes could roost or forage within the boundary and has very limited outdoor uncovered space. The centre caters for up to 76 children between the ages of 0 – 6 years old. Given the lack of trees and outdoor space it is unlikely that this centre would be affected by flying-foxes, even at peak occupancy of the Barcoo Court camp. To the best of the author's knowledge, there have been no recorded complaints to CHCC from the centre or other businesses within the industrial estate regarding flying-foxes.

The Hi Tech Drive industrial area on Hogbin Drive lies 200m north-west of the maximum camp extent and is surrounded by potential flying-fox roosting and foraging habitat. A range of businesses operate out of this area but given standard business hours are unlikely to be affected by flying-foxes even at peak occupancy.

Sawtell Catholic Care of the Aged facility on Marion Drive lies approximately 250m to the west of the maximum camp extent and is surrounded by potential flying-fox roosting and foraging habitat. A number of residences along the eastern boundary of the facility on Marion Drive and on Sea Eagle Drive, as well as residences on Plover Place abut potential flying-fox roosting and foraging habitat. To the best of the author's knowledge, there have been no recorded complaints to CHCC from the centre regarding flying-foxes.

Land identified as Primary Koala Habitat has been mapped within the Reserve (**Map 8, Appendix C**) and any operations undertaken within the Reserve must also comply with the Coffs Harbour City Council Koala Plan of Management (CHCC KPoM) (Lunney, Moon, Matthews and Turbill, 1999).

A sub-regional wildlife corridor has been identified (Scotts, 2003) and mapped across the reserve which assists in facilitating movement of fauna throughout the area east and west of the highway, connecting the ranges to the coastal strip in the area of Boambee Creek (**Map 8, Appendix C**).

Coffs Harbour Biodiversity Action Strategy (2015) and Coffs Harbour Open Space Strategy (under review) both apply to the land upon which the Barcoo Court camp is located. This Plan is one of the key documents that will underpin the Biodiversity Action Strategy. Barcoo Court Reserve forms part of Councils Open Space network and is required to have a Plan of Management (PoM) to guide actions and activities in the Reserve. A PoM would address issues such as bushfire risk and regulations, fire protection, consideration of Aboriginal and cultural heritage, vertebrate pest issues, flood and storm mitigation planning and mapping of access routes for services such as water and sewer infrastructure, authorised and unauthorised activities such as motorbike and bicycle riding, dog walking and the creation of trails and access points. In preparing the Barcoo Court VMP, consideration of such matters and how they interact with flying-foxes and camp management actions will be required to ensure management of the Reserve is strategically planned and balances the range of issues.

2.3.3 Woolgoolga

The Woolgoolga camp occurs on Crown tenured land (Woolgoolga Beach Reserve), and is covered by Public Recreation (RE1) and Recreational Waterways (W2) zones under the *Coffs Harbour Local Environmental Plan 2013* (**Map 9, Appendix C**). Woolgoolga Lakeside Caravan Park operates commercially from within the Woolgoolga Beach Reserve. The caravan park is situated within 60m of the northern camp edge, but within 10m of the maximum camp extent and are the only immediate camp neighbours. The Caravan Park caters mainly to tourists.

The nearest Low Density Residential Housing (R2) occurs 75 m south west of the camp extent in December 2016 on Melaleuca Ave on the other side of Woolgoolga Creek. The camp shifted location during preparation of this Plan and was located in Woolgoolga Beach Reserve opposite Melaleuca Ave in June 2017. The number of low density residential properties neighbouring the camp is:

- 0 properties within 50m
- 11 properties within 50 - 100m
- 17 properties within 100 - 200m

Sunset Caravan Park zoned Low Density Residential (R2) is located 450m to the south west of the camp extent in December 2016, but may be as close as 50-100m at maximum camp occupancy and is linked to the camp by a thin strip of riparian vegetation running south and then west along Woolgoolga Creek, part of Woolgoolga Beach Reserve and Woolgoolga Lake Reserve (**Map 9, Appendix C**). Residents of Sunset Caravan Park have made formal complaints about the flying-foxes, particularly at peak occupancy, suggesting that flying-foxes were roosting as far south of the main camp as the patch of vegetation immediately east of Sunset Caravan Park.

The Woolgoolga Beach Reserve is actively managed by Council and has been worked on by volunteers of the Woolgoolga Main Beach Dunecare Group since 2002. A Vegetation Management Plan for Woolgoolga Beach Reserve and Flying-fox Colony was prepared by Coffs Harbour Bushland Regenerators in 2012.

Land identified as Secondary Koala Habitat has been mapped within Woolgoolga Beach Reserve (**Map 10, Appendix C**) and any operations undertaken within the Reserve must also comply with the Coffs Harbour City Council Koala Plan of Management (CHCC KPoM) (Lunney, Moon, Matthews and Turbill, 1999).

An important regional wildlife corridor has been identified and mapped (Scotts, 2003) across Woolgoolga Beach Reserve and the flying-fox camp area facilitating movement of fauna along the coastal strip.

Coffs Harbour Biodiversity Action Strategy (2015) and Coffs Harbour Open Space Strategy (under review) both apply to the land upon which the Woolgoolga camp is located. This Plan is one of the key documents that will underpin the Biodiversity Action Strategy. Woolgoolga Beach Reserve forms part of Councils Open Space network and is required to have a Plan of Management (PoM) to guide actions and activities in the Reserve. A PoM would address issues such as bushfire risk and regulations, fire protection, consideration of Aboriginal and cultural heritage, vertebrate pest issues, flood and storm mitigation planning, consolidation of and mapping of access routes for services such as water and sewer infrastructure, authorised and unauthorised activities such as motorbike and bicycle riding, dog walking and the creation of trails and access points. Preparation of a PoM and updates and amendments to the Woolgoolga Beach VMP are required to ensure management of Woolgoolga Beach Reserve is strategically planned and includes consideration of such matters and how they interact with flying-foxes and camp management actions.

2.4 Reported issues related to the camps

The following list is a collation of the issues related to each camp that have been reported by the community; and/or listed in the existing Strategy and VMPs for Coffs Creek camp and Woolgoolga camp. Further discussion about community engagement efforts and outcomes can be found in **Section 3**.

2.4.1 Coffs Creek

There have been few approaches by residents to Council regarding issues with flying-foxes in the Coffs Creek area in recent times (2011 - 2017), particularly in comparison to the years between 1997 and 2008 when the camp was inhabited by a greater number of flying-foxes. Reported current and historical issues (CHCC, 2015) associated with the Coffs Creek camp include:

- urbanisation of the surrounding environment
- ongoing regular disturbance of the flying-fox camp
- encroachment of private space into the reserve
- an increasing weed presence
- flood mitigation issues and maintenance impacting on the reserve
- water quality issues
- community access issues and minimal facilities for the public in the reserve
- vandalism of the reserve
- noise as flying-foxes depart or return to the camp (acoustic testing results indicated levels 50 decibels above ambient at 3am when adults were returning to the camp in December 2004)
- noise from the camp during the day
- smell (particularly after or during rain in summer and autumn)
- fear of disease
- health and/or wellbeing impacts
- reduced general amenity
- damage to vegetation
- lack of understanding / knowledge about management actions taken by Council
- flying-foxes overhanging pathways / residential properties
- faecal drop on outdoor areas, cars and washing lines,
- canopy dieback due to utilisation of the camp as a permanent roosting site (CHCC 2015)
- The majority of issues related to the camp have been recorded during times when numbers exceeded 20,000 animals and often included large influxes of LRFF into the camp. An increase in complaints also occurred when the colony moved upstream, closer to residents on Adelines Way in response to destruction of roosting habitat at the southern end of the camp (2007-2008).
- The majority of issues discussed were related to odour and faecal drop on outdoor areas, cars, washing lines and play spaces. Respondents noted the difficulty of keeping property clean during water restrictions. Another key area of concern was the regular maintenance of vegetated buffers by CHCC.

2.4.2 Barcoo Court, Toormina

Reported issues associated with the Barcoo camp are similar to those at the Coffs Creek camp (**Section 2.4.1**). This camp has been the cause of the majority of complaints to Council since 2012. CHCC officers call or arrange to meet complainants in person to discuss and try to resolve any issues. There have been a number of complaints made to CHCC by residents of Barcoo Court over the last 5 years, to which Council has responded directly. Despite being invited, none of the residents of Barcoo Court attended the community workshop held during the development of this plan. Two residents from the surrounding area attended the workshop and provided constructive feedback.

Reported issues associated with the Barcoo Court camp include:

- urbanisation of the surrounding environment

- encroachment of private space
- presence of weeds
- noise as flying-foxes depart or return to the camp
- noise from the camp during the day
- smell (particularly after or during rain in summer and autumn)
- fear of disease
- health and/or wellbeing impacts
- reduced general amenity
- damage to vegetation
- frustration at perceived lack of action taken by Council
- flying-foxes overhanging pathways / residential properties
- faecal drop on outdoor areas, cars and washing lines,
- canopy dieback due to utilisation of the camp as a permanent roosting site
- The majority of issues related to the camp have been recorded during times when a large influx of either GHFF and / or LRFF was present in the camp.
- The majority of issues discussed were related to noise, odour and faecal drop on outdoor areas, cars, washing lines and play spaces.

There were two respondents from the surrounding area who attended the consultation session and enjoy the Barcoo Court camp and would prefer it is managed in situ. Reported positive feedback from these respondents related to the following:

- Recognition of the landscape-scale benefits flying-foxes provide through seed dispersal and pollination
- Acknowledgement of the need to conserve flying-foxes as an important native species
- Enjoyment gained from watching flying-foxes at the camp and/or flying out or in
- Appreciation of the intrinsic value of the camp
- Valued the camp as a potential tourism opportunity/attraction
- Appreciated the natural values of the camp and habitat
- Felt the camp impacted positively on their lifestyle and were lucky to have a camp nearby
- Valued the opportunity the camp provides for them and their family to get close to nature
- Recognised the need for people and wildlife to live together.

2.4.3 Woolgoolga

Reported issues associated with the Woolgoolga camp are similar to those at the Coffs Creek and Barcoo court camps (**Section 2.4.1**). CHCC officers call or arrange to meet complainants in person to discuss and try to resolve issues as they arise. Only one local Woolgoolga residents attended the community workshop held during the development of this plan.

Reported issues associated with the Woolgoolga camp include:

- Canopy trees are under threat of defoliation and/or death due to the presence of flying-foxes
- Original closed forest has been altered to an open, fragmented canopy with increased light levels and higher levels of weed incursion
- Heavy infestation by environmental weeds in certain areas
- Unauthorised camp access by pedestrians into existing remnant vegetation

- Ongoing issues regarding Woolgoolga Creek bank erosion and water quality (Coffs Harbour Bushland Regeneration Group VMP 2012)
- flying-foxes overhanging pathways / parks / road / tourist accommodation
- noise as flying-foxes depart or return to the camp
- noise from the camp during the day
- faecal drop on outdoor areas, cars and washing lines,
- smell (particularly after or during rain in summer and autumn)
- fear of disease
- health and/or wellbeing impacts
- The majority of issues related to the camp have been recorded during times when a large influx of GHFF and / or LRFF was present in the camp and the camp spilled over into areas that were closer to local residences (Sunset Caravan Park), tourist accommodation and Woolgoolga Beach and access tracks.
- The majority of issues raised were related to noise (tourists on holiday unable to sleep), odour and faecal drop in outdoor areas, along public access routes to amenities, cars, washing lines, play spaces. There was also concern about the perceived disease risk and general health and wellbeing.

There was one respondent from the surrounding area who enjoys the Woolgoolga camp and would prefer it is managed in situ. Reported positive feedback from this respondent related to the following:

- Acknowledgement of the need to conserve flying-foxes as an important native species
- Enjoyment gained from watching flying-foxes at the camp and/or flying out or in
- Appreciation of the intrinsic value of the camp
- Valued the camp as a potential tourism opportunity/attraction
- Valued the camp for potential educational opportunities for local students, community members and tourists
- Appreciated the natural values of the camp and habitat
- Felt the camp impacted positively on their lifestyle and were lucky to have a camp nearby
- Valued the opportunity the camp provides for them and their family to get close to nature
- Recognised the need for people and wildlife to live together.

2.5 Management response to date

2.5.1 Coffs Creek

In May 2001 NPWS officers met with Coffs Harbour City Council (CHCC) staff to canvas management options for the Coffs Creek camp. A community workshop was held in June 2001 to gather community concerns and the options they felt would address these concerns (Smith 2002). A draft Management Plan for the Coffs Creek camp was prepared in 2004. Following public exhibition of the draft plan, a working party with staff from CHCC, the NSW Department of Environment and Climate Change, a CHCC Councillor and community representatives was formed to develop the final plan, guided by the responses obtained from public submissions.

The final Coffs Creek Flying-fox Camp Management Strategy (the Strategy) and Vegetation Management Plan (VMP) were prepared by CHCC in consultation with relevant government agencies, community groups and other key stakeholders and adopted by Council in June 2007. Application for a Section 91 Licence under the TSC Act to modify habitat of a threatened species (GHFF), limit flying-fox numbers and impacts on surrounding residents was made in October 2007, as was a submission under the EPBC Act regarding potential impacts to the GHFF. The working group was in operation between

2005 and 2010, ceasing to meet once the most immediate actions relating to vegetation management as outlined in the Strategy and VMP were completed (CHCC, 2015).

The Strategy has three areas of focus being community values, ecological values, and urban landscape values. The main aims of the Strategy are as follows:

1. Community Values – incorporating community members into development of a plan to mitigate or ameliorate all perceived concerns expressed by the community regarding management of the Reserve. This included identifying long and short term measures to reduce impacts on neighbouring residents, monitoring of certain aspects of environmental health associated with the camp and providing a vegetated buffer between the camp and residents.
2. Ecological Values – improve the condition of, and restore the Endangered Ecological Community Lowland Rainforest on Floodplain within the Reserve, Primary Koala habitat within the Reserve, maintain and increase the value of the wildlife corridor across the Reserve, protect all listed Threatened Species, Endangered Ecological Communities and their habitat within the Reserve and implement a monitoring program for the Reserve.
3. Urban Landscape – provide recreational areas, educational and interpretative materials that support the long term goals and management of the Reserve, protect and enhance the coastal catchment values, address all of CHCCs legal responsibilities in a consolidated Plan, increase and enhance scenic values and visual amenity of the forested landscape within the Reserve.

The 2015 version of the Strategy and VMP finalises five years of on-ground works associated with Red Cedar Reserve (CHCC 2015). Management actions implemented to date and results obtained are outlined below.

A Water Quality Monitoring program was undertaken in 2003 to address potential pollution of Coffs Creek from both old and current upstream land use (banana plantations) and flying-foxes (CHCC, 2007). No identifiable pollution problems were attributed specifically to the flying-fox camp. Water Quality Monitoring continues to be conducted by CHCC through the Ecohealth program.

Camp disturbance monitoring was conducted during the summer season over several years in the early 2000's by CHCC officers. The aim was to limit unnecessary visitation to the camp by people and the operation of noisy machinery/tools in close proximity to the camp thereby reducing disturbance of flying-foxes and the noise emanating from the camp during the day. This was accomplished through education of neighbouring residents and regulation of certain noise emitting activities (CHCC, 2007).

A program of regular flying-fox camp monitoring was conducted by CHCC officers to record numbers and species present as well as the health and reproductive status of the colony (CHCC, 2007). Council officers and WIRES representatives monitored the camp for disturbance and the presence of dependent young as part of the implementation of the VMP between 2008 and 2012. The VMP was approved with an associated set of specific conditions and working requirements that were designed to protect flying-foxes from disturbance during works (CHCC, 2007). These requirements are similar to those described in **Section 9.3**. Council officers monitored flying-fox species and numbers at the camp on a quarterly basis until 2017 as part of the NFFMP and have done since the program's inception in 2012, with a small number of counts missed due to staff availability. WIRES flying-fox specialists will now assist Council in conducting NFFMP counts.

In accordance with the CHCC Coffs Creek Flying-fox VMP (**Map 11, Appendix C**) (CHCC, 2015);

- Weed control and infill planting was completed in Management Zone 1b in October 2012
- Removal of roost habitat from the rear of selected private properties in Gundagai Street backing onto Management Zone 2a (private property) was completed in 2009. Rehabilitation planting commenced in this area soon after and land owners were provided with advice from Council on vegetation management to minimise interactions with flying-foxes. This is a privately owned buffer and management of this area is the responsibility of individual landowners and does not form part of the VMP.
- Ground storey invasive weed species control was completed in Management Zone 2b and c (core camp area) during 2012. The VMP states that no large canopy weed species are to be removed from the core camp area in Management Zone 2, and this will continue to be enforced until significant regeneration of the core camp area has been achieved.
- Complete removal of large canopy weed species such as Camphor Laurel and Celtis from each property bordering the reserve and flood spillway in Management Zone 3a (private property), with associated rehabilitation planting completed in 2009.
- Selected removal of Camphor Laurel and Celtis from the Eastern end of the reserve and regeneration of riparian area in Management Zone 3b completed in 2011.
- Follow up weed control in Management Zone 4a completed in 2012.

If the VMP continues to be implemented, reviewed and updated over time, it will ensure the flying-fox habitat, the Endangered Ecological Community - Lowland Rainforest on Floodplain, Primary Koala habitat, the wildlife corridor and other listed Threatened Species, Endangered Ecological Communities and their habitat are restored and maintained within the Reserve. Whilst bush regeneration works have been undertaken at selected sites within the Reserve, weed removal and tree planting has occurred, follow-up works in previously managed sites and continued bush regeneration across the Reserve are required.

The number of flying-foxes at Coffs Creek camp reduced significantly between 2007 and 2010 from peak occupancy levels of 50, 000 to maximum numbers of 10, 000 - 15, 000, between 2012 and 2017. The reason for this decrease is not known. A varying degree of authorised (VMP) and unauthorised Camphor control occurred adjacent to and within the Reserve during this period and this resulted in a marked decrease in canopy cover that has not been replaced. No removal of canopy weed species within the core camp area was undertaken by CHCC officers as part of works required under the VMP.

With a reduction in the number of flying-foxes came a reduction in impacts felt by neighbouring residents (noise, smell, faecal drop, health concerns) and a similar reduction in complaints received by CHCC. There is a possibility that flying-foxes have largely avoided this camp since the marked reduction in canopy cover of the core camp area occurred. If this is the case, the Strategy's aim to restore and maintain habitat for listed threatened species that inhabit the Reserve (such as the GHFF), has not been met. Over the long term (20+ years), actions in the VMP aim to restore the native Lowland Rainforest community in this area which would provide suitable canopy cover, but there has been no immediate provision made for the loss of this canopy/roosting habitat for the GHFF in the interim period, partly owing to the fact that is was caused by unlawful conduct.

Environmental Health monitoring was conducted and whilst no specific impacts on water quality from the camp were reported, the water quality component continues to be monitored by CHCC. Noise level monitoring results were used to support the trimming of certain trees and vegetation near the worst affected properties. Whilst the vegetation works have been conducted, no follow-up monitoring of noise levels has occurred. It is assumed that noise levels are currently, and have previously been within acceptable limits because Council has not reported any further noise complaints. Whether these

measures will be adequate in the future if flying-fox numbers increase to peak occupancy levels is unknown.

Establishment of a vegetated buffer using native plant species between residents and the camp, excluding flying-foxes from roosting (trees less than 4m in outer buffer) but providing both a visual, noise and odour attenuation barrier in Management Zones 2b, 2c and 3b was completed in 2010 (**Figure 9**). Feedback from residents attending the community workshop in February 2017 suggests that maintenance of buffers is required to ensure they are performing the required function. Some areas of the buffer are reported to have grown beyond acceptable heights and are potentially providing flying-foxes with roosting and foraging habitat (Coffs Creek community workshop participants, pers.comm, Feb 2017). It was also reported that vegetation adjacent to the pedestrian bridge on the footpath between Adelines Way and Red Cedar Drive is overhanging the bridge and requires maintenance (**Figure 9**).

Improvement in the visual amenity and public access to the reserve has been conducted by CHCC with installation of footpaths and walkways, a pedestrian bridge, creation of a shaded children's playground, provision of recreational space and planting of a vegetated buffer (**Map 11, Appendix C**). The focus on educational material has been limited with no signage present at the Reserve providing any explanation of the Reserves values and the role of flying-foxes. Some residents expressed the desire to create a flying-fox theme at the children's playground during the February 2017 community workshop by incorporating educational materials, and in the design of new equipment. Neighbouring residents have also expressed concern about the safety of the pedestrian bridge at night, with no lighting provided (Coffs Creek community workshop participants, pers.comm, Feb 2017). At this stage Council has avoided installing lighting at this location as lighting may only increase the perception of safety rather than the actuality. Light spill may also negatively impact on nocturnal fauna using the area.

Management actions as set out in the Strategy and VMP have largely been implemented (CHCC, 2015). Management actions have been broadly successful in that;

- anecdotal evidence suggests community conflict regarding the flying-fox camp has reduced,
- the condition of the vegetation within the reserve has improved with the targeted removal of canopy, mid stratum and ground based weeds from within relevant management zones,
- rehabilitation and buffer plantings have become established,
- flying-foxes continue to inhabit the reserve
- flying-fox habitat contained within the reserve is formally protected by federal, state and local planning instruments and will be managed for continued use by flying-foxes and biodiversity conservation over the long term.

It is difficult to attribute the reduction in community conflict to any one action, or even the suite of management actions because it coincided with a reduction in the number of flying-foxes present at the camp. Whilst complaints from neighbouring residents of this camp are reported to have reduced over time (CHCC pers.comm.), there are no formal complaint records kept and as a result, there is no objective measure of the reduction in the number of complaints received by CHCC since adoption of the Strategy and implementation of management actions. It could be argued that the Strategy did not meet its objective of reducing community conflict to an acceptable level and promoting the co-existence of residents and flying-foxes considering that one resident felt strongly enough to illegally poison roost trees thereby reducing roost habitat within the camp during 2008-2009.

Outstanding management actions for the Reserve as reported in the 2015 Strategy update are presented in (**Table 1**):

Table 1: Outstanding Management Actions for Red Cedar Reserve (CHCC, 2015). Numbering follows that contained within the 2015 Strategy update and is not consecutive because only actions relevant to this Plan have been included.

Action Number	Action Category	Description	2015 status	2017 Plan Recommendation
5.1 Reserve Management				
1.4	Development Control Planning Policy	To prepare a Development Control Plan to guide development in and around existing, seasonal or temporary flying-fox camps within the LGA. The policy should aim to reduce the likelihood of future impacts on urban development through application of the following; Nomination of areas for possible future acquisition.	Not commenced	Investigate following release of preliminary habitat mapping from OEH, incorporating Eby and Law (2008) habitat mapping and winter and spring flowering tree species advice.
1.4	Development Control Planning Policy	Development of guidelines on buffer zones and restricted use areas in/around camps	Partially complete	Council to complete
1.4	Development Control Planning Policy	Develop control measures for properties impacted upon by camps to adequately provide for property and life style protection.	Partially complete	Council to complete
1.6	Staff Operational Sensitivity	Vegetation exclusion zone maintenance	Ongoing	Ensure in place for Red Cedar Reserve, Woolgoolga Beach Reserve and Barcoo (once VMP is finalised)
1.6	Staff Operational Sensitivity	Council information package	Not commenced	Seek to utilise existing resources, promote to operational staff. Incorporate newly developed resources each year during review of plan.
1.10	Formalise Implementation of Actions and Accountability	Monitoring of biodiversity	Ongoing	Continue to implement
1.10	Formalise Implementation of Actions and Accountability	Reporting to CHCC, OEH, DEE under licensing and plan implementation	Partially complete	Confirm status and complete where required
1.11	Implement Conservation Reserve Signage	Implementation of signage at strategic locations within the Conservation Reserve System to inform the public on prohibited acts within the conservation reserve system	Incomplete	Install new signage at all three camps following review of restrictive signage within Coffs Harbour Natural Area Reserve system.

Action Number	Action Category	Description	2015 status	2017 Plan Recommendation
1.11	Implement Conservation Reserve Signage	Domestic animal restrictions	Incomplete	As above
1.12	Identification of Sensitive Areas and Manage Hazards	Identification of hazard / natural disaster management priorities	Incomplete	Council to complete
1.12	Identification of Sensitive Areas and Manage Hazards	Flood mitigation works	Ongoing	Continue to implement
1.13	Apply the adaptive management approach	Communication methods and productivity of working group VMP / licensing requirements	Partially complete	Aligns with community feedback for more information from CHCC on implementation of actions. Council to continue to implement and improve educational resources and maintain regular community communications via a range of traditional and social media.
1.13	Apply the adaptive management approach	Information from a review of on ground restoration practices used to adjust implementation accordingly	Partially complete	Council to complete
5.2 Community Actions				
2.2	Involving the community and stakeholders in the management process	Addressing maintenance issues from the community	Ongoing	Aligns with community feedback for more information from CHCC on implementation of actions and regular maintenance of buffers at Coffs camp. Council to continue to implement and improve educational resources and maintain regular community communications via a range of traditional and social media. Council to seek funding to continue to implement VMP.
2.3	Cultural inclusion	Liaise with the Local Aboriginal Land Council to discuss input into the management of the reserve and interpretive material regarding the reserves cultural values.	Partially complete	Complete consultation with Garlambirla Guyuu Girrwaa Coffs Elders Group regarding naming of Red Cedar Reserve and invite comment from Elders on naming of the council reserve behind Barcoo Court.
2.6	Communication of outcomes and monitoring programs	CHCC to commit to regular release of information and updating of website information on management actions	Ceased 2009. Tied to operation of working group.	Re-commence with an educational focus, using traditional and social media platforms, positive media stories at key times in the year for flying-foxes and prior to / following implementation of management actions and camp counts.
2.7	Living with Flying-foxes Neighbourhood Information Session/s	Neighbourhood information sessions/s for the community on appropriate topics and courses of action covering but not limited to locating a sick or injured flying-fox in the reserve or at home.	Ongoing	Expand to include Woolgoolga and Barcoo neighbourhoods

Action Number	Action Category	Description	2015 status	2017 Plan Recommendation
5.3 The Restoration Process				
3.3	Works Program Safety Assessment	Identify additional trees which pose a threat to life or property	Ongoing	Continue to implement
3.5	Implementation of Vegetation Management Plan	Maintenance of tree vegetation, with structural issues will also be considered	Ongoing	Continue to implement
3.5	Implementation of Vegetation Management Plan	Core canopy closure / Canopy species establishment	Ongoing	Continue to implement
3.5	Implementation of Vegetation Management Plan	Encourage natural regeneration (of existing seed source) with ongoing control of exotic ground covers and vines.	Ongoing	Continue to implement
3.5	Implementation of Vegetation Management Plan	Adhere to the works schedules within each management zone (identified in VMP)	Partially complete	Continue to implement
3.6	Strategy Priority Implementation	Stage 3: Vegetation modification, to provide weed control in core roost area. Roost tree planting - low lying rainforest species.	Ongoing	Seek funding to continue to implement
3.6	Strategy Priority Implementation	Stage 4: Flood plain plants, with additional core roost plant, buffer and exclusion zones.	Ongoing	Seek funding to continue to implement
5.4 Biodiversity Management				
4.1	Monitoring of restoration works	Measuring the percentage of natural loss of vegetation	Ongoing	Continue to implement
4.2	Ecological Monitoring Program	Monitoring of flying-fox numbers and composition	Ongoing	Continue to implement in line with CSIRO National Flying-fox Monitoring Program 4 x year
4.2	Ecological Monitoring Program	Monitoring return of faunal diversity	Ongoing	Continue to implement
4.2	Ecological Monitoring Program	Monitor current Koala population within the reserve system	Ongoing	Continue to implement
4.2	Ecological Monitoring Program	Monitor weed composition within the camp	Ongoing	Continue to implement
4.2	Ecological Monitoring Program	Create a photographic diary of restoration works	Incomplete	Initiate with Council bush regeneration team

Action Number	Action Category	Description	2015 status	2017 Plan Recommendation
4.2	Ecological Monitoring Program	Monitor level of natural regeneration	Ongoing	Continue to implement
4.3	Compliance with Biodiversity Planning Policies	Coffs Harbour Environmental Awareness Strategy	Incomplete	Review and update Strategy accordingly
4.4	Compliance with State And Federal Conservation Policies	Threat Abatement requirements such as identification and mitigation	Partially complete	Threats identified in Section 6.3 of the Plan
5.5 Research				
5.1	Alternative Site Investigation	CHCC to conduct research into alternative site selection for the camp; Vegetation modelling for alternative sites	On hold until a Local Government Flying-fox Camp Strategy can be completed	Investigate following release of preliminary habitat mapping from OEH, incorporating Eby and Law (2008) habitat mapping and winter and spring flowering tree species advice.
5.1	Alternative Site Investigation	ID particular areas of importance and grade them according to all community and habitat parameters	As above	As for Action 5.1 above
5.1	Alternative Site Investigation	Associated threats to each of the sites	As above	As for Action 5.1 above
5.1	Alternative Site Investigation	Possibility of roost protection into the future	As above	As for Action 5.1 above
5.1	Alternative Site Investigation	Clarification of criteria for humidity and temperature requirements and suitability.	As above	As for Action 5.1 above
5.2	Define scientific research required	Support CSIRO national flying-fox counts	Ongoing	Continue to implement in line with CSIRO National Flying-fox Monitoring Program 4 x year
5.2	Define scientific research required	Support research into health impacts of flying-fox camps	Supported	Continue to implement
5.3	Establish Regional Planning Contacts	CHCC to create a network of other Councils with similar flying-fox management objectives on the North Coast of NSW	Ongoing	Continue to implement
5.6 Additional Actions				
	Heat Stress event planning	Being developed with WIRES, currently in Draft	Actioned	Best Practice Guidelines documented in Plan, key elements of WIRES Draft Mass Flying-fox Disaster Incident Guidelines included in Plan (Section 8.2.7)

Action Number	Action Category	Description	2015 status	2017 Plan Recommendation
	Vertebrate pest issues	Not addressed under this plan	On hold	Not addressed under this plan
	Tree poisoning	Currently under investigation with CHCC	Ongoing	Continue to implement
	Website information on question and answer		On hold	Incorporate into upgrade of educational resources on Council website

2.5.2 Barcoo Court, Toormina

There has been no management plan produced or any management actions undertaken at the Barcoo camp to date. Routine council maintenance of the Council Reserve and playing fields is limited to mowing of grassy areas. There are a number of environmental weeds and garden escapes present at this site that will require consideration. Production of a Plan of Management (PoM) for the Reserve would assist in the preparation of a VMP for this Reserve because it would take into account a range of competing management issues including bushfire risk, fire protection, Aboriginal and cultural heritage values, vertebrate pest management, flood and storm mitigation planning, mapping of access routes for services such as water and sewer infrastructure, authorised and unauthorised activities such as motorbike and bicycle riding, dog walking and the creation of trails and access points.

Council officers have monitored flying-fox species and numbers at the camp on a quarterly basis as part of the NFFMP. WIRES flying-fox specialists will now assist Council to conduct quarterly NFFMP counts.

Barcoo Court residents have made a number of complaints to Council over the past few years in regards to the flying-fox camp (Sue Stewart and Rachel Binskin pers. comm.). There are no formal records of flying-fox related complaints kept at Council. Council officers have attended the site and spoken with individual residents personally on a number of occasions.

2.5.3 Woolgoolga

A VMP was prepared by the Coffs Harbour Bushland Regeneration Group (2012) for CHCC which defined management zones 1 and 2 within the Woolgoolga Beach Reserve area and flying-fox camp (**Map 12, Appendix C**). Zone 1 restoration goals are to eradicate priority environmental weeds, deplete and exhaust the environmental weed seed bank, restore canopy through revegetation works and develop and enhance floristic structure and diversity. Zone 2 restoration goals are to eradicate priority environmental weeds and deplete the weed seed bank.

Management Zone 1

- Zone 1 was occupied by the flying-fox colony in 2012. This is a priority area of vegetation for restoration works, which are restricted to April – October each year.
- The disturbed area of Zone 1 supports canopy trees under threat of defoliation and/or death, as an ongoing natural process due to the presence of flying-foxes. Closed forest has been altered to an open, fragmented canopy with increased light levels and higher levels of weed incursion.
- The regenerating midstorey declines in resilience from south to north. The northern area of Zone 1 is heavily infested by environmental weeds. The southern area of vegetation is of moderate resilience with a low level of weeds, good native ground cover and natural regeneration in progress.
- A combination of low edge to area ratio and the presence of native canopy contribute to this area maintaining a high level of viability for restoration.
- Restoration work will occur in staged, localised areas to minimise flying-fox disturbance and allow the colony to adjust to work zones.
- Where required, revegetation of Littoral Rainforest and Swamp Sclerophyll Forest canopy species will supplement canopy gaps throughout Zone 1 and revegetation of understorey tree species into areas of dense weed infestation in the north of Zone 1.
- Restoration goals: eradicate priority environmental weeds, deplete and exhaust the environmental weed seed bank, restore canopy through revegetation works, develop and enhance floristic structure and diversity.

Management Zone 2

- A portion of Zone 2 was occupied by the flying-fox colony in 2012. Zone 2 has benefited from over 10 years of weed control and has a low level of environmental weeds.
- In the absence of major disturbance Zone 2 has developed substantial resilience to environmental weed infestation.
- The majority of Zone 2 supports intact native canopy, understorey and groundcover layers.
- Restoration goals: eradicate priority environmental weeds and deplete the weed seed bank.

The Coffs Harbour Bushland Regeneration Group VMP (2012) identified vegetation management strategy principles in relation to the Woolgoolga camp. Recommended works include:

- Revegetation around the periphery of the main camp using indigenous species to create a sheltered environment for flying-foxes and to buffer environmental extremes (e.g. temperature changes, wind exposure) to maintain an optimal roosting climate. Revegetation works also aim to fill existing gaps in the canopy.
- Control weed species across the site and maintain revegetation works through a regular weed control programme. Targeted weed control works will also increase available flying-fox habitat area within the main camp through natural regeneration of indigenous species, in conjunction with targeted revegetation works.
- Reduce unauthorised camp access by densely planting *Lomandra* and *Gahnia* species around the perimeter of the existing vegetation to delineate the authorised access track and encourage its use by pedestrians.
- Protection of estuarine areas through an on-going weed control and revegetation program to enhance creek bank stability, reduce weed incursion, promote natural regeneration of indigenous species and improve water quality.

Council officers have monitored flying-fox species and numbers at the camp on a quarterly basis as part of the NFFMP. WIRES flying-fox specialists will now assist Council to conduct quarterly NFFMP counts.

Community members, residents of Sunset Caravan Park and visitors to Woolgoolga Lake Caravan Park have made a number of complaints to Council and local members of parliament over the past few years in regards to the flying-fox camp (Sally Whitelaw, Sue Stewart pers. comm.).

3 Community engagement

A Flying-fox Land Managers' Network exits for land managers of flying-fox camps. CHCC participates in this forum and networks with relevant stakeholders to build upon other land managers' experience in the management of flying-fox camps. The forum is administered by OEH. The Strategy (CHCC, 2007) also recommended this as a management action.

3.1 Stakeholders

There are a range of stakeholders who are directly or indirectly affected by the three camps, or who are interested in its management. Stakeholders include those shown in **Table 2**.

Table 2: Stakeholders in the camps and Plan

Stakeholder	Interest/reported impacts
Residents who surround the Coffs Creek, Barcoo and Woolgoolga camps • Northern Beaches Residents Association	Residents living in streets surrounding each camp (generally within 500m of the Coffs Creek and Barcoo Court Camps and up to 1km from the Woolgoolga Camp) were personally invited to attend a community consultation. Numerous (estimated at approximately 100) complaints have been received by CHCC from neighbouring residents at all three camps in the period 1997 – 2017). Coffs Creek has traditionally been the source of most complaints (1997 – 2009) when the camp became permanent and numbers were often at or near peak occupancy. Complaints in recent times (2007 – 2016) have come more often from neighbouring residents of the Woolgoolga camp, but generally only during peak occupancy. Complaints from neighbouring residents of the Barcoo Court camp started soon after establishment of the camp in 2012 and increase during periods of peak occupancy. The Northern Beaches Residents Association addresses local issues and provides a voice for the region's residents. Invited to participate in community consultation but did not respond. Reported impacts/interests specific to residents include bat conservation, noise, smell, faecal drop, health / wellbeing / fear of disease, property devaluation and lost rental return

Stakeholder	Interest/reported impacts
Business owners • Coffs Harbour Chamber of Commerce	Interests specific to business owners include property devaluation, health / wellbeing / fear of disease, bat conservation, noise, smell and faecal drop. No reported complaints from local business owners or Chamber of Commerce
Indigenous community • Gumbaynggirr nation • Coffs Harbour & District Local Aboriginal Land Council (CH LALC) • Coffs Harbour 'Repair to Country' team (Darrunda-wajaar) • Yarrawarra Aboriginal Corporation	There are a number of recognised clan groups within the Gumbaynggirr Nation, including the Garby Elders, Garlambirla Guyuu Girrwaa (Coffs Elders group), Gumbular Julipi Elders and Bagawa (Coffs Harbour City Library 2013). The local indigenous community has a vision for a healthy ecosystem where plants and animals flourish. Coffs Creek (Buluunggal) plays an important role in the local aboriginal culture. Coffs Harbour LALC own and manage 7 ha of bushland along Coffs Creek for conservation. The Coffs Harbour 'Repair to Country' team undertakes bush regeneration contracts along Coffs Creek (CHRL 2015). CHCC is consulting with the Garlambirla Guyuu Girrwaa Coffs Elders Group regarding naming the Red Cedar Drive Reserve system after the traditional name for flying-fox (CHCC 2015). Yarrawarra Aboriginal Corporation at Corindi Beach is based in the homelands of the Garby Elders and Gumbaynggirr people, and preserves cultural knowledge for the Aboriginal community (www.yarrawarra.org.au). The Woolgoolga camp is located approximately 9 km south of the Yarrawarra Aboriginal Cultural Centre. Interests include cultural significance, bat conservation, preservation of native bushland and waterways.
Coffs Harbour Regional Landcare • Friends of Coffs Creek	Coffs Harbour Regional Landcare (CHRL) is a not for profit community organisation coordinating volunteers working on coastal sites across the Coffs Harbour area such as Coffs Coast Regional Park, council reserves or other public land. CHRL is a partner in the Jaliigirr Biodiversity Alliance (http://coffsharbourlandcare.org.au). Friends of Coffs Creek works along the Coffs Creek riparian zone undertaking rehabilitation works in remnant bushland, which includes two EECs and habitat for many threatened species such as GHFF (www.landcare.nsw.gov.au). Interests include bat conservation and preservation of native bushland and waterways.

Stakeholder	Interest/reported impacts
Schools and Early Childhood Centres	Schools/day care centres within 500m of camps include; Woolgoolga High School - Woolgoolga Lake Narranga Public School - Coffs Creek Lilly Pilly Early Learning Centre – Coffs Creek Goodstart Early Learning Centre – Barcoo Court Several Family Day Carers operate within the area surrounding Coffs Creek Reported impacts/interests include health / wellbeing / fear of disease, noise, smell, faecal drop and property devaluation
Hospitals • Coffs Harbour Health Campus	Coffs Harbour Health Campus is located within 3 km of the Coffs Creek and Barcoo Court camps. Interests include health / wellbeing / fear of disease, noise from foraging animals.
Airports • Coffs Harbour Regional Airport	Airport managers have a responsibility to reduce the risk of wildlife-aircraft strike. Coffs Harbour Regional Airport is located within 3.8 km of the Coffs Creek camp (see Section 8.2.7). Reported impacts/interests specific to airports include bat strike risk, bat detection, bat monitoring and reporting, hazard communication, landscaping management.
Equine facilities and vets • Boambee Equestrian Centre • S and K Horse Connections • HWH Stables • Nana Glen Sport, Recreation and Equestrian Centre	Equine facility managers and local vets should be aware of Hendra virus risk and appropriate mitigation measures. Where feasible, all horse owners within 20 km of the camps should be included in such communications. Boambee Equestrian Centre is located 2.6km west of the Barcoo Court camp[1]. S and K Horse Connections Equine Centre and Riding School is located 4km south and 5km west of the Barcoo Court camp[1]. HWH stables is located 11km west of Coffs Creek camp[1]. Nana Glen Sport, Recreation and Equestrian Centre is located 17.3km west of Woolgoolga Lake camp[1]. Interests/impacts include health / wellbeing / fear of disease, faecal drop.

Stakeholder	Interest/reported impacts
Orchardists and fruit growers	Fruit growers may be impacted by flying-foxes raiding orchards. There have been government programs and subsidies provided to this industry to protect crops in the form of netting since 2011. There are several orchards, blueberry farms and banana plantations within 20 km (common foraging distance) of each of the three camps. Reported impacts/interests specific to fruit growers include crop protection, bat conservation, noise, smell, faecal drop and property devaluation.
Other/adjoining landholders map showing cadastre of land ownership	All camps occur on Council owned and managed land. Adjoining landholders include private citizens and local businesses whose concerns have already been addressed in this table.
Civic leaders and influencers (including local, state and federal politicians) • Andrew Fraser, State Member of Parliament for Coffs Harbour electorate • Luke Hartsuyker, Federal Member for Parliament for Cowper electorate • 9 Councillors	Resident concerns and complaints include bat conservation, health / wellbeing / fear of disease, noise, smell, faecal drop, property devaluation and lost rental return.
National Parks Association (NPA)	A non-profit organisation that seeks to protect, connect and restore the integrity and diversity of natural systems in NSW and beyond, through National Parks, marine sanctuaries and other means. Interests include bat conservation and preservation of native bushland and waterways.
Local government • Coffs Harbour City Council	Local government has responsibilities to the community and environment of the area for which it is responsible in accordance with the *Local Government Act 1993*. Council is also responsible for administering local laws, plans and policies, and appropriately managing assets (including land) for which it is responsible.
Local Government NSW (LGNSW)	LGNSW is an industry association that represents the interests of councils in NSW. LGNSW is able to assist councils by providing funding opportunities for the implementation of management actions associated with the Plan.

Stakeholder	Interest/reported impacts
NSW Office of Environment and Heritage (OEH) • NSW National Parks and Wildlife Service (NPWS)	OEH is responsible for administering legislation relating to (among other matters) the conservation and management of native plants and animals, including threatened species and ecological communities. NPWS manage over 850 NSW national parks and reserves and are committed to the conservation of NSW biodiversity and cultural heritage. Interests include bat conservation and preservation of native bushland and waterways. OEH is also a source of advice and information relating to the management of flying foxes. OEH is able to assist councils by providing funding opportunities for the implementation of management actions associated with the Plan.
Commonwealth Department of the Environment (DoE) (relevant to camps with grey-headed flying-foxes or other matters of national environmental significance)	DoE is responsible for administering federal legislation relating to matters of national environmental significance, such as the grey-headed flying-fox and any other federally-listed values of the camp site.
Wildlife carers and conservation organisations • NSW Wildlife Information, Rescue and Education Service (WIRES) • Royal Society for the Protection of Animals (RSPCA)	Wildlife carers and conservation organisations have an interest in flying-fox welfare and conservation of flying-foxes and their habitat. These groups are made up of dedicated volunteers with experience and skills in wildlife care and rescue. All flying-fox carers are vaccinated against Lyssavirus. Mid North Coast WIRES have an existing relationship with Council and will continue to consult with Council and advise Council on matters pertaining to flying-foxes, particularly in the areas of animal welfare, heat stress and other incidents. Mid North Coast WIRES will be assisting Council to conduct quarterly NFFMP counts at camps within the LGA. RSPCA will provide advice and assist Council, where required to maintain compliance with the Prevention of Cruelty to Animals Act 1979.
Department of Health	Inform and advise Council if a public health matter arises in the vicinity of any of the flying-fox camps and is related in any way to human and flying-fox interactions.
Researchers/universities/CSIRO • Southern Cross University	Researchers have an interest in flying-fox behaviour, biology and conservation.

Table 3 provides a summary of the infrastructure present within 500m of the three camps being reviewed in this plan, and the distance to each camp at maximum occupancy.

Table 3: Infrastructure present within 500m of each camp and distance to each camp at maximum occupancy

Flying-fox camp	Infrastructure within 500m	Proximity (m)
Barcoo	Urban dwellings	25 - 500
Barcoo	Hargraves Park (Rugby club)	50
Barcoo	Various businesses	50-80
Barcoo	Goodstart Early Learning Centre	80
Barcoo	Sawtell Fire Station	80
Barcoo	Playing fields	150
Barcoo	Link Indoor Leisure Centre	200
Barcoo	Service station	200
Barcoo	Industrial estate (Hi Tech Drive)	200
Barcoo	Sawtell Catholic Care of the Aged	250
Barcoo	Toormina shopping centre	250
Coffs Creek	Urban dwellings	5 - 500
Coffs Creek	Lilly Pilly Early Learning Centre	90
Coffs Creek	Narranga Public School	250
Woolgoolga	Woolgoolga Lakeside Holiday Park	10 - 60
Woolgoolga	Urban dwellings	75 - 500
Woolgoolga	Cemetery	200
Woolgoolga	Sunset Caravan Park	200
Woolgoolga	Woolgoolga High School	475

3.2 Engagement methods

Considerable effort has been made to engage with the community regarding the flying-fox camp to:

- understand the issues directly and indirectly affecting the community
- raise awareness within the community about flying-foxes
- correct misinformation and allay fears
- share information and invite feedback about management responses to date
- seek ideas and feedback about possible future management options

The types of engagement that have been undertaken in the development of this plan include:

- promotion of contact details of responsible officers
- telephone conversations to record issues and complaints

- face-to-face meetings and telephone calls with adjacent residents and complainants
- media (print, social media)
- brochures and other educational material
- website pages and links
- direct contact with adjacent residents and stakeholders via letter
- public meeting / workshop
- feedback form available at public meeting / workshop

A consultation timeline was provided to participants at the public meeting / workshop and will be posted on Councils website once the draft plan goes on display for public comment.

Workshop participants were provided with the option of going on a mailing list to be kept up to date with plan development and implementation. Regular statements regarding progress against the Plan online and via the mailing list will assist to keep the community engaged. Information could include actions undertaken to secure funding for the implementation of ongoing management, notifications to the community of planned actions and the completion of planned actions at each roost camp, articles of interest regarding flying-foxes, notifications of quarterly counts and links to the NFFMP we viewer. Use of media if anything occurs, i.e. publishing a feature article in local paper, radio interviews, traditional and social media, will also assist.

3.3 Community feedback – management options

CHCC met with Eco Logical Australia (ELA) in 2016 to discuss an approach to a planned community flying-fox consultation session. The outcomes of this meeting included:

- CHCC to distribute a letter to relevant stakeholders including residents adjacent to the three camps, WIRES, Chamber of Commerce, Northern Beaches Residents Association, National Parks Association, Office of Environment and Heritage / National Parks and Wildlife Service and the Local Aboriginal Land Council.
- A community consultation session was planned for early 2017.
- ELA to provide a flying-fox management plan project overview.
- Panel (ELA and CHCC) will listen to, respond and record concerns expressed during meeting.
- ELA will present and discuss management ideas based on experience with other camps and OEH template.

A community consultation session was held on 15 February 2017 by CHCC and ELA at the Narranga Public School. This session was attended by 10 community members and 1 stakeholder representative (WIRES). A number of completed community feedback forms were provided to Council after the consultation session.

A summary of the main feedback received from the community consultation is as follows:

- Three valid community feedback forms were completed during the 2017 community consultation session.
- The overall feedback from the community received via engagement favoured flying-fox camp management measures that:
    - would be unlikely to have a negative impact on the flying-foxes
    - would not change the natural or ecological values of the site

- would not impact on the visual appeal or on recreational opportunities currently undertaken at the site.
- were of low financial cost to residents and businesses near the site
- provided a long-term solution
- ensured the risk of transmission of flying-fox pathogens, viruses and disease remains low
- reduced the impact of noise and odour on nearby residents and businesses
- reduced the impact of flying-fox excrement
- would be unlikely to risk moving the camp or impacts to other areas that may also be near residents or businesses

Table 4 provides a summary of the feedback gathered during the 2017 community consultation session.

Table 4: 2017 community feedback

Camp	Main concerns	Priority management options	Comments
Woolgoolga	1. Continues health of flying-fox population. 2. Environmental and tree protection. 3. Site recreational uses continued.	1. Increased education (e.g. Woolgoolga High School) on benefits of a local camp. 2. Camp population monitoring by various interested groups (e.g. schools, community). 3. Development of a seed collection, propagation and revegetation project for buffer zones of camp. 4. Regular Council feedback to interest groups about camp health, population numbers and bat species (GHFF, BFF, LRFF).	Disappointed at lack of community interest in Woolgoolga camp
All camps	1. Protection of flying-foxes. 2. Protection of camp habitat. 3. Increased effort to actively manage camps.	1. Manage and protect local wildlife (and flying-fox) habitat. 2. No clearing of camp habitat. 3. No killing of flying-foxes.	Nil
All camps	1. Preserve and protect all existing camps. 2. Use Council planning instruments to progress the plan for expanding wildlife habitat zones (including flying-fox). 3. Increased community education on benefits of a local camp.	1. Land/habitat protection and acquisition. 2. Land/habitat rehabilitation programs. 3. Regulatory instruments to stop the killing of flying-foxes. 4. Community education and support for wildlife rescue groups (e.g. WIRES etc.). 5. Advice and support for Level 1 strategies. 6. Distribute education materials to residents living near camps which explain the benefits of a local camp.	Great ideas presented by Council about educational signage around camps (including Toormina). Distribute education materials to residents living near camps which explain the benefits of a local camp.

4 Legislation and policy

Legislation and policies that are applicable to flying-fox management is provided below.

4.1 Local government

Local government is required to prepare planning schemes (including Environmental Planning Instruments and Development Control Plans) consistent with provisions under the *Environmental Planning and Assessment Act 1979* (EP&A Act; see Section 4.2.5).

Planning schemes enable a local government authority to manage growth and change in their local government area (LGA) through land use and administrative definitions, zones, overlays, infrastructure planning provisions, assessment codes and other administrative provisions. A planning scheme identifies the kind of development requiring approval, as well as zoning all areas within the LGA based on the environmental values and development requirements of that land.

Local Environment Plans are environmental planning instruments that are legal documents and that relate to a local government area. Other environmental planning instruments, such as State Environmental Planning Policies (SEPPs), may relate to the whole or part of the state. A development control plan provides detailed planning and design guidelines to support the planning controls in a Local Environment Plan.

Coffs Harbour Local Environment Plan 2013 relates to this Plan by providing land use zonings which allow certain types of activities within lands mapped under each type of zoning. Coffs Creek camp and Barcoo Court, Toormina are both primarily zoned E2 for Environmental Protection. The Woolgoolga Lake camp is zoned RE1 for Public Recreation, allowing a broader range of activities than E2. The LEP also provides details regarding the Preservation of Trees or Vegetation which seeks to preserve the amenity of an area, including biodiversity values through the preservation of trees and other vegetation, Heritage Conservation (cultural and Aboriginal), and Terrestrial Biodiversity (including provisions to protect Koala Habitat, wildlife corridors and High Value Arboreal Habitat). Some of these clauses (Preservation of Trees and Vegetation) will be replaced by the *Biodiversity Conservation Act 2016* (see Section 4.2.1 below).

Coffs Harbour Development Control Plan 2015 aims to give effect to the aims of the LEP, facilitate development that is permissible under the LEP and achieve objectives of land use zones under the LEP. Council has drafted amendments to relevant sections of the DCP to ensure new developments are assessed in the context of the existing flying-fox camps.

Coffs Harbour Biodiversity Action Strategy (CHCC, 2015) sets out the process by which Council identifies, and protects biodiversity values across the LGA. This Plan is one of several key documents that feed into the Biodiversity Action Strategy. It also provides guidance on how to avoid, reduce or minimise, mitigate and ameliorate impacts to biodiversity values and provisions for restoration and rehabilitation, offsetting and compensation for impacts. The way that impacts to biodiversity are dealt with under NSW state environmental legislation is changing under the Biodiversity Conservation Act (see Section 4.2.1 below). Of particular importance is the method by which impacts will be offset or compensated for. Trimming and potential removal of vegetation to create buffers at Barcoo Court, as recommended in Section 8.3.1 of this Plan may require alternative assessment pathway and offsetting calculations than presented in the Coffs Harbour Biodiversity Action Strategy.

Coffs Harbour Open Space Strategy (CHCC, 2010) is currently under review. It is designed to guide the planning, management and development of Councils Open Space network to meet the needs of a growing community. As a manager of community land under the Local Government Act, Council is required to ensure appropriate levels of Council resources are set aside for Open Space management, ensure consideration of the impacts of the residential interface with Open Space areas are planned for and mitigated at DCP and subdivision stage, ensure up to date and relevant Plans of Management are completed for reserves, and develop a good neighbour program to reduce impacts on natural areas. Management actions outlined for each of the camps in this Plan adhere to the broad aims of the Open Space Strategy (2010).

4.2 State

4.2.1 Local Government Act 1993

The primary purpose of this Act is to provide the legal framework for an effective, efficient and environmentally responsible, open system of local government. Most relevant to flying-fox management is that it also provides encouragement for the effective participation of local communities in the affairs of local government and sets out guidance on the use and management of community land. All three flying-fox camps that are the focus of this Plan occur on community owned land (Council Reserves).

As a requirement of the LG Act, Council is required to prepare Plans of Management (PoM) for Council owned community land. These PoM include a description of the land, objectives and performance targets for the land, a description of buildings or improvements on the land and specify purposes for which any further development of the land will be permitted. Future revisions of PoM will be required to balance the range of management issues for each reserve, some of which have the potential to be affected by flying-fox management. Issues include but are not limited to Aboriginal and cultural heritage, bushfire risk, flood and storm mitigation works, vertebrate pests, access points, walking trails, vegetation management and authorised and unauthorised activities. Consideration of all the issues from a whole of reserve approach is necessary from a statutory standpoint to allow operational works programs to proceed with minimal risk to the public and Council.

4.2.2 Biodiversity Conservation Act 2016

In November 2016 the NSW parliament passed the *Biodiversity Conservation Bill 2016*. This new legislation will replace the *Threatened Species Conservation Act 1995* and provisions relating to animals and plants in the *National Parks and Wildlife Act 1974* and is due to take effect 25 August 2017. Among other things, the Biodiversity Conservation Act introduces new requirements for biodiversity assessment and will require proponents to offset significant biodiversity impacts through the purchase and retirement of biodiversity credits. It will also change the requirements around licensing of actions relating to impacts upon threatened species such as the Grey-headed Flying-fox. The government has recently exhibited draft regulations that provide further detail on the changes as well as establishing the transitional arrangements for projects which are being assessed during the time period in which the new legislation will take effect. This Plan has been prepared in accordance with the legislation that applies as of the date of publication of this report (prior to 25 August 2017) and the transitional arrangements published by the government.

Given that the Plan will be implemented after the 25 August 2017, the BC Act may apply and consideration has been given to the way that the new legislation may affect implementation of the Plan. Assessments of impacts under this Plan will be conducted under Part 5 of the EP&A Act because all camps and management actions recommended occur on Council owned land. Upon completion of a Review of Environmental Factors (REF) for proposed works or actions impacting Grey-headed Flying-foxes or other threatened species, populations or communities, Council can opt into or out of the

Biodiversity Assessment Methodology for determining the value of any offsets required as a result of proposed works under the Biodiversity Conservation Act 2017. Opting out means that impacts would be assessed under a 5 part test of significance (very similar to existing approval pathways). Opting in would require Council to determine whether the Biodiversity Assessment Methodology is triggered by proposed works or actions and a Biodiversity Assessment Report required.

4.2.3 Flying-fox Camp Management Policy 2015

The Flying-fox Camp Management Policy 2015 (the Policy) has been developed to empower land managers, primarily local councils, to work with their communities to manage flying-fox camps effectively. It provides the framework within which OEH will make regulatory decisions. In particular, the Policy strongly encourages local councils and other land managers to prepare Camp Management Plans for sites where the local community is affected. OEH developed the Flying-fox Camp Management Plan Template 2016 as part of the Policy.

Under the Biodiversity Conservation Act, a biodiversity conservation licence for a pre-determined amount of time will be required to allow approved actions (impacting upon threatened species, communities or threatened species habitat) to proceed without prosecution under the Act. No further detail is available on the licensing requirements that will apply under the Biodiversity Conservation Act in relation to management actions that may impact upon threatened species habitat (namely roosting habitat of the Grey-headed Flying-fox).

4.2.4 Threatened Species Conservation Act 1995

The objectives of the *Threatened Species Conservation Act 1995* (TSC Act) include to conserve biological diversity and protect the critical habitat of threatened species, populations and ecological communities. The GHFF is listed as threatened under the TSC Act.

Section 91 of the TSC Act provides for the application of licences if the proposed action is likely to result in one or more of the following:

a. harm to any animal that is of, or is part of, a threatened species, population or ecological community
b. the picking of any plant that is of, or is part of, a threatened species, population or ecological community
c. damage to critical habitat
d. damage to habitat of a threatened species, population or ecological community.

An assessment of impacts is required for any threatened species or their habitat, population, or ecological community that may be impacted by actions proposed in the Plan. Further detail is provided in Sections 9 and 10.

Section 94 of the Act provides factors (the 7-part test) to assess whether the proposed action is likely to have a significant effect on any threatened species or their habitats, population or ecological community (note, this is therefore not just applicable to flying-foxes). If OEH determines that a significant effect is likely, it may require a species impact statement (SIS) to be prepared and publicly exhibited. If OEH assesses a section 91 licence application and determines that a significant impact is unlikely, a section 95 certificate will be issued.

As stated above, the TSC Act will be repealed and replaced with the Biodiversity Conservation Act during the latter half of 2017. Assessment of impacts to the threatened Grey-headed Flying-fox as a result of recommended management actions from the Plan have been conducted under the existing

legislation as per the transitional arrangements. Licensing and approvals for implementation of the Plan will be based upon information provided in Section 9 and 10.

4.2.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the conservation of nature, objects, places or features of cultural value and the management of land reserved under this Act. All native animals and many species of native plants are protected under the NPW Act. All native fauna, including flying-foxes, are specifically protected under section 98.

Under this Act, licences can be issued for actions such as harming or obtaining any protected fauna for specified purposes, picking protected plants or damaging habitat of a threatened species, population or ecological community. Note that the definition of 'harm' includes to hunt, shoot, poison, net, snare, spear, pursue, capture, trap, injure or kill. The definition of 'pick' includes to *gather, pluck, cut, pull up, destroy, poison, take, dig up, crush, trample, remove or injure the plant or any part of the plant*.

Camps which only support LRFF and/or BFF records (not threatened, but protected under the NPW Act) and no GHFF records (listed as threatened under the TSC Act), may require a licence under section 120 of the NPW Act.

OEH is unlikely to support any actions proposed in a Camp Management Plan that involves dispersal of flying-foxes from lands under National Parks and Wildlife Service (NPWS) control.

As stated above, certain sections of the NPW Act will be repealed and replaced with the Biodiversity Conservation Act during the latter half of 2017. Assessment of impacts to the threatened Grey-headed Flying-fox as a result of recommended management actions from the Plan have been conducted under the existing legislation as per the transitional arrangements. Licensing and approvals for implementation of the Plan will be based upon information provided in Section 9 and 10.

4.2.6 Prevention of Cruelty to Animals Act 1979

It may be an offence under this Act if there is evidence of unreasonable/unnecessary torment of flying-foxes or other animals associated with camp management activities. Adhering to welfare and conservation measures provided in Section 9.3 will ensure compliance with this Act.

4.2.7 Companion Animals Act 1998

This Act aims to provide for the effective and responsible management of companion animals including domestic dogs which can cause stress to flying-foxes. It is an offence under this Act to allow a dog to harass native fauna. Section 6A(1) of the Act requires councils to promote awareness of the requirements of the Act with respect to the ownership of animals. To satisfy that requirement Coffs Harbour Council adopted a Companion Animals Management Plan (CAMP) in August 2000. Under the CAMP (CHCC, 2000), Woolgoolga Lake (north of Lake Road, in the barbeque area bounded by the caravan park, Woolgoolga Creek and the Woolgoolga Beach Reserve Trust) is an area where dogs are prohibited. Red Cedar Reserve and the Coffs Creek Flying-fox Camp, the Barcoo Court, Toormina Flying-fox Camp and Woolgoolga Lake Flying-fox Camp are all areas where dogs are permitted on leashes.

4.2.8 Environmental Planning and Assessment Act 1979

The objects of the *Environmental Planning and Assessment Act 1979* (EP&A Act) are to encourage proper management, development and conservation of resources, for the purpose of the social and economic welfare of the community and a better environment. It also aims to share responsibility for environmental planning between different levels of government and promote public participation in environmental planning and assessment.

The EP&A Act is administered by the NSW Department of Planning and Environment.

Development control plans under the Act should consider flying-fox camps so that planning, design and construction of future developments is appropriate to avoid future conflict.

Development under Part 4 of the Act does not require licensing under the TSC Act.

Where public authorities such as local councils undertake development under Part 5 of the EP&A Act (known as 'development without consent' or 'activity'), assessment and licensing under the TSC Act may not be required. However a full consideration of the development's potential impacts on threatened species will be required in all cases.

Where flying-fox camps occur on private land, land owners are not eligible to apply for development under Part 5 of the EP&A Act. Private land owners should contact Council and the NSW Office of Environment and Heritage to explore management options for camps that occur on private land. Under the new Biodiversity Conservation Act (see Section 4.2.1), private land owners are required to determine whether development (i.e. vegetation clearing) requires further assessment and/or will exceed the thresholds for the offset scheme or test of significance. If they do, the Biodiversity Assessment Methodology must be used to quantify the impacts and a Biodiversity Assessment Report will be required to accompany the development application.

4.2.9 Protection of the Environment Operations Act 1997

The main object of the *Protection of the Environment Operations Act 1997* (POEO Act) is to set out explicit protection of the environment polices (PEPs) and adopt more innovative approaches to reducing pollution.

Detailed advice and guidance on noise regulation which may be relevant to management of impacts associated with flying-fox camps can be found in the EPA's *Noise guide for local government* (EPA 2013).

4.2.10 State Environmental Planning Policies

SEPPs are environmental planning instruments which address specific planning issues within NSW. These SEPPs often remove power from local councils in order to control specific types of development or development in specific areas. SEPPs often transfer decision-making from Council to the Planning Minister. There are no SEPPs that apply at any of the Coffs flying-fox camps.

4.3 Commonwealth

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides protection for the environment, specifically matters of national environmental significance (MNES). A referral to the Commonwealth DoE is required under the EPBC Act for any action that is likely to significantly impact on an MNES.

MNES under the EPBC Act that relate to flying-foxes include:

- world heritage sites (where those sites contain flying-fox camps or foraging habitat)
- wetlands of international importance (where those wetlands contain flying-fox camps or foraging habitat)
- nationally threatened species and ecological communities.

The GHFF is listed as a vulnerable species under the EPBC Act, meaning it is an MNES. It is also considered to have a single national population. DoE has developed the Referral guideline for management actions in GHFF and Spectacled Flying-fox camps (DoE 2015) (the Guideline) to guide whether referral is required for actions pertaining to the GHFF.

The Guideline defines a nationally important GHFF camp as one that has either:

- contained ≥10,000 GHFF in more than one year in the last 10 years, or
- been occupied by more than 2500 GHFF permanently or seasonally every year for the last 10 years.

Coffs Creek, Barcoo and Woolgoolga Lake are all nationally important GHFF camps. Provided that management at nationally important camps follows the mitigation standards below, DoE has determined that a significant impact to the population is unlikely, and referral is not likely to be required.

Referral will be required if a significant impact to any other MNES is considered likely as a result of management actions outlined in the Plan. Self-assessable criteria are available in the Significant Impact Guidelines 1.1 (DoE 2013) to assist in determining whether a significant impact is likely; otherwise consultation with DoE will be required.

Mitigation standards

- The action must not occur if the camp contains females that are in the late stages of pregnancy or have dependent young that cannot fly on their own.
- The action must not occur during or immediately after climatic extremes (heat stress event[1], cyclone event[2]), or during a period of significant food stress[3].
- Disturbance must be carried out using non-lethal means, such as acoustic, visual and/or physical disturbance or use of smoke.
- Disturbance activities must be limited to a maximum of 2.5 hours in any 12 hour period, preferably at or before sunrise or at sunset.
- Trees are not felled, lopped or have large branches removed when flying-foxes are in or near to a tree and likely to be harmed.
- The action must be supervised by a person with knowledge and experience relevant to the management of flying-foxes and their habitat, who can identify dependent young and is aware of climatic extremes and food stress events. This person must make an assessment of the relevant conditions and advise the proponent whether the activity can go ahead consistent with these standards.
- The action must not involve the clearing of all vegetation supporting a nationally-important flying-fox camp. Sufficient vegetation must be retained to support the maximum number of flying-foxes ever recorded in the camp of interest.

[1] A 'heat stress event' is defined for the purposes of the Australian Government's Referral guideline for management actions in GHFF and SFF camps as a day on which the maximum temperature does (or is predicted to) meet or exceed 38°C.

[2] A 'cyclone event' is defined as a cyclone that is identified by the Australian Bureau of Meteorology (www.bom.gov.au/cyclone/index.shtml).

[3] Food stress events may be apparent if large numbers of low body weight animals are being reported by wildlife carers in the region.

These standards have been incorporated into mitigation measures detailed in Section 9.3. If actions cannot comply with these mitigation measures, referral for activities at nationally important camps is likely to be required.

4.3.2 Convention on International Civil Aviation

As the Coffs Creek and Barcoo camps require specific proocols to manage the risk of airstrike associated with Coffs Harbour Regional Airport the legislative requirements and guidelines associated with wildlife hazard assessment and management around airports is included below.

International Civil Aviation Organisation (ICAO): Convention on International Civil Aviation

I. ICAO Annex 14 Section.

II. CAO Annex 14 Doc 9317, Airport Services Manual: Part 3, Wildlife Control and reduction: Section 4, Section 6, Section 9 & Section 10.

III. ICAO Annex 14 Doc 9184 Airport Planning Manual: Part 2 Land Use and Environmental Control, Appendix 2.

Australian Civil Aviation Safety Regulations (CASR).

I. CASR Subparagraph 139.095.

II. ASR Manual of Standards MOS Part 139 Section 10.6.4 & section 10.14.

III. CASR Manual of Standards MOS Part 139, Advisory Circular (AC) AC-130-26 Section 6, Section 7 and Section 9.

IV. National Airports Safeguarding Framework (NASAF) Guideline C Managing the risk of wildlife strikes in the vicinity of airports.

5 Other ecological values of the sites

Vegetation was ground-truthed during site assessments undertaken by ELA during December 2016 and is largely consistent with mapped vegetation type/s on-site at the three camps.

5.1 Coffs Creek camp

The ecological values contained within the Coffs Creek camp include:

- a permanent resident maternity flying-fox camp containing GHFF which is listed as a Vulnerable species under the TSC and EPBC Acts
- Primary Koala habitat under Coffs Harbour's Koala Plan of Management (KPoM) 1999 (**Map 6**, **Appendix C**)
- an area of *Foothills to Escarpment Brush Box - Tallowwood - Blackbutt Wet Forest* vegetation (CH_WSF05)(**Map 13, Appendix C**)
- elements of *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregion* vegetation, an EEC under the TSC Act (**Map 13**, **Appendix C**)
- a portion of the wildlife link corridor system extending along Coffs Creek (**Map 6, Appendix C**)
- numerous recorded threatened fauna (including microbats, birds, frogs and mammals) which regularly utilise the habitat of the camp (CHCC 2015).

5.2 Barcoo Court, Toormina camp

The ecological values contained within the Barcoo camp include:

- a permanent resident maternity flying-fox camp containing GHFF which is listed as a Vulnerable species under the TSC and EPBC Acts
- an area of *Coastal Paperbark Swamp Oak Floodplain Forest* vegetation (CH_FrW01), an EEC under the TSC Act (**Map 14, Appendix C**)
- an area of *Coast Sand Blackbutt - Bloodwood - Apple Forest* vegetation (CH_DOF09) (**Map 14, Appendix C**)
- numerous recorded threatened fauna which regularly utilise the habitat of the camp.

5.3 Woolgoolga camp

The ecological values contained within the Woolgoolga camp include:

- a permanent resident maternity flying-fox camp containing GHFF which is listed as a Vulnerable species under the TSC and EPBC Acts
- elements of *Swamp Sclerophyll Forest* and *Sub-tropical Coastal Floodplain Forest* (**Map 15, Appendix C**) which are EECs under the TSC Act (Coffs Harbour Bushland Regeneration Group Pty Ltd. 2012)
- an area of *Coastal Paperbark Swamp Oak Floodplain Forest* vegetation (CH_FrW01), an EEC under the TSC Act (**Map 15, Appendix C**)
- an area of *Lowlands Swamp Box - Paperbark - Red Gum Dry Forest* vegetation (CH_DOF06) (**Map 15, Appendix C**)
- an area of *Coastal Paperbark Swamp Box Littoral Forest* vegetation (CH_FrW05) (**Map 15, Appendix C**)

- areas mapped as high conservation, or as wildlife corridors (**Map 10, Appendix C**)
- numerous recorded threatened fauna which regularly utilise the habitat of the camp.

5.4 Threatened species

A list of threatened species known to occur within 10 km of the three camps is provided in **Appendix A**, including the likelihood of species occurring within 10 km of individual camps.

5.5 Vegetation

Table 5 provides a summary of the vegetation communities present within each camp as mapped by CHCC (or otherwise OEH camp mapping was used). The area within each camp and their likely Endangered Ecological Community (EEC) status under the *Threatened Species Conservation Act 1995* (TSC Act) and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is also provided.

Table 5: Vegetation communities, area (ha) and likely EEC status at each camp

Flying-fox camp	Map unit code	Vegetation community name	EEC present	Hectares
Barcoo Camp	CH_DOF09	Coast Sand Blackbutt - Bloodwood - Apple Forest	Unlikely	<0.1
Barcoo Camp	CH_FrW01	Coastal Paperbark Swamp Oak Floodplain Forest	Likely	0.9
Barcoo Camp	CH_FrW01 / CH_FrW04	Coastal Paperbark Swamp Oak Floodplain Forest	Likely	0.3
Bark Hut Road	CH_RF11	Escarpment and Lowland Bangalow - Carabeen - Black Booyong Palm Gully Rainforest	Likely	1.0
Bark Hut Road	CH_WSF17	Foothills Turpentine - Grey Gum - Ironbark Moist Shrubby Forest	Unlikely	0.2
Bonville	CH_DOF01	Coast and Escarpment Blackbutt Dry Forest	Unlikely	0.3
Bonville	CH_FrW01	Coastal Paperbark Swamp Oak Floodplain Forest	Likely	1.4
Bonville	CH_SW01	Estuarine Mangrove Forest	Unlikely	0.1
Bonville	CH_SW06	Sea Rush Saltmarsh	Likely	0.6
Bonville	CH_SW07	Estuarine Samphire - Saltwater Couch Saltmarsh	Likely	0.3
Bruxner Park	CH_RF11	Escarpment and Lowland Bangalow - Carabeen - Black Booyong Palm Gully Rainforest	Likely	2.7
Bruxner Park	CH_WSF05	Foothills to Escarpment Brush Box - Tallowwood - Blackbutt Wet Forest	Unlikely	1.2
Coffs Creek Camp	CH_WSF05	Foothills to Escarpment Brush Box - Tallowwood - Blackbutt Wet Forest	Unlikely	0.7
Coramba	CH_FrW07	River Oak Riparian Forest of the Orara River Valley	Likely	<0.1

Flying-fox camp	Map unit code	Vegetation community name	EEC present	Hectares
Coramba	CH_RF09	Hinterland White Booyong Floodplain Rainforest	Likely	6.4
Pine Creek	CH_RF09	Hinterland White Booyong Floodplain Rainforest	Likely	2.3
Pine Creek	CH_WSF01	Coast and Hinterland Riparian Flooded Gum Bangalow Wet Forest	Unlikely	0.3
Pine Creek	CH_WSF08	Southern Foothills Blackbutt - Turpentine - Tallowwood Wet Ferny Forest	Unlikely	0.8
Sandy Beach	CH_FrW01	Coastal Paperbark Swamp Oak Floodplain Forest	Likely	1.0
Sandy Beach	CH_FrW04	Coastal Paperbark Sedgeland Dominated Forest	Likely	<0.1
Woolgoolga Camp	CH_DOF06	Lowlands Swamp Box - Paperbark - Red Gum Dry Forest	Likely	1.4
Woolgoolga Camp	CH_FrW01	Coastal Paperbark Swamp Oak Floodplain Forest	Likely	0.7
Woolgoolga Camp	CH_FrW05 / CH_DOF06	Coastal Paperbark Swamp Box Littoral Forest	Likely	0.6

The most significant data highlighted in **Table 5** are the areas of:

- 6.4 ha of Hinterland White Booyong Floodplain Rainforest (CH_RF09) vegetation at the Coramba Nature Reserve camp.
- 2.7 ha of Escarpment and Lowland Bangalow - Carabeen - Black Booyong Palm Gully Rainforest (CH_RF11) at the Bruxner Park camp.
- 2.3 ha of Hinterland White Booyong Floodplain Rainforest (CH_RF09) vegetation at the Pine Creek camp.

These are all likely to represent the EEC *Lowland Rainforest on Floodplain in the New South Wales North Coast* or *Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions* listed under the TSC Act and the EPBC Act.

Table 6 provides a summary of the vegetation communities present within flying-fox camps within the Coffs Harbour LGA (as mapped by CHCC, or otherwise OEH camp mapping was used). The area within a flying-fox camp and the likelihood of Endangered Ecological Community (EEC) status under the *Threatened Species Conservation Act 1995* (TSC Act) and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is also provided.

Table 6: Vegetation communities present within camps in relation to proportion across the LGA

Code	Community name	Flying-fox camp (ha)	Across LGA (ha)
CH_DOF01	Coast and Escarpment Blackbutt Dry Forest	0.3	6808.7
CH_DOF06	Lowlands Swamp Box - Paperbark - Red Gum Dry Forest	1.4	2013.4
CH_DOF09	Coast Sand Blackbutt - Bloodwood - Apple Forest	<0.1	334.3
CH_EX02	Camphor laurel	0.7	632.9

Code	Community name	Flying-fox camp (ha)	Across LGA (ha)
CH_FrW01	Coastal Paperbark Swamp Oak Floodplain Forest	4.2	943.8
CH_FrW04	Coastal Paperbark Sedgeland Dominated Forest	<0.1	528.7
CH_FrW05	Coastal Paperbark Swamp Box Littoral Forest	0.6	158.3
CH_FrW07	River Oak Riparian Forest of the Orara River Valley	<0.1	189.3
CH_RF09	**Hinterland White Booyong Floodplain Rainforest**	**8.7**	**43.9**
CH_RF11	Escarpment and Lowland Bangalow - Carabeen - Black Booyong Palm Gully Rainforest	3.6	4279.7
CH_SW01	Estuarine Mangrove Forest	0.1	146.3
CH_SW06	Sea Rush Saltmarsh	0.6	37.7
CH_SW07	Estuarine Samphire - Saltwater Couch Saltmarsh	0.3	113.7
CH_WSF01	Coast and Hinterland Riparian Flooded Gum Bangalow Wet Forest	0.3	4748.5
CH_WSF05	Foothills to Escarpment Brush Box - Tallowwood - Blackbutt Wet Forest	1.9	4773.8
CH_WSF08	Southern Foothills Blackbutt - Turpentine - Tallowwood Wet Ferny Forest	0.8	1292.2
CH_WSF17	Foothills Turpentine - Grey Gum - Ironbark Moist Shrubby Forest	0.2	3053.4

The most significant data highlighted in **Table 6** is the area of 8.7 ha of Hinterland White Booyong Floodplain Rainforest (CH_RF09) vegetation, which is likely to represent the EEC *Lowland Rainforest on Floodplain in the New South Wales North Coast* listed under the TSC Act and the EPBC Act. This indicates that flying-fox camps support approximately 20% of this rainforest community, relative to the total mapped cover of this vegetation community across the LGA.

6 Flying-fox ecology and behaviour

General information about flying-fox ecology, behaviour and human and animal health is provided in Sections 6 and 7.

6.1 Ecological role

Flying-foxes, along with some birds, make a unique contribution to ecosystem health through their ability to move seeds and pollen over long distances (Southerton et al. 2004). This contributes directly to the reproduction, regeneration and viability of forest ecosystems (DoE 2016a).

It is estimated that a single flying-fox can disperse up to 60,000 seeds in one night (ELW&P 2015). Some plants, particularly *Corymbia* spp., have adaptations suggesting they rely more heavily on nocturnal visitors such as bats for pollination than daytime pollinators (Southerton et al. 2004).

Grey-headed flying-foxes may travel 100 km in a single night with a foraging radius of up to 50 km from their camp (McConkey et al. 2012), and have been recorded travelling over 500 km in two days between camps (Roberts et al. 2012). In comparison bees, another important pollinator, move much shorter foraging distances of generally less than one kilometre (Zurbuchen et al. 2010).

Long-distance seed dispersal and pollination makes flying-foxes critical to the long-term persistence of many plant communities (Westcott et al. 2008; McConkey et al. 2012), including eucalypt forests, rainforests, woodlands and wetlands (Roberts et al. 2006). Seeds that are able to germinate away from their parent plant have a greater chance of growing into a mature plant (EHP 2012). Long-distance dispersal also allows genetic material to be spread between forest patches that would normally be geographically isolated (Parry-Jones & Augee 1992; Eby 1991; Roberts 2006). This genetic diversity allows species to adapt to environmental change and respond to disease pathogens. Transfer of genetic material between forest patches is particularly important in the context of contemporary fragmented landscapes.

Flying-foxes are considered ‘keystone’ species given their contribution to the health, longevity and diversity among and between vegetation communities. These ecological services ultimately protect the long-term health and biodiversity of Australia’s bushland and wetlands. In turn, native forests act as carbon sinks, provide habitat for other fauna and flora, stabilise river systems and catchments, add value to production of hardwood timber, honey and fruit (e.g. bananas and mangoes; Fujita 1991), and provide recreational and tourism opportunities worth millions of dollars each year (EHP 2012; ELW&P 2015).

6.2 Flying-foxes in urban areas

Flying-foxes appear to be roosting and foraging in urban areas more frequently. There are many possible drivers for this, as summarised by Tait et al. (2014):

- loss of native habitat and urban expansion
- opportunities presented by year-round food availability from native and exotic species found in expanding urban areas
- disturbance events such as drought, fires, cyclones
- human disturbance or culling at non-urban roosts or orchards
- urban effects on local climate

- refuge from predation
- movement advantages, e.g. ease of manoeuvring in flight due to the open nature of the habitat or ease of navigation due to landmarks and lighting.

6.3 Under threat

Flying-foxes roosting and foraging in urban areas more frequently can give the impression that their populations are increasing; however, the grey-headed flying-fox is in decline across its range and in 2001 was listed as vulnerable by the NSW Government through the TSC Act.

At the time of listing, the species was considered eligible for listing as vulnerable as counts of flying-foxes over the previous decade suggested that the national population may have declined by up to 30%. It was also estimated that the population would continue to decrease by at least 20% in the next three generations given the continuation of the current rate of habitat loss and culling.

The main threat to grey-headed flying-foxes in NSW is clearing or modification of native vegetation. This threatening process removes appropriate roosting and breeding sites and limits the availability of natural food resources, particularly winter–spring feeding habitat in north-eastern NSW. The urbanisation of the coastal plains of south-eastern Queensland and northern NSW has seen the removal of annually-reliable winter feeding sites, and this threatening process continues.

There is a wide range of ongoing threats to the survival of the GHFF, including:

- habitat loss and degradation
- conflict with humans (including culling at orchards)
- infrastructure-related mortality (e.g. entanglement in barbed wire fencing and fruit netting, power line electrocution, etc.)
- predation by native and introduced animals
- exposure to extreme natural events such as cyclones, drought and heat waves.

Flying-foxes have limited capacity to respond to these threats and recover from large population losses due to their slow sexual maturation, small litter size, long gestation and extended maternal dependence (McIlwee & Martin 2002).

6.4 Camp characteristics

All flying-foxes are nocturnal, roosting during the day in communal camps. These camps may range in number from a few to hundreds of thousands, with individual animals frequently moving between camps within their range. Typically, the abundance of resources within a 20–50 kilometre radius of a camp site will be a key determinant of the size of a camp (SEQ Catchments 2012). Therefore, flying-fox camps are generally temporary and seasonal, tightly tied to the flowering of their preferred food trees. However, understanding the availability of feeding resources is difficult because flowering and fruiting are not reliable every year, and can vary between localities (SEQ Catchments 2012). These are important aspects of camp preference and movement between camps, and have implications for long-term management strategies.

Little is known about flying-fox camp preferences; however, research indicates that apart from being in close proximity to food sources, flying-foxes choose to roost in vegetation with at least some of the following general characteristics (SEQ Catchments 2012):

- closed canopy >5 metres high
- dense vegetation with complex structure (upper, mid- and understorey layers)

- within 500 metres of permanent water source
- within 50 kilometres of the coastline or at an elevation <65 metres above sea level
- level topography (<5° incline)
- greater than one hectare to accommodate and sustain large numbers of flying-foxes.

Optimal vegetation available for flying-foxes must allow movement between preferred areas of the camp. Specifically, it is recommended that the size of a patch be approximately three times the area occupied by flying-foxes at any one time (SEQ Catchments 2012).

6.5 Species profiles

6.5.1 Black flying-fox *(Pteropus alecto)*

Figure 4: Black flying-fox indicative species distribution, adapted from OEH 2015a

The black flying-fox (BFF) (**Figure 1**) has traditionally occurred throughout coastal areas from Shark Bay in Western Australia, across Northern Australia, down through Queensland and into NSW (Churchill 2008; OEH 2015a). Since it was first described there has been a substantial southerly shift by the BFF (Webb & Tidemann 1995). This shift has consequently led to an increase in indirect competition with the threatened GHFF, which appears to be favouring the BFF (DoE 2016a).

They forage on the fruit and blossoms of native and introduced plants (Churchill 2008; OEH 2015a), including orchard species at times.

BFF are largely nomadic animals with movement and local distribution influenced by climatic variability and the flowering and fruiting patterns of their preferred food plants. Feeding commonly occurs within 20 kilometres of the camp site (Markus & Hall 2004).

BFF usually roost beside a creek or river in a wide range of warm and moist habitats, including lowland rainforest gullies, coastal stringybark forests and mangroves. During the breeding season camp sizes can change significantly in response to the availability of food and the arrival of animals from other areas.

6.5.2 Grey-headed flying-fox (Pteropus poliocephalus)

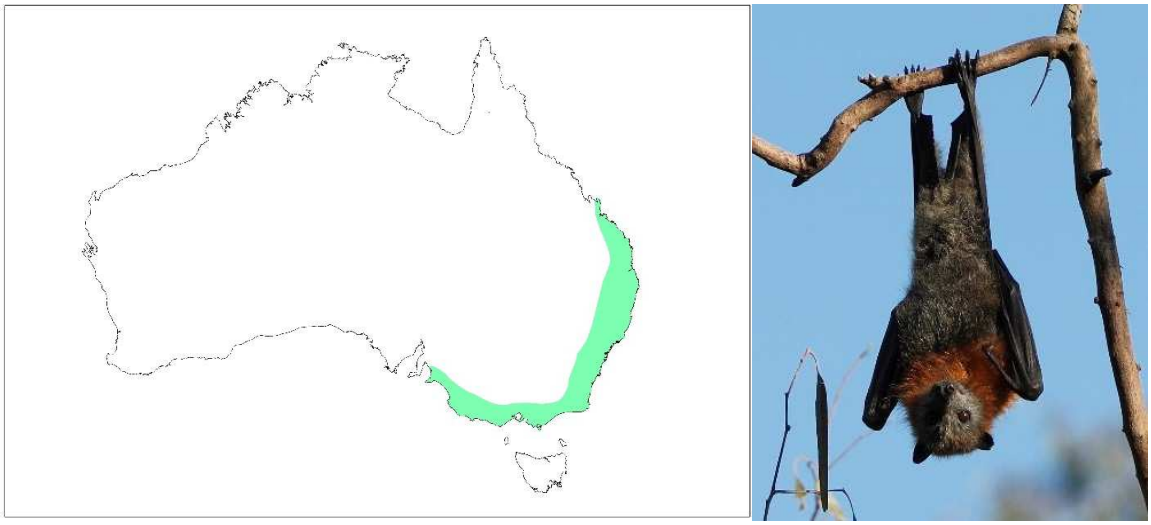


Figure 5: Grey-headed flying-fox indicative species distribution, adapted from OEH 2015a

The grey-headed flying-fox (GHFF) (**Figure 2**) is found throughout eastern Australia, generally within 200 kilometres of the coast, from Finch Hatton in Queensland to Melbourne, Victoria (OEH 2015d). This species now ranges into South Australia and has been observed in Tasmania (DoE 2016a). It requires foraging resources and camp sites within rainforests, open forests, closed and open woodlands (including melaleuca swamps and banksia woodlands). This species is also found throughout urban and agricultural areas where food trees exist and will raid orchards at times, especially when other food is scarce (OEH 2015a).

All the GHFF in Australia are regarded as one population that moves around freely within its entire national range (Webb & Tidemann 1996; DoE 2015). GHFF may travel up to 100 kilometres in a single night with a foraging radius of up to 50 kilometres from their camp (McConkey et al. 2012). They have been recorded travelling over 500 kilometres over 48 hours when moving from one camp to another (Roberts et al. 2012). GHFF generally show a high level of fidelity to camp sites, returning year after year to the same site, and have been recorded returning to the same branch of a particular tree (SEQ Catchments 2012). This may be one of the reasons flying-foxes continue to return to small urban bushland blocks that may be remnants of historically-used larger tracts of vegetation.

The GHFF population has a generally annual southerly movement in spring and summer, with their return to the coastal forests of north-east NSW and south-east Queensland in winter (Ratcliffe 1932; Eby 1991; Parry-Jones & Augee 1992; Roberts et al. 2012). This results in large fluctuations in the number of GHFF in NSW, ranging from as few as 20% of the total population in winter up to around 75% of the total population in summer (Eby 2000). They are widespread throughout their range during summer, but in spring and winter are uncommon in the south. In autumn they occupy primarily coastal lowland camps and are uncommon inland and on the south coast of NSW (DECCW 2009).

There is evidence the GHFF population declined by up to 30% between 1989 and 2000 (Birt 2000; Richards 2000 cited in OEH 2011a). There is a wide range of ongoing threats to the survival of the GHFF, including habitat loss and degradation, deliberate destruction associated with the commercial horticulture industry, conflict with humans, infrastructure-related mortality (e.g. entanglement in barbed wire fencing and fruit netting, power line electrocution, etc.) and competition and hybridisation with the BFF (DECCW 2009). For these reasons it is listed as vulnerable to extinction under NSW and federal legislation (see **Section 4**).

6.5.3 Little red flying-fox (Pteropus scapulatus)

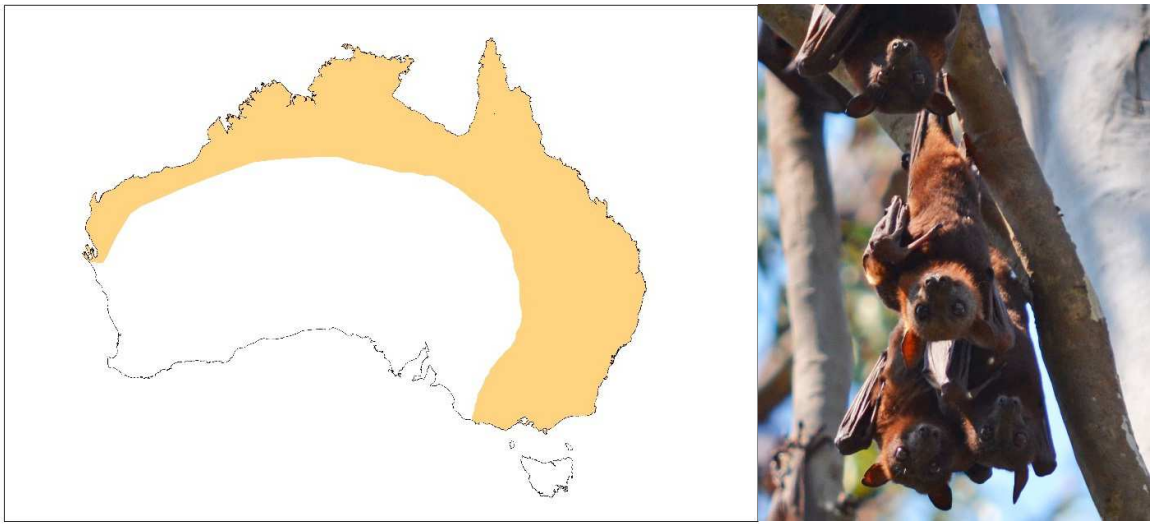


Figure 6: Little red flying-fox indicative species distribution, adapted from OEH 2015a

The little red flying-fox (LRFF) (**Figure 3**) is widely distributed throughout northern and eastern Australia, with populations occurring across northern Australia and down the east coast into Victoria.

The LRFF forages almost exclusively on nectar and pollen, although will eat fruit at times and occasionally raids orchards (Australian Museum 2010). LRFF often move sub-continental distances in search of sporadic food supplies. The LRFF has the most nomadic distribution, strongly influenced by availability of food resources (predominantly the flowering of eucalypt species) (Churchill 2008), which means the duration of their stay in any one place is generally very short.

Habitat preferences of this species are quite diverse and range from semi-arid areas to tropical and temperate areas, and can include sclerophyll woodland, melaleuca swamplands, bamboo, mangroves and occasionally orchards (IUCN 2015). LRFF are frequently associated with other Pteropus species. In some colonies, LRFF individuals can number many hundreds of thousands and they are unique among Pteropus species in their habit of clustering in dense bunches on a single branch. As a result, the weight of roosting individuals can break large branches and cause significant structural damage to roost trees, in addition to elevating soil nutrient levels through faecal material (SEQ Catchments 2012).

Throughout its range, populations within an area or occupying a camp can fluctuate widely. There is a general migration pattern in LRFF, whereby large congregations of over one million individuals can be found in northern camp sites (e.g. Northern Territory, North Queensland) during key breeding periods (Vardon & Tidemann 1999). LRFF travel south to visit the coastal areas of south-east Queensland and NSW during the summer months. Outside these periods LRFF undertake regular movements from north to south during winter–spring (July–October) (Milne & Pavey 2011).

6.5.4 Reproduction

Black and grey-headed flying-foxes

Males initiate contact with females in January with peak conception occurring around March to April/May; this mating season represents the period of peak camp occupancy (Markus 2002). Young (usually a single pup) are born six months later from September to November (Churchill 2008). The birth season becomes progressively earlier, albeit by a few weeks, in more northerly populations (McGuckin & Blackshaw 1991), however out of season breeding is common with births occurring later in the year.

Young are highly dependent on their mother for food and thermoregulation. Young are suckled and carried by the mother until approximately four weeks of age (Markus & Blackshaw 2002). At this time they are left at the camp during the night in a crèche until they begin foraging with their mother in January and February (Churchill 2008) and are usually weaned by six months of age around March. Sexual maturity is reached at two years of age with a life expectancy up to 20 years in the wild (Pierson & Rainey 1992).

As such, the critical reproductive period for GHFF and BFF is generally from August (when females are in final trimester) to the end of peak conception around April. Dependent pups are usually present from September to March (see Figure 4).

Little red flying-fox

The LRFF breeds approximately six months out of phase with the other flying-foxes. Peak conception occurs around October to November, with young born between March and June (McGuckin & Blackshaw 1991; Churchill 2008) (Figure 4). Young are carried by their mother for approximately one month then left at the camp while she forages (Churchill 2008). Suckling occurs for several months while young are learning how to forage. LRFF generally birth and rear young in temperate areas (rarely in NSW).

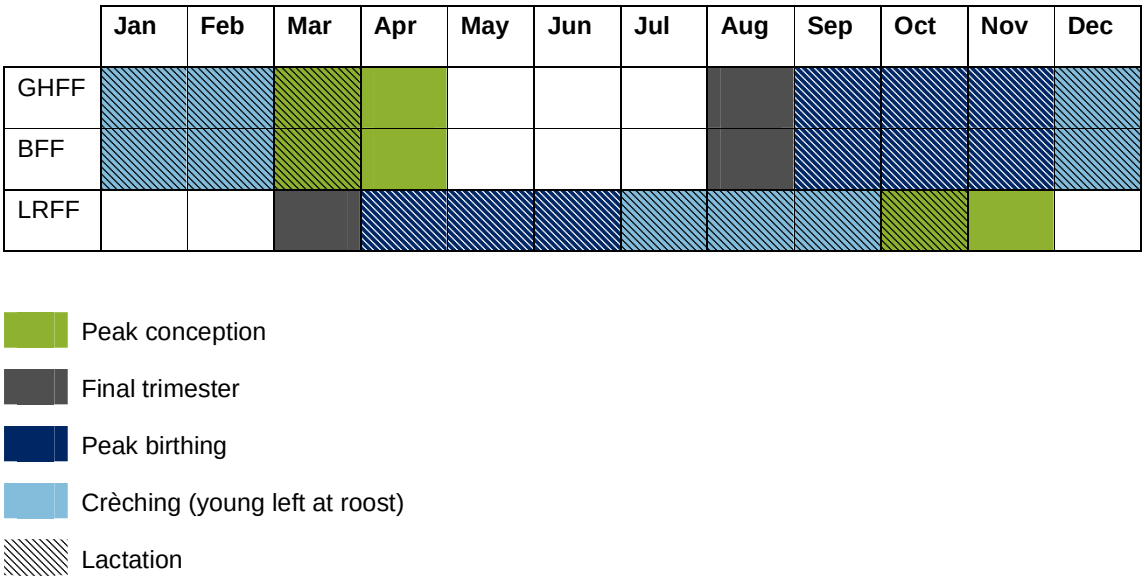


Figure 7: Indicative flying-fox reproductive cycle.

Note that LRFF rarely birth and rear young in NSW. The breeding season of all species is variable between years and location, and expert assessment is required to accurately determine phases in the breeding cycle and inform appropriate management timing.

7 Human and animal health

Flying-foxes, like all animals, carry pathogens that may pose human health risks. Many of these are viruses which cause only asymptomatic infections in flying-foxes themselves but may cause significant disease in other animals that are exposed. In Australia the most well-defined of these include Australian bat lyssavirus (ABLV), Hendra virus (HeV) and Menangle virus. Specific information on these viruses is provided in **Appendix H.**

Outside of an occupational cohort, including wildlife carers and vets, human exposure to these viruses is extremely rare and similarly transmission rates and incidence of human infection are very low. In addition, HeV infection in humans apparently requires transfer from an infected intermediate equine host and direct transmission from bats to humans has not been reported. Thus despite the fact that human infection with these agents can be fatal, the probability of infection is extremely low and the overall public health risk is judged to be low (Qld Health 2016).

7.1 Disease and flying-fox management

A recent study at several camps before, during and after disturbance (Edson et al. 2015) showed no statistical association between HeV prevalence and flying-fox disturbance. However the consequences of chronic or ongoing disturbance and harassment and its effect on HeV infection were not within the scope of the study and are therefore unknown.

The effects of stress are linked to increased susceptibility and expression of disease in both humans (AIHW 2012) and animals (Henry & Stephens-Larson 1985; Aich et. al. 2009), including reduced immunity to disease.

Therefore it can be assumed that management actions which may cause stress (e.g. dispersal), particularly over a prolonged period or at times where other stressors are increased (e.g. food shortages, habitat fragmentation, etc.), are likely to increase the susceptibility and prevalence of disease within the flying-fox population, and consequently the risk of transfer to humans.

Furthermore, management actions or natural environmental changes may increase disease risk by:

- forcing flying-foxes into closer proximity to one another, increasing the probability of disease transfer between individuals and within the population
- resulting in abortions and/or dropped young if inappropriate methods are used during critical periods of the breeding cycle. This will increase the likelihood of direct interaction between flying-foxes and the public, and potential for disease exposure
- adoption of inhumane methods with potential to cause injury which would increase the likelihood of the community coming into contact with injured/dying flying-foxes.

The potential to increase disease risk should be carefully considered as part of a full risk assessment when determining the appropriate level of management and the associated mitigation measures required.

8 Planned management options

Under legislation effective at the date of publication of this Plan, a section 91 licence application under the TSC Act (see **Section 4** and **Appendix J**) will be required for any camp management action where GHFF have been recorded and this includes all three permanent camps; Coffs Creek, Barcoo Court and Woolgoolga Lake.

Planned management actions listed in this section include outstanding actions from the Coffs Creek Strategy listed in **Table 1, Section 2.5.1**.

8.1 Site-specific analysis of camp management options

Appendix D provides an overview of commonly used management options considered in the development of the Plan. These are categorised as Level 1, 2 or 3 in accordance with the Policy. **Table 11, Appendix D** provides an analysis of the full suite of management options as they apply to the Coffs Creek, Barcoo Court and Woolgoolga Lake camps in Coffs LGA. All actions that have been assessed as appropriate for this Plan at the current time are listed in detail in the text and in **Table 7** below. If these actions prove unsuccessful following review and evaluation, Council may consider applying actions not listed in this section but outlined in **Appendix D**.

The process for making decisions regarding management of flying-foxes prior to commencement of the Biodiversity Conservation Act is depicted in **Figure 8**. Some steps in this process may change once the Biodiversity Conservation Act commences.

The Federal inquiry into the impacts of flying-fox camps recently recommended that the Department of the Environment and Energy develop, in consultation with relevant state and local governments, a tool that assists councils to make decisions on action, referral and education in the most appropriate way, relevant to the flying-fox impacts in their jurisdiction (House of Representatives Standing Committee on the Environment and Energy, 2017).

The National Environmental Science Program through the Threatened Species Recovery Hub (DoEE, 2017) are developing an easy-to-access, universal, decision making tool to aid councils (as a primary target audience) in navigating the different requirements and sources of information they need to make decisions on urban flying-fox camp management.

Until the tool is released, the current Plan and planned management options that appear in this section serves as the best practice method available to aid land managers in the management of flying-fox camps. Once the Federal decision making tool is released, the Plan will be reviewed against the tool and updated where required.

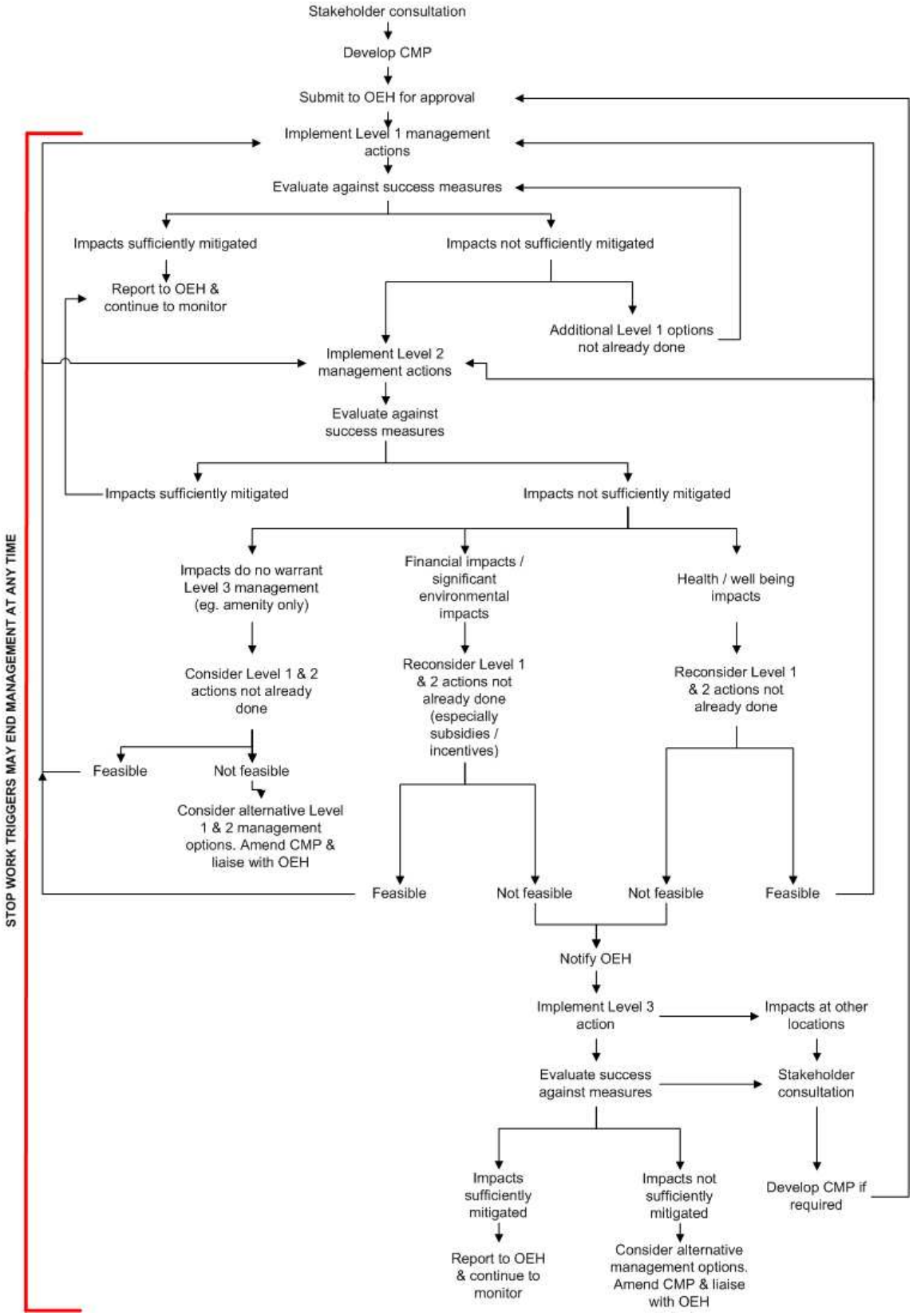


Figure 8: Example flow chart to demonstrate the planned process for management decision-making

8.2 Level 1 Actions

8.2.1 Complaint tracking

Flying-fox enquiries and complaints are not currently consistently documented. One of the most critical elements of the planned management approach is to set up a system of complaint tracking whereby any enquiries/complaints regarding flying-foxes can be logged and progress against actions tracked over time in a way that allows for measurement of complaint levels or tracking of accountability. The simplest and most basic measure of success for many of the recommended management actions is a reduction in the number of complaints / complainants received on any particular issue. Key components of a complaint tracking database include:

- Name of complainant
- Date
- Nature of enquiry (e.g.: smell, noise, health and wellbeing, faecal drop, reduced amenity, reduced rental income, reduced property value, new camp, sick or injured flying-fox, educational resource request, report of vandalism to camp, buffer maintenance requirement, infrastructure maintenance requirement etc.).
- Requested action
- Council staff dealing with enquiry
- Date action implemented by Council staff

8.2.2 Education and awareness programs (Communications)

Community feedback and the original Strategy for the Coffs Creek camp identified a widely shared need and desire for more information and educational resources to be provided relating to flying-foxes and the management of camps (**Table 1, Section 2.5.1 & Table 4, Section 3.3**). There are a number of ways to achieve an increase in positive educational and communication interactions with the community regarding flying-foxes. A combination of the following actions will be implemented:

- Audit, update (where required) and augment the suite of educational materials held by Council that are currently available to the community and staff to ensure they conform to current best practice. Resources available to the community should include advice on living with flying-foxes, general flying-fox ecology and behaviour, public health issues and diseases associated with flying-foxes, management of camps and management of crops that are affected by flying-foxes, backyard netting of fruit trees and wildlife friendly fencing (brochures produced by Tolga Bat Hospital, *Wildlife Friendly Fencing Project*), contacts and information on wildlife careers. A recent Federal inquiry into flying-foxes (House of Representatives Standing Committee on the Environment and Energy, 2017) recommended the development of standard educational materials on aspects of flying-fox management that could be adapted locally and used nationwide. Hunter Councils are currently developing a regional flying-fox community education project which aligns very closely with the Federal recommendation.
- Develop and install on-site educational signage within each Reserve at strategic vantage points around the flying-fox camps, such as along walking tracks, on pedestrian bridges, adjacent to playgrounds and in community picnic areas (suggested by the community). Include prohibited activities and penalties applicable for non-compliance.
- Work with the Local Aboriginal Land Council and Garlambirla Guyuu Girrwaa Coffs Elders Group regarding naming of the Reserves, input into the management of the Reserves and interpretive material regarding each Reserves cultural values.

- Engage regularly with camp neighbours by providing updates on the timing and completion of management actions and camp counts via traditional and social media (suggested by the community).
- Host Living with Flying-foxes Neighbourhood Information Sessions for the community on appropriate topics and courses of action, suggested one session for each of the three neighbourhoods once every two years.
- Engage regularly with the community on their website and via traditional and social media outlets promoting and highlighting the key ecological roles of flying-foxes (forest pollination, rainforest species seed dispersal) and / or at specific times of year (arrival of pregnant mothers, when favoured foraging species are in heavy blossom locally, birthing of young, mating, prior to predicted heat stress or severe weather events). This may include the organisation of an annual bat night event, involving local flying-fox experts, Council staff and volunteers from WIRES (promoted and supported by the Australasian Bat Society in March/April every year).
- Liaise with the Flying-fox Land Managers' Network for land managers of flying-fox camps to build upon other land managers' experience in the management of flying-fox camps.
- Build upon and promote the eco-tourism potential of flying-foxes on Council website and via traditional and social media, the nightly fly-out from large camps being one of nature's greatest spectacles. The fly-out of Mexican Free-tailed Bats in their millions from Congress Ave Bridge, Austin Texas has become an eco-tourism success with hundreds of people gathering nightly during spring and summer to watch the fly-out generating 10 million dollars in tourist revenue annually (Bat Conservation International website; http://www.batcon.org/index.php/our-work/regions/usa-canada/protect-mega-populations/cab-intro viewed 27 March 2017).
- Continue to administer the *Companion Animals Act 1998* and undertake compliance of authorised and unauthorised activities that occur in Council reserves that may impact on flying-fox camps, i.e. access by dogs, creation of unauthorised access points and trails, use of motorbikes, firearms, fire crackers / rockets, chainsaws, scatter guns, lighting of fires, etc.
- Contact landowners whose properties form the buffer created on privately owned land along Gundagai Street to ensure continued maintenance of vegetation at appropriate levels.

8.2.3 Property modification with/without subsidies

Council will investigate funding to subsidise the cost of purchasing vehicle and washing line covers for use by affected residents. Residents with properties adjoining flying-fox camps or within 300m of the existing edge of a flying-fox camp need to apply to Council to be considered eligible for these items. A range of other measures that will not be subsidised may prove useful to residents neighbouring Coffs Creek, Barcoo Court and Woolgoolga Lake and will be promoted to residents by Council as required (**Appendix D**). This will be accomplished in conjunction with a targeted education event/campaign or simply sent in a letter to residents along with educational materials and product supplier/installer information. Community feedback received during the workshop held in February 2017 indicated a willingness by some members of the community to adopt and promote these measures.

8.2.4 Service Subsidies

Neighbouring residents of the Coffs Creek camp requested subsidies associated with water usage for cleaning purposes during the workshop held in February 2017.

A combination of the following actions will be implemented to address this community request;

- allowance of applications under the Councils Financial Hardship Policy to assist neighbouring landowners adjacent to flying-fox camps with costs associated with cleaning personal items / areas affected by bat droppings / faecal waste.
- applying exemptions to certain residents from some water restrictions to allow those residents to more effectively clean property affected by flying-foxes.
- the purchase of high powered hose/s which can be loaned to selected neighbouring properties adjacent to flying-fox camps, to clean various personal items or areas affected by bat droppings / faecal waste.

Critical thresholds of flying-fox numbers at a camp and distance to a camp may be used to determine when subsidies would apply. Suggested critical thresholds are when flying-fox numbers are at, or near/approaching 5, 000 and / or when Council experiences an influx of complaints about faecal drop from a flying-fox camp. Residents whose properties are adjacent to, or within 300m of the edge of the flying-fox camp would be eligible to apply for subsidies. The level of potential subsidy could be determined by the degree of flying-fox impact per property, and would be assessed on a case-by-case basis.

8.2.5 Routine camp maintenance and operational activities

Residents from Coffs Creek have reported that the existing vegetated buffers require maintenance (trimming) to prevent flying-foxes from roosting within them. A reduction in the maximum height of vegetation in the outer buffer of Coffs Creek camp to 2.5m has been recommended. Works to reduce the outer buffer height from 4 m to 2.5 m will only be conducted when there are no flying-foxes present within the inner or outer buffer areas, outside the maternity season (August to April) following the standard protocols in **Section 9.3**, which set out appropriate times of year and times of day for works to be undertaken. No works will be undertaken during adverse weather conditions or at high levels of camp occupancy (70-75% of peak occupancy levels). Any machinery used to trim vegetation must be started at a minimum distance of 100m from the nearest edge of the camp, and a gradual approach to the outer buffer commenced once flying foxes have re-settled. The standard protocols must be included in the Council's operational works plan.

General maintenance activities such as mowing, mulching and removal of leaf litter or other material on the ground in publically accessible areas adjoining the camps are carried out by Council staff. Council continues to implement the existing VMPs (weed removal, trimming and planting of understorey vegetation) for Coffs Creek and Woolgoolga Beach Reserve and to seek ongoing funding for outstanding bush regeneration works. Standard protocols to protect workers and the flying-foxes will be enacted as set out in **Section 9.3**. Any machinery used must be started at a minimum distance of 100m from the nearest edge of the camp, and a gradual approach to the outer buffer commenced once flying foxes have re-settled. These protocols must be included in the Council's operational works plan.

Public recommendations to camp neighbours have been developed and applied in the past at Coffs Creek camp for carrying out operations that may disturb flying-foxes, which can result in excess camp noise. Such recommendations included limiting the use of disturbing activities to certain days or certain times of day in the areas adjacent to the camps and advising adjacent residents of activity days. Such activities may include lawn-mowing, using chainsaws, whipper-snippers, using generators and testing alarms or sirens. A recommendation to start up any machinery at a distance from the camp and gradually move closer as flying-foxes become used to the noise and settle down will be included in Council's suite of education and communication actions and could be presented as part of a fact sheet, flyer, community education day, email update to camp neighbours or Living With Flying-foxes webpage.

Whilst activity days and times are currently not required at any of the camps, this strategy may be evaluated as an option for each camp when numbers are at, or near/approaching (70-75%) peak

occupancy and / or when Council experiences an influx of complaints about noise from the flying-fox camp. Approximate numbers for investigating whether the implementation of this action is required are as follows:

- Coffs Creek >15, 000 flying-foxes of any species present
- Barcoo Court > 13, 000 flying-foxes of any species present
- Woolgoolga Lake > 20, 000 flying-foxes of any species present

Success of recommended activity days and times in reducing noise from flying-foxes during the day will be dependent upon the level of education and communication that Council has with neighbouring residents and the degree to which residents are willing to participate and co-operate.

In certain management zones at Coffs Creek and Woolgoolga Beach Reserve, bush regeneration works can only be only conducted between April and October when fewer or no flying-foxes are present. Both Coffs Creek and Woolgoolga Beach Reserve VMPs suggest working in localised areas when conducting bush regeneration at flying-fox camps to allow the colony to adjust to work zones. During periods of increased flying-fox presence, contract works may be limited to the hours after mid-day to reduce disturbance to flying-foxes and nearby residents. Council bush regeneration staff also conduct work at a distance of 20 m from the edge of camps, where possible. In updating the VMPs for each of these reserves, the standard protocols provided in **Section 9.3** will be included.

There are a suite of standard protocols for works conducted at camps or in the vicinity of camps provided in **Section 9.3** and the noise reducing protocols have been included in this section. The existing Coffs Creek and Woolgoolga Beach Reserve VMPs must be updated to ensure compliance with these standard protocols.

8.2.6 Revegetation and land management to create alternative habitat

When revegetating areas as potential flying-fox habitat, consideration should be given to tree species that will provide year-round food, increasing the attractiveness of the designated site. Law, Eby and Somerville (2002) produced guidelines for tree planting to conserve flying-foxes and reduce orchard damage. The paper outlines priority suitable spring and winter flowering species for all regions along the east coast of Australia, and provides advice on where to plant, fast-tracking tree planting and ways of measuring success.

Potential flying-fox habitat mapping using camp preferences and suitable land tenure to assist in initial alternative site selection was recommended in the original Coffs Creek Camp Strategy (CHCC, 2007) and listed as being on hold in the reviewed Strategy produced in 2015 (see **Table 1, Section 2.5.1**, and CHCC, 2015).

The loss of suitable foraging and roosting habitat is the key threat to flying-foxes (Department of the Environment and Energy, 2017). Increasing the availability of suitable foraging and roosting habitat will assist in alleviating some of the food shortage issues felt by flying-foxes which may also act to reduce the concentration of flying-foxes in urban areas.

The National Draft Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (Department of the Environment and Energy, 2017) has stated that the primary objective for recovery of the GHFF is to identify, protect and enhance native foraging and roosting habitat critical to the survival of the GHFF. Winter foraging habitat is considered to be of greatest concern and vegetation communities that contain *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora, C. eximia, C. maculata* (south of Nowra, New South Wales), *Grevillea robusta* or *Melaleuca quinquenervia* should

be prioritised for conservation where they occur in areas away from (minimum of 300 m) sensitive receivers. Sensitive receivers are defined in this Plan as:

- a school or day care centre
- aged care facility
- centre for the care of people with intellectual/physical disabilities
- hospitals
- playgrounds
- horse stables; or
- within 200m of the runway of an airport

A mapping project to identify priority sites for revegetation/rehabilitation for flying-foxes across NSW, based upon existing flying-fox camp locations, species records and future climate modelling is currently in the early stages of being developed by OEH, under the Saving our Species program. Council input into this process and assistance in selecting sites with adequate buffers from urban residences and other sensitive receivers will be beneficial.

Once the map is finalised, it should be used to select suitable land parcels within the LGA to be investigated for future acquisition and rezoning (where required), restoration, and protection as council or NPWS reserves for the purposes of increasing flying-fox foraging and roosting habitat. Future investment in flying-fox habitat within the LGA should be based upon this mapping and associated advice. This Plan strongly recommends this management action be incorporated into future urban planning framework and steps are taken to identify potentially suitable land parcels as soon as possible. This Plan also recommends funding is sought to conduct a feasibility study to assess the likelihood of success and determine the warranted level of resource allocation to habitat improvement of suitable land parcels identified via this process.

The recent Federal report on the management of urban flying-fox camps titled ‘Living with fruit bats’ (Commonwealth of Australia, 2017) supports this recovery action through its recommendation that the Australian Government establish a funding pool to enable recovery actions identified in the draft recovery plan to be carried out.

A Plan of Management (PoM) would address issues such as bushfire risk and regulations, fire protection, consideration of Aboriginal and cultural heritage, vertebrate pest issues, flood and storm mitigation planning, consolidation of and mapping of access routes for services such as water and sewer infrastructure, authorised and unauthorised activities such as motorbike and bicycle riding, dog walking and the creation of trails and access points. Preparation of a PoM and updates and amendments to existing VMPs will ensure management of the Reserves is strategically planned and includes consideration of such matters and how they interact with flying-foxes and camp management actions.

Coffs Creek Vegetation Management Plan

Management actions and progress against them are detailed in **Section 2.5.1**. Community feedback obtained during the workshop held in February 2017 indicated continued support for implementation of the VMP but highlighted the need for regular and routine maintenance of buffer zones on public land, with reports of flying-foxes roosting within one of the vegetated buffer zones. The community also supported the continued selective and staged removal of tall trees, especially Camphor Laurels (**Figure 9**).

The vegetated buffers created at Coffs Creek on public land as part of the pre-existing VMP were intended to provide both a visual barrier and reduce noise and smell from the core camp area (**Map 11, Appendix C**). The buffers (Zone 2 and 3) were planted between 2008 and 2010 with low growing native species not palatable to flying-foxes, with a provision to maintain the trees in the outer buffer at a maximum height of 4m and trees in the inner buffer at a maximum height of 12m (CHCC, 2007).

The VMP states that no large canopy weed species are to be removed from the core camp area in Management Zone 2 (Zones 2a, 2b and 2c not including inner and outer buffer zones) until significant regeneration of the core camp area has been achieved. It also states that no more than 10% of the canopy within the core camp area can be removed at any one time. Ground truthing of this area during December 2016 field surveys indicated that there is still a significant area of canopy damage, mainly in Zone 2b which equates to roughly 26% of the core camp area in Management Zone 2 (**Figure 9**). Removal of canopy weed species from the core camp area will therefore not occur. Monitoring and calculations for continued treatment of Camphor Laurel shall be ongoing in conjunction with OEH. Trimming of trees to a height of less than 12m within the inner buffer and no more than 2.5 m within the outer buffer areas is required in Management Zone 2, provided the standard procedures to protect flying foxes as listed in **Section 9.3** are followed. Flying-foxes have been known to roost occasionally at heights of 4 m and neighbouring residents of Coffs Creek camp have reported this behaviour. Maintaining trees and shrubs within all outer buffers to a maximum height of 2.5 m and updating the VMP accordingly will address this issue.

Follow up weed control works to suppress all weeds and infill planting conducive to Koala habitat to be continued in Management Zone 1 (**Map 11, Appendix C**). Weed control of ground layer species and vines where required to allow for maturation of planted and regenerating native mid-storey and canopy species, planting of native species to enhance and promote Lowland Rainforest on Floodplain vegetation community and flying fox roosting to continue in Management Zone 2 (**Figure 9**). Follow-up weed control works and infill planting of native species to continue in Management Zone 3, not known to be used as roost site by flying-foxes (**Map 11, Appendix C**). Ongoing weed control of all weed species, planting of native species and riparian restoration including planting and water quality protection to continue in Management Zone 4, not known to be a roost site for flying foxes (**Map 11, Appendix C**). All works to adhere to standard measures listed in **Section 9.3**.

The VMP will be updated in line with this Plan. Continued implementation of the VMP, adaptive review over time, will lead to rehabilitation of the vegetation in the Reserve and it will continue to be a viable roosting and foraging site for flying-foxes and a range of other native species. In its current state, the ability of the vegetation within the Reserve to provide additional roosting space for a large influx of flying-foxes is limited.

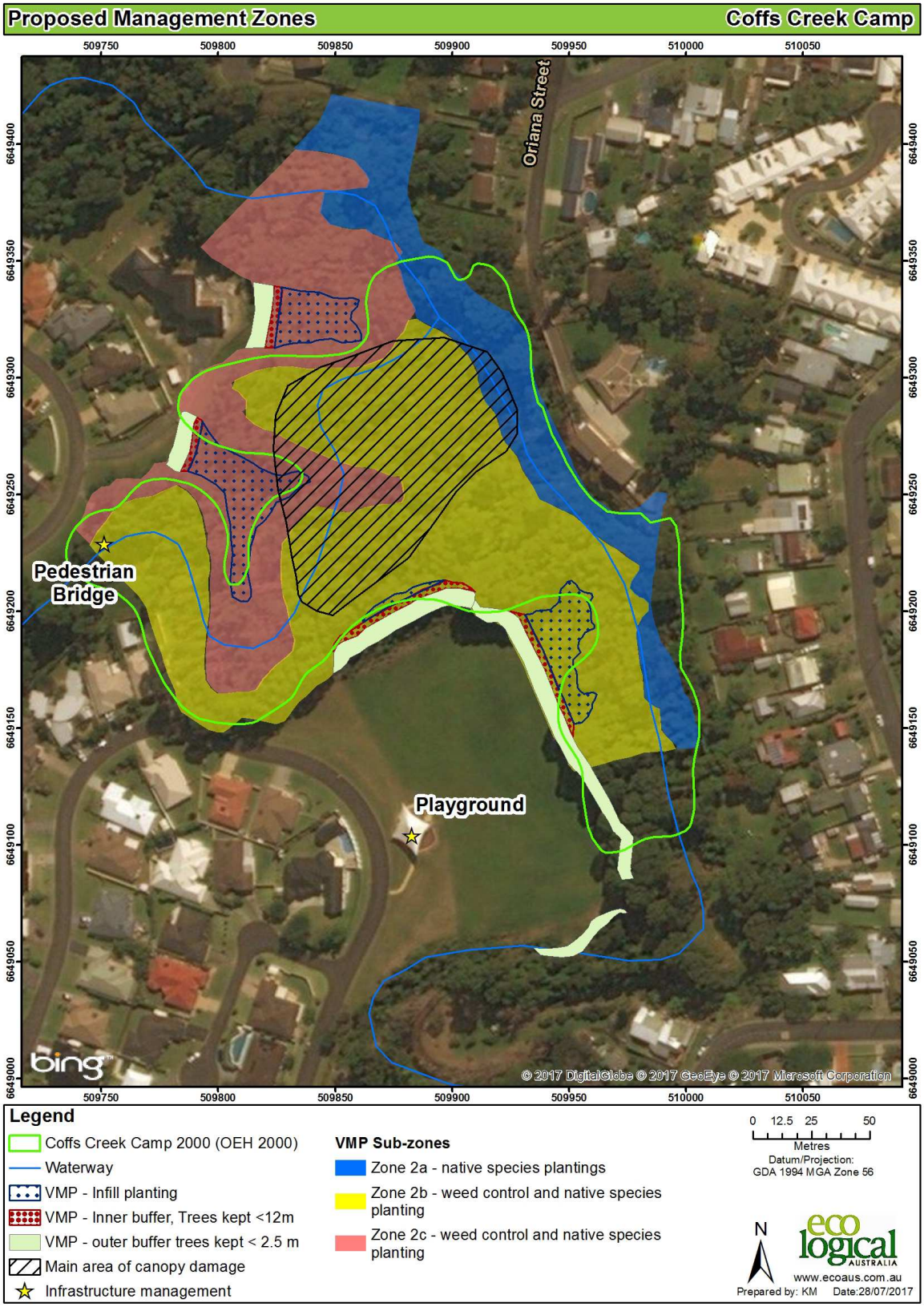


Figure 9: Coffs Creek Camp - Management Zones 2017

Barcoo Court vegetation management

The site is considered to be a suitable and viable site for a flying-fox camp, with few residential neighbours informally buffered from the camp by a Council easement, and a large area of suitable potential habitat available to accommodate flying-foxes when numbers increase during periods of peak occupancy. The vegetation within the core camp area is in relatively good condition and represents the NSW TSC Act endangered ecological community, S*wamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* with most weed species restricted to a few metres either side of the artificial drainage line that follows the Barcoo Court residential property boundary (**Map 14, Appendix C**).

A detailed VMP, based upon **Figure 10** is required to support a new bush regeneration works program at the Barcoo camp, with further consultation from Barcoo Court residents and OEH sought during the development of the plan. Further details of the planned management actions for this area are presented in **Section 8.3.1** under Level 2 actions because they relate to the creation of a buffer through vegetation removal on public land. The PoM and VMP will include standard protocols for the protection of flying-foxes and workers (Section 9.3).

This vegetation associated with the Council easement requires active management of tree regeneration and spread. Maintaining this grassed verge (relatively free of trees) would prevent encroachment of roosting bats in close proximity to neighbouring backyards. However, there may be a need to retain some trees and or plant a screen of trees unsuitable as roosting or foraging habitat for flying-foxes to provide a visual and physical barrier (vegetated buffer) between the camp and neighbouring residents which may help to reduce noise, smell and odour emanating from the camp. Careful consideration will need to be given to management of this area to allow for the multiple functions it serves.

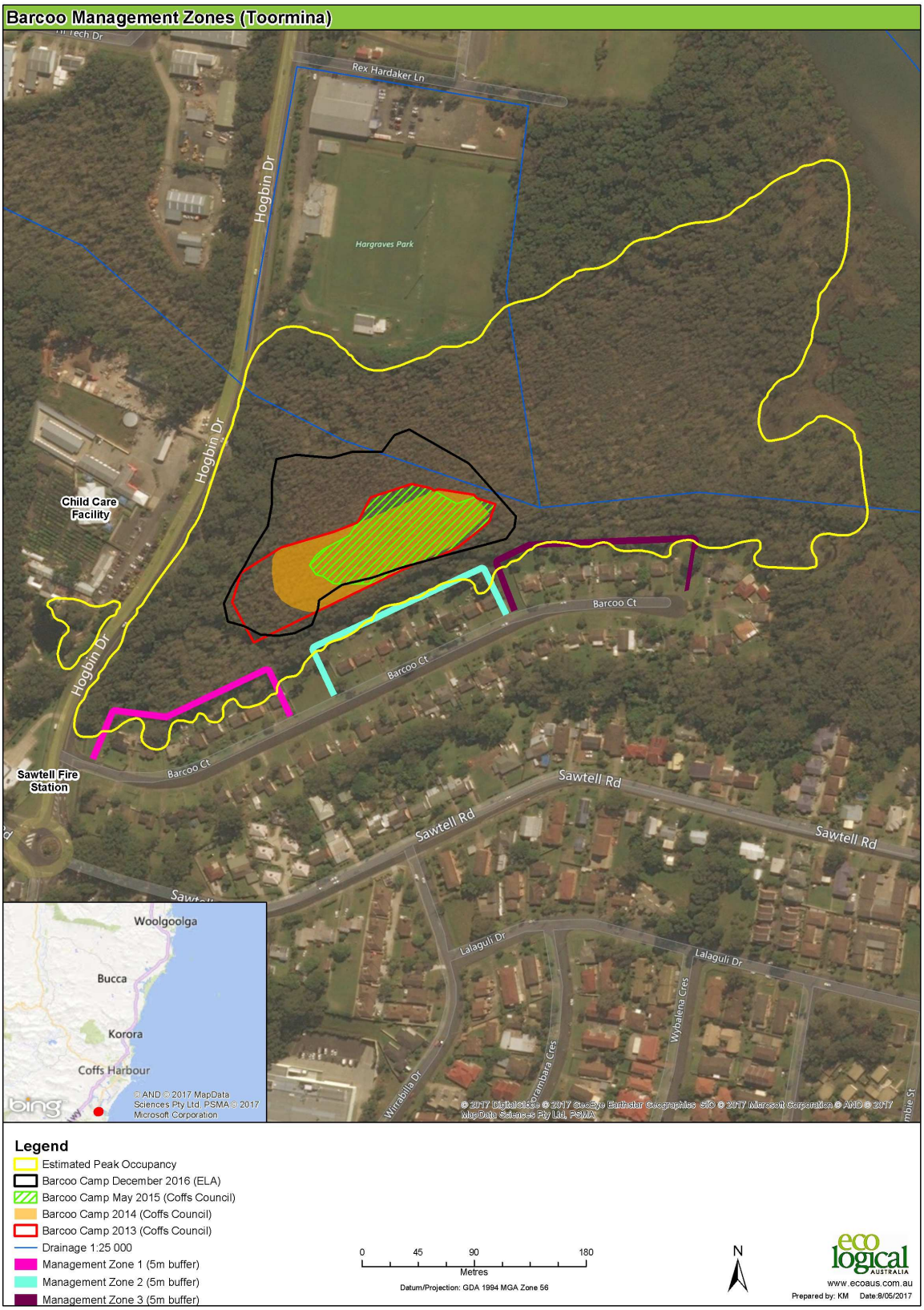


Figure 10: Barcoo Court proposed management zones, tree trimming and removal in 5m buffer from residential properties.

Woolgoolga Beach Reserve Vegetation Management Plan

The Woolgoolga Beach Reserve is considered to be a suitable and viable site for a flying-fox camp, with a natural creek buffer to residential neighbours, and a large area of suitable potential habitat available to accommodate flying-foxes when numbers increase during periods of peak occupancy. The Woolgoolga Beach Reserve VMP (Coffs Harbour Bushland Regeneration Group, 2012) aims to promote and retain the native vegetation communities present within the site, to reduce the occurrence of weed species and to provide improved habitat and roosting opportunities for flying-foxes. No works are allowed between October and March each year to protect flying-foxes. Community feedback obtained during the workshop held in February 2017 indicated continued support for implementation of the VMP, without knowledge of the specific actions contained within it.

Continued implementation of the Woolgoolga Beach Reserve VMP requires understorey, midstorey and vine weed removal within Zone 1, which contains the core flying-fox camp area (**Map 4, Appendix C**). Significant damage to the canopy trees in the northern part of this zone occurred between 2014 and 2016 with large numbers of flying foxes present for extended periods and an influx of LRFF in 2016 (**Figure 11**). Works will focus on replanting of native tree species preferred by flying-foxes and encouragement of natural regeneration. Any weed removal works within the midstorey will be undertaken whilst retaining a functional midstorey to allow flying-foxes refuge areas from extreme heat events. Removal of weeds form the midstorey layer and vine weeds will not exceed 20% of the cover in the main area of canopy damage (**Figure 11**). Removal of ground layer weeds to continue in a staged manner as per the VMP, so that only a small part of the flying-fox roost area is within an active work zone at any one time.

A PoM for Woolgoolga Beach Reserve will be prepared and the VMP will be updated in line with the PoM and this Plan. Standard measures and protocols to avoid impacting flying-foxes as outlined in **Section 9.3** of this Plan will be followed to ensure there is no significant impact upon the flying-foxes or their roosting habitat within the Reserve.

Regeneration and rehabilitation of Woolgoolga Beach Reserve will improve the condition of the vegetation communities present and promote the use of the Reserve by a range of native fauna species.

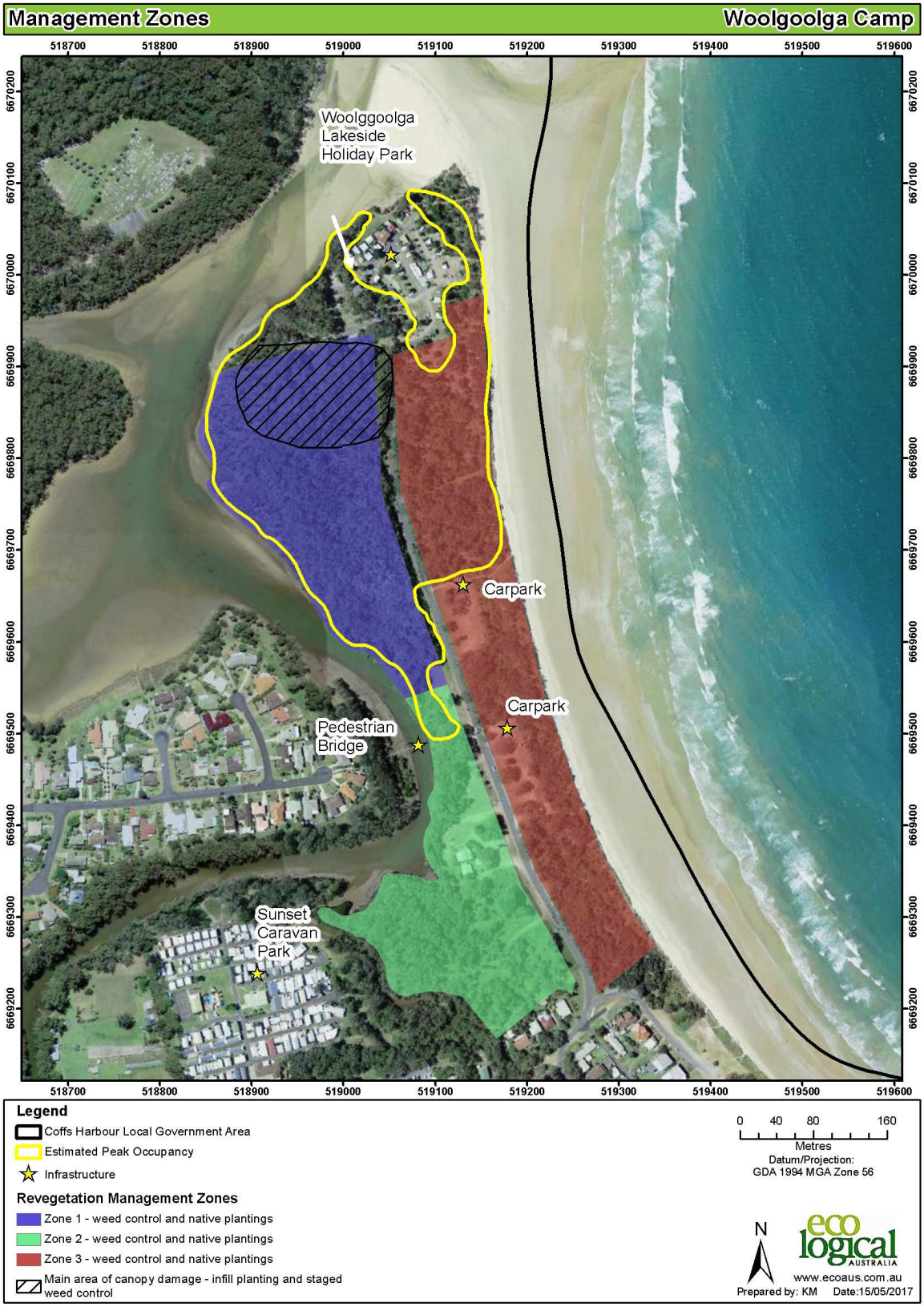


Figure 11: Woolgoolga Beach Reserve Management Zones

8.2.7 Protocols to manage incidents

Heat Stress/ Roost Collapse/Abortion Storm/Abandonment of Young

Any flying-fox camp within Coffs LGA is susceptible to heat stress and is likely to become increasingly so with the increased temperatures and extreme weather events predicted as a result of climate change (Welbergen et al, 2008). Council may monitor the Flying-Fox Heat Stress forecaster http://www.animalecologylab.org/ff-heat-stress-forecaster.html (Welbergen 2017a) prior to a predicted heat wave where local temperatures are likely to exceed 37^{o}C. Other events which may affect camps include roost collapse; a mass abortion storm and/or abandonment of dependent flying-fox pups.

Council may close public access to camps when notice of a public health risk, food shortage or roost collapse has been given by Council staff, EPA, WIRES, flying-fox experts or OEH. Access should not be permitted for a suitable period to allow flying-foxes to recover, to arrange removal of bodies and to reduce the risk of members of the public coming into contact with dead/injured flying-foxes. Council will seek the advice of the relevant staff, EPA, WIRES, flying-fox experts and OEH to determine when to allow access to camps. Trained and vaccinated WIRES volunteers will be exempt from public access exclusions to attend to affected flying-foxes if required.

The local wildlife care group (WIRES, Mid North Coast Branch) has drafted a Mass Flying-Fox Disaster Incident document which outlines its response to such mass disasters (mainly heat stress). Council and WIRES will discuss and ensure that this Plan and the WIRES document are in agreement and contain complementary advice. Council and WIRES will also discuss ways in which the two groups can advise and assist each other in the event of an incident and; what other organisations may be of assistance, e.g. water tankers to spray high above the camp canopy during a heat stress incident.

Wildlife Strike Prevention in CHRA Terminal Airspace

Coffs Creek and Barcoo Court camps require specific protocols to manage the risk of airstrike associated with Coffs Harbour Regional Airport (CHRA).

A Wildlife Hazard Management Plan was prepared by Avisure (2016) for the Coffs Harbour Regional Airport which identified the Coffs Creek and Barcoo flying-fox camps as priority areas.

The Avisure plan (2016) identifies that flying-foxes are a high risk species due to the possibility of a mass strike. Confirmed strikes by single bats at CHRA have occurred on two occasions between 2011 – 2015 (one by a GHFF and one by an unidentified flying-fox).

In the Avisure plan (2016), Coffs Creek and Barcoo camps are listed as moderate priority areas. Table C7 lists the following required actions associated with both moderate priority camps.

- CHRA will liaise with National Parks and Wildlife Service (NPWS) regarding the size of each flying-fox camp. The assumption is that NPWS will inform CHRA of large changes / increases in camp size/s.
- If flying-fox numbers are ‘high’ the CHRA is required to issue a Notice to Airman (NOTAM) to aircraft operators.
- A number of general flying-fox management recommendations are provided:
- Improvements to hazard communication: approaching / departing aircraft will radio CHRA for status / activity updates on flying-foxes if a hazard warning notice has been issued in the En Route Supplement Australia (ERSA) and/or use of NOTAM.
- Hazard monitoring: determine flying-fox trigger numbers or risk levels for increased monitoring or mitigation of flying-foxes at off-airport sites.
- Recording of flying-fox strikes.

Species Action Plans are provided for both GHFF and Unidentified Flying-foxes. These highlight that flying-foxes transiting through airport air space and aircraft flight paths, particularly during the nightly exodus from their daytime roosts, are a serious hazard (Avisure 2016).

CHRA hazard management actions for flying-foxes are as follows:

Active Management

- Monitor flight strips for individuals or flocks and report hazard to aircraft operators.

Passive Management

- Remove trees and shrubs from airside and landside areas whose fruits and flowers attract flying-foxes.
- Develop a landscaping policy that provides guidance on appropriate plant species use.
- During high risk periods, encourage delayed take-offs and landings.
- Monitor flying-fox roosts in the vicinity of the airport to identify local population trends.
- Where possible, schedule flight operations to avoid peak activity.

Additional Responses

- Issue a Wildlife Hazard Notification or NOTAM if the hazard is likely to remain high for a definable period.
- Where regular monitoring identifies a defined or seasonal trend, update the ERSA to include hazard details, time of hazard, location, expected duration, and general hazard avoidance advice for pilots (Avisure 2016).

Issues with the Avisure plan (2016) include:

- Informing CHRA of large changes / increases in camp size/s should be the responsibility of CHCC rather than NPWS, as both camps are located on Council-owned land and CHCC monitors the flying-fox populations every 3 months. NPWS has a limited role in monitoring and/or managing these camps.
- A clear definition of what constitutes a ‘high’ number of flying-foxes at a camp is not provided.

Further consultation between CHRA, Avisure, OEH and Council is required prior to deciding upon what constitutes a ‘high’ number of flying-foxes and determining what trigger levels should apply to initiate increased monitoring or mitigation at off-airport sites. A suggested level to be used as the definition of high flying-fox numbers for discussion with CHRA is when the camp reaches 75% of peak occupancy or approximately 13, 000 flying-foxes.

It is recommended that CHCC make this Plan available to CHRA and discuss planned management actions for the Coffs Creek and Barcoo Court camp with CHRA at their annual meeting. It is also recommended that CHCC suggest CHRA look to consider the presence of flying-foxes in any future scheduling of flight times and approach/exit directions. Risk of airstrike will be dramatically reduced if flights are not scheduled to take-off or land in the hour after sunset. This will also reduce the risk of airstrike with other wildlife populations (Wedge-tailed Shearwaters and Ibis) that also pose a risk of airstrike. Where such factors as weather conditions, ambient light, and airport scheduling factors permit, flights that are arriving or departing in the hour after sunset should be directed to do so from the northern and western side of the airstrip.

8.2.8 Participation in research

CHCC will endeavour to provide assistance / information to any research studies that aim to investigate the management of flying-fox camps, this includes the camp counts as part of the National Flying-fox Monitoring Program and research studies investigating the health impacts of flying-fox camps.

8.2.9 Appropriate land-use planning

This action was identified in the Strategy in 2007 and had not been resolved in 2015 (**Table 1, Section 2.5.1**, and CHCC, 2015). It is recommended that details are included in the Development Control Plan (DCP) to guide development in and around existing, seasonal or temporary flying-fox camps within the LGA. The DCP should aim to reduce the likelihood of future impacts on urban development, addressing such issues as adequate buffers between camps and development.

Section 8.2.6 recommends identification of priority sites for revegetation/rehabilitation of flying-fox habitat within the LGA and incorporation of those sites into the future urban planning framework. A feasibility study to assess the likelihood of success and determine the warranted level of resource allocation to habitat improvement of suitable land parcels identified via this process should also be undertaken. Suitable land parcels must be a minimum of 300 m from sensitive receivers. Sensitive receivers are defined in this Plan as:

- a school or day care centre
- aged care facility
- centre for the care of people with intellectual/physical disabilities
- hospitals
- playgrounds
- horse stables; or
- within 200m of the runway of an airport

8.3 Level 2 Actions

8.3.1 Buffers

This Plan does not recommend the creation of any new buffers through vegetation removal from within designated flying-fox camp habitat at Coffs Creek or Woolgoolga Lake camps. The Coffs Creek camp already contains numerous vegetated buffers. These were created by Council in 2008/2009 through tree removal to deter flying-foxes from roosting close to nearby residents, and new plantings to create a visual /sound barrier. Neighbouring residents of Coffs Creek camp have indicated that regular maintenance of these buffers is required to ensure they fulfil their purpose and do not create additional flying-fox habitat. A privately owned buffer located along Coffs Creek behind Gundagai Street occurs on private land where each Lot has centre title to the midpoint of Coffs Creek. Council assisted landowners of these properties to remove Camphor Laurels and plant shrubs and provided training and advice on vegetation management to reduce and minimise interactions with flying-foxes when the buffer was created in 2009. It is the responsibility of private land owners to manage these buffers.

Woolgoolga Beach Reserve VMP also recommends the creation of a vegetated buffer of low growing spiky plants around the edge of management zones 1 and 2 to reduce unauthorised public access into the core of the camp.

There is currently no VMP for the Barcoo Court Reserve. This plan recommends the preparation of a VMP and PoM, based on **Figure 10**, in consultation with the residents of Barcoo Court and OEH (**Section 8.2.6**). At present there is a Council easement and an artificially created vegetated drain /

creek that runs east west behind residences on the north side of Barcoo Court separating them from the flying-fox camp. This easement and drain are between 5 and 15m wide as measured from the fence line of residences to the edge of the current camp area. There are mature trees within the easement against the fence line of neighbouring properties that flying-foxes occasionally roost and forage in during periods of peak camp occupancy (**Section 2.2.2**).

In order to reduce the impacts from flying-foxes roosting and feeding in close proximity to residential properties on the north side of Barcoo Court, the Plan provides for residents, in consultation with Council staff, to discuss trimming or removal of trees. Only those trees within 5 m of the boundary of residential properties and located within the Council easement will be considered for trimming or removal (**Figure 10**). Most of the area represented by the Barcoo Court camp is mapped as *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (SSF), as an Endangered Ecological Community under the *Threatened Species Conservation Act 1995* (TSC Act) (**Map 14, Appendix C**). It is also mapped as Primary and Secondary Koala habitat (**Map 8, Appendix C**). The total amount of vegetation being considered for trimming or removal is 0.16 ha.

Three indicative management zones have been identified;

- Zone 1 is located behind numbers 2- 16 Barcoo Court and is in an area of low impact, furthest from the corer camp area. A significant amount of vegetation is within the Council easement and the 5m buffer and the easement is a maximum of 5 - 6m wide.
- Zone 2 is located behind numbers 18 – 26 Barcoo Court and is the area of greatest impact from flying-foxes adjacent to the core camp area. There is a moderate amount of vegetation within the 5m buffer, but the easement widens to 8+m in places in this Zone.
- Zone 3 is located behind numbers 28 – 40 Barcoo Court and is in an area of moderate to high impact. A significant amount of vegetation is within the Council easement and the 5m buffer but the easement extends to 15+m in this Zone.

An indicative assessment of the potential impacts of a maximum amount of tree trimming or removal within the easement is provided in **Section 10**, based upon the Management Zones 1-3 presented in **Figure 10** to ensure impacts on flying-foxes and other threatened species or communities have been adequately addressed. Under the legislation current at the time of publication of this Plan, there may be a requirement to undertake compensatory planting of primary and secondary Koala habitat tree species as part of the VMP to offset for the loss of Koala habitat.

However, under the Biodiversity Conservation Act (due to commence on 25 August 2017), Council may choose to prepare a Biodiversity Assessment Report using the Biobanking Assessment Methodology to quantify impacts and calculate the offset required for the loss of vegetation and threatened species habitat.

It is important to note that there will be pre and post action monitoring and reporting requirements associated with the creation of buffers at Barcoo Court. The VMP will clearly state the standard measures to avoid impacts to flying-foxes as set out in **Section 9.3** that will apply for all management actions recommended. These measures include detail on timing of works, the supervisory requirements by flying fox experts and detailed information that must be collected and recorded prior to, during and after works have been completed.

8.4 Temporary Camps

Temporary camps occasionally form in new locations and flying foxes may only be present in these temporary camps for a number of days or weeks. **Section 2.1.4** describes a number of historical camp locations within the LGA that have not been occupied regularly by flying-foxes between 2007 and 2017 or developed into permanent camp locations. Sensitive locations are defined in this Plan as areas where flying foxes are roosting within 50m of:

- a school or day care centre
- aged care facility
- centre for the care of people with intellectual/physical disabilities
- hospitals
- playgrounds
- horse stables; or
- within 200m of the runway of an airport

If a new camp establishes in a sensitive location as defined above, Council staff will monitor the camp weekly and undertake a targeted education and awareness program with neighbouring residents and stakeholders. Council's Senior Biodiversity Officer will be informed of the new camp. Council will also consult with OEH to discuss suitable triggers for an increased level of action should conflict arise that cannot be ameliorated by implementation of off-site Level 1 actions.

In cases where flying-foxes establish a camp in a sensitive location and weekly monitoring indicates increased camp size and increasing complaints and/or impacts, this will be the trigger point for moving to higher level actions with the approval of OEH. In planning for higher level actions Council must consult with OEH, local flying-fox experts, WIRES and affected / impacted parties to determine the most appropriate response.

Early dispersal before a camp is established at a new location may be possible in the case of sensitive locations because it can be less costly and slightly lower risk than dispersing a historic camp. Early dispersal before a camp has established at a sensitive location has the potential to increase pressure on flying-foxes that may have relocated from another dispersed camp, which may exacerbate impacts on these individuals. If early dispersal at a sensitive location is successful, it can mitigate all impacts at that site, and is often stated as the preferred method for impacted community members. Early dispersal will not be undertaken without documented consideration of impacts to flying-foxes and other ecological values and consultation with OEH, flying-fox experts and stakeholders. Preparation and approval of a dispersal plan will be required prior to any on-ground action.

The Federal government has recommended that a decision making tool be developed to assist land managers navigate a pathway for the management of flying-fox camps. This decision making tool may incorporate scenarios associated with new camps in sensitive locations. This plan should be reviewed and updated once this tool has been produced.

Table 7: Management approach overview

Issue	Management aim	Success measure	Management actions to be considered		
			Level 1 actions	**Level 2 actions**	**Level 3 actions**
Complaint tracking	Measure level of community conflict	Reduced number of complaints/complainants to Council regarding flying-foxes. Critical to measuring the success of most other management actions.	Education and awareness. Introduce a flying-fox database at CHCC for tracking complaints.	Nil	Nil
Noise	Mitigate noise impacts.	Reduce number of complaints/complainants	Property modification. Appropriate land-use planning. Dense planting to create screens at boundaries. Revegetate / rehabilitate selected suitable sites away from sensitive receivers to create alternative habitat. Maintain existing buffers	Level 2 actions will not be considered to mitigate this issue.	Level 3 actions will not be considered to mitigate this issue.
Flying-foxes overhanging pathways / residential properties	Prevent flying-foxes overhanging pathways/properties.	Reduce number of complaints from residents about access to pathways and residential properties	Divert / temporarily close paths (if/when required). Property modification, advise residents on appropriate backyard plantings and remove those that attract flying-foxes, adhering to standard management protocols (**Section 9.3**).	No additional trimming of vegetation or creation of additional buffers required at this stage at Coffs Creek or Woolgoolga. Review Plan if this becomes an issue and all Level 1 actions have been exhausted. Barcoo Court VMP to be produced, trimming or removal of overhanging vegetation may be required.	Level 3 actions will not be considered to mitigate this issue.

Issue	Management aim	Success measure	Management actions to be considered		
			Level 1 actions	Level 2 actions	Level 3 actions
Faecal drop	Mitigate impacts of faecal drop.	Reduction in complaints/complainants on the impacts of faecal drop	Education and awareness (e.g. managing foraging attractants and tips to reduce impacts / fear of disease). Property modification (including providing a community loan high pressure water hose to clean affected areas). Exemptions or subsidies for water use. Appropriate land-use planning. Protocols to manage incidents (e.g. cleaning at schools prior to young children arriving). Revegetate / rehabilitate selected suitable sites away from sensitive receivers to create alternative habitat. Maintenance of existing buffers at Coffs Creek and Woolgoolga.	Creation of buffer through trimming of overhanging vegetation may be required at Barcoo Court, VMP to be prepared.	Level 3 actions will not be considered to mitigate this issue.
Smell	Mitigate impacts of smell.	Reduction in complaints/complainants	Education and awareness programs (e.g. ensuring community understand not associated with uncleanliness). Property modification. Appropriate land-use planning. Dense planting at boundaries (including use of fragrant flowers to mask odour). Revegetate / rehabilitate selected suitable sites away from sensitive receivers to create alternative habitat. Maintenance of existing buffers at Coffs Creek and Woolgoolga.	Creation of buffer through trimming of overhanging vegetation may be required at Barcoo Court, VMP to be prepared.	Level 3 actions will not be considered to mitigate this issue.

Issue	Management aim	Success measure	Management actions to be considered		
			Level 1 actions	Level 2 actions	Level 3 actions
Fear of disease	Promote awareness of actual low disease risk. Reassure community.	All concerned community members have received and have access to factual information on disease.	Education and awareness programs including community information session (e.g. ensuring community understand actual low risk of disease transfer and simple mitigation measures). Protocols to prevent incidents (e.g. heat stress events) monitored using web viewer and/or notification by WIRES, and managed, Camps closed to public and public informed if flying-foxes are sick, malnourished, dying or otherwise unwell).	Level 2 actions will not be considered to mitigate this issue.	Level 3 actions will not be considered to mitigate this issue.
Health / wellbeing impacts	Mitigate health and wellbeing impacts.	Reduction in complaints/complainants about disease risk	Education and awareness programs. Property modification to prevent wellbeing impacts associated with noise, smell. Protocols to prevent incidents (e.g. heat stress events) monitored using web viewer and/or notification by WIRES, and managed, Camps closed to public and public informed if flying-foxes are sick, malnourished, dying or otherwise unwell). Routine management actions to improve the site (bush regeneration to reduce weeds and encourage native species). Revegetate /rehabilitate selected suitable sites away from sensitive receivers to create alternative habitat. Maintenance of existing buffers at Coffs Creek and Woolgoolga	Creation of buffer through trimming of overhanging vegetation may be required at Barcoo Court, VMP to be prepared.	Level 3 actions will not be considered to mitigate this issue.

Issue	Management aim	Success measure	Management actions to be considered		
			Level 1 actions	Level 2 actions	Level 3 actions
Damage to vegetation	Mitigate impacts to vegetation.	Increase in canopy cover, improved condition of vegetation community, reduction in weeds, increased presence of juvenile native species, decreased weed seed bank.	Routine bush regeneration as set out in Coffs Creek Flying-fox Camp Strategy and VMP and Woolgoolga Beach Reserve VMP to improve the condition of vegetation in each Reserve. Production of VMP for Barcoo Court camp and Council Reserve. Prioritise adjacent and alternative sites for revegetation / rehabilitation away from sensitive receivers to create alternative flying-fox habitat, relieving pressure on existing habitat.	Level 2 actions are not considered necessary at this stage. Review Plan if damage to vegetation worsens despite implementation of VMPs.	Level 3 actions will not be considered to mitigate this issue.
Property devaluation	Reduce economic loss associated with potential property devaluation.	Property value not being impacted for owners that purchased property prior to camp formation, as assessed through independent valuation.	Property modification. Subsidise services related to water usage to reduce impacts. Off-set through funding or incentives (e.g. water rate reduction). Appropriate land-use planning. Dense planting unsuitable as roosting or foraging habitat for flying-foxes to create screens at residential boundaries. Revegetate / rehabilitate selected suitable sites away from sensitive receivers to create alternative habitat. Maintenance of existing buffers at Coffs Creek and Woolgoolga	Creation of buffer through trimming of overhanging vegetation may be required at Barcoo Court, VMP to be prepared.	Level 3 actions will not be considered to mitigate this issue.

Issue	Management aim	Success measure	Management actions to be considered		
			Level 1 actions	Level 2 actions	Level 3 actions
Lost rental return	Reduce economic loss associated with lost rental return.	Rental return is not being impacted for owners that purchased property prior to camp formation, as assessed through an independent valuation.	Subsidise services related to water usage to reduce impacts. Off-set through funding or incentives (e.g. water rate reduction). Appropriate land-use planning. Dense planting unsuitable as roosting or foraging habitat for flying-foxes to create screens at residential boundaries. Revegetate / rehabilitate selected suitable sites away from sensitive receivers to create alternative habitat. Maintenance of existing buffers at Coffs Creek and Woolgoolga	Creation of buffer through trimming of overhanging vegetation may be required at Barcoo Court, VMP to be prepared.	Level 3 actions will not be considered to mitigate this issue.

8.5 Stop work triggers

The management program outlined above will cease and will not recommence or progress to subsequent levels without consulting OEH if:

- any of the animal welfare triggers occur on more than two days during the program, such as unacceptable levels of stress (see **Table 8**)
- there is a flying-fox injury or death
- a new camp/camps appear to be establishing
- impacts are created or exacerbated at other locations
- there appears to be potential for conservation impacts (e.g. reduction in breeding success identified through independent monitoring)
- standard measures to avoid impacts (detailed in **Section 9.3**) cannot be met.

Management may also be terminated at any time if:

- unintended impacts are created for the community around the camp
- allocated resources are exhausted.

Table 8: Planned action for potential impacts during management

Welfare trigger	Signs	Action
Unacceptable levels of stress	If any individual is observed: • panting • saliva spreading • located on or within 2 m of the ground	Works to cease for the day.
Fatigue	In-situ management • more than 30% of the camp takes flight • individuals are in flight for more than 5 minutes • flying-foxes appear to be leaving the camp	In-situ management Works to cease and recommence only when flying-foxes have settled* / move to alternative locations at least 50 m from roosting animals.
Injury/death	• a flying-fox appears to have been injured/killed on site (including aborted foetuses) • females in final trimester • dependent/crèching young present • loss of condition evident	Works to cease immediately and OEH notified AND rescheduled OR adapted sufficiently so that significant impacts (e.g. death/injury) are highly unlikely to occur, as confirmed by an independent expert (see **Appendix B**) OR stopped indefinitely and alternative management options investigated.

*maximum of two unsuccessful attempts to recommence work before ceasing for the day.

9 Assessment of impacts to flying-foxes

Standard measures to avoid impacting flying-foxes at the camp during management are provided in **Section 9.3,** will form part of Council's operational planning documents and be adhered to by Council during all management actions. Only if these standard measures cannot be complied with at any camp is an assessment of impacts, along with proposed mitigation measures, required.

Given most of the actions recommended are Level 1, or a continuation of previously assessed Level 2 actions (Coffs Creek VMP), the only impact assessment that may be required will be that for implementation of the Barcoo Court VMP, which is yet to be produced. This section of the Plan has been undertaken with the understanding that it may need to be reviewed and updated once the Barcoo Court VMP is produced.

It is recommended that both the Coffs Creek VMP and Woolgoolga Beach Reserve VMP be reviewed and updated to ensure they comply with the standard measures to avoid impacting flying-foxes during camp management described in **Section 9.3** and to also take into consideration the suite of other management issues that may be in operation at each Reserve that would be addressed in a PoM as discussed in Sections 2 and 4.

9.1 Regional context

With no significant removal of vegetation recommended in the Plan, there are not expected to be any impacts upon the regional flying-fox camp sites at Glenreagh, Bellingen and Minnie Waters.

Potential trimming or removal of 0.16 ha of the endangered ecological community *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (TSC Act) that is occasionally used as foraging and roosting habitat by GHFF at Barcoo Court, Toormina is unlikely to affect the regional population of flying foxes. There are 1731.94 ha of Swamp Sclerophyll Forest EEC within Coffs LGA. The amount of this vegetation community included in management zones 1 – 3 at Barcoo Court represents less than 0.05% of the total Swamp Sclerophyll Forest EEC in the LGA. The standard measures to avoid impacts set out in **Section 9.3** will be adhered to during any vegetation trimming or removal works at Barcoo Court.

9.2 Flying-fox habitat to be affected

Potential trimming or removal of 0.16 ha of the endangered ecological community *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (TSC Act) that is occasionally used as foraging and roosting habitat by GHFF at Barcoo Court is proposed as a management action in the Plan. Maintenance trimming of the vegetated buffer at Red Cedar Reserve (which is not currently being used as flying-fox roosting or foraging habitat), removal of weeds from the understorey and planting of native species to reduce canopy gaps at Red Cedar Reserve and Woolgoolga Beach Reserve will also be carried out in areas of flying-fox habitat as part of this Plan.

Standard measures and protocols to avoid impacting flying-foxes have been included and will be updated to comply with **Section 9.3** of this Plan to ensure there is no significant impact upon the flying-fox roosting habitat within the Reserve.

9.3 Standard measures to avoid impacts

The following mitigation measures will be complied with at all times during Plan implementation, along with any pre-existing measures to avoid impacts to other ecological values (e.g. to protect a threatened ecological community in or near the camp) as outlined in the Coffs Creek VMP and Woolgoolga Beach Reserve VMP.

9.3.1 All management activities

These flying-fox specific measures are included to avoid impacts. Timing has been set around GHFF and BFF breeding only, as LRFF rarely birth and rear young in NSW. However, if LRFF are present during their normal birthing and rearing period (i.e. March – October) or are identified as being in final trimester / with dependent young, Council will need to consult with OEH to determine appropriate management timing.

Emergency protection works in instances such as flood, fire etc. may not be able to comply with all of these measures but all efforts will be made in the event of an emergency to minimise impacts to flying-foxes as much as possible. Routine management and maintenance works will comply with these measures because they will form part of the operational works plan for Councils standard activities and will be flagged as part of the sign – off process.

Further background information on management activities is provided in the following OEH factsheets:

Routine camp management (Level 1) actions

http://www.environment.nsw.gov.au/animals/flying-fox-routine.htm

Creation of buffers (Level 2) actions

http://www.environment.nsw.gov.au/animals/flying-fox-buffer.htm

- All personnel will be appropriately experienced, trained and inducted. Induction will include each person's responsibilities under this Plan.
- All personnel will be briefed prior to the action commencing each day, and debriefed at the end of the day.
- Works will cease and OEH consulted in accordance with the 'stop work triggers' section of the Plan.
- Large crews will be avoided where possible.
- The use of loud machinery and equipment that produces sudden impacts/noise will be limited. Where loud equipment (e.g. chainsaws) is required they will be started away from the camp and allowed to run for a short time to allow flying-foxes to adjust.
- Activities that may disturb flying-foxes at any time during the year will begin as far from the camp as possible, working towards the camp gradually to allow flying-foxes to habituate.
- Any activity likely to disturb flying-foxes so that they take flight will be avoided during the day during the sensitive GHFF/BFF birthing period (i.e. when females are in final trimester or the majority are carrying pups, generally August – December) and avoided altogether during crèching (generally November/December to February). Where works cannot be done at night after fly-out during these periods, it is preferable they are undertaken in the late afternoon close to or at fly-out. If this is also not possible, a person experienced in flying-fox behaviour will monitor the camp for at least the first two scheduled actions (or as otherwise deemed to be required by that person) to ensure impacts are not excessive and advise on the most appropriate methods (e.g. required buffer distances, approach, etc.).

- OEH will be immediately contacted if LRFF are present between March and October, or are identified as being in final trimester / with dependent young.
- Non-critical maintenance activities will ideally be scheduled when the camp is naturally empty. Where this is not possible (e.g. at permanently occupied camps) they will be scheduled for the best period for that camp (e.g. when the camp is seasonally lower in numbers and breeding will not be interrupted, or during the non-breeding season, generally May to July).
- Works will not take place in periods of adverse weather including strong winds, sustained heavy rains, in very cold temperatures or during periods of likely population stress (e.g. food bottlenecks or heat stress http://www.environment.nsw.gov.au/animals/flying-fox-heat.htm). Wildlife carers will be consulted to determine whether the population appears to be under stress.
- Works will be postponed on days predicted to exceed 35°C (or ideally 30°C), and for one day following a day that reached ≥35°C. If an actual heat stress event has been recorded at the camp or at nearby camps, a rest period of several weeks will be scheduled to allow affected flying-foxes to fully recover. See the OEH fact sheet on responding to heat stress in flying-fox camps (**Appendix F**).
- Evening works may commence after fly-out. Noise generated by the works should create a first stage disturbance, with any remaining flying-foxes taking flight. Works should be paused at this stage to monitor for any remaining flying-foxes (including crèching young, although December – February should be avoided for this reason) and ensure they will not be impacted. All Level 1 and 2 works (including pack up) will cease by 0100 to ensure flying-foxes returning early in the morning are not inadvertently dispersed. Works associated with Level 3 actions may continue provided flying-foxes are not at risk of being harmed.
- If impacts at other sites are considered, in OEH's opinion, to be a result of management actions under this Plan, assistance will be provided by the proponent to the relevant land manager to ameliorate impacts. Details of this assistance are to be developed in consultation with OEH.
- Any proposed variations to works detailed in the Plan will be approved, in writing, by OEH before any new works occur.
- OEH may require changes to methods or cessation of management activities at any time.
- Ensure management actions and results are recorded to inform future planning. See the OEH fact sheet on Monitoring, evaluating and reporting (http://www.environment.nsw.gov.au/animals/flying-fox-monitor.htm)

It is the responsibility of the land manager and contractors to conduct a risk assessment and determine workplace health and safety requirements; however, minimum requirements are provided below.

Human safety

- All personnel to wear protective clothing including long sleeves and pants; additional items such as eye protection and a hat are also recommended. People working under the camp should wash their clothes daily. Appropriate hygiene practices will be adopted such as washing hands with soap and water before eating/smoking.
- All personnel who may come into contact with flying-foxes will be vaccinated against Australian bat lyssavirus with current titre.
- A wash station will be available on site during works along with an anti-viral antiseptic (e.g. Betadine) should someone be bitten or scratched.

- Details of the nearest hospital or doctor who can provide post-exposure prophylaxis will be kept on site.

Noise reduction recommendations

Noise reduction recommendations may be enacted when flying fox numbers are above 75% of peak occupancy in the neighbourhoods surrounding each of the camps. Residents whose properties adjoin the camp, or who reside within 100m of the camp edge are to be advised of these recommendations. The protocols are designed to limit the amount of disturbance to the flying foxes which will reduce the amount of noise emitted by the camp and decrease noise impacts and complaints from neighbouring residents whilst the camp is at or near peak occupancy.

- Limiting the use of disturbing activities such as lawn-mowing, using chainsaws, whipper-snippers, using generators and testing alarms or sirens to certain days (alternate days of the week, on only Monday, Wednesday, Friday and Saturday) and/or certain times of day (between the hours of 2pm and dusk)
- Starting up any machinery at the furthest distance from the camp and gradually moving closer once flying foxes have settled

Post-works

- Reports for Level 2 and 3 actions (no levels 3 actions are proposed in this plan) will be submitted to OEH as per any required license requirements. License reporting requirements will be met however it is anticipated that each report is to include:
  - results of pre- and post-work population monitoring
  - any information on new camps that have formed in the area
  - impacts at other locations that may have resulted from management, and suggested amelioration measures
  - an assessment of how the flying-foxes reacted to the works, with particular detail on the most extreme response and average response, outlining any recommendations for what aspects of the works went well and what aspects did not work well
  - further management actions planned including a schedule of works
  - an assessment[4] of how the community responded to the works, including details on the number and nature of complaints before and after the works
  - detail on any compensatory plantings undertaken or required
  - expenditure (financial and in-kind costs)
  - Plan evaluation and review (see **Section 11**).

9.3.2 All Level 2 and 3 actions

Prior to works

- Relevant consents, licenses and approvals are obtained (if required) and conditions have been incorporated into operational works plans, staff inducted and advised of conditions to be implemented prior to works commencing.

[4] A similar approach should be taken to pre-management engagement (see **Section 3**) to allow direct comparison, and responses should be assessed against success measures (**Section 9**) to evaluate success.

- Residents adjacent to the camp will be individually notified one week prior to on-ground works commencing. This will include information on what to do if an injured or orphaned flying-fox is observed, a reminder not to participate in or interfere with the program, and details on how to report unusual flying-fox behaviour/daytime sightings. Relevant contact details will be provided (e.g. Program Coordinator). Resident requests for retention of vegetation and other concerns relating to the program will be taken into consideration.
- Where the Plan is being implemented by Council, information will be placed on Council's website along with contact information.
- OEH will be notified at least 48 hours before works commence.
- A protocol, in accordance with the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012a), for flying-fox rescue will be developed including contact details of rescue and rehabilitation organisations. This protocol will be made available to all relevant staff, residents and volunteers prior to the action commencing. See **Appendix K** for an example protocol.
- A licensed wildlife carer will be notified prior to beginning works in the event that rescue/care is required.

Monitoring

- A person trained in flying-fox counts will undertake an on-site population assessment prior to, during works and after works have been completed, including:
  - number of each species
  - ratio of females in final trimester
  - approximate age of any pups present including whether they are attached or likely to be crèched
  - visual health assessment
  - mortalities.
- Counts will be done at least:
  - once immediately prior to works
  - daily during works
  - immediately following completion
  - one month following completion
  - 12 months following completion.

During works

- A flying-fox expert (identified in **Section 12.3**) will attend the site as often as OEH considers necessary to monitor flying-fox behaviour and ensure compliance with the Plan and the Policy. They must also be able to identify pregnant females, flightless young, individuals in poor health and be aware of climatic extremes and food stress events. This person will make an assessment of the relevant conditions and advise the supervisor/proponent whether the activity can go ahead.
- At least one flying-fox rest day with no active management will be scheduled fortnightly, preferably weekly.

9.3.3 Vegetation trimming/removal

These measures apply for actions involving any vegetation removal. These measures are required at Coffs Creek during maintenance of the vegetated buffer. These measures may also be required at Barcoo Court, dependent upon the recommendations of the VMP and consultations with residents.

- Dead wood and hollows will be retained on site where possible as habitat.
- Vegetation chipping is to be undertaken as far away from roosting flying-foxes as possible (at least 100 metres).

9.3.4 Canopy vegetation trimming/removal

This Plan includes the option to trim or remove trees that are occasionally used for feeding and roosting (peak occupancy only) at Barcoo Court. Only those trees located within the Council easement and within 5m of the boundary of residential properties on the northern side of Barcoo Court will be considered for trimming or removal.

Prior to works

- Trees to be removed or lopped will be clearly marked (e.g. with flagging tape) prior to works commencing, to avoid unintentionally impacting trees to be retained.

During works

- Any tree lopping, trimming or removal is undertaken under the supervision of a suitably qualified arborist (minimum qualification of Certificate III in Horticulture (Arboriculture) who is a member of an appropriate professional body such as the National Arborists Association).
- Trimming will be in accordance with relevant Australian Standards (e.g. AS4373 Pruning of Amenity Trees), and best practice techniques used to remove vegetation in a way that avoids impacting other fauna and remaining habitat.
- No tree in which a flying-fox is roosting will be trimmed or removed. Works may continue in trees adjacent to roost trees only where a person experienced in flying-fox behaviour assesses that no flying-foxes are at risk of being harmed. A person experienced in flying-fox behaviour is to remain on site to monitor, when canopy trimming/removal is required within 50 metres of roosting flying-foxes.
- While most females are likely to be carrying young (generally September – January) vegetation removal within 50 metres of the camp will only be done in the evening after fly-out, unless otherwise advised by a flying-fox expert.
- Tree removal as part of management will be offset at a ratio described in the Coffs Harbour DCP 2015. Where threatened vegetation removal is required, the land manager will prepare an Offset Strategy to outline a program of restoration works in other locations (in addition to existing programs). Alternatively Council may elect to use the offset scheme provided to determine offset requirements under the Biobanking Assessment Methodology as described under the Biodiversity Conservation Act which is due to commence on 25 August 2017.

9.3.5 Bush regeneration

Ongoing bush regeneration works programs at the Woolgoolga and Coffs Creek camps should be continued and the VMPs for each updated in line with recommendations in the plan. Funding will be required to develop and support a new bush regeneration works program at the Barcoo camp.

- All works will be carried out by suitably qualified and experienced bush regenerators, with at least one supervisor knowledgeable about flying-fox habitat requirements (and how to retain them for Level 1 and 2 actions) and trained in working under a camp.
- Vegetation modification, including weed removal, will not alter the conditions of the site such that it becomes unsuitable flying-fox habitat for Level 1 and 2 actions.
- Weed removal should follow a mosaic pattern, maintaining refuges in the mid- and lower storeys at all times.

- Weed control in the core habitat area will be undertaken using hand tools only (or in the evening after fly-out while crèching young are not present).
- Species selected for revegetation will be consistent with the habitat on site, and in buffer areas or conflict areas should be restricted to small shrubs/understorey species to reduce the need for further roost tree management in the future.

9.3.6 Additional mitigation measures for any activity at a nationally important GHFF camp

In addition to those detailed above, the following measures are required for any activity other than routine camp management (Level 1 actions) at a nationally important GHFF camp. Nationally important flying-fox camps within the Coffs LGA include Coffs Creek, Barcoo Court and Woolgoolga Lake. In circumstances where mitigation standards are not applied, significant impacts are likely and the proposed action is more likely to require referral under the EPBC Act. See **Section 4.2.1** for further detail.

- The action will not occur if the camp contains females that are in the late stages of pregnancy or have dependent young that cannot fly on their own (generally August to February).
- Disturbance activities will be limited to a maximum of 2.5 hours in any 12-hour period, preferably at or before sunrise or at sunset. Disturbance activities can be defined as any activity, other than routine activities, that disturbs the camp and therefore this may apply to both Level 2 and 3 activities.
- The action will not involve the clearing of all vegetation supporting a nationally important flying-fox camp. Sufficient vegetation will be retained to support the maximum number of flying-foxes ever recorded in the camp of interest.

10 Assessment of impacts to other threatened species or communities

The routine camp maintenance such as trimming of vegetated buffers and weed control works proposed in this document for Coffs Creek camp and Woolgoolga Lake camp will not significantly affect other threatened species, populations or ecological communities and requires no further assessment.

Potential trimming or removal of trees located in the Council easement on the north side of Barcoo Court within 5m of, or overhanging the boundary of residential properties has the potential to impact threatened species, populations and ecological communities and the impacts of this action will be formally assessed.

10.1 Description of potential impacts

In order to reduce the impacts from flying-foxes roosting and feeding in close proximity to residential properties on the north side of Barcoo Court, the Plan provides for residents, in consultation with Council staff, to discuss trimming or removal of trees. Only those trees within 5 m of the boundary of residential properties and located within the Council easement will be considered for trimming or removal (**Figure 10, Section 8**). The total amount of vegetation being considered for trimming or removal is 0.16 ha.

10.2 Affected species

A preliminary list of threatened flora and fauna species, populations and ecological communities known or likely to occur within the locality (a radius of 10km) of each camp appears in **Appendix A.** This list was filtered to identify threatened species, populations or communities considered likely to occur or periodically utilise the Barcoo Court camp area based upon information obtained during the site inspection and knowledge of the species ecology, hereafter termed affected species.

The vegetation community within the Council easement has been identified as an endangered ecological community under the NSW TSC Act; *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (**Map 14, Appendix C**). The majority of the trees that will potentially be affected are mature *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Casuarina glauca* (Swamp Oak). There were no obvious hollows observed in any of the trees that will potentially be affected.

Seven part tests were conducted for each of the following affected species, and communities known or likely to occur on site;

- *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Swamp Sclerophyll Forest EEC)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bent-winged Bat)
- *Myotis macropus* (Southern Myotis)
- *Phascolarctos cinereus* (Koala)

If the situation changes (particularly upon production of the Barcoo Court VMP) and further actions are required at any of these camps, any developments/actions likely to affect other threatened species,

populations or ecological communities (identified in **Section 5**), may require a species impact statement (SIS) as outlined in section 110 of the *Threatened Species Conservation Act 1995* (TSC Act).

10.3 Seven part tests

10.3.1 Swamp Sclerophyll Forest

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (SSF) is listed as an Endangered Ecological Community under the *Threatened Species Conservation Act 1995* (TSC Act). This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only support 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. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent.

The most widespread and abundant dominant trees include *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Broad-leaved Paperbark). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (Sweet Willow Bottlebrush), *Casuarina glauca* (Swamp Oak) and *Eucalyptus resinifera* subsp*. hemilampra* (Red Mahogany), *Livistona australis* (Cabbage Palm) and *Lophostemon suaveolens* (Swamp Turpentine).

A layer of small trees may be present, including *Acacia irrorata* (Green Wattle), *Acmena smithii* (Lilly Pilly), *Elaeocarpus reticulatus* (Blueberry Ash), *Glochidion ferdinandi* (Cheese Tree) and the paperbarks *Melaleuca linariifolia* and *M. styphelioides*. A shrub layer may be present, including occasional vine species. The groundcover is composed of abundant sedges, ferns, forbs, and grasses.

The community persists within the Barcoo camp area in a moderate to good condition, with an intact native canopy, native understorey species and native species regeneration occurring, along with a level of exotic species infestation around the perimeter of the camp patch.

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Swamp Sclerophyll Forest is not a threatened species.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Swamp Sclerophyll Forest is not an endangered population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The Barcoo camp is located north-east of the junction of Hogbin Drive and Barcoo Court in the suburb of Toormina. A tributary of Boambee Creek occurs to the north of the camp.

A total area of approximately 0.16 ha of SSF could potentially be cleared as part of the proposal, as part of a 12.4 ha patch of SSF at this locality. The area which may be cleared includes 0.05 ha of SSF within Management Zone 1, 0.04 ha of SSF within Management Zone 2 and 0.07 ha of SSF within Management Zone 3.

The potential clearing of approximately 0.16 ha of SSF as part of the proposal represents a loss of around 1.3% of the total SSF patch (12.4 ha), and a loss of around 0.009% at a regional scale, where approximately 1,732 ha of SSF remains in the Coffs Harbour LGA.

This small area (0.16 ha) of SSF would be directly affected by the proposal for the facilitation of a buffer zone between local residents and the Barcoo camp.

The proposed clearing has the potential to result in a reduction in the local extent of this community. However the potential reduction in extent is small and not likely to place the local occurrence at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The potential proposed clearing will result in the removal of some canopy trees and an area of understorey within this SSF patch. Indirect impacts are likely to result in increased weed invasion. However the areas subject to the proposed clearing are already modified with a number of weed species already present in moderate densities. The additional modification to both the canopy and understorey will not place the local occurrence at risk of extinction. Furthermore, the proposal will seek to manage weeds and biodiversity values through the implementation of a site-based Vegetation Management Plan.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposed clearing event will result in the removal and modification of approximately 0.16 ha of SSF.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed clearing event will not result in fragmentation of this community. The area of direct impact occurs along one section of the perimeter of a larger patch of SSF.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The condition of SSF in the Barcoo camp is moderate to good. Areas of moderate condition SSF support intact native canopy with native understorey species present along with exotic species infestation occurring primarily around the perimeter of the camp patch. These moderate condition areas grade into good condition area with virtual no weed species present. These moderate condition areas will be directly impacted through removal of an area of canopy and understorey species.

Indirect impacts such as increased weed invasion, sedimentation and erosion will be managed through a site-specific Vegetation Management Plan.

Some areas of moderate quality SSF are to be retained within the Barcoo camp. Good condition SSF within the central area of the patch will be retained in the local occurrence of this community. The Barcoo camp and associated SSF will be subject to a site-specific Vegetation Management Plan and restoration works as required.

The relative importance of the areas to be removed and modified is less than the areas to be retained in the Barcoo camp and local occurrence. The areas to be removed or modified are not considered as highly significant to the long-term survival of the community.

e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for this community. The subdivision does not occur where any critical habitat has been declared for any other species, population or community.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or threat abatement plan has been prepared for Swamp Sclerophyll Forest.

g) The action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following key threatening process listed under Schedule 3 of the TSC Act are relevant to the current proposal and may pose threats to this community:

- Clearing of native vegetation
- Invasion and establishment of exotic vines and scramblers
- Invasion, establishment and spread of Lantana (*Lantana camara*)
- Anthropogenic Climate Change.

A small area (0.16 ha) of modified moderate quality SSF is proposed for clearing. A larger area of this community will be retained as the local occurrence. The Barcoo camp and associated SSF will be subject to a site-specific Vegetation Management Plan and restoration works (including weed control works) as required. It is considered unlikely that the proposal would significantly exacerbate this key threatening process such that this community would be at risk of extinction.

Conclusion

On the basis of the above considerations, it is unlikely that the proposal would result in a significant impact on the survival of this EEC. Consequently, a Species Impact Statement is not required for the proposal with respect to Swamp Sclerophyll Forest.

10.3.2 Koala

The Koala is known to extend from the tropical north to the temperate south along either side of the Great Dividing Range in eastern Australia. The Coffs Harbour LGA has a well-documented Koala population and was the first LGA in NSW to complete a Comprehensive Koala Plan of Management (CKPoM) (Lunney et. al. 1999a and 1999b). Koalas can occupy areas of high urban and peri-urban development as is the Coffs Harbour experience. They have also been documented to traverse open grassland areas to access preferred habitat.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

There are numerous Koala records from the Toormina/Sawtell area, the nearest being relatively recent records from land in front of Boambee Bay Resort 400 m to the east of Barcoo Court. The Koala habitat of the study area has been mapped (**Map 15, Appendix C**) as Primary and Secondary Koala habitat and contains three Koala Feed Tree species (Swamp Mahogany, Broad-leaved Paperbark and Swamp Oak). The distance between the subject site and several local Koala records is within the home range of individual Koalas. It is likely that Koalas utilise the forested areas north of Barcoo Court periodically as part of their foraging habitat.

Approximately 0.16 ha of Swamp Sclerophyll Forest EEC containing Koala feed tree species would be cleared under the current Plan. Removal of this vegetation will not create a barrier to Koala movement on and around the site, but will reduce the area of potential Primary and Secondary Koala habitat available in this locality. The vegetation to be trimmed or removed does not represent an identified wildlife corridor but does allow Koalas to move through the area between areas of Koala habitat.

The main threats to the Koala population within the Coffs Harbour – Toormina area are habitat loss, and direct mortality through dog attacks and vehicle strikes. Maintenance of habitat and corridors linking areas of suitable habitat is essential for Koala population conservation.

Overall, there will be a net loss of approximately 0.16 ha of Primary and Secondary Koala habitat on-site as a result of the current proposal to trim or remove trees within the Council easement.

Given the very small amount of Koala habitat proposed for removal as a management action under the Plan, the lifecycle of an individual or small population of Koalas would not be dependent on such a small amount of habitat and therefore the current proposal is unlikely to undermine the viability of a local population.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

There are no Endangered Koala Populations in this area.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The Koala is not an EEC.

(d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed,

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

iii. the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

The management actions recommended in the Plan suggest trimming or removal of 0.16 ha of Swamp Sclerophyll Forest EEC containing Koala feed tree species. The proposed trimming or removal of trees will not sever an existing connective corridors for Koala movement, isolate or fragment habitat. The vegetation to be trimmed or removed is likely to form a small part within a larger home range of the local Koala population and does not represent core breeding or foraging habitat.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No relevant areas of critical habitat have been declared, within the locality, under Part 3 of the NSW TSC Act, therefore no critical habitat will be affected.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

An approved recovery plan has been prepared by the former Department of Environment and Climate Change (DECC) for the Koala in 2008. The recovery plan has several broad objectives including conserving existing Koala habitat and to rehabilitate and restore habitat and populations. It also discusses a range of threats to the viability of Koala populations. Habitat loss and degradation are relevant to this proposal. Given the loss of several Koala feed trees and a patch of approximately 0.16 ha of mapped Koala habitat, the overall impact of this proposal will be a net loss in existing Primary and Secondary Koala habitat. This tree and habitat loss may be compensated for via revegetation plantings and/or bushland regeneration works within an adjacent or alternative area of the Barcoo Court Reserve, or other existing Koala habitat in the locality (yet to be determined). Should this option be pursued, and it should be examined under the Barcoo Court VMP, this has the potential to improve the quality of habitat available in the locality.

There will be no reduction in the connectivity of key habitat areas or movement corridors, nor will the tree trimming or removal contribute to secondary impacts (such as increased road kill or dog attacks), and hence overall not contribute to these primary processes responsible for the decline of Koalas. In this manner, and assuming that compensation measures outlined above are undertaken, the proposal is not inconsistent with the recovery plan for the Koala.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSC Act 1995 defines a “threatening process” as “a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities”. Loss and fragmentation of habitat due to urban, residential and rural development is a recognised threat to Koalas (Lunney et. al. 1999). Koala habitat loss within the quarry property may be compensated for via revegetation plantings and/or bushland regeneration works within an alternative area of appropriate, existing Koala habitat in the locality (yet to be determined). Should this option be pursued, this has the potential to improve the quality of habitat available in the locality. Assuming these compensatory measures are undertaken, the proposal is not considered likely to introduce any additional threatening processes not currently operating at this location.

Conclusion

On the basis of the above considerations, it is unlikely that the proposed tree trimming or removal would result in a significant impact on the survival of a local population of the Koala. Consequently, a Species Impact Statement is not required for the proposal with respect to the Koala.

10.3.3 Threatened Microbats - Eastern Bentwing Bat, Little Bentwing Bat, Large-footed Myotis

Eastern Bentwing Bat *Miniopterus schreibersii oceanensis*

The Eastern Bentwing-Bat is listed as Vulnerable under the NSW TSC Act 1995 and is known from the area.

The Eastern Bentwing-Bat is known to utilise subterranean roosts (caves, rock overhangs and rock crevices) or artificial roosts (bridges, mine shafts, disused rail tunnels, culverts). However, breeding habitat is confined to specific subterranean caves, sea caves, mineshafts or tunnels with a suitable microclimate for maternity colonies which sometimes number in the tens of thousands. Each population is centred upon a maternity roost and disperses to other locations within range (several hundred kilometres) during the non-breeding season. There is limited overlap between territories. Nightly foraging movements can be in the order of 65km (Churchill, 2008). No breeding habitat for the Eastern Bentwing-Bat has been recorded in the local area.

All vegetation communities present within the study area, including the cleared land represent potential foraging habitat for this species. There is no potential roosting habitat in the Barcoo Court camp area.

Little Bentwing Bat *Miniopterus australis*

The Little Bentwing-Bat is listed as Vulnerable under the NSW TSC Act 1995 and is known from the area. This species is distributed along the central and north coast of NSW north from the Hawkesbury River to Cape York in Queensland (Churchill, 1998).

The Little Bentwing-Bat is known to utilise subterranean roosts (caves, rock overhangs and rock crevices) or artificial roosts (bridges, mine shafts) as well as roosting in tree hollows. However, breeding habitat is confined to specific subterranean caves, sea caves, mineshafts or tunnels with a suitable microclimate for maternity colonies which sometimes number in the tens of thousands. No breeding habitat for the Little Bentwing-Bat has been recorded in the local area.

All vegetation communities present within the study area, including the cleared land represent potential foraging habitat for this species. Potential roosting habitat can be found within tree hollows.

Large-footed Myotis *Myotis macropus*

The Large-footed Myotis is listed as Vulnerable under the NSW TSC Act 1995 and is know from Boambee Creek adjacent to the site. It is a habitat specialist with particular foraging and roosting requirements. It is always associated with permanent water suited to its foraging mode but proximity to suitable roost locations is presumed to limit its distribution and occurrence.

In NSW, the Large-footed Myotis is known to roost in suitable voids such as certain caves, disused mines, tunnels, tree hollows, under bridges, in cracks and holes in drainage culverts and even in buildings (Richards 1995, Lumsden and Menkhorst 1995). It forms roosting colonies, commonly comprising up to two dozen individuals but recorded at up to several hundred individuals. Colony roosts

are typically close to bodies of water such as rivers and reservoirs and site selection is presumed to vary with season and reproductive status, winter roosts will differ from maternity sites (Dwyer 1970; Jones and Rayner 1991). No breeding habitat for Myotis has been recorded within a 5 km radius of the study area, but several breeding colonies are known from the LGA.

Large feet are used to trawl for air breathing aquatic invertebrates, as well as small fish (Law and Urquhart 2000). Trawling involves flying 5-100 cm above the water before dipping to contact the surface, which they briefly rake (Dwyer 1970; Jones and Raynor 1991).

Boambee Creek is potential foraging habitat for this species, with roosting habitat located within tree hollows within 100m of a waterway.

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at the risk of extinction.

Individual microbats associated with the subject site are presumably part of broader meta-populations of each species extending throughout the remnant woodland of the area to the north, east, south, and west. Without detailed study it is impossible to determine the geographical range of the populations which may exist within the study area, or the level of connectivity to other surrounding populations. The study area may form part of the territory of several individual bats of a number of species including Myotis and Eastern and Little Bentwings. Similarly, it is possible that the study area may form part of the territory for a breeding colony of Large-footed Myotis. Limited knowledge exists on the ecology of microbats so it is difficult to estimate home ranges but Myotis are capable of flying 12km each way from their roosts when foraging.

The study area represents potential foraging habitat for all three of these microbat species. Micro bat activity levels, foraging, roosting and breeding are generally concentrated over suitable fresh water bodies such as Boambee Creek or within remnant patches of woodland such as Barcoo Court Reserve. These micro bat species are also able to forage over cleared land, open pasture, agricultural and residential land in search of insectivorous prey, and may utilise isolated trees as roosts.

The proposal involves the removal of 0.16 ha of SSF which represents potential foraging habitat for all three microbat species. There were no hollows identified in any of the trees to be trimmed or removed but a more detailed study of the trees is required prior to works. Microbats are able to roost in hollows with very small entrances which are difficult to observe from the ground. Each of the three microbats being considered requires a network of active roosts, shifting between roosts every few days or as conditions require. It has been suggested that this strategy enables microbats to roost in close proximity to unpredictable and/or geographically dispersed food resources, cope with the unexpected loss of a roost due to stochastic events such as fire or tree fall, assist in avoidance of predators and to reduce the incidence of parasite build up within a single roost.

The proposal is unlikely to affect the reproductive behavior of the Eastern Bentwing Bat, Little Bentwing Bat or Myotis as no breeding habitat is being removed.

Movements of microbats between areas of suitable habitat will not be affected by this Proposal.

Given that these three microbat species are capable of ranging over a wide area and provided no individuals are killed during tree trimming or removal, local populations of these species should not be significantly affected by the proposal.

The proposal will not have an adverse effect on the lifecycle of the Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis or place viable local populations at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

There are no endangered populations of these species, as defined under the TSC Act that exist within the study area.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

None of these species represent an EEC

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

None of these species represent an EEC

d) in relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

The proposal will result in removal of 0.16 ha of potential microbat foraging habitat within the Barcoo Court flying-fox camp area. This involves trimming or removal of a number of trees and the foraging resources contained within them.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The area in question contains suitable foraging habitat for all three species of microbats and access to this habitat will not be affected by the proposal. It is likely that the study area forms only part of a larger area of suitable habitat utilised by local populations of these species.

The proposal will not isolate habitat or increase fragmentation of habitat for local populations of the Eastern Bentwing Bat, Little Bentwing Bat or Myotis that may inhabit the study area nor affect movements of these species.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,

The connectivity between areas of known and potential microbat habitat within the locality will not be affected by the proposal. The area forms only part of a larger area of suitable habitat utilised by local populations of these highly mobile microbat species.

No significant microbat roosts will be removed, disturbed or lost so the reproductive output of local populations of microbats should not be affected by trimming or removal of 0.16 ha of vegetation.

It is therefore unlikely that the site represents core foraging, roosting or breeding habitat for any of the three microbat species. Removal of 0.16 ha of foraging habitat is unlikely to have a significant effect on the long term survival of local populations of the Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis whose home range may include the study area.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat as defined under the TSC Act has been declared for the Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plan has been prepared for the Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis.

The main threats to these species include loss, damage or disruption to roosting sites and this will not occur as a result of the proposed tree trimming or removal works.

Other actions recommended by OEH and relevant to this proposal include the retention and protection of hollow-bearing trees (including dead trees), younger mature trees as a future hollow bearing resource and stands of native vegetation which represent foraging habitat for these species. The proposal is broadly consistent with these recommendations in retaining a large area of suitable foraging and potential roosting habitat for these species within the main Barcoo Court flying-fox camp area.

There is no threat abatement plan which lists the Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis as affected species that is applicable to this proposal.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Microbats are subject to severe threatening processes such as loss of habitat through land clearing or changes to the diversity of vegetation which impacts upon the availability and diversity of invertebrate prey species. Whilst the KTP relating to land clearing will be triggered, the amount of habitat being lost is very small in relation to what remains on the site and across the broader region and LGA.

Conclusion

The study area contains potential foraging habitat for all three microbat species. No roost sites will be lost as part of this proposal.

The proposal is considered unlikely to result in a significant impact on the Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis because:

- No significant (breeding/maternity) roost sites were identified during surveys.
- The viability of local populations of any of the microbat species will not be compromised or placed at risk of extinction.
- Removal of the foraging habitat is not considered to be a significant loss of roosting habitat for local populations of these species.
- The proposal will not fragment or isolate areas of habitat for the Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis or affect movements of these species between areas of suitable habitat.

- Eastern Bentwing Bat, Little Bentwing Bat or Large-footed Myotis habitat to be impacted by the proposal is not considered to be important for the long term survival of local populations of these species in the locality.
- The proposal will not have an adverse effect on critical habitat for these species (directly or indirectly).

Consequently, a Species Impact Statement is not required for the proposal with respect to microbats.

11 Evaluation and review

The Plan will have a scheduled review, which will include evaluation of management actions against measures shown in **Table 11,** and outlined in **Section 8**.

The following will trigger a reactive review of the Plan:

- completion of a management activity
- progression to a higher level of management
- changes to relevant policy/legislation
- new management techniques becoming available
- outcomes of research that may influence the Plan
- incidents associated with the camp.

Results of each review will be discussed with OEH.

If the Plan is to remain current, a full review after 5 years including stakeholder consultation and expert input will be required.

12 Plan administration

12.1 Monitoring of the camps

Quarterly monitoring of the area, size and composition of the three permanent camps, Coffs Creek, Woolgoolga and Barcoo Court, Toormina will be undertaken by Council officers and other trained persons (WIRES), as set out under the NFFMP methodology and reporting standards (February, May, August and November each year). This should occur regardless of whether the NFFMP continues. At the conclusion of each round of monitoring, Council should inform the community of results via traditional or social media, using the same categories as the NFFMP to quantify numbers and species present.

In addition to recording flying-fox numbers and species present, any changes in the roosting location, area or size of the camp should also be noted and recorded in Councils flying-fox database. Suggested methods for recording changes in area/size of camps include;

- Express area/size of roosting as a percentage of the total Reserve area (estimate only, less accurate but quick)
- Map boundaries of roosting area (investment of time and effort, may be difficult in certain camps)
- Note changed location of core roosting area by recording distance and direction in m from centre of previously recorded roosting area

Increases in the camp size or number of flying-foxes present could be an early warning sign of potential conflict issues. If this occurs, Council should seek the advice of a flying-fox expert, and other members of the OEH flying-fox forum to determine whether a wider phenomenon is occurring. Council should consider placing a news article about flying-foxes on traditional and social media platforms, discussing the role of flying-foxes and their movements in response to food availability, particularly in early spring when camps often increase in size prior to birthing of young (GHFF and BFF) and in autumn when

mating occurs (GHFF and BFF) and noise levels are highest. Reference should be made to relevant events such as heavy flowering/blossom of locally preferred foraging species, maternity season, dispersal of nearby camps (within 100 km), or heat stress.

Each time a management action is planned to occur, Council should notify neighbouring camp residents via email, traditional or other social media platforms. Council should also inform the community in this way, once actions or works are complete.

Any reports of new camps or previously unknown roosting locations on Council land should be followed up immediately by Council staff (Senior Biodiversity Officer) to investigate whether flying-foxes are present, the status of the roost in terms of species mix and reproductive status of individuals. Where required, Council should seek input from WIRES, OEH, and local flying-fox experts in the development of an initial response to enquiries from the community regarding any newly established flying-fox camps. If camps are located within 300m of sensitive receivers, further consultation with the sensitive receiver, and with OEH and local flying-fox experts should be sought. Reference to this Plan, particularly Level 1 actions, will assist in highlighting the initial steps that can be taken to minimise conflict between sensitive receivers and any newly established flying-fox roost. Progression to undertake any Level 2 or 3 action at a newly established camp will require licences and approvals from OEH prior to implementation. Level 2 and 3 actions at any new camps are only likely to proceed if the location of the camp is deemed to be unsuitable (defined as a sensitive location in **Section 8.4**) by Council in consultation with OEH.

12.2 Reporting

Council will report on the progress of the Plan to OEH as required by any license requirements (or after the 5 year review) and update the Plan if new information or changes to management are required, as set out in **Section 11**. If management actions are proving unsuccessful and higher level actions are being considered, consultation and approval from OEH may be required. There may also be additional licensing requirements prior to undertaking higher level actions.

12.3 Management structure and responsibilities

Table 9 identifies who is responsible for each action, including specific types of contractors and experts planned to be involved in management implementation. Where specific contractors are not provided in the Plan, Council will need to detail them in relevant licence applications for OEH approval.

Council and contractors are required to develop a project health and safety plan that includes all relevant contact details prior to implementing actions in the Plan, for team reference.

Table 9: Roles and responsibilities

CHCC Section	Name	Required experience/approvals	Responsibilities/authority
Local Planning	CHCC Senior Biodiversity Officer	Project management Reporting	Inform and consult with stakeholders and interested parties Evaluate program Submit reports to OEH/DoE Collect and collate data Review Management Plan Submit and Manage Grant Applications Ensure compliance with the Plan.
Strategic Asset Management	CHCC Asset Strategist	Project management Team leadership and coordination Data management Human resource management Reporting	Submit reports to OEH/DoE Collect and collate data Submit and Manage Grant Applications
Survey and Design	Environmental Project Officers	Project management Data management Reporting	Manage Contracts Liaise with OEH and DoE Coordinate Quarterly Flying-fox Counts
Asset Project Delivery	Project Leader Open Space and Buildings	Project management Data management Reporting	Develop VMPs and annual work plans Manage Contracts Coordinate community engagement
IC&M Roads and Open Spaces	CHCC Maintenance Coordinator Horticulture	Recommended ABLV-vaccinated (employer to assess risk) Team training, leadership and supervision	Coordinate Coastal Works field teams and ensure all personnel are appropriately experienced and trained for their roles Induct Coastal Works personnel to the program Collect and collate data Pre- and post-management monitoring Coordinate daily site briefings Coordinate daily activities Report non-standard flying-fox behaviour Participate in management activities
IC&M Roads and Open Spaces	CHCC Bush Regeneration Officer	Recommended ABLV-vaccinated (employer to assess risk) Ideally all team knowledgeable in flying-	Attend daily site briefings for onsite works Participate in relevant management activities Collect and collate data

CHCC Section	Name	Required experience/approvals	Responsibilities/authority
		fox biology, behaviour and camp management however not essential Team training, leadership and supervision	Report non-standard flying-fox behaviour Nominate daily activities Determine daily works end point
IC&M Roads and Open Spaces	Technical Officer (Open Space)	Experience in managing bush regeneration	Report on performance of contract Report non-standard flying-fox behaviour to WIRES/OEH/ CHCC Asset Strategist and CHCC Senior Biodiversity Officer. Liaise with wildlife carers/veterinarians (to arrange rescue/relocation/re-introduction of orphaned/injured wildlife only) Close off areas to public if required
Contractor [e.g. arborist, bush regeneration contractor]	TBA	Relevant licences and experience in field Team training, leadership and supervision Recommended ABLV-vaccinated (employer to assess risk)	Conduct specified activities (e.g. tree trimming, bush regeneration) Provide reports back to contract manager Adhere to all directions given by contract manager Coordinate contract field teams and ensure all personnel are appropriately experienced and trained for their roles
Observer/support WIRES	WIRES Flying-fox co-ordinator	Approval to access site Trained in flying-fox rescue and ecology Recommended ABLV-vaccinated Knowledgeable in flying-fox biology, behaviour and camp management (see **Appendix B** for detail)	Arrange rescue/care/relocation/re-introduction of orphaned/injured wildlife if required (under licence) if required Undertake Quarterly Flying-fox Counts at direction of Asset Strategist Coordinate mass incidents and provide guidance to Council regarding closure of recreational areas (section 8.2.7)
Flying-fox expert	TBA	Knowledgeable in flying-fox biology, behaviour and camp management (see **Appendix B** for detail) See **Appendix B**	On-site population assessment, monitor flying-fox behaviour, if required.

12.4 Adaptive management

The review of the Plan will allow for adaptive management to occur whereby the success of management actions implemented throughout the previous five years (or earlier if changing circumstances demand it) can be evaluated against objectives. Solutions to any issues will be discussed with affected parties and should also involve relevant stakeholders. Changes to the approach or implementation of management actions can then be incorporated into the updated Plan. Where changes to the Plan involve Level 2 or 3 management actions, consultation with OEH will be required and there may be additional approvals and licensing obtained before re-commencing implementation.

12.5 Funding commitment

An indicative cost for each of the management actions proposed in the Plan is provided below. CHCC submitted a grant funding application to the Local Government NSW Flying-foxes Grant Program and the Coffs Harbour City Council Environmental Levy (EL) program to provide funding for the implementation of several of the recommended management actions outlined in the Plan. Previously, CHCC EL funding has been awarded for VMP implementation in both Red Cedar Reserve and Woolgoolga Beach Reserve. However, recent EL funding applications have been unsuccessful and this has significantly reduced the implementation of VMP works within both Reserves. This Plan strongly recommends Council seek to secure funding in the short term for:

- production and implementation of a VMP for the Council Reserve containing the Barcoo Court Flying-fox camp,
- tree trimming and removal works that may be required at the Barcoo Court camp
- updating the VMP for Red Cedar Reserve and Woolgoolga Beach Reserve
- incorporation of Flying-fox considerations into reserve PoMs
- ongoing VMP works within Red Cedar Reserve and Woolgoolga Beach Reserve
- hosting community information sessions on flying-foxes
- erection of educational signage at the three camps
- purchase of car covers, washing line covers, high pressure water hoses

Table 10: Management Actions and associated indicative costs for implementation

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
Level 1 actions				
1.1	Complaints tracking	Development of a system for formal documentation of complaints and complaint resolution. This will allow any camp maintenance issue to be reported to Council in a timely fashion and responses to those actions to be tracked. Aligns with community feedback for more information from CHCC on implementation of actions and regular maintenance of buffers at Coffs camp.	Council	In kind - if using existing Council database/software.
2.1	Education and awareness programs	Develop a kit of educational materials and resources for members of the public. Seek to utilise existing resources and update /review as new materials are produced. Council to commit to regular release of information and updating of website information on management actions, including a question and answer section of the website or email address to contact. Re-commence with an educational focus, using traditional and social media platforms, positive media stories at key times in the year for flying foxes and prior to / following implementation of management actions and camp counts.	Council	In kind - time to review existing material, liaise with Hunter Councils on education resource package, update website, maintain contacts with other Councils managing flying-fox camps
2.2	Education and awareness programs	Living with Flying foxes Neighbourhood Information Session/s for the community on appropriate topics and courses of action covering but not limited to locating a sick or injured flying fox in the reserve or at home, how to minimise disturbance to the camp and reduce noise from flying foxes in your use of machinery. Conduct one session for each neighbourhood (Coffs Creek, Toormina, and Woolgoolga) every two years.	Council	$150 - 240 in total for hall hire and catering for three halls once every two years. In kind - 1 - 2 days Council staff time to plan event, 9 hours staff time for attendance at 3 events every two years.
2.3	Education and awareness programs	Develop a Council staff information package on working with flying-foxes. Seek to utilise existing resources, promote to operational staff. Incorporate newly developed resources each year during review of plan.	Council	In kind - time to review existing material, liaise with Hunter Councils on education resource package, update website, maintain contacts with other Councils managing flying-fox camps

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
2.4	Education and awareness programs	Cultural inclusion. Liaise with the Local Aboriginal Land Council to discuss input into the management of the reserve and interpretive material regarding the reserves cultural values. Complete consultation with Garlambirla Guyuu Girrwaa Coffs Elders Group regarding naming of Red Cedar Reserve and invite comment from Elders on naming of the council reserve behind Barcoo Court.	Council	In kind - time to meet with Elders group.
2.5	Education and awareness programs	CHCC to liaise with the network of other Councils with similar flying fox management objectives, across the state and particularly on the North Coast of NSW	Council	In kind - time to liaise with Hunter Councils on education resource package, maintain contacts with other Councils managing flying-fox camps
2.6	Education and awareness programs	Promotion of flying-foxes through generation of three or four positive media releases per year on flying fox ecology and behaviour	Council	In kind
2.7	Education and awareness programs	Implementation of signage at strategic locations within the Conservation Reserve System to inform the public on prohibited acts within the conservation reserve system and domestic animal restrictions. Install new signage at all three camps once review of restrictive signage within Coffs Harbour Natural Area Reserve system is complete. Continue to administer the *Companion Animals Act 1998*.	Council	$2000 - $3000 per sign from design to install
2.8	Education and awareness programs	Set up a camp neighbour email group. Aligns with community feedback for more information from CHCC on implementation of actions and regular maintenance of buffers at Coffs camp. Council to continue to implement and improve educational resources and maintain regular community communications via a range of traditional and social media.	Council	In kind - Council to email residents and neighbours group with regular updates on management of camps/reserves
2.9	Education and awareness programs	Annual bat event. Could be held in conjunction with Living with Flying foxes Neighbourhood Information Sessions (see Action 2.2)	Council / WIRES / Local bat experts / Australasian Bat Society	In kind - one day of staff time to organise, 3 hours volunteer WIRES time and 3 hours (volunteer or approx. $300) for a local bat expert to lead a talk/walk
2.10	Education and awareness programs	Contact landowners of properties on Gundagai Street with centre title to Coffs Creek to ensure the vegetated buffer created in 2009 remains functional and fit for purpose.	Council	In kind – Council to send a letter to land owners seeking feedback on the management of the buffer.

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
3.1	Property modifications without subsidies	Promotion of range of property modifications to community	Private landowners	Dependent upon modifications
3.2	Property modifications with subsidies	Car and washing line covers to be purchased by Council at the request of eligible residents	Council	$150 - $350 per car cover, $150 - $300 per washing line cover
4.1	Service subsidies	Water or rate subsidy. Residents whose properties are within 300m of the existing camp edge when the camp contains > 5,000 flying-foxes may apply for subsidies.	Council	Loss of Council revenue of approx. $18,000 per year for full subsidy of approx. 90 residents
4.2	Service subsidies	Possible exemptions to water restrictions. Residents whose properties are within 300m of the existing camp edge when the camp contains > 5,000 flying-foxes may apply for subsidies.	Council	Nil
4.3	Service subsidies	High pressure water hose(s) for loan to affected residents. Residents whose properties are within 300m of the existing camp edge when the camp contains > 5,000 flying-foxes may apply for subsidies.	Council	$50 - $250 per hose
5.1	Routine camp maintenance	Mowing, mulching, general maintenance of Council reserves. Ensure operational work plans flag activities/works occurring within 100 m of a flying-fox camp and enact standard measures to avoid impacts (**Section 9.3**).	Council	Built into existing Council operational work programs, along with standard measures to avoid impacts (**Section 9.3**)
5.2	Routine camp maintenance and progression of actions	Implementation of existing VMPs for Coffs Creek and Woolgoolga Beach Reserve. Includes core canopy closure / canopy species establishment, encouragement of natural regeneration (of existing seed source) with ongoing control of exotic ground covers and vines, adherence to the works schedules within each management zone (identified in VMPs) and standard measures listed in **Section 9.3.**	Council	$30, 000 - $40, 000 to complete existing VMPs for Red Cedar Reserve and Woolgoolga Beach Reserve.
5.3	Routine camp maintenance and progression of actions	Implement ecological monitoring program. Monitor percentage of natural loss of vegetation, return of faunal diversity, current Koala population within the reserve system, weed composition within the camp, level of natural regeneration. Create a photographic diary of restoration works. Carried over from Coffs Camp strategy and VMP review 2015.	Council	In kind - complete as part of existing programs

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
5.4	Routine camp maintenance and progression of actions	Identify additional trees which pose a threat to life or property. Carried over from Coffs Camp Strategy and VMP review 2015	Council	Built into existing Council work programs
5.5	Routine camp maintenance and progression of actions	Maintenance of tree vegetation, with structural issues will also be considered. Carried over from Coffs Camp Strategy and VMP review 2015	Council	Built into existing Council work programs
5.6	Routine camp maintenance and progression of actions	Red Cedar Reserve Coffs Creek VMP Stage 3 works: Vegetation modification, to provide weed control (ground covers only) in core roost area. Roost tree planting - low lying rainforest species. Carried over from Coffs Camp Strategy and VMP review 2015	Council	$10, 000+ Seek funding to continue to implement
5.7	Routine camp maintenance and progression of actions	Red Cedar Reserve Coffs Creek VMP Stage 4: Flood plain plants, with additional core roost plant, buffer and exclusion zones. Carried over from Coffs Camp Strategy and VMP review 2015	Council	$5, 000+ Seek funding to continue to implement
5.8	Routine camp maintenance and progression of actions	Vegetation exclusion zone maintenance. Ensure in place for Red Cedar Reserve. Carried over from Coffs Camp Strategy and VMP review 2015.	Council	Built into existing Council work programs
5.9	Routine camp maintenance and progression of actions	Flood mitigation works at Red Cedar Reserve. Carried over from Coffs Camp Strategy and VMP review 2015.	Council	Built into existing Council work programs
5.10	Routine camp maintenance and progression of actions	Identification of hazard / natural disaster management priorities. Carried over from Coffs Camp Strategy and VMP review 2015.	Council	Built into existing Council work programs
5.11	Routine camp maintenance and progression of actions	Instigation of noise restricting recommendations when camp numbers are at or approaching 75% of peak occupancy; 15, 000 flying foxes at Coffs Creek,13, 000 flying foxes at Barcoo and 20,000 at Woolgoolga Lake. Recommendations provided in **Section 9.3**.	Council, neighbouring residents	In kind - time to inform community of protocol periods of operation

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
6.1	Revegetation and land management	Identify priority sites for revegetation. Liaise with OEH to determine level of Council input into development of key flying-fox habitat mapping, and LG NSW to determine whether a Local Government Flying-fox strategy will be developed. Incorporate Eby and Law (2008) habitat mapping and Law, Eby and Sommerville (2002) winter and spring flowering tree species advice. Seek latest research on roost camp parameters such as location, altitude, proximity to water, humidity, temperature and suitability of vegetation community. Council to conduct research into alternative flying-fox habitat site selection and conduct vegetation modelling for alternative sites.	OEH / Council / LG NSW	In kind
6.2	Revegetation and land management	Commission feasibility study to determine level of investment required to secure land tenure and restore sites as functioning flying fox habitat, investigate the likelihood of outcomes and required changes to zoning. Areas/sites of importance should be identified and graded according to all community and habitat parameters. Associated threats to each site should be outlined as should the possibility of site protection into the future.	Council	$15, 000 - $25, 000 to complete feasibility study
6.3	Revegetation and land management	Produce VMP for priority flying-fox habitat site(s) identified and selected for future revegetation and protection from the alternative site investigation program outlined in Action 6.1 and 6.2 above.	Council	$5, 000 - $10, 000 per site
6.4	Revegetation and land management	Produce VMP for Barcoo camp based upon advice provided in the Plan and proposed management zones depicted in **Figure 10.** Update VMPs for Coffs Creek and Woolgoolga Camps in line with the Plan and PoMs for each reserve.	Council	$5, 000 - $10, 000 for Barcoo camp VMP $5, 000 - $10, 000 for Woolgoolga camp VMP $5, 000 - $10, 000 for Coffs Creek VMP
6.5	Revegetation and land management	Prepare Plans of Management (PoM) for Reserves to ensure consideration of management issues such as bushfire risk, Aboriginal and cultural heritage, vertebrate pest issues, flood and storm mitigation works, access points, walking trails, vegetation management and authorised and unauthorised activities.	Council	In kind - time to prepare PoMs

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
7.1	Protocols to manage incidents	Heat stress Best Practice Guidelines documented in Plan, key elements of WIRES Draft Mass Flying-fox Disaster Incident Guidelines included in Plan (**Section 8.2.7**).	WIRES / Council	In kind - liaise with WIRES to ensure Draft Mass Disaster Incident Guidelines comply with Plan
7.2	Protocols to manage incidents	Heat stress / Abandonment of Young / Abortion Storm / Roost Collapse. Camps closed to public and public informed if flying-foxes are sick, malnourished, dying or otherwise unwell. Monitor for heat stress using web viewer (**Section 8.2.7**) and/or notification by WIRES	Council	In kind - liaise with WIRES regarding need for camp closures.
7.3	Protocols to manage incidents	Airstrike. Maintain existing meeting schedule with Coffs Regional Airport to provide advice on flying-fox risk. Transfer responsibility of reporting on flying-fox numbers from NPWS to CHCC. Advise CHRA when flying-fox numbers increase to 75% of peak occupancy levels at Barcoo Court (13,000 flying-foxes) and Coffs Creek camp (15,000) and continue discussions with CHRA whenever flying-fox health issues occur or non routine works within the camps are planned.	Council / Coffs Harbour Regional Airport	In kind - attendance at annual meetings, liaison with CHRA
7.4	Protocols to manage incidents	If a new camp establishes in a sensitive location as defined in **Section 8.4,** Council will monitor the camp weekly and undertake a targeted education and awareness program with neighbouring residents and stakeholders. Council will also consult with OEH to discuss suitable triggers for an increased level of action. If weekly monitoring indicates increased camp size and increasing complaints and/or impacts, this will be the trigger point for moving to higher level actions with the approval of OEH.	Council	In kind - but may require immediate funding to implement actions and develop plan in consultation with OEH and other relevant stakeholders.
8.1	Participation in Research	Participation in CSIRO National Flying-fox Monitoring Program. Continue to conduct quarterly counts (Feb, May, Aug, Nov) at each of the three permanent camps, and any newly established camps	Council / WIRES / other trained and approved personnel	Built into existing Council work programs
8.2	Participation in Research	Provide assistance / information on management of flying-foxes to any research studies or other Councils seeking collaboration.	Council	In kind - provision of information when requested
8.3	Participation in Research	Support research into health impacts of flying-fox camps	Council	In kind - provision of information when requested

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
9.1	Appropriate land use planning	Include a section in the Development Control Plan to guide development in and around existing, seasonal or temporary flying-fox camps within the LGA. The DCP should aim to reduce the likelihood of future impacts on urban development, addressing such issues as adequate buffers between camps and development.	Council	In kind
9.2	Appropriate land use planning	Development of guidelines on buffer zones and restricted use areas in/around camps. Carried over from Coffs Camp VMP review 2015.	Council	In kind
9.3	Appropriate land use planning	Develop control measures for properties impacted upon by camps to adequately provide for property and life style protection. Carried over from Coffs Camp VMP review 2015.	Council	In kind
10.1	Evaluation and review of Plan	Monitor complaint/comment levels via complaints database, neighbourhood and email group, Council flying fox webpage. Update Plan according to significant issues/incidents that arise	Council	In kind
10.2	Evaluation and review of Plan	Reporting on progress of VMPs used to adjust implementation of bush regeneration practices accordingly	Council / Bush regeneration contractors	In kind
10.3	Evaluation and review of Plan	Reporting to Council, OEH, DEE under licensing and plan implementation.	Council	In kind
10.4	Evaluation and review of Plan	Completion of a management activity, progression to a higher level of management, changes to relevant policy and legislation, new management techniques available, outcomes of research that may influence the Plan, incidents associated with the camp will all trigger a review of the Plan. Plan review in accordance with license requirements or after 5 years.	Council	Dependent upon nature of review. In kind - minor changes and updates (completion of management activity, changes to relevant policy or legislation). Seek funding to conduct a thorough review of the Plan.
Level 2 Actions				

Number	Management Action Type	Management Action Description	Responsible party	Estimated Costs
11.1	Buffers through vegetation removal	Removal/trimming of trees located within the Council easement on north side of Barcoo Court and or within 5m of the property boundary. Ongoing maintenance of trimmed trees on Council land likely to be required. Residents also offered advice on management of trees within private property to reduce impacts form flying-foxes foraging or roosting on private property.	Council / Residents of Barcoo Court / Arborist / Bush Regeneration Contractor	$5, 000 - $10, 000 for tree trimming/removal. In kind - time to consult with residents as part of VMP.

References

Aich, P, Potter, AA and Griebel, PJ 2009, 'Modern approaches to understanding stress and disease susceptibility: A review with special emphasis on respiratory disease', *International Journal of General Medicine*, vol. 2, pp. 19–32.

AIHW 2012, *Risk factors contributing to chronic disease*, Cat no. PHE 157, Australian Institute of Health and Welfare, viewed 12 February 2017, www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=10737421546.

Atlas of Living Australia 2015, viewed 12 February 2017, www.ala.org.au.

Australasian Bat Society, viewed 12 January 2017, ausbats.org.au/.

Australian Museum 2010, *Little Red Flying-fox*, viewed 1 December 2016,

AVA 2015, *Hendra virus*, Australian Veterinary Association, viewed 1 December 2016, www.ava.com.au/hendra-virus.

Avisure, 2016. *Coffs Harbour Regional Airport Wildlife Hazard Management Plan*. Prepared for Coffs Harbour Regional Airport, April 2016.

Birt, P 2000, 'Summary information on the status of the Grey-headed (*Pteropus poliocephalus*) and Black (*P. alecto*) Flying-Fox in New South Wales,' Proceedings of workshop to assess the status of the grey-headed flying-fox in New South Wales. University of Sydney, Sydney, New South Wales, Australia, pp. 78-86.

CDC 2014, *Hendra virus disease (HeV): Transmission,* Centers for Disease Control and Prevention, updated 17 March 2014, viewed 10 January 2017, www.cdc.gov/vhf/hendra/transmission/index.html.

Churchill, S 2008, *Australian Bats*, Allen & Unwin, Crows Nest, NSW.

Coffs Harbour Bushland Regeneration Group Pty Ltd. 2012. *Vegetation Management Plan Woolgoolga Beach Reserve and Flying-fox Colony*. Prepared for Coffs Harbour City Council, May 2012.

Coffs Harbour City Council (CHCC) 2000. *Companion Animals Management Plan*. Coffs Harbour City Council, Coffs Harbour.

Coffs Harbour City Council (CHCC) 2007. *Coffs Creek Flying-fox Camp (Strategy and Vegetation Management Plan)*. Coffs Harbour City Council, Coffs Harbour.

Coffs Harbour City Council (CHCC) 2010 Open Space Strategy 2010 Connecting Parks and People. Coffs Harbour City Council, Coffs Harbour.

Coffs Harbour City Council (CHCC) 2015. Coffs Harbour Biodiversity Action Strategy 2012 – 2030; From the Ocean to the Ranges. Coffs Harbour City Council, Coffs Harbour.

Coffs Harbour City Council (CHCC) 2015. *Coffs Creek Flying-fox Camp Biodiversity Action Strategy and Vegetation Management Plan – Final Report*. Coffs Harbour City Council, Coffs Harbour.

Coffs Harbour City Library (CHCC) 2013. *Aboriginal history of the Coffs Harbour region*. Compiled by Liz Thomas (Special Collections Librarian), January 2013.

Coffs Harbour Regional Landcare 2015. *Buluunggal – The Aboriginal Community Vision for the Coffs Creek Catchment and Estuary*. Available at: http://coffsharbourlandcare.org.au/buluunggal-the-aboriginal-community-vision-for-the-coffs-creek-catchment-and-estuary

DECC 2008, *Best practice guidelines for the grey-headed flying-fox*, Department of Environment and Climate Change NSW, Sydney, viewed 10 January 2017, www.environment.nsw.gov.au/resources/threatenedspecies/08540tsdsflyingfoxbpg.pdf.

DECCW 2009, *Draft National Recovery Plan for the Grey-headed Flying-fox* Pteropus poliocephalus, prepared by Dr Peggy Eby for Department of Environment, Climate Change and Water NSW, Sydney, viewed 12 January 2017, www.environment.nsw.gov.au/resources/threatenedspecies/08214dnrpflyingfox.pdf.

Den Exter, K, Roberts, B, Underwood, A and Martin, L 2011, *A discussion paper on flying-foxes and the implications for bush regeneration at their camp sites*, Big Scrub Landcare, posted 28 March 2011, viewed 12 January 2017, bigscrubrainforest.org.au/?p=129.

DoE 2014, *How can flying-foxes be managed in accordance with national environmental law*? Australian Government Department of the Environment, Canberra, viewed 12 January 2017, www.environment.gov.au/biodiversity/threatened/species/flying-fox-law.

DoE 2015, *Referral guideline for management actions in grey-headed and spectacled flying-fox camps*, Australian Government Department of the Environment, Canberra, viewed 12 January 2017, www.environment.gov.au/system/files/resources/6d4f8ebc-f6a0-49e6-a6b6-82e9c8d55768/files/referral-guideline-flying-fox-camps.pdf.

DoE 2016a, *Pteropus poliocephalus in Species Profile and Threats Database*, Australian Government Department of the Environment, Canberra, viewed 12 January 2017, www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=186.

DoE 2016b, *Monitoring Flying-fox Populations*, Australian Government Department of the Environment, Canberra, viewed 12 January 2017, www.environment.gov.au/biodiversity/threatened/species/flying-fox-monitoring.

DPI 2013, *Australian bat lyssavirus*, June 2013 Primefact 1291 2nd edition, Department of Primary Industries, NSW, viewed 12 January 2017, www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/461873/Australian-Bat-lyssavirus.pdf.

DPI 2014, *Hendra virus*, June 2014 Primefact 970 9th edition, Department of Primary Industries, NSW, viewed 12 January 2017, www.dpi.nsw.gov.au/__data/assets/pdf_file/0019/310492/hendra_virus_primefact_970.pdf.

DPI 2015a, *Hendra virus*, Department of Primary Industries, NSW, viewed 12 January 2017, www.dpi.nsw.gov.au/agriculture/livestock/horses/health/general/hendra-virus.

DPI 2015b, *Lyssavirus and other bat health risks*, Department of Primary Industries, Primary Industry Biosecurity, NSW, viewed 12 January 2017, www.dpi.nsw.gov.au/biosecurity/animal/humans/bat-health-risks.

Eby, P 1991, 'Seasonal movements of Grey-headed Flying-foxes, *Pteropus poliocephalus* (Chiroptera: Pteropodidae) from two maternity roosts in northern New South Wales', *Wildlife Research*, vol. 18, pp. 547–59.

Eby, P 2000, 'The results of four synchronous assessments of relative distribution and abundance of Grey-headed Flying-fox *Pteropus poliocephalus*', Proceedings from workshop to assess the status of the Grey-headed Flying-fox in New South Wales, pp. 66–77.

Eby, P. and Law, B., 2008, '*Ranking the feeding habitats of Grey-headed flying-foxes for conservation management*.' A report for the Department of Environment and Climate Change (NSW) and The Department of Environment, Water, Heritage and the Arts. http://www.environment.nsw.gov.au/resources/threatenedspecies/GHFFmainreport.pdf

Ecosure 2011, 'Hendra Virus Risk Assessment for the Gold Coast Equine Precinct: Residual Risk Report', unpublished report to City of Gold Coast.

Edson, D, Field, H, McMichael, L, Jordan, D, Kung, N, Mayer, D and Smith, C 2015, 'Flying-fox Roost Disturbance and Hendra Virus Spillover Risk', *PLoS ONE,* vol. 10, no. 5, viewed 12 January 2017, www.ncbi.nlm.nih.gov/pmc/articles/PMC4446312/pdf/pone.0125881.pdf.

EHP 2012, *Living with Wildlife – Flying-foxes*, Department of Environment and Heritage Protection, Queensland, updated 14 May 2012, viewed 12 January 2017, www.ehp.qld.gov.au/wildlife/livingwith/flyingfoxes/importance.html.

EPA 2013, *Noise Guide for Local Government*, Environment Protection Authority, Sydney.

Fujita, MS 1991, 'Flying-fox (*Chiroptera: Pteropodidae*) pollination, seed dispersal, and economic importance: a tabular summary of current knowledge', *Resource Publication No. 2*, Bat Conservation International.

GeoLINK 2012*, Lorn Flying-fox management strategy,* report prepared for Maitland City Council.

Hall, L and Richards, G 2000, *Flying-foxes: fruit and blossom bats of Australia*, UNSW Press, Sydney.

Henry, JP and Stephens-Larson, P 1985, 'Specific effects of stress on disease processes' in Moberg, GP (ed.), *Animal Stress*, American Physiological Society, pp.161–175.

House of Representatives Standing Committee on the Environment and Energy, 2017, *Living with fruit bats: Inquiry into flying-fox management in the eastern states*. Canberra.

IUCN 2015, *Little red flying-fox*, International Union for the Conservation of Nature, www.iucnredlist.org.

Law, B., Eby, P. and Somerville, D., 2002, 'Tree planting to conserve flying-foxes and reduce orchard damage'. Publication: *Managing the Grey-headed Flying-fox as a Threatened Species in NSW*, edited by Peggy Eby and Daniel Lunney, 2002. Royal Zoological Society of New South Wales, Mosman, NSW.

Lunney, D., Moon, C., Matthews, A. and Turbill, J. 1999. *Coffs Harbour City Koala Plan of Management Part A and B*. National Parks and Wildlife Service, Hurstville.

Lunney, D, Richards, G and Dickman, C 2008, *Pteropus poliocephalus*, in IUCN 2011, *IUCN Red List of Threatened Species*, Version 2011.2, viewed 12 January 2016, www.iucnredlist.org.

Markus, N 2002, 'Behaviour of the Black Flying-fox *Pteropus alecto*: 2. Territoriality and courtship', *Acta Chiropterologica*, vol. 4, no. 2, pp.153–166.

Markus, N and Blackshaw, JK 2002, 'Behaviour of the Black Flying-fox *Pteropus alecto*: 1. An ethogram of behaviour, and preliminary characterisation of mother-infant interactions', *Acta Chiropterologica*, vol. 4, no. 2, pp. 137–152.

Markus, N and Hall, L 2004, 'Foraging behaviour of the black flying-fox (*Pteropus alecto*) in the urban landscape of Brisbane, Queensland', *Wildlife Research*, vol. 31, no. 3, pp. 345-355.

McCall, BJ, Field, H, Smith, GA, Storie, GJ and Harrower, BJ 2005, 'Defining the risk of human exposure to Australian bat lyssavirus through potential non-bat animal infection', *CDI*, vol. 29, no. 2, pp. 200–203, www.health.gov.au/internet/main/publishing.nsf/content/cda-cdi2902-pdf-cnt.htm/$FILE/cdi2902k.pdf.

McConkey, KR, Prasad, S, Corlett, RT, Campos-Arceiz, A, Brodie, JF, Rogers, H and Santamaria, L 2012, 'Seed dispersal in changing landscapes', *Biological Conservation*, vol. 146, pp. 1–13, doi:10.1016/j.biocon.2011.09.018.

McGuckin, MA and Blackshaw, AW 1991, 'Seasonal changes in testicular size, plasma testosterone concentration and body weight in captive flying-foxes (*Pteropus poliocephalus* and *P. scapulatus*)', *Journal of Reproduction and Fertility*, vol. 92, pp. 339–346.

McIlwee, AP and Martin, IL 2002, 'On the intrinsic capacity for increase of Australian flying-foxes', *Australian Zoologist*, vol. 32, no. 1.

NSW Health 2013, *Rabies and Australian Bat Lyssavirus Infection*, NSW Health, North Sydney, viewed 1 December 2016, www.health.nsw.gov.au/Infectious/factsheets/Pages/Rabies-Australian-Bat-Lyssavirus-Infection.aspx.

OEH 2011a, *Grey-headed Flying-fox vulnerable species listing: NSW Scientific Committee final determination*, Office of Environment and Heritage, Sydney, viewed 1 December 2016, www.environment.nsw.gov.au/determinations/GreyheadedFlyingFoxVulSpListing.htm.

OEH 2011b, *NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna*, Office of Environment and Heritage, Sydney, viewed 17 February 2017, www.environment.nsw.gov.au/resources/wildlifelicences/110004FaunaRehab.pdf.

OEH 2012a. *NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes*, Office of Environment and Heritage, Sydney, viewed 12 February 2017, www.environment.nsw.gov.au/resources/wildlifelicences/120026flyingfoxcode.pdf.

OEH 2012b. *Fine-Scale Vegetation Mapping of the Coffs Harbour Local Government Area* (version 1.1, Class 5).

OEH 2015a, *Flying-foxes* (including fact sheets), Office of Environment and Heritage, Sydney, viewed 1 December 2016, www.environment.nsw.gov.au/animals/flyingfoxes.htm.

OEH 2015b, *Flying-fox Camp Management Policy 2015*, Office of Environment and Heritage, Sydney, viewed 1 December 2016, www.environment.nsw.gov.au/resources/threatenedspecies/150070-flyingfoxcamp-policy.pdf.

OEH 2015c, *Flying-fox Camp Management Plan Template 2015*, Office of Environment & Heritage, Sydney, viewed 1 December 2016, www.environment.nsw.gov.au/resources/threatenedspecies/150102-flyingfoxcamp-template.pdf.

OEH 2015d, *GHFF threatened species profile*, Office of Environment and Heritage, Sydney, viewed 1 December 2016, www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10697

OEH 2017, Responding to heat stress in flying-fox camps, viewed 1 December 2016, http://www.environment.nsw.gov.au/animals/flying-fox-heat.htm

Parry-Jones, KA and Augee, ML 1992, 'Movements of the Grey-headed Flying-foxes (*Pteropus poliocephalus*) to and from a colony site on the central coast of New South Wales', *Wildlife Research,* vol. 19, pp. 331–40.

Parry-Jones, K and Augee, M 2001 'Factors affecting the occupation of a colony site in Sydney, New South Wales by the Grey-headed Flying-fox *Pteropus poliocephalus* (Pteropodidae)', *Austral Ecology*, vol. 26, pp. 47–55.

Pierson, ED and Rainey, WE 1992, 'The biology of flying-foxes of the genus Pteropus: A Review', in: Wilson, DE and GL Graham (eds)*, Pacific Island Flying-foxes*: *Proceedings of an International Conservation Conference*, US Department of the Interior – Biological Report no. 90, pp. 1–17.

Ratcliffe, F 1932, 'Notes on the Fruit Bats (Pteropus spp.) of Australia', *Journal of Animal Ecology*, vol. 1, no. 1, pp. 32–57.

Roberts, BJ 2006, *Management of Urban Flying-fox Roosts: Issues of Relevance to Roosts in the Lower Clarence, NSW*, Valley Watch Inc, Maclean.

Roberts, B and Eby, P 2013, Review of past flying-fox dispersal actions between 1990–2013, publisher unknown, viewed 1 December 2017, www.environment.nsw.gov.au/resources/animals/flying-fox-2014-subs/flyingfoxsub-jenny-beatson-part2.pdf.

Roberts, BJ, Catterall, CP, Eby, P and Kanowski, J 2012, 'Long-Distance and Frequent Movements of the Flying-Fox *Pteropus poliocephalus*: Implications for Management', *PLoS ONE*, vol. 7, no. 8, e42532.

Roberts, BJ, Eby, P, Catterall, CP, Kanowski, J and Bennett, G 2011, 'The outcomes and costs of relocating flying-fox camps: insights from the case of Maclean, Australia', in Law, B, Eby, P, Lunney, D and Lumsden, L (eds), *The Biology and Conservation of Australasian Bats*, Royal Zoological Society of NSW, Mosman, NSW.

Roberts, B, Kanowski, J and Catterall, C 2006, *Ecology and Management of Flying-fox Camps in an Urbanising Region*, Rainforest CRC Tropical Forest Landscapes, Issue 5, viewed 1 December 2016, www.rainforest-crc.jcu.edu.au/issues/ITFL_flyingfox.pdf.

SEQ Catchments 2012, *Management and Restoration of flying-fox Roosts: Guidelines and Recommendations*, SEQ Catchments Ltd funded by the Australian Government's Caring for Our Country, viewed 1 December 2016, www.environment.nsw.gov.au/resources/animals/flying-fox-2014-subs/flyingfoxsub-jenny-beatson-part3.pdf.

Scotts, D. 2003. *Key Habitats and Corridors for Forest Fauna: A Landscape Framework for Conservation in North-east New South Wales*. NSW NPWS Occasional Paper 32, NSW National Parks and Wildlife Service, Sydney.

Shinwari, MW, Annand, EJ, Driver, L, Warrilow, D, Harrower, B, Allcock, RJN, Pukallus, D, Harper J, Bingham, J, Kung, N and Diallo, IS 2014, 'Australian bat lyssavirus infection in two horses', *Veterinary Microbiology*, vol. 173, pp. 224–231.

Smith, M. 2002. Management of roost sites of the Grey-headed Flying-fox *Pteropus poliocephalus* on the north coast of NSW: a National Parks & Wildlife Service perspective. Publication: Eby, P. and

Lunney, D. January 1, 2002. *Managing the Grey-headed Flying-fox as a Threatened Species in NSW*, Royal Zoological Society of New South Wales.

Southerton, SG, Birt, P, Porter, J and Ford, HA 2004, 'Review of gene movement by bats and birds and its potential significance for eucalypt plantation forestry', *Australian Forestry*, vol. 67, no. 1, pp. 45–54.

Stanvic, S, McDonald, V and Collins, L 2013, *Managing heat stress in flying-foxes colonies*, viewed 12 January 2017, www.fourthcrossingwildlife.com/HeatStress-StanvicMcDonaldCollins.pdf.

Tidemann, C, Eby, P, Parry-Jones, K and Vardon, M 1999, *The Action Plan for Australian Bats: Grey-headed Flying-fox*, Environment Australia, www.environment.gov.au/node/14622.

Tolga Bat Hospital, *Wildlife Friendly Fencing Project*, Tolga Bat Hospital partly funded by grants from WWF and Australian Government Caring for Our Country, viewed 10 January, 2017, www.wildlifefriendlyfencing.com/WFF/Home.html.

Webb, N and Tidemann, C 1995, 'Hybridisation between black (*Pteropus alecto*) and grey-headed (*P. poliocephalus*) flying-foxes (Megachiroptera: Pteropodidae)', *Australian Mammalogy*, vol. 18, pp. 19–26.

Webb, NJ and Tidemann, CR 1996, 'Mobility of Australian flying-foxes, *Pteropus* spp. (Megachiroptera): evidence from genetic variation', *Proceedings of the Royal Society London Series B,* vol. 263, pp. 497–502.

Welbergen, JA 2014, 'Canaries in the coalmine: flying-foxes and extreme heat events in a warming climate', presentation at the Griffith Climate Change Seminar, July 2014, www.griffith.edu.au/research/research-excellence/griffith-climate-change-response-program/program/?a=628188.

Welbergen, JA 2017a 'Flying-fox Heat Stress forecaster: http://www.animalecologylab.org/ff-heat-stress-forecaster.html

Welbergen, JA 2017b 'Responding to heat stress in flying-fox camps' viewed 23 March 2017; http://www.animalecologylab.org/uploads/4/4/9/0/44908845/ff_heat_stress_management_responses.pdf

Welbergen, JA, Klose, SM, Markus, N and Eby, P 2008, 'Climate change and the effects of temperature extremes on Australian flying-foxes', *Proceedings of the Royal Society of London B: Biological Sciences*, vol. 275, no. 1633, pp.419–425, viewed 12 February 2017, rspb.royalsocietypublishing.org/content/275/1633/419.short.

Westcott, DA, McKeown, A, Murphy, HT and Fletcher, CS 2011, *A monitoring method for the Grey-headed Flying-fox,* Pteropus poliocephalus, CSIRO, Queensland, viewed 1 December 2016, www.environment.gov.au/biodiversity/threatened/species/pubs/310112-monitoring-methodology.pdf.

WIRES, 2016, DRAFT Mass Flying-fox Disaster Incident Guidelines. Coffs Harbour, Mid north Coast WIRES.

Zurbuchen, A, Landert, L, Klaiber, J, Muller, A, Hein, S and Dorn, S 2010, 'Maximum foraging ranges in solitary bees: only few individuals have the capability to cover long-foraging distances', *Biological Conservation,* vol. 142, no. 3, pp. 669–676.

Appendix A Likelihood of occurrence

Five categories for likelihood of occurrence of species are used in this report and are defined below. Assessment of likelihood was based on species locality records, presence or absence of suitable habitat features within the study area, results of previous studies, on-site field surveys and professional judgement.

- yes - the species is known to occur within suitable habitat within the study area.
- likely - a medium to high probability that a species occupies or uses habitat within the study area.
- potential - suitable habitat for a species occurs within the study area, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur.
- unlikely - a very low to low probability that a species occupies or uses habitat within the study area.
- no - habitat within the study area and in the immediate vicinity is unsuitable for the species, or, in the case of plants, the species was not located during searches of the study area.

ECOLOGICAL COMMUNITIES

Community Name	TSC Act Status	EPBC Act Status	Description	Distribution	Habitat	TSC listing equivalent	Potential camp habitat	Likelihood of occurrence
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	E	CE	Typically is a closed canopy of trees that can be interspersed with canopy gaps that are common in exposed situations or with storm events. The canopy forms a mosaic due to canopy regeneration, typically in the form of basal coppice following canopy decapitation due to prevailing salt laden winds and storm events. Emergents may be present, for example, *Banksia* or *Eucalyptus.* The ground stratum of the vegetation typically is very sparse.	Typically occurs within two kilometres of the coast; in NSW, found in the NSW North Coast, Sydney Basin and South East Corner bioregions.	Occurs on dunes and flats, cheniers, berms, cobbles, headlands, scree, seacliffs, marginal bluffs, spits, deltaic deposits, coral rubble and islands.	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Coffs Creek Woolgoolga	No
Lowland Rainforest of Subtropical	E	CE	Generally a moderately tall to tall closed forest. Buttresses	From Qld to the Clarence River	Occurs on basalt and alluvial soils,		Coffs Creek	Potential

Community Name	TSC Act Status	EPBC Act Status	Description	Distribution	Habitat	TSC listing equivalent	Potential camp habitat	Likelihood of occurrence
Australia			are common as is an abundance and diversity of vines. The canopy is often multilayered.	(near Grafton) in northern NSW. Also isolated areas between the Clarence River and Hunter River such as the Bellinger and Hastings valleys.	or occasionally on enriched rhyolitic soils and basaltically enriched metasediments.Mostly occurs in areas <300 m above sea level, in areas with high annual rainfall (>1300 mm). Typically occurs more than 2 km from the coast.		Woolgoolga Barcoo	
Subtropical and Temperate Coastal Saltmarsh		V	Consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate and vegetation is generally of less than 0.5 m height (with the exception of some reeds and sedges).	Within a relatively narrow margin of the Australian coastline, within the subtropical and temperate climatic zones south of the South- east Queensland IBRA bioregion.	Typically restricted to the upper intertidal environment; mainly associated with the soft substrate shores of estuaries and embayments (sandy and/or muddy) and on some open, low wave energy coasts).	Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions.	Coffs Creek Woolgoolga Barcoo	No

Community Name	TSC Act Status	EPBC Act Status	Description	Distribution	Habitat	TSC listing equivalent	Potential camp habitat	Likelihood of occurrence
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E		The composition of the tree stratum (which may exceed 40 m in height) varies considerably, but the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. siderophloia* (grey ironbark), *Corymbia intermedia* (pink bloodwood) and, north of the Macleay floodplain, *Lophostemon suaveolens* (swamp turpentine). A layer of small trees may be present, including *Allocasuarina torulosa* (forest oak), *Alphitonia excelsa* (red ash), *Glochidion ferdinandi* (cheese tree), *Callistemon* spp., *Melaleuca* spp. and *Casuarina glauca* (swamp oak). Scattered shrubs include *Breynia oblongifolia, Acacia concurrens, Commersonia* spp., and *Hibiscus* spp. Occasional vines include *Eustrephus latifolius, Parsonsia straminea and Geitonoplesium cymosum*. The groundcover is composed of abundant forbs, scramblers and grasses.	Coastal floodplains of the North Coast of NSW. Known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens.	Associated with clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains.		Coffs Creek Woolgoolga Barcoo	Yes

Community Name	TSC Act Status	EPBC Act Status	Description	Distribution	Habitat	TSC listing equivalent	Potential camp habitat	Likelihood of occurrence
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E		The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. It has a dense to sparse tree layer in which *Casuarina glauca* (swamp oak) is the dominant species northwards from Bermagui. Other trees including *Acmena smithii* (lilly pilly), *Glochidion* spp. (cheese trees) and *Melaleuca* spp. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford. *Melaleuca ericifolia* is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines, *Parsonsia straminea, Geitonoplesium cymosum* and *Stephania japonica* var. *discolor*, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. The composition of the ground stratum varies depending on levels of salinity in the groundwater.	Coastal floodplains of NSW. Known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes, Port Stephens, Maitland, Newcastle, Cessnock, Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Hawkesbury, Baulkham Hills, Hornsby, Lane Cove, Blacktown, Auburn, Parramatta, Canada Bay, Rockdale, Kogarah, Sutherland, Penrith, Fairfield, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley.	Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains Generally occurs below 20 m elevation.		Coffs Creek Woolgoolga Barcoo	Yes

Community Name	TSC Act Status	EPBC Act Status	Description	Distribution	Habitat	TSC listing equivalent	Potential camp habitat	Likelihood of occurrence
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E		The most widespread and abundant dominant trees include *Eucalyptus robusta* (swamp mahogany), *Melaleuca quinquenervia* (paperbark) and, south from Sydney, *Eucalyptus botryoides* (bangalay) and *Eucalyptus longifolia* (woollybutt). Shrubs include *Acacia longifolia, Dodonaea triquetra, Ficus coronata, Leptospermum polygalifolium* subsp*. polygalifolium* and *Melaleuca* spp. Occasional vines include *Parsonsia straminea, Morinda jasminoides* and *Stephania japonica* var*. discolor*. The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei, Pteridium esculentum, Hypolepis muelleri, Calochlaena dubia, Dianella caerulea, Viola hederacea, Lomandra longifolia, Entolasia marginata* and *Imperata cylindrica*.	Known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, Lake Macquarie, Wyong, Gosford, Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland, Wollongong, Shellharbour, Kiama and Shoalhaven.	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Generally occurs below 20 m (though sometimes up to 50 m) elevation.		Coffs Creek Woolgoolga Barcoo	Yes

FLORA

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
Rutaceae	*Acronychia littoralis*	Scented Acronychia	E1	E	Between Fraser Island in Qld and Port Macquarie on the north coast of NSW.	Littoral rainforest on sand.	Coffs Creek Woolgoolga Barcoo	Unlikely
Poaceae	*Alexfloydia repens*	Floyd's Grass	E1		Only on the NSW mid north coast from Coffs Harbour to Scotts Head. Two disjunct areas: around Sawtell and along Warrell Creek.	Predominantly in swamp sclerophyll forest where *Casuarina glauca* (Swamp Oak) and/or *Melaleuca quinquenervia* (Broad-leaved Paperbark) are usually the dominant canopy species.	Coffs Creek Barcoo	Potential
Casuarinaceae	*Allocasuarina defungens*	Dwarf Heath Casuarina	E1	E	Only in NSW, from the Nabiac area, north-west of Forster, to Byron Bay on the NSW north coast.	Tall heath on sand, also nearby-coastal hills or headlands adjacent to sandplains.	Coffs Creek Woolgoolga Barcoo	Unlikely
Poaceae	*Arthraxon hispidus*	Hairy Jointgrass	V	V	In NSW, found on the northern tablelands and north coast.	Edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	Coffs Creek Woolgoolga Barcoo	Potential
Rutaceae	*Boronia umbellata*	Orara Boronia	V	V	Between Glenreagh and Lower Bucca, north of Coffs Harbour.	In and around gullies in wet open forest.	Coffs Creek Woolgoolga Barcoo	Potential
Euphorbiaceae	*Chamaesyce psammogeton*	Sand Spurge	E		Found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*)	Woolgoolga	Unlikely

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
					Queensland (and Lord Howe Island). Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park, Moonee Beach Nature Reserve and Bundjalung National Park.			
Corynocarpaceae	*Corynocarpus rupestris* subsp. *rupestris*	Glenugie Karaka	V	V	Known only from Glenugie Peak Flora Reserve, south-east of Grafton.	Dry rainforest on steep basalt boulder slopes.	Coffs Creek Barcoo	Unlikely
Lauraceae	*Cryptocarya foetida*	Stinking Cryptocarya	V	V	Coastal south-east Qld and north-east NSW south to Iluka.	Littoral rainforest, on sandy or basaltic soils.	Coffs Creek	Unlikely
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton.	Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	Coffs Creek Woolgoolga Barcoo	Potential

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
Apocynaceae	*Cynanchum elegans*	White-flowered Wax Plant	E1	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley.	Dry rainforest; littoral rainforest; *Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia* (Coastal Tea-tree– Coastal Banksia) coastal scrub; *Eucalyptus tereticornis* (Forest Red Gum) or *Corymbia maculata* (Spotted Gum) open forest and woodland; and *Melaleuca armillaris* (Bracelet Honeymyrtle) scrub.	Coffs Creek Woolgoolga	Unlikely
Ebenaceae	*Diospyros mabacea*	Red-fruited Ebony	E1	E	Only in north-east NSW. Found in a few stands on the Tweed and Oxley Rivers, upstream from Murwillumbah, on Stotts Island in the lower Tweed River and west of Mullumbimby on the Brunswick River.	Lowland subtropical rainforest, often close to rivers.	Coffs Creek Barcoo	Potential
Sapindaceae	*Diploglottis campbellii*	Small-leaved Tamarind	E1	E	Coastal lowlands between Richmond River on the Far North Coast of NSW and Mudgeeraba Creek on the Gold Coast hinterland, Qld.	Confined to the warm subtropical rainforests of the NSW-Qld border lowlands and adjacent low ranges, ranging from lowland subtropical rainforest to drier subtropical rainforest with a Brush Box open overstorey.	Coffs Creek Barcoo	Unlikely

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
Orchidaceae	*Diuris praecox*	Rough Doubletail	V	V	Between Bateau Bay and Smiths Lake, in hills and slopes of near-coastal districts.	Open forests.	Coffs Creek Barcoo	Unlikely
Orchidaceae	*Diuris sp. aff. chrysantha*	Byron Bay Diuris	E1		This orchid is known from a single location only, at Byron Bay in north-east NSW. Only about 20 plants have been recorded.	Occurs in low-growing grassy heath on clay soil.	Barcoo	Unlikely
Proteaceae	*Eidothea hardeniana*	Nightcap Oak	E1	CE	Has been found only in the Nightcap Range north of Lismore.	Upland warm temperate rainforest, usually near creeks.	Coffs Creek Barcoo	Unlikely
Cyperaceae	*Eleocharis tetraquetra*	Square-stemmed Spike-rush	E1		In NSW, found on the north coast at Boambee near Coffs Harbour and near Grafton and Murwillumbah.	Damp locations on stream edges and in and on the margins of freshwater swamps.	Coffs Creek Barcoo	Unlikely
Lauraceae	*Endiandra floydii*	Crystal Creek Walnut	E1	E	In NSW, confined to the Tweed and Brunswick Valleys and Byron Bay area.	Warm temperate or subtropical rainforest with Brush Box overstorey, and in regrowth rainforest and Camphor Laurel forest.	Coffs Creek Barcoo	Unlikely
Lauraceae	*Endiandra hayesii*	Rusty Rose Walnut	V	V	From Burleigh Heads in Qld to the Richmond River in north-east NSW.	Sheltered moist gullies in lowland subtropical and warm temperate rainforest on alluvium or basaltic soils.	Coffs Creek Barcoo	Unlikely

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
Proteaceae	*Hakea archaeoides*	Big Nellie Hakea	V	V	Restricted to the hinterland between Kempsey and Taree, around Mt Boss, Broken Bago and Landsdowne.	Steep, rocky, sheltered slopes and in deep gullies in open eucalypt forest.	Coffs Creek Barcoo	Unlikely
Haloragaceae	*Haloragis exalata* subsp. *velutina*	Tall Velvet Sea-berry	V	V	North coast of NSW and south-eastern Qld.	Damp places near watercourses, and woodland on the steep rocky slopes of gorges.	Coffs Creek	Unlikely
Proteaceae	*Hicksbeachia pinnatifolia*	Red Bopple Nut	V	V	Coastal areas of north-east NSW from the Nambucca Valley north to south-east Queensland.	Subtropical rainforest, moist eucalypt forest and Brush Box forest.	Woolgoolga	Potential
Fabaceae (Faboideae)	*Kennedia retrorsa*		V	V	Believed to be restricted to the Mount Dangar area and the adjacent Goulburn River catchment.	Ranges from sheltered forest in riparian areas to steep, exposed rocky ridgelines.	Coffs Creek	Unlikely
Lindsaeaceae	*Lindsaea incisa*	Slender Screw Fern	E1		In NSW it is known only from a few locations between Woombah and just south of Coffs Harbour.	Dry eucalypt forest on sandstone and moist shrubby eucalypt forest on metasediments. Usually found in waterlogged or poorly drained sites along creeks.	Coffs Creek Barcoo	Potential
Proteaceae	*Macadamia integrifolia*	Macadamia Nut	P	V	Not known to occur naturally in the wild in NSW; recorded from Camden Haven but it is not known if the tree was cultivated or growing naturally.	Drier subtropical rainforest.	Coffs Creek Woolgoolga Barcoo	Unlikely

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
Proteaceae	*Macadamia tetraphylla*	Rough-shelled Bush Nut	V	V	Confined chiefly to the north of the Richmond River in north-east NSW, extending just across the border into Qld.	Subtropical rainforest, usually near the coast.	Coffs Creek Woolgoolga Barcoo	Unlikely
Apocynaceae	*Marsdenia longiloba*	Slender Marsdenia	E1	V	In NSW, occurs at scattered locations on the north coast north from Barrington Tops.	Subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest, areas with rock outcrops.	Coffs Creek Woolgoolga Barcoo	Potential
Myrsinaceae	*Myrsine richmondensis*	Ripple-leaf Muttonwood	E1	E	Coraki, Boatharbour near Lismore, and the Cherry Tree area west of Casino.	Subtropical and dry rainforest and swamp forest on creek flats and slopes on basalt derived soil.	Coffs Creek	Unlikely
Sapotaceae	*Niemeyera whitei*	Rusty Plum, Plum Boxwood	V		Coast and adjacent ranges of northern NSW from the Macleay River into southern Qld.	Rainforest and adjacent moist eucalypt forest.	Coffs Creek Woolgoolga Barcoo	Potential
Orchidaceae	*Oberonia complanata*	Yellow-flowered King of the Fairies	E1		Within NSW, several historical collections from Byron Bay, Lismore, and Coffs Harbour. More recently recorded from Lismore and Wollumbin.	Littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes, stream-side areas, swampy forests and mangroves. Grows on trees and rocks.	Coffs Creek Barcoo	Potential

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
Orchidaceae	*Oberonia titania*	Red-flowered King of the Fairies	V		Occurs on the NSW north coast north from Kendall, and also in in Queensland and Norfolk Island. It is known from 10 locations in NSW, two of which occur within Dorrigo National Park and Washpool National Park.	Occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves.	Barcoo	Potential
Apocynaceae	*Parsonsia dorrigoensis*	Milky Silkpod	V	E	Found only within NSW, in the north coast region between Kendall and Woolgoolga.	Subtropical and warm-temperature rainforest, rainforest margins, and moist eucalypt forest up to 800 m, on brown clay soils.	Coffs Creek Woolgoolga Barcoo	Potential
Orchidaceae	*Peristeranthus hillii*	Brown Fairy-chain Orchid	V		North-eastern NSW, north from Port Macquarie, extending to north-eastern Qld as far as the Bloomfield River.	Littoral Rainforest and Rainforest on Floodplain, in coastal and near-coastal areas. Epiphytic on tree trunks and thick vines.	Coffs Creek Barcoo	Potential
Polygonaceae	*Persicaria elatior*	Tall Knotweed	V	V	In northern NSW the species is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests).	Beside streams and lakes, swamp forest or disturbed areas.	Coffs Creek Barcoo	Potential
Orchidaceae	*Phaius australis*	Southern Swamp Orchid	E1	E	Qld and north-east NSW as far south as Coffs Harbour.	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in	Coffs Creek Woolgoolga	Potential

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
						coastal areas.	Barcoo	
Fabaceae (Faboideae)	*Pultenaea maritima*	Coast Headland Pea	V		Within NSW, recorded from Newcastle north to Byron Bay on 16 headlands.	Grasslands, shrublands and heath on exposed coastal headlands.	Coffs Creek Woolgoolga Barcoo	Unlikely
Simaroubaceae	*Quassia* sp. *Mooney Creek*	Moonee Quassia	E1	E	Scattered distribution from the Moonee Creek area north of Coffs Harbour to north-east of Grafton.	Tall moist eucalypt forest and tall dry eucalypt forest.	Coffs Creek Woolgoolga	Potential
Orchidaceae	*Sarcochilus fitzgeraldii*	Ravine Orchid	V	V	North-east NSW, north of the Macleay River, to Maleny in south-east Qld.	On rocks or rarely on bases of trees, in subtropical rainforest, usually near streams, from 500-700 m.	Coffs Creek Barcoo	Unlikely
Orchidaceae	*Sarcochilus hartmannii*	Hartman's Sarcochilus	V	V	From the Richmond River in northern NSW to Gympie in south-east Qld.	On volcanic rocks, in sclerophyll forest or exposed sites, from 500 to 1000 m. Rarely on bases of trees.	Coffs Creek	Unlikely
Fabaceae (Caesalpinioideae)	*Senna acclinis*	Rainforest Cassia	E1		Coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Qld.	Subtropical and dry rainforest.	Coffs Creek Woolgoolga	Potential
Fabaceae (Faboideae)	*Sophora tomentosa*	Silverbush	E1		Coastal areas north from Old Bar near Taree, into Qld.	Coastal dunes and berms.	Coffs Creek Woolgoolga	Unlikely

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
							Barcoo	
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	Subtropical and littoral rainforest on gravels, sands, silts and clays.	Coffs Creek	Potential
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands.	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Coffs Creek Woolgoolga Barcoo	Unlikely
Apocynaceae	*Tylophora woollsii*	Cryptic Forest Twiner	E1	E	From the NSW north coast and New England Tablelands to southern Qld.	Moist eucalypt forest, moist sites in dry eucalypt forest and rainforest margins.	Coffs Creek Woolgoolga Barcoo	Potential
Myrtaceae	*Uromyrtus australis*	Peach Myrtle	E1	E	Found only in the far north-east of NSW in Nightcap and Mount Jerusalem National Parks and Whian Whian State Conservation Area, west of Mullumbimby.	Warm temperate rainforest on less fertile soils derived from rhyolite rock.	Coffs Creek Barcoo	Unlikely
Rutaceae	*Zieria prostrata*	Headland Zieria	E1	E	Restricted to four coastal headlands in the Coffs Harbour area of north-east NSW.	Low grassy heath and wind-pruned open to sparse shrubland.	Coffs Creek Barcoo	Unlikely

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp habitat	Likelihood of occurrence
Rutaceae	*Zieria smithii*	Low growing form of *Z. smithii*, Diggers Head	E2		Population occurs at Diggers Head at Coffs Harbour.	Low heath with *Themeda australis* (Kangaroo Grass) on a coastal headland.	Coffs Creek Woolgoolga	Unlikely

FAUNA

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Aves	Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	E4A	E	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions.	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana (*River Oak).	Coffs Creek Woolgoolga Barcoo	No (very rare winter visitor to Coffs coast)
Aves	Procellariidae	*Ardenna carneipes*	Flesh-footed Shearwater	V	J,K	Recorded in NSW coastal waters. Breeds on Lord Howe Island.	Marine.	Coffs Creek Woolgoolga Barcoo	No (potential outside study area only and not impacted by proposal)
Aves	Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	V		Widespread in eastern, southern and southwestern Australia. In NSW it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in much of the Upper Western region.	Often found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts. Also found in shrublands and heathlands and various modified habitats, including farm land and regenerating forests; very	Woolgoolga Barcoo	No – closed canopy habitat at all three camps is unsuitable for this species

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
							occasionally in moist forests or rainforests.		
Aves	Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west.	Permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. (bullrushes) and *Eleocharis* spp. (spikerushes).	Coffs Creek Woolgoolga	No - habitat unsuitable and high human presence
Aves	Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E1		In NSW, found sporadically in coastal areas, and west of the divide throughout the sheep-wheat belt.	In NSW, it occurs in lowland grassy woodland and open forest.	Coffs Creek Woolgoolga Barcoo	No – habitat unsuitable.
Aves	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E1	C,J,K	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin.	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Coffs Creek Woolgoolga Barcoo	Unlikely – habitat too modified and high human presence
Aves	Scolopacidae	*Calidris tenuirostris*	Great Knot	V		In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith.	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and	Woolgoolga	No - habitat too modified and high human presence

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
							lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.		
Aves	Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina.	Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Coffs Creek Woolgoolga Barcoo	Potential – where Allocasuarina littoralis is present on site
Mammalia	Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Coffs Creek Woolgoolga Barcoo	No – suitable roosting habitat not present

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Mammalia	Vespertilionidae	*Chalinolobus nigrogriseus*	Hoary Wattled Bat	V		Widely distributed across northern Australia although absent from the arid centre. In north east NSW it extends from Port Macquarie in the south, north to the Queensland border. The species has been recorded as far west as Armidale and Ashford.	In NSW, occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Forests with naturally sparse understorey layers may provide the best habitat. Roosts in hollows and rock crevices. Will occupy urban areas with suitable habitat.	Woolgoolga	Unlikely – no suitable habitat available at this location.
Aves	Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V		From eastern through central NSW, west to Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell.	Eucalypt woodlands and dry open forest.	Coffs Creek Barcoo	No – suitable habitat not present.
Aves	Campephagidae	*Coracina lineata*	Barred Cuckoo-shrike	V		Rare in NSW but recorded along coast south to the Manning River.	Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses.	Coffs Creek Woolgoolga Barcoo	Potential – recorded 600m south of Woolgoolga Lake.

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Amphibia	Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V		Along the coastal margin from Litabella National Park in south-east Qld to Kurnell in Sydney.	Acidic swamps on coastal sand plains (typically in sedgelands and wet heathlands), drainage lines, and swamp sclerophyll forests.	Coffs Creek Woolgoolga Barcoo	Potential – some suitable habitat at Barcoo and records from Airport lands on opposite side of Boambee Creek
Aves	Psittacidae	*Cyclopsitta diopthalma coxeni*	Coxen's Fig-Parrot	E4A	E	Limited to about five populations scattered between Bundaberg in Qld and the Hastings River in NSW.	Drier rainforests and adjacent wetter eucalypt forest, and wetter lowland rainforests.	Coffs Creek Toormina	No – not recorded in Coffs LGA for many years
Aves	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		Distribution in NSW is nearly continuous from the coast to the far west.	Inhabits eucalypt forests and woodlands, mallee and *Acacia* woodland.	Coffs Creek Woolgoolga Barcoo	Potential – recorded 250m away at cemetery on northern edge of Woolgoolga Lake
Aves	Dasyornithidae	*Dasyornis brachypterus*	Eastern Bristlebird	E1	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the	Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass	Coffs Creek Woolgoolga	No – habitat not suitable.

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						NSW/Victorian border.	understorey.		
Mammalia	Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld.	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Coffs Creek Woolgoolga Barcoo	Unlikely – Woolgoolga and Barcoo too isolated from existing populations, Coffs has a high human presence
Aves	Diomedeidae	*Diomedea antipodensis*	Antipodean Albatross	V	V	The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia.	Breeds on isolated subantarctic islands, usually in grass tussocks. Regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter. Potential forage in NSW waters is considered significant for the species.	Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Diomedeidae	*Diomedea exulans*	Wandering Albatross	E1	E,J	Has been recorded along the length of the NSW coast.	Marine.	Coffs Creek Woolgoolga Barcoo	No (potential outside study area only and not impacted by proposal)
Aves	Diomedeidae	*Diomedea gibsoni*	Gibson's Albatross	V	V	Regularly occurs off the NSW coast usually between Green Cape	Marine.	Coffs Creek Woolgoolga	No (potential outside study area only and not impacted

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						and Newcastle.			by proposal)
Aves	Casuariidae	*Dromaius novaehollandiae*	Emu population in the New South Wales North Coast Bioregion	E2		The species is now restricted to coastal and near-coastal areas between Evans Head and Red Rock and a small isolated population further west in the Bungawalbin area. There are few recent sightings from its former stronghold in Bundjalung National Park.	Occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest.	Barcoo	No – Emu population does not occur in this areas
Aves	Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1		Coastal and subcoastal northern and eastern Australia, south to central-eastern NSW and with vagrants recorded further south and inland.	In NSW, floodplain wetlands of the major coastal rivers are key habitat. Also minor floodplains, coastal sandplain wetlands and estuaries.	Coffs Creek Woolgoolga Barcoo	Potential – recorded 350m away on western edge of Woolgoolga Lake, potential habitat at Barcoo. Unlikely – Coffs Creek no suitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
									habitat
Aves	Accipitridae	*Erythrotriorchis radiatus*	Red Goshawk	CE	V	The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens.	Inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers.	Woolgoolga Barcoo	No – not recorded in NSw for many years

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Aves	Burhinidae	*Esacus magnirostris*	Beach Stone-curlew	E4A		Across northern and north-eastern Australia, south to the Manning River in north-eastern NSW, with occasional vagrants to south-eastern NSW and Victoria.	Exclusively along the coast, on beaches, islands, reefs and in estuaries, and edges of or near mangroves.	Barcoo	Unlikely – no exposed sand flats adjacent to camp and high human presence
Aves	Hydrobatidae	*Fregetta grallaria grallaria*	White-bellied Storm-Petrel		V	Breeds in at least two locations in Australia: Roach Island and Balls Pyramid, in the Lord Howe Island group. Reported to breed on Mutton Bird Island (unconfirmed).	Forages over near-shore waters along the coast of Australia. It nests in crevices between large volcanic rocks and in burrows excavated in banks. Breeding colonies are often situated along dykes.	Coffs Creek Woolgoolga Barcoo	No – habitat unsuitable
Aves	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V		In NSW, found from the coast westward as far as Dubbo and Albury.	Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	Coffs Creek Woolgoolga	Potential – individuals feed on nectar producing canopy species
Aves	Meliphagidae	*Grantiella picta*	Painted Honeyeater	V		Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas.	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Coffs Creek Woolgoolga	No – habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Aves	Gruidae	*Grus rubicunda*	Brolga	V		Formerly found across Australia, except for the SE corner, Tasmania and the SW third of the country. Still abundant in the northern tropics, but very sparse across the southern part of its range.	Dependent on wetlands, especially shallow swamps. Often feed in dry grassland or ploughed paddocks or even desert claypans.	Woolgoolga	No – habitat unsuitable
Aves	Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V		Distributed along the entire NSW coast.	Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	Coffs Creek Woolgoolga Barcoo	No – habitat unsuitable
Aves	Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	E1		Thinly scattered along the entire NSW coast.	Intertidal flats of inlets and bays, open beaches and sandbanks.	Coffs Creek Woolgoolga Barcoo	No – habitat unsuitable
Aves	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V		Commonly seen in coastal and near coastal areas of Australia. Also found using inland terrestrial wetlands, especially along larger inland rivers and at freshwater swamps and lakes.	Usually seen nesting or perched in tall trees, or foraging over waterways and adjacent land.	Woolgoolga Barcoo	Potential – recorded within 50m of Woolgoolga Lake and Barcoo, emergent Eucalypts present at Woolgoolga Lake suitable as nest sites

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Aves	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V		Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment.	Open eucalypt forest, woodland or open woodland, including sheoak or *Acacia* woodlands and riparian woodlands of interior NSW.	Coffs Creek Woolgoolga Barcoo	No – preferred habitat not available.
Reptilia	Elapidae	*Hoplocephalus stephensii*	Stephens' Banded Snake	V		Coast and ranges from Southern Qld to Gosford in NSW.	Rainforest and eucalypt forests and rocky areas up to 950 m in altitude.	Coffs Creek Woolgoolga Barcoo	Unlikely – few hollow bearing trees and limited rainforest and eucalypt forest present at Barcoo and Woolgoolga. Coffs Creek contains some suitable potential habitat but is a highly disturbed site.
Aves	Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	V		Occurs in northern and eastern Australia, mainly in coastal and subcoastal regions, from the NE Kimberley Division of WA to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with	Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing	Woolgoolga Barcoo	No suitable habitat present at any of the these sites

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						stragglers recorded in SE NSW (possibly in response to unfavourable conditions further north).	and aquatic vegetation.		
Aves	Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V		In NSW, records are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland.	Terrestrial and estuarine wetlands. Also flooded grassland, forest, woodland, rainforest and mangroves where permanent water is present.	Coffs Creek Woolgoolga Barcoo	Likely – recorded 50m from Woolgoolga Lake in picnic area adjacent to Flying-fox camp Potential - recorded 1 km from Barcoo
Mammalia	Vespertilionidae	*Kerivoula papuensis*	Golden-tipped Bat	V		Scattered locations on east coast of Australia to south of Eden in southern NSW.	Rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, *Casuarina*-dominated riparian forest and coastal *Melaleuca* forests.	Coffs Creek Woolgoolga Barcoo	Potential - habitat available within Woolgoolga and Barcoo camps
Aves	Psittacidae	*Lathamus discolor*	Swift Parrot	E1	E	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west	Box-ironbark forests and woodlands.	Coffs Creek Woolgoolga Barcoo	No – habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						slopes.			
Aves	Scolopacidae	*Limosa limosa*	Black-tailed Godwit	V		In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland.	Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	Woolgoolga	No – habitat unsuitable
Aves	Scolopacidae	*Limosa lapponica baueri*	Bar-tailed Godwit		V	Occurs in the coastal areas of all Australian states and is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria.	Occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-	Woolgoolga Barcoo	No – habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
							flats.		
Aves	Scolopacidae	*Limosa lapponica menzbieri*	Northern Siberian Bar-tailed Godwit		CE	Usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh. usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. They prefer exposed sandy or soft mud substrates on intertidal flats, banks and beaches. This species does not breed in Australia.	Nests on the ground in open tundra, usually on dry elevated sites and often between clumps of grass	Woolgoolga Barcoo	No – habitat unsuitable
Amphibia	Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region.	Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or *Eleocharis* spp. (spikerushes). Some populations occur in highly disturbed areas.	Coffs Creek Woolgoolga Barcoo	Unlikely – limited habitat available at Barcoo

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Amphibia	Hylidae	*Litoria olongburensis*	Olongburra Frog	V	V	Distributed from Fraser Island in southern Qld to Yuraygir National Park in northern NSW.	Confined to coastal sandplain wallum swamps. Breeding habitat is characterised by the presence of emergent sedges.	Coffs Creek Woolgoolga	No – suitable habitat not present at either camp
Aves	Accipitridae	*Lophoictinia isura*	Square-tailed Kite	V		In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast.	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Coffs Creek Woolgoolga Barcoo	Unlikely to be breeding on site – habitat too modified at Coffs Creek, and high human presence at all three camps
Aves	Procellariidae	*Macronectes giganteus*	Southern Giant Petrel	E1	E	Common visitor off the coast of NSW.	Marine.	Coffs Creek Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Procellariidae	*Macronectes halli*	Northern Giant-Petrel	V	V	Common visitor in NSW waters, predominantly along the south-east coast during winter and autumn.	Marine.	Coffs Creek Woolgoolga	No (potential outside study area only and not impacted by proposal)
Mammalia	Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		East coast and ranges south to Wollongong in NSW.	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests	Coffs Creek Woolgoolga Barcoo	Likely –may roost in tree hollows at any of the sites, no maternity roosts

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
							and banksia scrub.		present
Mammalia	Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V		In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga.	Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Coffs Creek Woolgoolga Barcoo	Likely – foraging habitat only at all three sites, no roosting or breeding habitat present
Amphibia	Myobatrachidae	*Mixophyes balbus*	Stuttering Frog	E1	V	Along the east coast of Australia from southern Qld to north-eastern Victoria.	Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Coffs Creek Woolgoolga	Unlikely- prefers to be on more elevated position in catchment
Amphibia	Myobatrachidae	*Mixophyes iteratus*	Giant Barred Frog	E1	E	Coast and ranges from Eumundi in south-east Qld to Warrimoo in the Blue Mountains.	Freshwater permanent/semi-permanent streams, generally at lower elevation. Riparian rainforest or wet sclerophyll forest is favoured.	Coffs Creek Woolgoolga Barcoo	Potential – Coffs Creek contains suitable habitat, no suitable habitat at Barcoo or Woolgoolga Lake

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Mammalia	Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		Found along the east coast from south Qld to southern NSW.	Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Coffs Creek Woolgoolga Barcoo	Potential – may roost and breed in hollow bearing trees at any of the three camps
Mammalia	Vespertilionidae	*Myotis macropus*	Southern Myotis	V		In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers.	Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Coffs Creek Barcoo	Likely – recorded upstream of Barcoo, roosting habitat only in hollow bearing trees. Potential – may roost and breed in hollow bearing trees at Coffs Creek
Aves	Strigidae	*Ninox connivens*	Barking Owl	V		Wide but sparse distribution in NSW, avoiding the most central arid regions. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests.	Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	Coffs Creek Barcoo	Unlikely – habitat too modified and exposed

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Aves	Strigidae	*Ninox strenua*	Powerful Owl	V		In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains.	Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Coffs Creek Woolgoolga Barcoo	Potential – recorded 750m west of Woolgoolga and known to feed on Flying-foxes
Aves	Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	P	C,J,K	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records.	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Coffs Creek Woolgoolga Barcoo	No - habitat unsuitable
Insecta	Hesperiidae	*Ocybadistes knightorum*	Black Grass-dart Butterfly	E1		Occurs only on the NSW mid north coast from Coffs Harbour to Scotts Head. It is currently known from two disjunct areas: a northern population centred around Sawtell and a southern population along Warrell Creek.	Restricted to areas supporting its larval food plant *Alexfloydia repens* (Floyd's Grass). Habitat is predominantly located in swamp sclerophyll forest.	Coffs Creek Barcoo	Potential – recorded 500m north of Barcoo

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Aves	Laridae	*Onychoprion fuscata*	Sooty Tern	V		In NSW only known to breed at Lord Howe Island. Occasionally seen along coastal NSW, especially after cyclones.	Marine.	Coffs Creek Barcoo	No (potential outside study area only and not impacted by proposal)
Aves	Procellariidae	*Pachyptila turtur subantarctica*	Fairy Prion		V	Often beachcast on the south-eastern coast of Australia, and are commonly seen offshore over the continental shelf and over pelagic waters. Beachcast birds are found along the whole coast of NSW.	Breeds on islands and rock stacks. It burrows in soil, or uses crevices and caves in cliffs or rock falls. The subspecies can also nest in scrub, herbland, tussock or pasture	Woolgoolga Barcoo	No (potential outside study area only and not impacted by proposal)
Aves	Accipitridae	*Pandion cristatus*	Eastern Osprey	V		Common around the northern NSW coast, and uncommon to rare from coast further south. Some records from inland areas.	Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	Coffs Creek Woolgoolga Barcoo	Potential – suitable foraging and nesting habitat at Woolgoolga and Barcoo
Insecta	Petaluridae	*Petalura litorea*	Coastal Petaltail	E1		Known from Byfield (Queensland) to Bonville (south of Coffs Harbour). Known in NSW from a very small number of locations, including Brooms Head, Tucabia, Diggers Camp and Bonville.	Occupies a variety of permanent to semi-permanent coastal freshwater wetlands.	Barcoo	No - habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Mammalia	Petauridae	*Petaurus australis*	Yellow-bellied Glider	V		Along the eastern coast to the western slopes of the Great Dividing Range, from southern Qld to Victoria.	Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	Coffs Creek Woolgoolga Barcoo	No - habitat unsuitable
Mammalia	Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V		Widely though sparsely distributed on both sides of the Great Dividing Range in eastern Australia, from northern Qld to western Victoria.	Mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Coffs Creek Woolgoolga Barcoo	No - habitat unsuitable
Mammalia	Petauridae	*Petauroides volans*	Greater Glider		V	Restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. Two isolated inland subpopulations also exist.	Largely restricted to eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	Woolgoolga Barcoo	No - habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Mammalia	Macropodidae	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit.	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Coffs Creek Woolgoolga Barcoo	No – habitat unsuitable
Mammalia	Dasyuridae	*Phascogale tapoatafa*	Brush-tailed Phascogale	V		In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide.	Dry sclerophyll open forest, heath, swamps, rainforest and wet sclerophyll forest.	Coffs Creek Barcoo	No - no known populations in either location
Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands.	Eucalypt woodlands and forests.	Coffs Creek Woolgoolga Barcoo	Likely – recorded from areas within 100m of all three camps, foraging habitat present
Aves	Diomedeidae	*Phoebetria fusca*	Sooty Albatross	V	V	There are occasional sightings off the NSW coast, north of Grafton.	Marine.	Coffs Creek Woolgoolga	No (potential outside study area only and not impacted by proposal)

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Insecta	Noctuidae	*Phyllodes imperialis southern subspecies*	Pink Underwing Moth	E1	E	In NSW it is known to occur in a small number of localities from the QLD border to Wardell, and there is a disjunct population in the Bellingen area.	Subtropical rainforest below about 600 m elevation; breeding habitat is restricted to areas where the caterpillar's food plant *Carronia multisepalea* occurs.	Coffs Creek Woolgoolga	No – food plant not known from these locations
Mammalia	Dasyuridae	*Planigale maculata*	Common Planigale	V		Occurs in coastal north-eastern NSW, and reported from as far south as the central NSW coast west of Sydney.	Rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas.	Coffs Creek Barcoo	Unlikely – marginal suitable habitat at Barcoo, highly disturbed habitat Coffs Creek
Mammalia	Potoroidae	*Potorous tridactylus*	Long-nosed Potoroo	V	V	In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm.	Coastal heaths and dry and wet sclerophyll forests.	Coffs Creek Woolgoolga Barcoo	No – suitable habitat not present
Mammalia	Muridae	*Pseudomys novaehollandiae*	New Holland Mouse		V	Fragmented distribution across eastern NSW.	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Coffs Creek Woolgoolga Barcoo	No – suitable habitat not present Coffs Creek and Barcoo. Unlikely – Woolgoolga lack of connection

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
									with larger areas of suitable habitat
Aves	Procellariidae	*Pterodroma leucoptera leucoptera*	Gould's Petrel	V	E	Recorded off NSW coast. Breeds on Cabbage Tree Island offshore from Port Stephens, and on nearby Boondelbah island.	Marine. Nesting habitat is located within steeply sloping rock scree gullies with a canopy of Cabbage Tree Palms.	Coffs Creek Woolgoolga Barcoo	No (potential outside study area only and not impacted by proposal)
Aves	Procellariidae	*Pterodroma neglecta neglecta*	Kermadec Petrel (west Pacific subspecies)	V	V	Vagrant birds occur in coastal NSW waters, particularly after storm events. Breeds on Balls Pyramid (near Lord Howe Island) and Phillip Island (near Norfolk Island).	Marine.	Coffs Creek Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Procellariidae	*Pterodroma nigripennis*	Black-winged Petrel	V		Recorded off NSW coast. Breeds on Lord Howe Island.	Marine.	Coffs Creek	No (potential outside study area only and not impacted by proposal)
Mammalia	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria.	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit	Coffs Creek Barcoo Woolgoolga	Known-significant maternity roost at all three sites

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
							crops.		
Aves	Columbidae	*Ptilinopus magnificus*	Wompoo Fruit-Dove	V		In NSW, occurs south along coast and coastal ranges to the Hunter River.	Rainforest, low-elevation moist eucalypt forest and brush box forests.	Coffs Creek Woolgoolga Barcoo	Potential – Coffs Creek, when fruit is available, less likely at Woolgoolga and Barcoo due to lack of fruiting trees
Aves	Columbidae	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V		In NSW, found on coast and ranges north from Newcastle. Vagrants are occasionally found further south to Victoria.	Sub-tropical and dry rainforest, moist eucalypt forest and swamp forest, where fruit is plentiful.	Coffs Creek Woolgoolga Barcoo	Potential – Coffs Creek, when fruit is available, less likely at Woolgoolga and Barcoo due to lack of fruiting trees
Aves	Columbidae	*Ptilinopus*	Superb Fruit-Dove	V		Occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where	Woolgoolga	Unlikely – less common in region

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						far south as eastern Victoria and Tasmania.	there are fruit-bearing trees.		
Aves	Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E1	E, Mar	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys.	Swamps, dams and nearby marshy areas.	Coffs Creek Woolgoolga Barcoo	No – habitat unsuitable
Mammalia	Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V		A wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia it is a rare visitor. There are scattered records of this species across the New England Tablelands and North West Slopes.	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	Woolgoolga	Potential – may roost in tree hollows on site
Reptilia	Scincidae	*Saiphos reticulatus*	Three-toed Snake-tooth Skink		V	Occurs on the coast and in the ranges from the Macleay Valley in NSW to Cooloola in south-eastern Queensland. Known to inhabit rainforest and occasionally moist eucalypt forest, on	Found in loose, well mulched friable soil, in and under rotting logs, in forest litter, under fallen hoop pine bark and under decomposing cane mulch	Woolgoolga	No – habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						loamy or sandy soils.			
Mammalia	Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V		Both sides of the great divide, from the Atherton Tableland in Qld to north-eastern Victoria, mainly along river systems and gullies. In NSW it is widespread on the New England Tablelands.	Woodland, moist and dry eucalypt forest and rainforest.	Coffs Creek Woolgoolga Barcoo	Unlikely – may forage over sites but prefers less urbanised and more elevated locations
Aves	Laridae	*Sternula albifrons*	Little Tern	E1	C,J,K	In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria.	Sheltered coastal environments, harbours, inlets and rivers.	Coffs Creek Woolgoolga Barcoo	No (potential outside study area only and not impacted by proposal)
Aves	Anatidae	*Stictonetta naevosa*	Freckled Duck	V		Found primarily in SE and SW Australia, occurring as a vagrant elsewhere. It breeds in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina.	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps	Woolgoolga	No – non breeding vagrant only, habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						Disperses during droughts to wetlands in the Murray River basin. May also occur as far as coastal NSW and Victoria during drought.	to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.		
Aves	Sulidae	*Sula dactylatra*	Masked Booby	V	J,K	Recorded off the NSW coast. Breeds on Lord Howe Island.	Marine.	Coffs Creek Barcoo	No (potential outside study area only and not impacted by proposal)
Mammalia	Pteropodidae	*Syconycteris australis*	Common Blossom-bat	V		Found north from Hawks Nest in NSW in coastal areas of eastern Australia.	Often roost in littoral rainforest and feed in adjacent heathland and paperbark swamps. Also recorded in subtropical rainforest, wet sclerophyll forest and other coastal forests.	Coffs Creek Barcoo	Potential (Barcoo only) –suitable roosting sites nearby and foraging habitat on site
Aves	Diomedeidae	*Thalassarche bulleri*	Buller's Albatross		V	Frequently seen off the coast from Coffs Harbour, south to Tasmania and west to Eyre Peninsula. A seasonal visitor which does not breed in Australia.	Marine. In Australia, observed over inshore, offshore and pelagic waters.	Woolgoolga	No (potential outside study area only and not impacted by proposal)

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
Aves	Diomedeidae	*Thalassarche bulleri platei*	Northern Buller's Albatross		V	A non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland.	Marine. In Australia, observed over inshore, offshore and pelagic waters.	Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Diomedeidae	*Thalassarche cauta*	Shy Albatross	V	V	Occurs along the east coast south from Stradbroke Island and across the south coast to Carnarvon in WA. It is commonly recorded off southeast NSW, though rarely north of Sydney.	Marine.	Coffs Creek Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Diomedeidae	*Thalassarche cauta steadi*	White-capped Albatross		V	Common off the coast of south-east Australia throughout the year.	Marine. Occurs both inshore and offshore and enters harbours and bays. Scavenge at commercial fishing grounds.	Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Diomedeidae	*Thalassarche eremita*	Chatham Albatross		E1	Main foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania	Marine. Occurs both inshore and offshore and enters harbours and bays.	Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Diomedeidae	*Thalassarche impavida*	Campbell Albatross		V	A non-breeding visitor to Australian waters. Non-breeding birds are most commonly seen	Marine.	Woolgoolga	No (potential outside study area only and not impacted

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						foraging over the oceanic continental slopes off Tasmania, Victoria and NSW.			by proposal)
Aves	Diomedeidae	*Thalassarche melanophris*	Black-browed Albatross	V	V	Regularly recorded off the NSW coast during May-November.	Marine.	Coffs Creek Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Diomedeidae	*Thalassarche salvini*	Salvin's Albatross		V	A non-breeding visitor to Australian waters.	Marine. It occurs both inshore and offshore and enters harbours and bays.	Woolgoolga	No (potential outside study area only and not impacted by proposal)
Aves	Alcedinidae	*Todiramphus chloris*	Collared Kingfisher	V		In NSW, occurs along north coast south to the estuary of the Tweed River, with rare scattered records south to the Clarence River.	Mainly restricted to mangrove associations of estuaries, inlets, sheltered bays and islands, and the tidal flats and littoral zone bordering mangroves.	Coffs Creek Woolgoolga Barcoo	Unlikely – not known as far south as Coffs
Aves	Turnicidae	*Turnix melanogaster*	Black-breasted Button-quail		V	Restricted to coastal and near-coastal regions of south-eastern Queensland and N-E NSW. The main populations occur within S-E Queensland. In N-E NSW, they are restricted to the Northern Rivers and Tablelands. In NSW	Mainly found in rainforests and forests. They prefer drier low closed forests. May also be found in low, dense acacia thickets and, in littoral areas, in vegetation behind sand dunes	Woolgoolga	No – habitat unsuitable

Class	Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Potential camp location	Likelihood of occurrence
						the species is found as far as the Walcha-Yarrowitch area and near Dorrigo.			
Aves	Tytonidae	*Tyto longimembris*	Eastern Grass Owl	V		Recorded occasionally in all mainland states. In NSW they are more likely to be resident in the north-east.	Areas of tall grass, including grass tussocks, swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	Coffs Creek Barcoo	No – Coffs Creek, no suitable habitat. Unlikely - Barcoo suitable habitat nearby
Aves	Tytonidae	*Tyto novaehollandiae*	Masked Owl	V		Recorded over approximately 90% of NSW, excluding the most arid north-western corner. Most abundant on the coast but extends to the western plains.	Dry eucalypt forests and woodlands from sea level to 1100 m.	Coffs Creek Woolgoolga Barcoo	Unlikely – habitat unsuitable
Aves	Tytonidae	*Tyto tenebricosa*	Sooty Owl	V		Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands.	Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	Coffs Creek Woolgoolga Barcoo	Unlikely – habitat unsuitable

Key

TSC Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

EPBC Act: Bonn = Listed migratory species under Bonn Convention, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable

FM Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

References

Fauna

DoE, 2014. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

OEH, 2014. Threatened Species Profiles. Available at: http://threatenedspecies.environment.nsw.gov.au/tsprofile/browse_scientificname.aspx.

Pizzey, G. and Knight, F. (2007). The Field Guide to the Birds of Australia. 8th Edition. Harper Collins, Sydney.

Flora

DoE, 2014. Species Profile and Threats Database. Available at: Http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

OEH, 2014. Threatened Species Profiles. Available at: http://threatenedspecies.environment.nsw.gov.au/tsprofile/browse_scientificname.aspx.

The Royal Botanic Gardens and Domain Trust, 2014. PlantNET - The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia. Available at: http://plantnet.rbgsyd.nsw.gov.au

EECs

DoE, 2014. Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

OEH, 2014. Threatened Species Profiles. Available at: http://threatenedspecies.environment.nsw.gov.au/tsprofile/browse_scientificname.aspx.

Appendix B Expert assessment requirements

The following are the minimum required skills and experience which must be demonstrated by each expert.

Flying-fox expert

Essential

- Knowledge of flying-fox habitat requirements.
- Knowledge and experience in flying-fox camp management.
- Knowledge of flying-fox behaviour, including ability to identify signs of flying-fox stress.
- Ability to differentiate between breeding and non-breeding females.
- Ability to identify females in final trimester.
- Ability to estimate age of juveniles.
- Experienced in flying-fox population monitoring including static and fly-out counts, demographics and visual health assessments.

Desirable

- It is strongly recommended that the expert is independent of the Plan owner to ensure transparency and objectivity. OEH may be able to provide assistance with flying-fox experts.
- ABLV-vaccinated (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Trained in flying-fox rescue (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Local knowledge and experience.

Ecologist

Essential

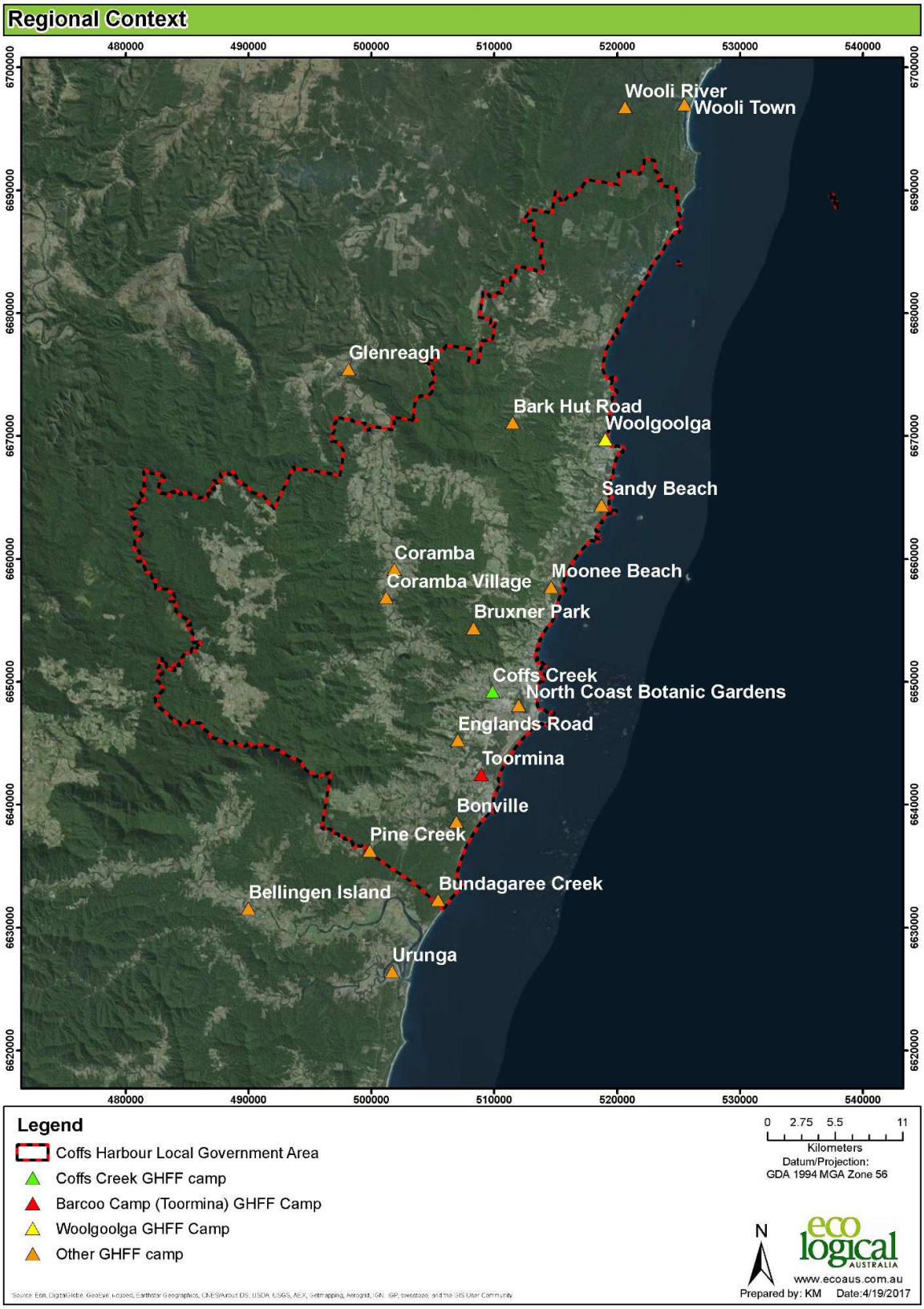
- At least five years demonstrated experience in ecological surveys, including identifying fauna and flora to species level, fauna habitat and ecological communities.
- The ability to identify flora and fauna, including ground-truthing of vegetation mapping.
- Formal training in ecology or similar, specifically flora and fauna identification.

Desirable

- Tertiary qualification in ecology or similar.
- Local knowledge and experience.
- Accredited Biobanking Assessor under the Threatened Species Conservation Act 1995.
- Practising member of the Ecological Consultants Association of NSW.

Depending on the site, for example when vegetation management is proposed for an endangered ecological community or an area with a high likelihood of containing other threatened flora and fauna species, a specialist in that field (e.g. specialist botanist) may be required.

Appendix C Mapping

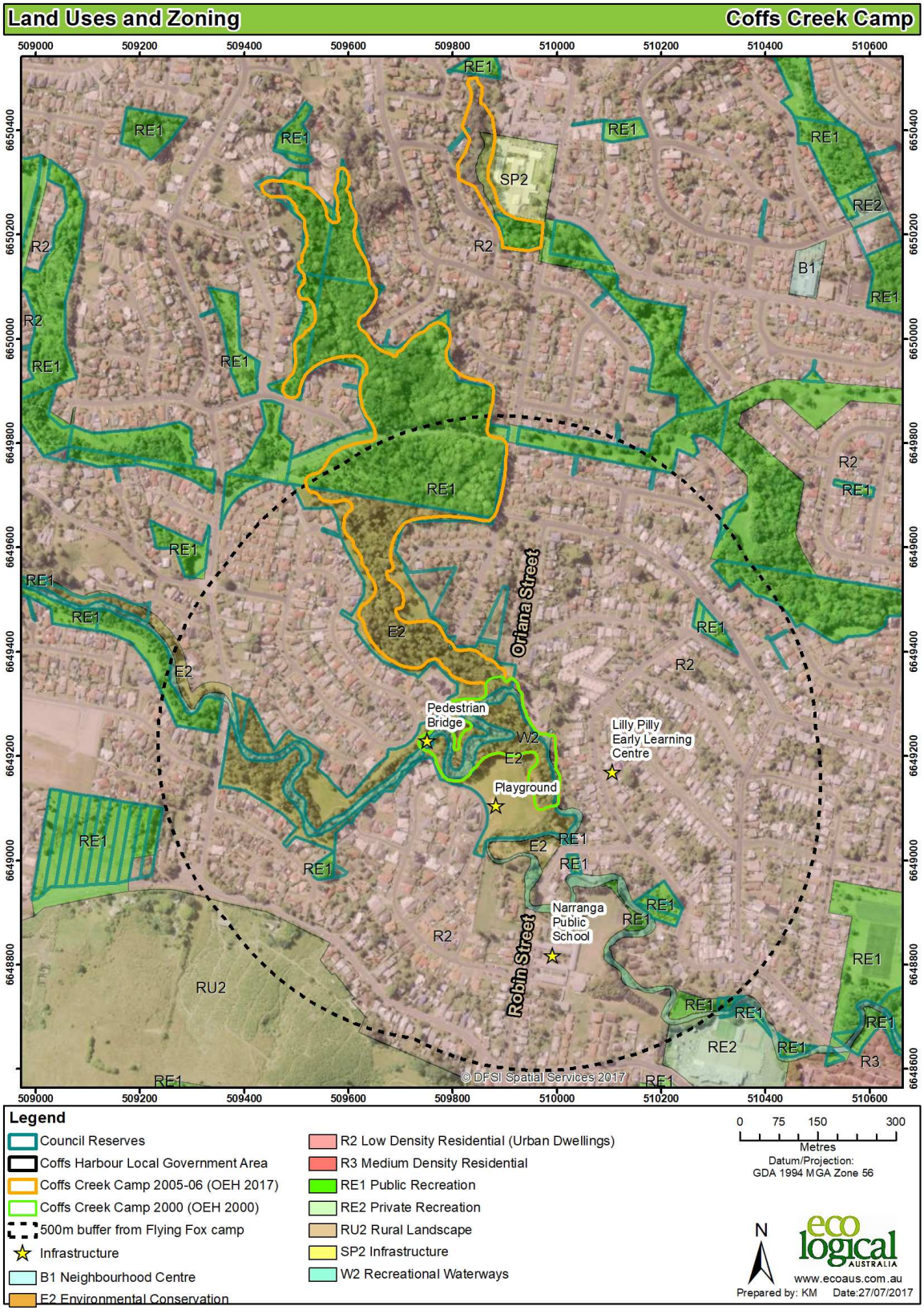


1 Regional context - Flying-fox camps within and surrounding Coffs Harbour Local Government Area

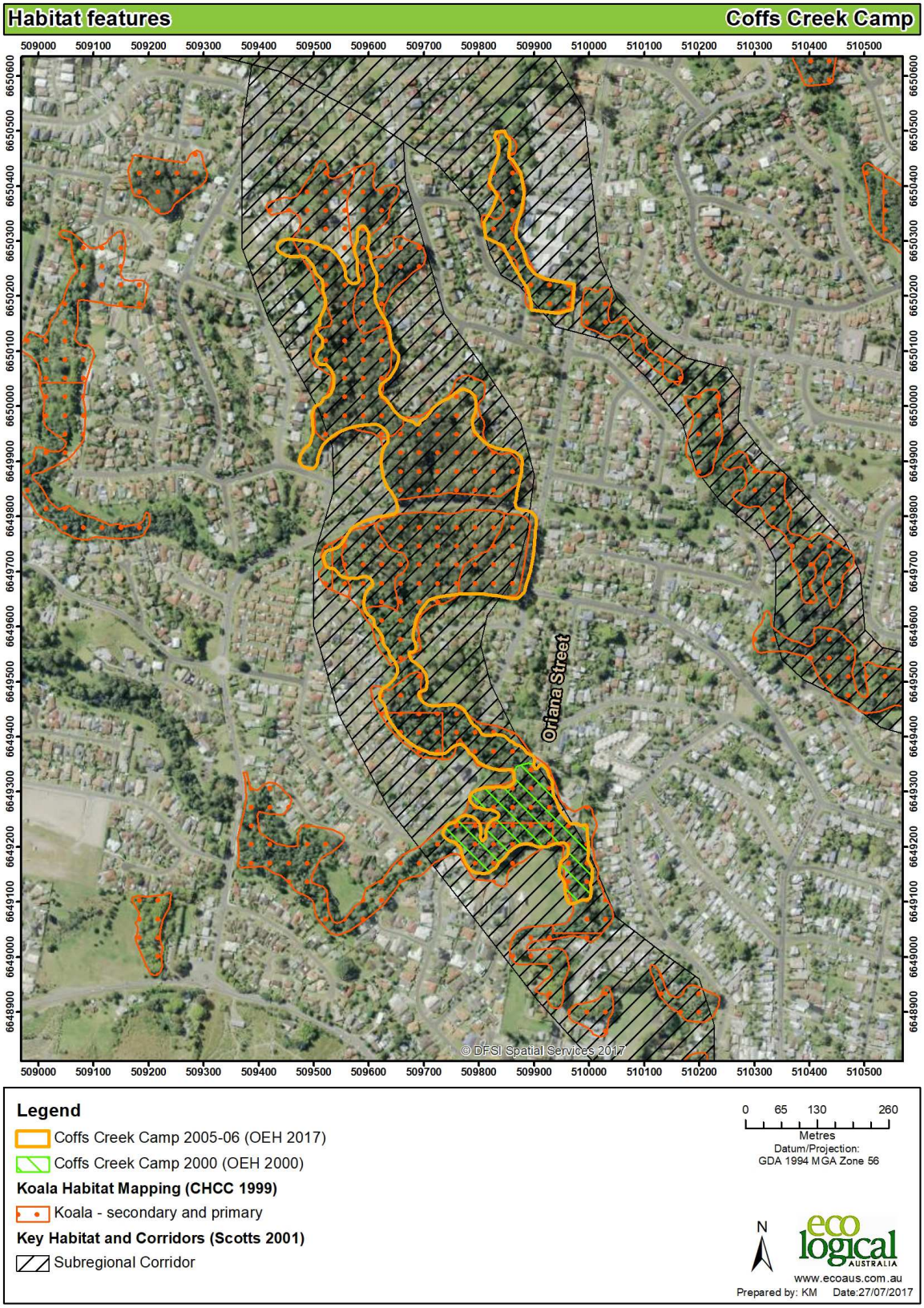
2 Coffs Creek Flying-fox camp

3 Barcoo Court Flying-fox camp

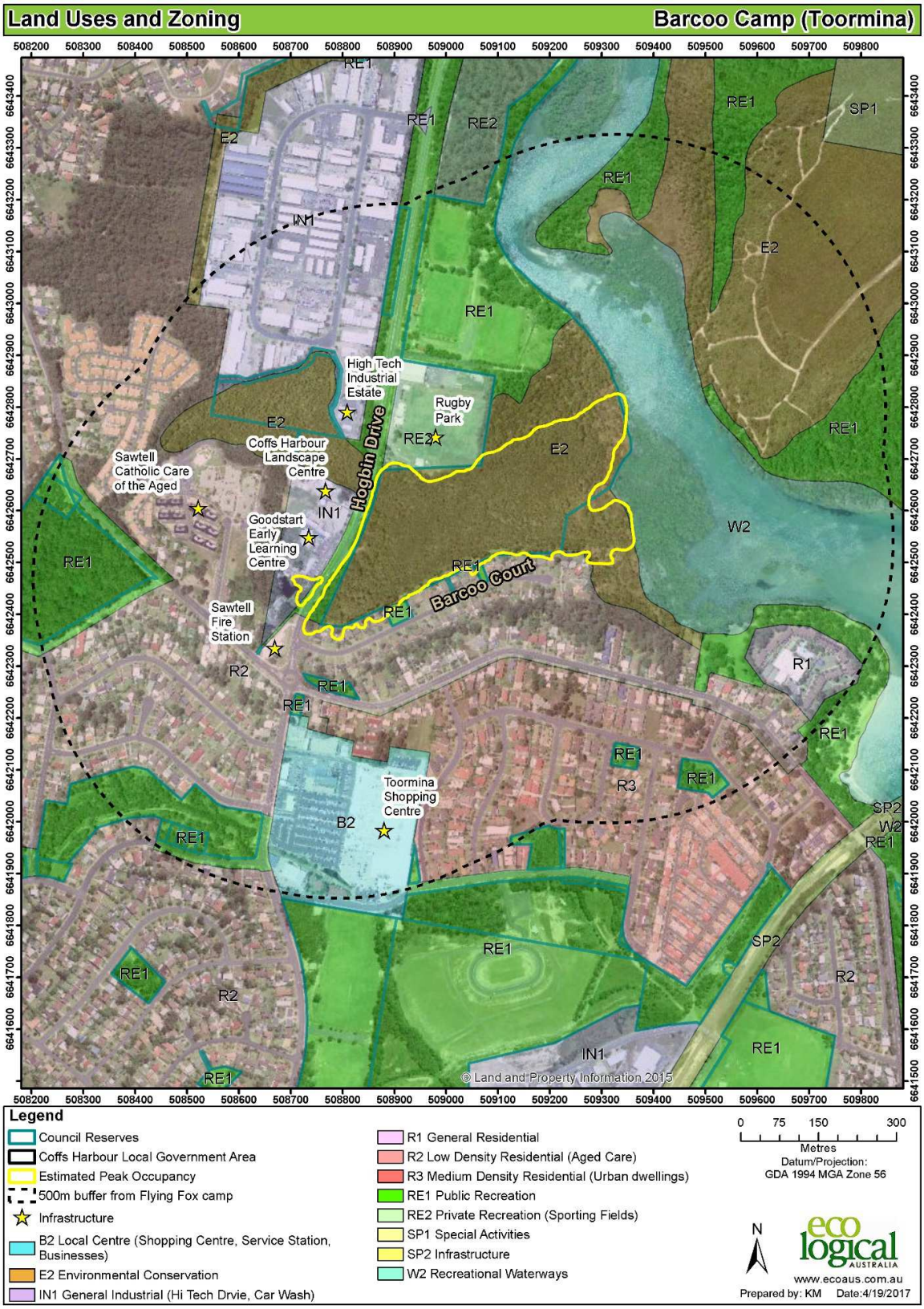
4 Woolgoolga Lake Flying-fox camp



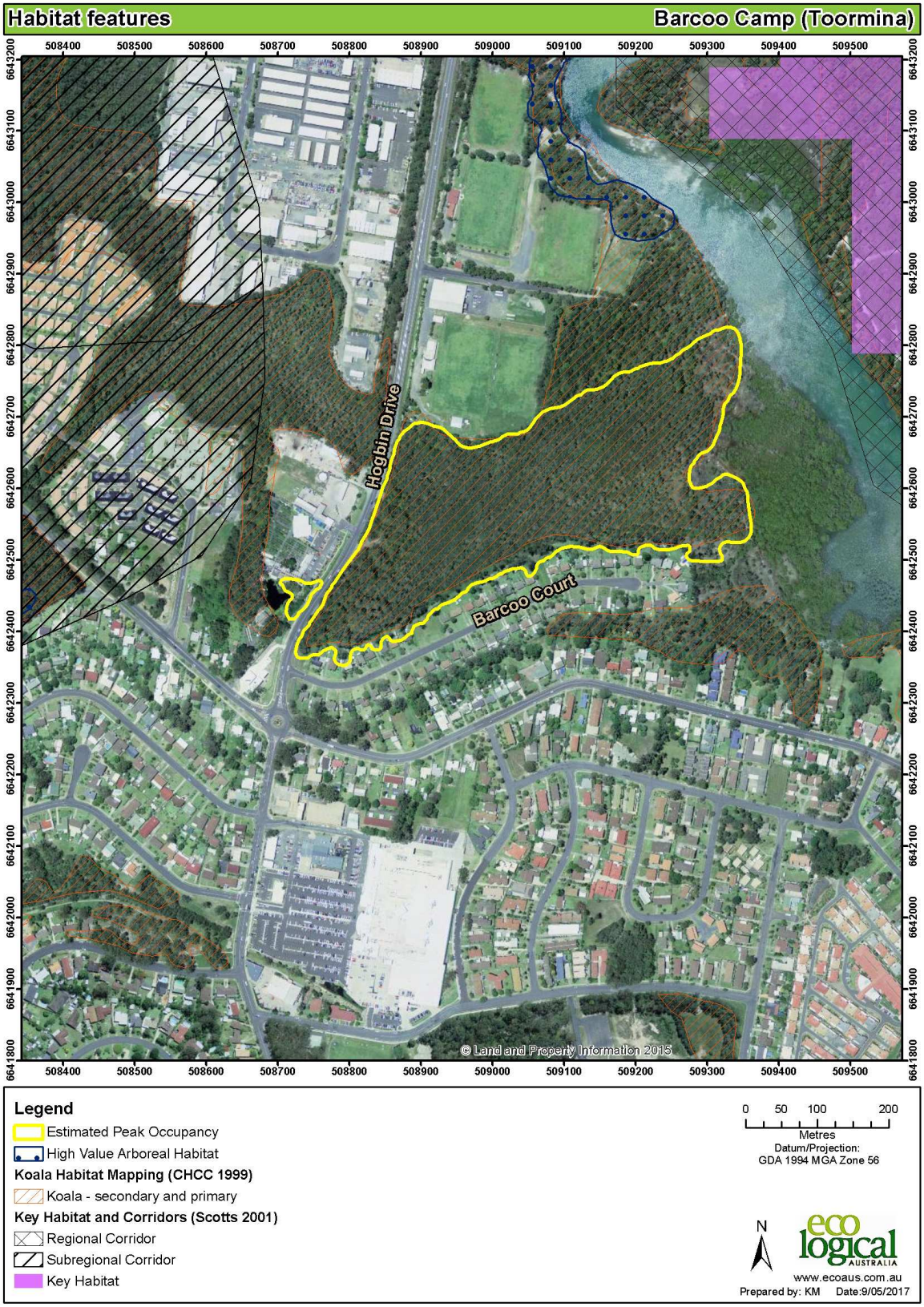
5 Coffs Creek Flying-fox camp – land tenure and significant infrastructure



6 Coffs Creek Flying-fox camp – habitat features (Koala habitat and wildlife corridors)

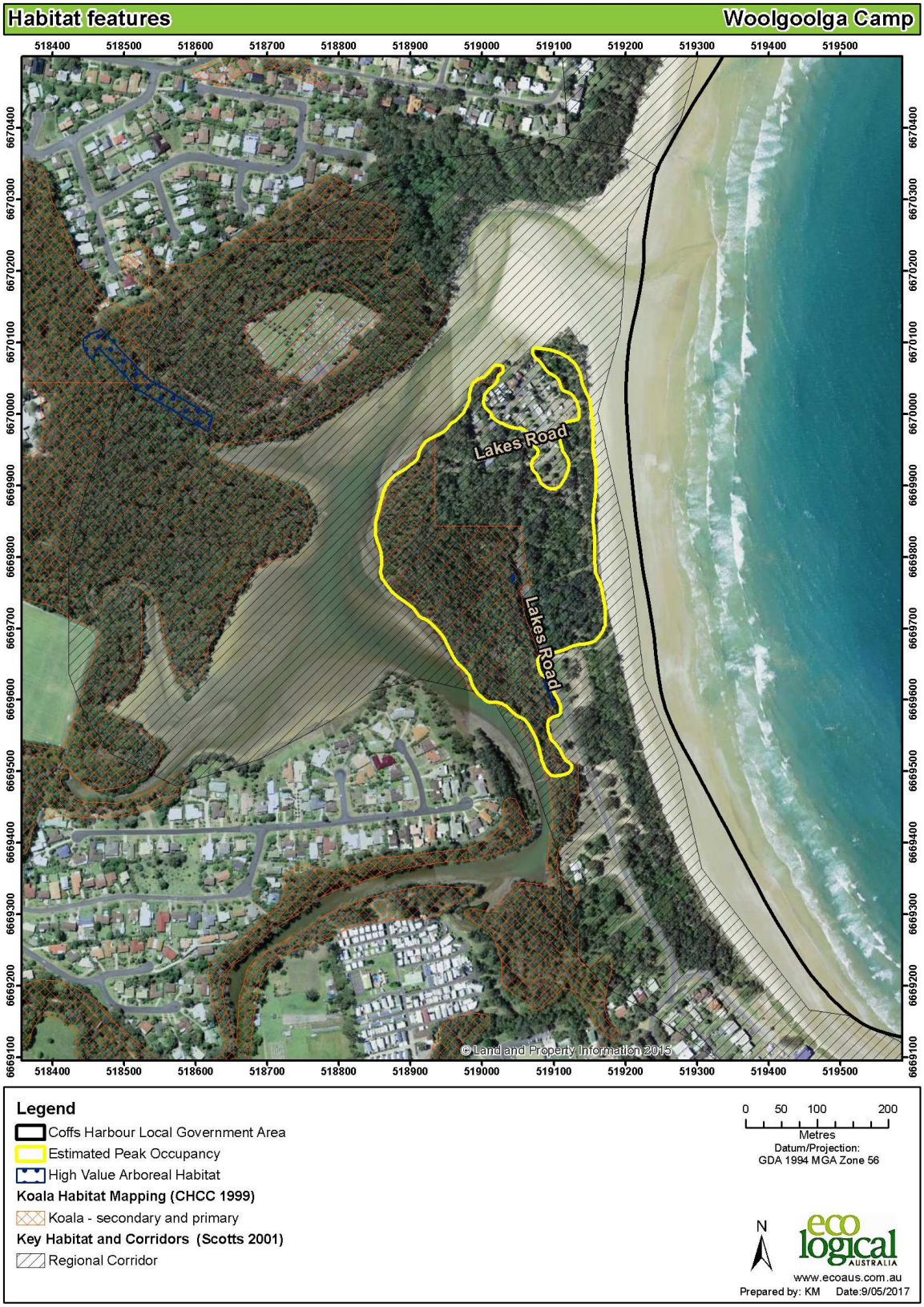


7 Barcoo Court Flying-fox camp – land tenure and significant infrastructure

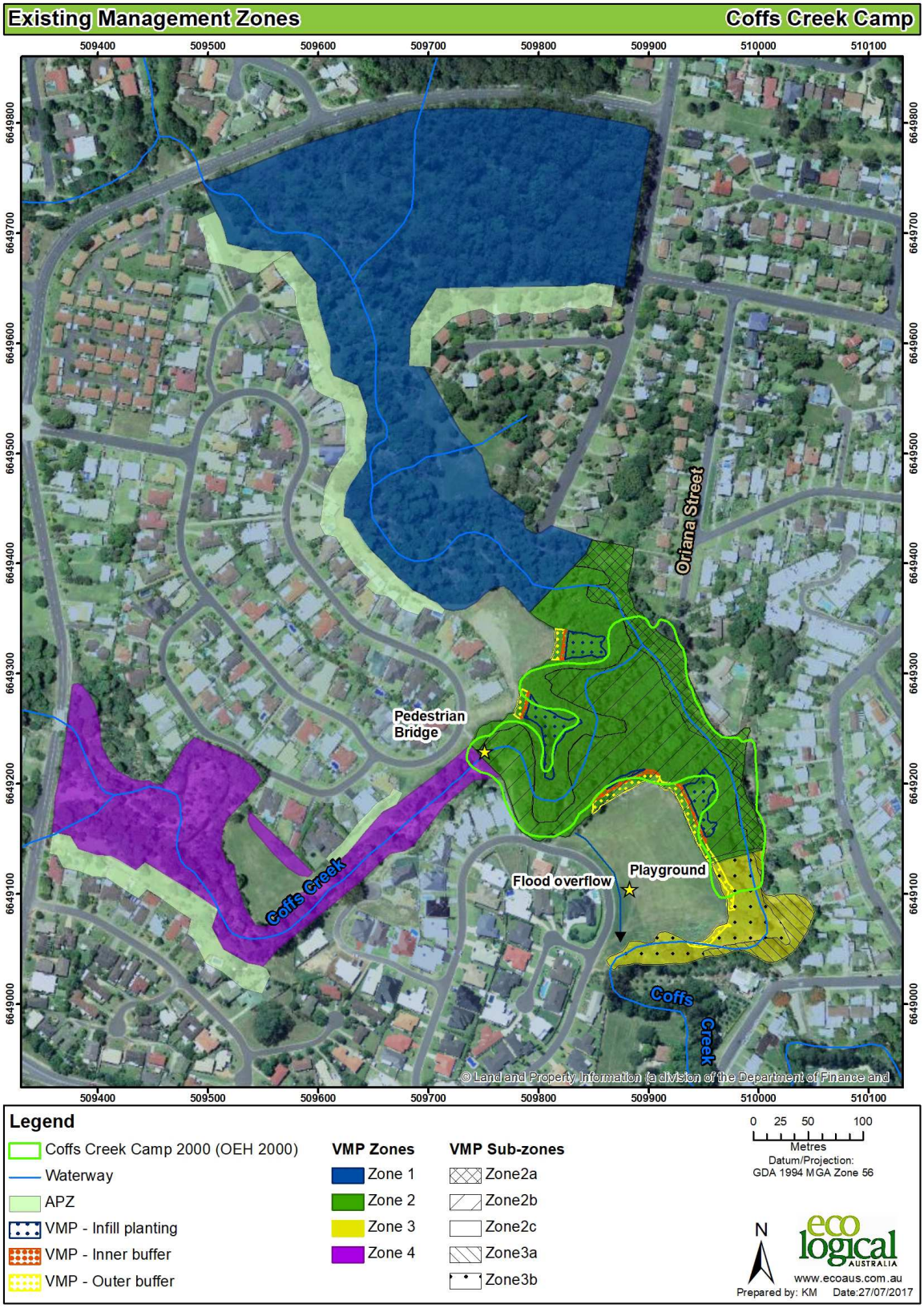


8 Barcoo Court Flying-fox camp – habitat features (Koala habitat and wildlife corridors)

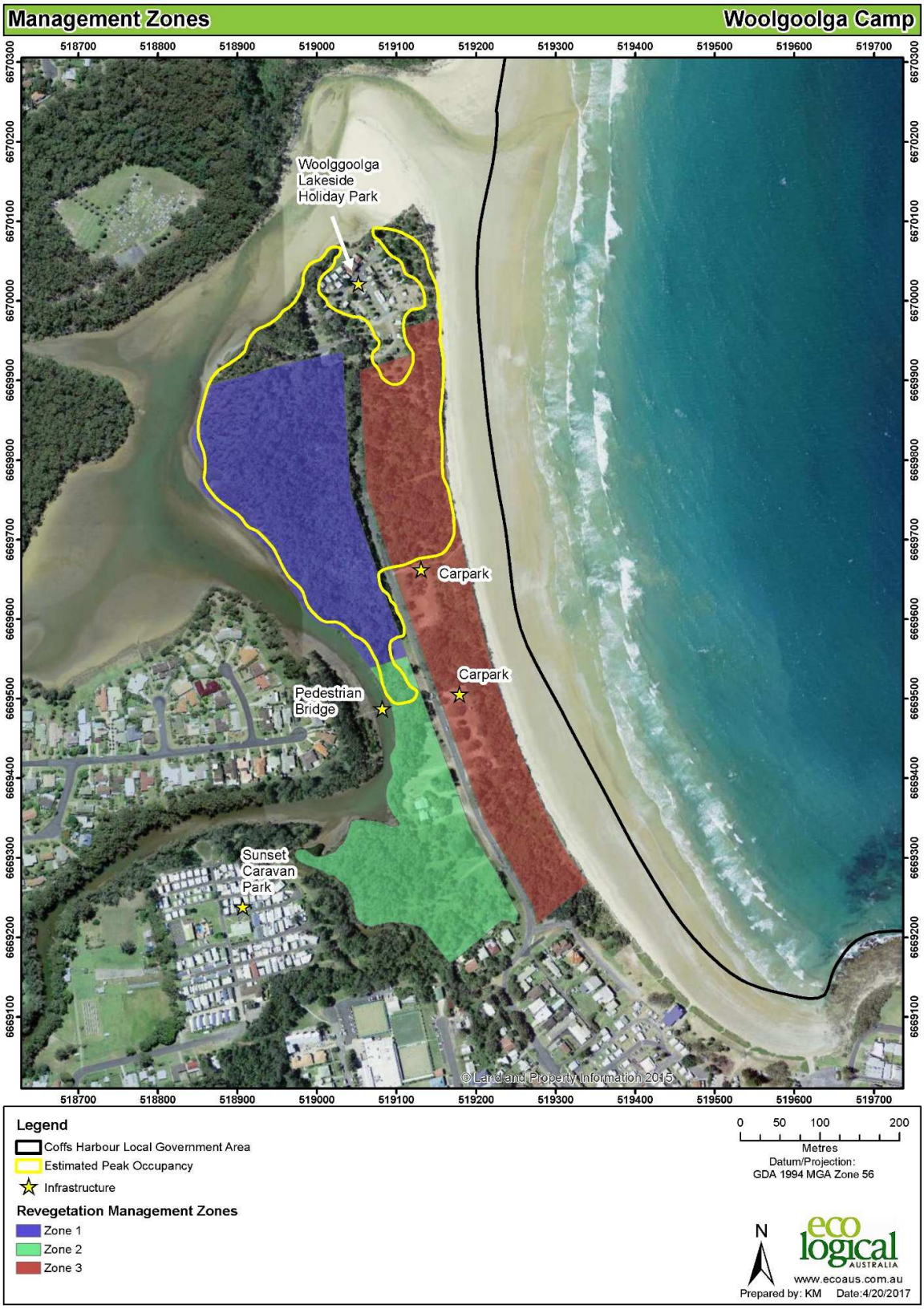
9 Woolgoolga Lake Flying-fox camp – land tenure and significant infrastructure



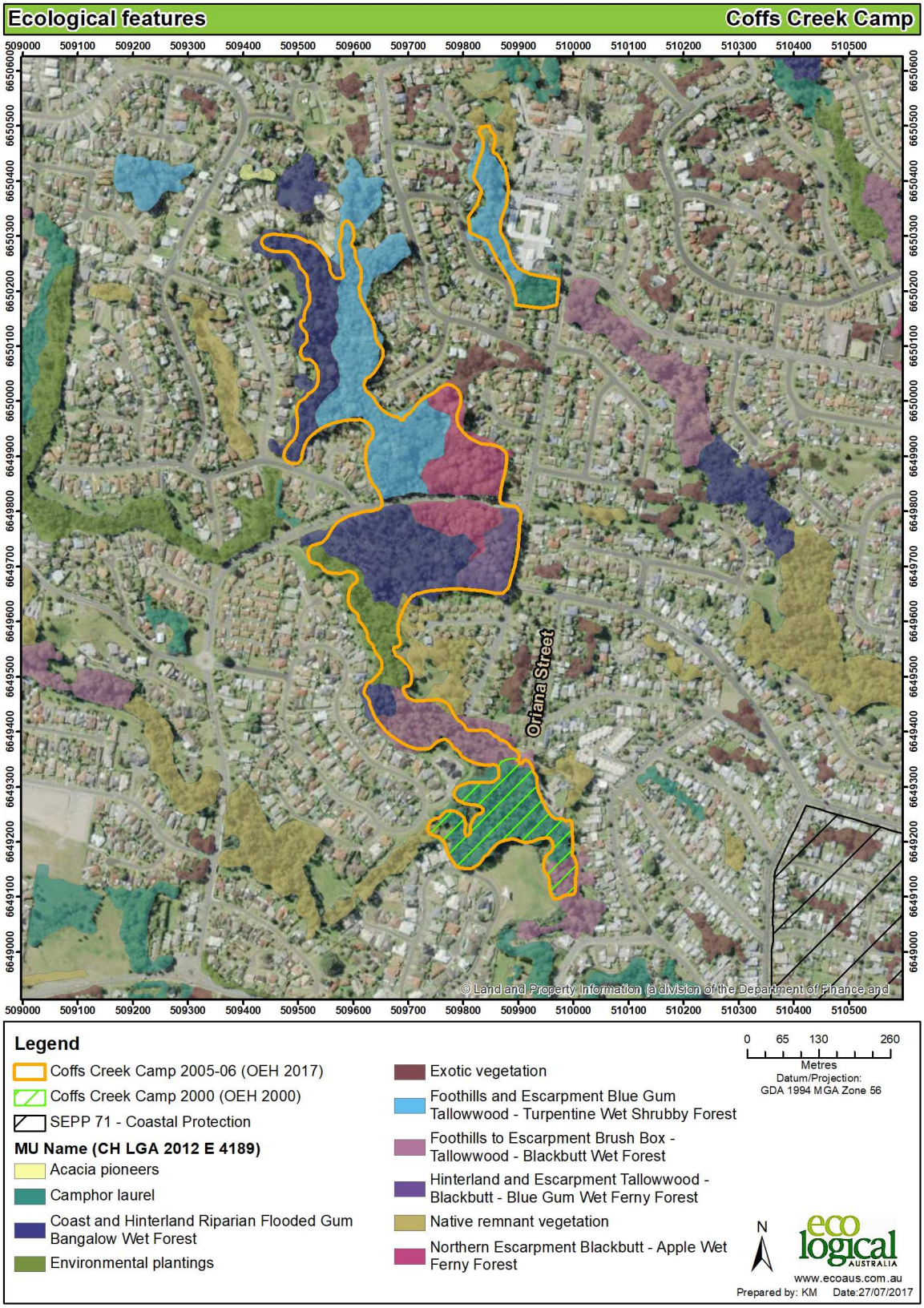
10 Woolgoolga Lake Flying-fox camp – habitat features (Koala habitat, wildlife corridors, high value arboreal habitat)



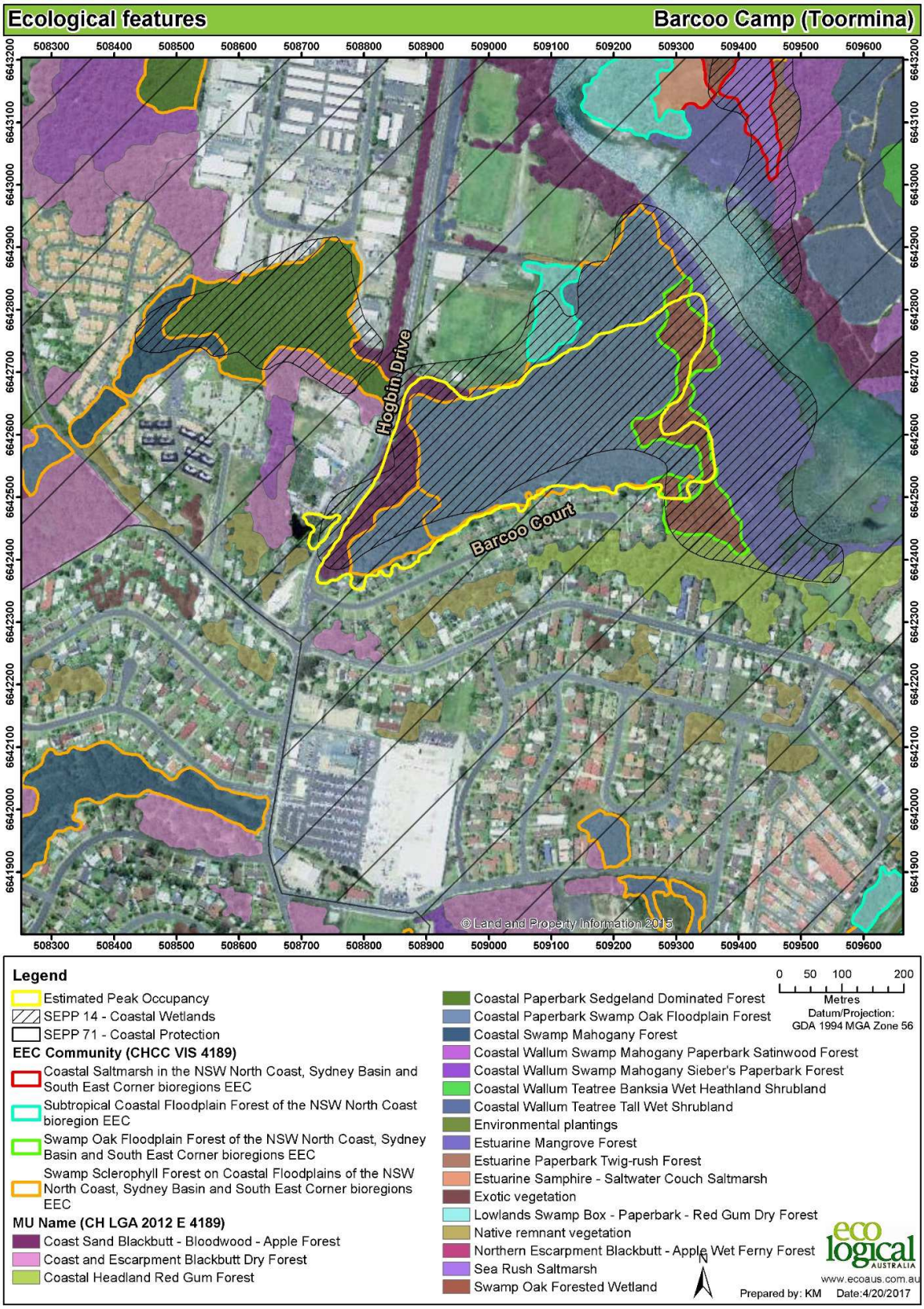
11 Coffs Creek Flying-fox camp – VMP management zones



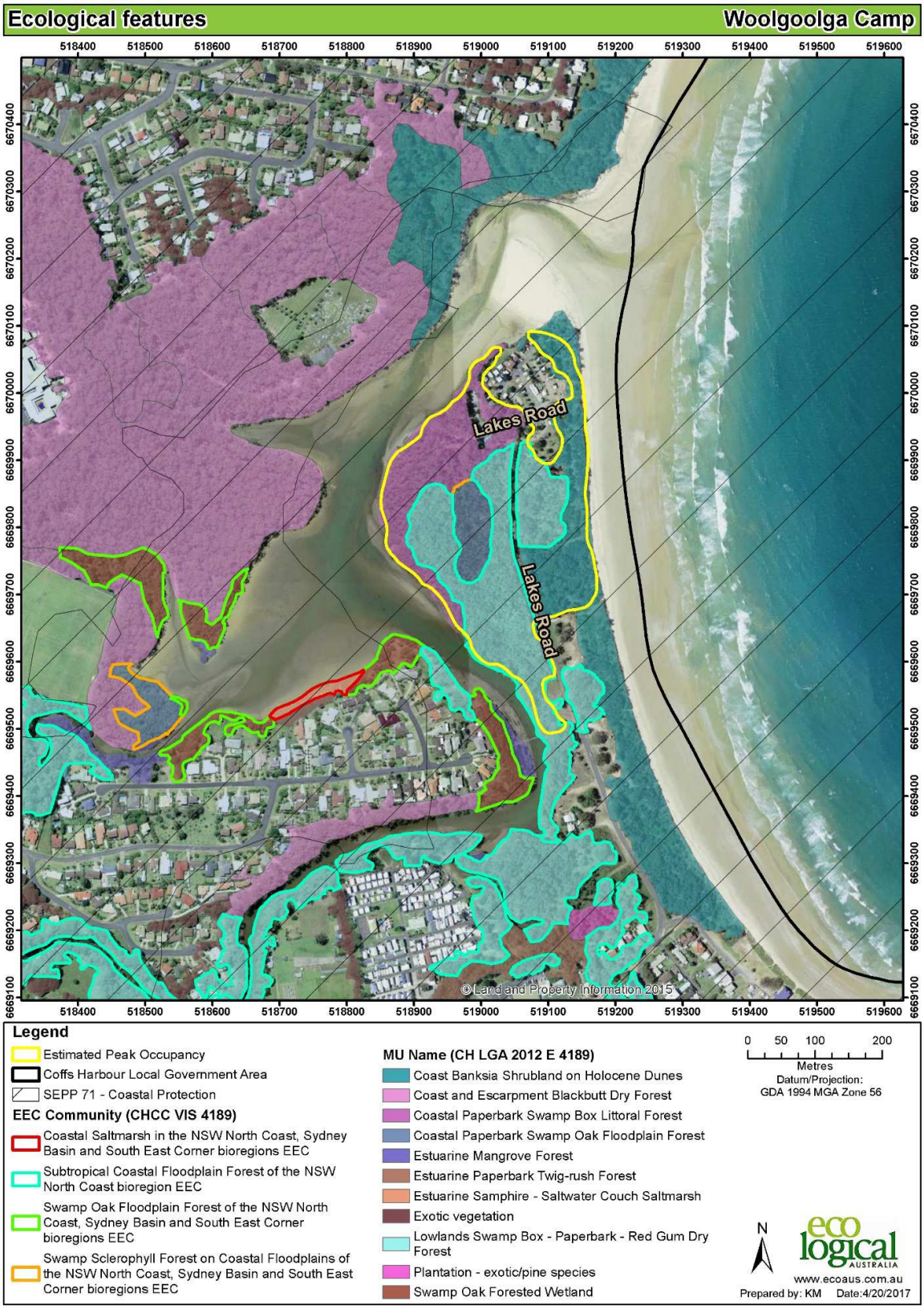
12 Woolgoolga Lake Flying-fox camp – VMP management zones



13 Coffs Creek Flying-fox camp – Ecological features (vegetation communities, SEPPs)



14 Barcoo Court Flying-fox camp – Ecological features (vegetation communities, SEPPs)



15 Woolgoolga Lake Flying-fox camp – Ecological features (vegetation communities, SEPPs)

Appendix D Camp Management Options

Level 1 actions: routine camp management

Education and awareness programs

This management option involves undertaking a comprehensive and targeted flying-fox education and awareness program to provide accurate information to the local community about flying-foxes.

Such a program would include managing risk and alleviating concern about health and safety issues associated with flying-foxes, options available to reduce impacts from roosting and foraging flying-foxes, an up-to-date program of works being undertaken at the camp, and information about flying-fox numbers and flying-fox behaviour at the camp.

Council can increase community education around flying-foxes by posting educational content and positive media surrounding the preparation of flying-fox camp management plans on the Council website, and using pre-existing educational material from OEH and Department of Health. Development of face-to-face public meetings and telephone calls with adjacent residents will also increase the level of community awareness of flying-foxes. Council can develop and install on-site educational signage at strategic vantage points around flying-fox camps, such as walking tracks.

Council can brief councillors and Federal or State Members for Parliament about the potential for increased public comment on flying-foxes.

Residents should also be made aware that faecal drop and noise at night is mainly associated with plants that provide food, independent of camp location. Staged removal of foraging species such as fruit trees and palms from residential yards, or management of fruit (e.g. bagging, pruning) will greatly assist in mitigating this issue.

Collecting and providing information should always be the first response to community concerns in an attempt to alleviate issues without the need to actively manage flying-foxes or their habitat. Where it is determined that management is required, education should similarly be a key component of any approach. See also **Section 3** and incorporate an education and awareness program into any community engagement plan.

An education program may include components shown in **Figure 5**.

The likelihood of improving community understanding of flying-fox issues is high. However, the extent to which that understanding will help alleviate conflict issues is probably less so. Extensive education for decision-makers, the media and the broader community may be required to overcome negative attitudes towards flying-foxes.

It should be stressed that a long-term solution to the issue resides with better understanding flying-fox ecology and applying that understanding to careful urban planning and development.

Figure 12: Possible components of an education program

Property modification without subsidies

The managers of land on which a flying-fox camp is located would promote or encourage the adoption of certain actions on properties adjacent or near to the camp to minimise impacts from roosting and foraging flying-foxes, as detailed below. Approval may be required for some activities (refer to **Section 4** for further information).

- Create visual/sound/smell barriers with fencing or hedges. To avoid attracting flying-foxes, species selected for hedging should not produce edible fruit or nectar-exuding flowers, should grow in dense formation between two and five metres (Roberts 2006) (or be maintained at less than 5 metres). Vegetation that produces fragrant flowers can assist in masking camp odour where this is of concern.
- Manage foraging trees (i.e. plants that produce fruit/nectar-exuding flowers) within properties through pruning/covering with bags or wildlife friendly netting, early removal of fruit, or tree replacement.
- Cover vehicles, structures and clothes lines where faecal contamination is an issue, or remove washing from the line before dawn/dusk.

- Move or cover eating areas (e.g. BBQs and tables) within close proximity to a camp or foraging tree to avoid contamination by flying-foxes.
- Install double-glazed windows, insulation and use air-conditioners when needed to reduce noise disturbance and smell associated with a nearby camp.
- Follow horse husbandry and property management guidelines provided at the NSW Department of Primary Industries Hendra virus web page (DPI 2015a).
- Include suitable buffers and other provisions (e.g. covered car parks) in planning of new developments.
- Turn off lighting at night which may assist flying-fox navigation and increase fly-over impacts.
- Consider removable covers for swimming pools and ensure working filter and regular chlorine treatment.
- Appropriately manage rainwater tanks, including installing first-flush systems.
- Avoid disturbing flying-foxes during the day as this will increase camp noise.

The cost would be borne by the person or organisation who modifies the property; however, opportunities for funding assistance (e.g. environment grants) may be available for management activities that reduce the need to actively manage a camp.

Property modification subsidies

Fully funding or providing subsidies to property owners for property modifications may be considered to manage the impacts of the flying-foxes. Providing subsidies to install infrastructure may improve the value of the property, which may also offset concerns regarding perceived or actual property value or rental return losses.

The level and type of subsidy would need to be agreed to by the entity responsible for managing the flying-fox camp. There are no subsidies currently proposed for property modifications. However, dependent upon the socio-economic situation of residents experiencing issues in the future (perhaps based upon possession of a Concession card, Pension card), and following annual review of this Plan, Council may wish to consider applying for funding, or allocating funds to cover or partially cover the costs of certain property modifications as the need arises.

Service subsidies

This management option involves providing property owners with a subsidy to help manage impacts on the property and lifestyle of residents. Types of services that could be subsidised include clothes washing, cleaning outside areas and property, car washing or power bills. Rate reductions could also be considered.

Routine camp maintenance and operational activities

Examples of routine camp management actions are provided in the Policy. These include:

- removal of tree limbs or whole trees that pose a genuine health and safety risk, as determined by a qualified arborist
- weed removal, including removal of noxious weeds under the Noxious Weeds Act 1993, or species listed as undesirable by a council
- trimming of understorey vegetation or the planting of vegetation
- minor habitat augmentation for the benefit of the roosting animals

- mowing of grass and similar grounds-keeping actions that will not create a major disturbance to roosting flying-foxes
- application of mulch or removal of leaf litter or other material on the ground.

Revegetation and land management to create alternative habitat

This management option involves revegetating and managing land to create alternative flying-fox roosting habitat through improving and extending existing low-conflict camps or developing new roosting habitat in areas away from human settlement.

Selecting new sites and attempting to attract flying-foxes to them has had limited success in the past, and ideally habitat at known camp sites would be dedicated as a flying-fox reserve. However, if a staged and long-term approach is used to make unsuitable current camps less attractive, whilst concurrently improving appropriate sites, it is a viable option (particularly for the transient and less selective LRFF). Supporting further research into flying-fox camp preferences may improve the potential to create new flying-fox habitat.

When improving a site for a designated flying-fox camp, preferred habitat characteristics detailed in **Section 6.4** should be considered.

Foraging trees planted amongst and surrounding roost trees (excluding in/near horse paddocks) may help to attract flying-foxes to a desired site. They will also assist with reducing foraging impacts in residential areas. Consideration should be given to tree species that will provide year-round food, increasing the attractiveness of the designated site.

Depending on the site, the potential negative impacts to a natural area will need to be considered if introducing non-indigenous plant species.

The presence of a water source is likely to increase the attractiveness of an alternative camp location. Supply of an artificial water source could be considered if unavailable naturally, however this is likely to be cost-prohibitive and is not considered necessary for the Coffs LGA at present.

Potential habitat mapping using camp preferences (**Section 6.4**) and suitable land tenure can assist in initial alternative site selection. A feasibility study would then be required prior to site designation to assess likelihood of success and determine the warranted level of resource allocated to habitat improvement.

Protocols to manage incidents

This management option involves implementing protocols for managing incidents or situations specific to particular camps. Incidents relevant to camps within Coffs LGA include heat stress, roost collapse, abortion storms / abandonment of young and airstrike.

Heat stress occurs when the camp is subjected to extremely high temperatures leading to flying-foxes changing their behaviour and/or dying.

Roost collapse refers to the situation where a major roost tree within a camp collapses from old age, high winds or human intervention. All flying-fox camps within Coffs LGA are susceptible to roost collapse.

Abortion storm / abandonment of dependent young refers to the phenomenon where female flying-foxes abort or abandon their babies in large numbers over a short period. It is thought this is a response to

shortages of food prior to birthing or shortly after birthing, some form of major disturbance in the camp or disease. All flying-fox camps within Coffs LGA are susceptible to this phenomenon.

Airstrike refers to the risk of flying-foxes colliding with an aeroplane in the vicinity of Coffs Harbour Regional Airport (CHRA). Coffs Creek and Barcoo Court camps require specific protocols to manage the risk of airstrike associated with Coffs Harbour Regional Airport. Further details are provided in **Section 8.2.7**.

Heat stress

Exposure to high temperatures results in mortality in GHFF and BFF and is known to occur when the surrounding air temperature exceeds 40°C (Parry-Jones and Augee 2001, Stanvic, McDonald and Collins 2013, Welbergen et al. 2008, Welbergen, 2014 & 2017b). This is especially true when the high temperatures are accompanied by low humidity and hot drying winds (Department of SE 2006). Rates of mortality are lower at ambient temperatures of 41-43.5°C and increase rapidly at temperatures above 43.5°C, predominantly affecting flightless young.

From 35^0C flying-foxes begin to change their behaviour to reduce exposure to heat, and the symptoms of heat stress in flying-foxes are generally observed in the order they appear below:

- wing fanning
- shade seeking
- clustering
- clumping
- panting
- saliva spreading (licking wrists and wing membranes)
- descending to lower levels of vegetation or to the ground.

If none of these methods reduce body temperature by a sufficient amount, death is the end result.

The draft recovery plan for the GHFF (OEH, 2016) aims to improve ways to minimise heat stress on juvenile Grey-headed Flying-foxes. The NSW government has developed a fact sheet on heat stress events (OEH, 2017) and appropriate responses to the events: http://www.environment.nsw.gov.au/animals/flying-fox-heat.htm, as well as a Code of practice for injured, sick and orphaned flying-foxes (OEH, 2012a) which provides details on standards for rescue, transport, euthanasia, care procedures, husbandry, housing and release http://www.environment.nsw.gov.au/resources/wildlifelicences/120026flyingfoxcode.pdf All responses to heat stress events within the Coffs LGA must conform to these standards, guidelines and codes of practice.

Heat stress events in flying-fox colonies have traditionally been managed by volunteer wildlife carers, largely belonging to the group WIRES (Mid North Coast Branch) in the Coffs LGA. Other personnel able to respond include any officers with a role in animal welfare such as Council officers, Department of Primary Industries, OEH staff, NPWS staff, RSPCA or registered veterinarians. There is a requirement for all rescuers to be licensed and trained to care for flying-foxes as an individual, or as a member of a licenced fauna rehabilitation group. A requirement of being licensed is to be immunised against Australian Bat Lyssavirus (ABLV) and to source and wear suitable protective equipment and clothing when handling flying-foxes. This information is also applicable in the case of roost collapses and abortion storms.

The currently accepted method of reducing heat stress (Welbergen, 2017b) is for teams of wildlife carers to closely monitor colonies when temperatures are expected to exceed 38^0C. Teams of carers record the response of flying-foxes to rising temperatures throughout the day and enter colonies once temperatures have dropped back down to 37^0C. At this point teams of carers move through the colony and mist spray individual flying-foxes on the ground, low in trees or in distress with water either from a hand held spray bottle or from a backpack sprayer. Once a spray run is complete, sprayed animals are to be checked and if the animal has not responded after 15 minutes, resprayed. If the animal does not improve after a second spray and observation period, it may then be removed to the first aid station set up outside the camp. This technique minimises stress and disturbance to other animals in the camp and targets the response to the neediest individuals (Welbergen, 2017b).

If animals removed from the camp can be rehydrated and are fit enough to return to the camp (following the standards set out in the Code of practice for injured, sick and orphaned flying-foxes), they will be returned and released prior to the evening fly-out, with attempts made to reunite pups with surviving mothers at this time. Animals requiring longer rehabilitation will remain with wildlife carers until such time as they are fit enough to be released at the camp.

Disturbance must be kept to a minimum during heat stress events because flying-foxes will occupy the coolest microhabitats available within the camp and any disturbance may move them into less desirable locations, increase stress and body temperature placing them at greater risk of death (Welbergen, 2017b). Members of the public must be excluded from camps during these periods.

Current research on responding to heat stress events suggests rescuers enter the camp when temperatures fall below 37^0C (Welbergen, 2017b). This will minimise additional stress to flying-foxes during the highest temperatures. Wholesale misting of camps using fire houses or something similar has not yet proven to be effective because although it decreases temperature, it also raises humidity which can result in a net increase in heat stress (Welbergen, 2017b). Until further research can illustrate a clear positive impact upon flying-foxes suffering from heat stress, misting of camps using fire hoses is not recommended.

There has been no co-ordinated data collection and review following heat stress events to allow a determination of which interventions and how they are applied result in the most successful outcomes for flying-foxes in affected camps. A data sheet to be used when responding to heat stress events has been produced and can be downloaded from the OEH website http://www.environment.nsw.gov.au/animals/flying-fox-heat.htm (example also provided in **Appendix D**).

Information collected during heat stress events should include observations of the camp during the heat stress event, what treatments were applied, numbers of each species present, and relevant injury and mortality data. Monitoring of the site in the days following the heat stress event will be important as flying-foxes may exhibit the impacts of stress for several days after the event. Any dead flying-foxes which are banded should be reported to the Australian Bird and Bat Banding Scheme.

Having completed any mortality and post-mortem assessment, carcasses should be disposed of. As with any animal waste, flying-fox carcasses should be disposed of by people wearing appropriate protective clothing. Carcasses should be picked up using a shovel or by hand while wearing thick gloves, double-bagged and dropped at a registered landfill site.

Roost Collapse and Abortion Storm / Abandonment of Young

Disturbance must be kept to a minimum following a roost collapse, abortion storm or abandonment of young event because surviving flying-foxes may be already suffering from stress and any disturbance may increase this placing them or their young at greater risk of sickness, injury or death. Members of the public must be excluded from camps following such events for a suitable period to allow flying-foxes to recover and to reduce the risk of members of the public coming into contact with dead flying-foxes.

Monitoring of the site in the days following the event will be important as flying-foxes may exhibit the impacts of stress for several days/weeks after the event. Any dead flying-foxes which are banded should be reported to the Australian Bird and Bat Banding Scheme.

Having completed any mortality and post-mortem assessment, carcasses should be disposed of. As with any animal waste, flying-fox carcasses should be disposed of by people wearing appropriate protective clothing. Carcasses should be picked up using a shovel or by hand while wearing thick gloves, double-bagged and dropped at a registered landfill site.

Participation in research

This management option involves participating in research to improve knowledge of flying-fox ecology to address the large gaps in our knowledge about flying-fox habits and behaviours and why they choose certain sites for roosting. Further research and knowledge sharing at local, regional and national levels will enhance our understanding and management of flying-fox camps.

Appropriate land-use planning

Land-use planning instruments may be able to be used to ensure adequate distances are maintained between future residential developments and existing or historical flying-fox camps. While this management option will not assist in the resolution of existing land-use conflict, it may prevent issues for future residents.

Property acquisition

Property acquisition may be considered if negative impacts cannot be sufficiently mitigated using other measures. This option will clearly be extremely expensive, however is likely to be more effective than dispersal and in the long-term may be less costly. There are currently no properties impacted to such a degree that property acquisition is recommended and no member of the community has indicated a preference for this action to be enacted.

Do nothing

The management option to ‘do nothing’ involves not undertaking any management actions in relation to the flying-fox camp and leaving the situation and site in its current state. This option is not considered to be a viable action for any of the three permanent camps in the Coffs LGA and was not supported by the community.

Level 2 actions: in-situ management

Buffers

Buffers can be created through vegetation removal and/or the installation of permanent/semi-permanent deterrents.

Creating buffers may involve planting low-growing or spiky plants between residents or other conflict areas and the flying-fox camp. Such plantings can create a visual buffer between the camp and residences or make areas of the camp inaccessible to humans.

Buffers greater than 300 m are likely to be required to fully mitigate amenity impacts (SEQ Catchments 2012). The usefulness of a buffer to mitigate odour and noise impacts generally declines if the camp is within 50 m of human habitation (SEQ Catchments 2012), however any buffer will assist and should be as wide as the site allows.

Buffers through vegetation removal

Vegetation removal aims to alter the area of the buffer habitat sufficiently so that it is no longer suitable as a camp. The amount required to be removed varies between sites and camps, ranging from some weed removal to removal of most of the canopy vegetation.

Any vegetation removal should be done using a staged approach, with the aim of removing as little native vegetation as possible. This is of particular importance at sites with other values (e.g. ecological or amenity), and in some instances the removal of any native vegetation will not be appropriate. Thorough site assessment (further to desktop searches, see **Appendix F**) will inform whether vegetation management is suitable (e.g. can impacts to other wildlife and/or the community be avoided?).

Removing vegetation can also increase visibility into the camp and noise issues for neighbouring residents which may create further conflict.

Suitable experts (**Appendix B**) should be consulted to assist selective vegetation trimming/removal to minimise vegetation loss and associated impacts.

The importance of under- and mid-storey vegetation in the buffer area for flying-foxes during heat stress events also requires consideration.

Buffers without vegetation removal

Permanent or semi-permanent deterrents can be used to make buffer areas unattractive to flying-foxes for roosting, without the need for vegetation removal. This is often an attractive option where vegetation has high ecological or amenity value. Deterrents are not required or recommended as a management action at this stage.

While many deterrents have been trialled in the past with limited success, there are some options worthy of further investigation:

- Visual deterrents – Visual deterrents such as plastic bags, fluoro vests (GeoLINK 2012) and balloons (Ecosure 2016, pers. comm.) in roost trees have shown to have localised effects, with flying-foxes deterred from roosting within 1–10 m of the deterrents. The type and placement of visual deterrents would need to be varied regularly to avoid habituation.
- Noise emitters on timers – Noise needs to be random, varied and unexpected to avoid flying-foxes habituating. As such these emitters would need to be portable, on varying timers and a diverse array of noises would be required. It is likely to require some level of additional disturbance to maintain its effectiveness, and ways to avoid disturbing flying-foxes from desirable areas would need to be identified. This is also likely to be disruptive to nearby residents.

- Smell deterrents – For example, bagged python excrement hung in trees has previously had a localised effect (GeoLINK 2012). The smell of certain deterrents may also impact nearby residents, and there is potential for flying-foxes to habituate.
- Canopy-mounted water sprinklers – This method has been effective in deterring flying-foxes during dispersals (Ecosure personal experience), and a current trial in Queensland is showing promise for keeping flying-foxes out of designated buffer zones. This option can be logistically difficult (installation and water sourcing) and may be cost-prohibitive. Design and use of sprinklers need to be considerate of animal welfare and features of the site. For example, misting may increase humidity and exacerbate heat stress events, and overuse may impact other environmental values of the site.

Note that any deterrent with a high risk of causing inadvertent dispersal may be considered a Level 3 action.

The use of visual deterrents, in the absence of effective maintenance, could potentially lead to an increase in rubbish in the natural environment.

This Plan does not recommend creation of additional buffers without vegetation removal at Coffs Creek or Woolgoolga Lake flying-fox camps, and no responses from the community indicated support for such an action. The existing buffers at Coffs Creek and Woolgoolga camps were found to be adequate, provided certain routine maintenance is carried out.

Noise attenuation fencing

Noise attenuation fencing could be installed in areas where the camp is particularly close to residents. This may also assist with odour reduction, and perspex fencing could be investigated to assist fence amenity. Although expensive to install, this option could negate the need for habitat modification, maintaining the ecological values of the site, and may be more cost-effective than ongoing management.

No neighbouring residents have expressed a desire for noise attenuating fencing to be installed at this stage. Level 1 actions such as property modifications should be enacted prior to investigating whether Level 2 actions such as noise attenuation fencing is warranted at a property if this becomes an issue in the future.

Level 3 actions: disturbance or dispersal

Nudging

Noise and other low intensity active disturbance restricted to certain areas of the camp can be used to encourage flying-foxes away from high conflict areas. This technique aims to actively ‘nudge’ flying-foxes from one area to another, while allowing them to remain at the camp site.

Unless the area of the camp is very large, nudging should not be done early in the morning as this may lead to inadvertent dispersal of flying-foxes from the entire camp site. Disturbance during the day should be limited in frequency and duration (e.g. up to four times per day for up to 10 minutes each) to avoid welfare impacts. As with dispersal, it is also critical to avoid periods when dependent young are present (as identified by a flying-fox expert).

Nudging is not recommended as a management action for any of the Coffs LGA camps at this stage. Maintenance of a suitable buffer between neighbouring land uses can be achieved through the selective use of vegetation buffers, screens and grassed areas.

Dispersal

Dispersal is not anticipated to be an appropriate option for any of the Coffs camps, under the current level of human and flying-fox interaction. All three permanent camps have limited suitable and securely tenured alternative roosting habitat available within the surrounding area. In addition, the impact of dispersals on animal welfare and the entire flying-fox population is unquantified at this stage. The requirement for excessive initial and ongoing financial investment to maintain any of the well-established camps free from flying-foxes is likely to be beyond the Councils capacity to sustain the effort required. There is an increased risk of aircraft strike associated with changed flying-fox movement patterns that could occur during and after dispersal attempts (Coffs Creek and Barcoo Court camps).

Dispersal aims to encourage a camp to move to another location, through either disturbance or habitat modification.

There is a range of potential risks, costs and legal implications that are greatly increased with dispersal (compared with in-situ management as above). See **Appendix H** for more details. These include:

- impact on animal welfare and flying-fox conservation
- splintering the camp into other locations that are equally or more problematic
- shifting the issue to another area
- impact on habitat value
- effects on the flying-fox population, including disease status and associated public health risk
- impacts to nearby residents associated with ongoing dispersal attempts
- excessive initial and/or ongoing capacity and financial investment
- negative public perception and backlash
- increased aircraft strike risk associated with changed flying-fox movement patterns
- unsuccessful management requiring multiple attempts, which may exacerbate all of the above.

Despite these risks, there are some situations where camp dispersal may be considered. Dispersal can broadly be categorised as ‘passive’ or ‘active’ as detailed below.

Passive dispersal

Removing vegetation in a staged manner can be used to passively disperse a camp, by gradually making the habitat unattractive so that flying-foxes will disperse of their own accord over time with little stress (rather than being more forcefully moved with noise, smoke, etc.). This is less stressful to flying-foxes, and greatly reduces the risk of splinter colonies forming in other locations (as flying-foxes are more likely to move to other known sites within their camp network when not being forced to move immediately, as in active dispersal).

Generally, a significant proportion of vegetation needs to be removed in order to achieve dispersal of flying-foxes from a camp or to prevent camp re-establishment. For example, flying-foxes abandoned a camp in Bundall, Queensland once 70% of the canopy/mid-storey and 90% of the understorey had been removed (Ecosure 2011). Ongoing maintenance of the site is required to prevent vegetation structure returning to levels favourable for colonisation by flying-foxes. Importantly, at nationally important camps (defined in **Section 4.2.1**) sufficient vegetation must be retained to accommodate the maximum number of flying-foxes recorded at the site.

This option may be preferable in situations where the vegetation is of relatively low ecological and amenity value, and alternative known permanent camps are located nearby with capacity to absorb the

additional flying-foxes. While the likelihood of splinter colonies forming is lower than with active dispersal, if they do form following vegetation modification there will no longer be an option to encourage flying-foxes back to the original site. This must be carefully considered before modifying habitat.

There is also potential to make a camp site unattractive by removing access to water sources. However at the time of writing this method had not been trialled so the likelihood of this causing a camp to be abandoned is unknown. It would also likely only be effective where there are no alternative water sources in the vicinity of the camp.

Active dispersal through disturbance

Dispersal is more effective when a wide range of tools are used on a randomised schedule with animals less likely to habituate (Ecosure pers. obs. 1997–2015). Each dispersal team member should have at least one visual and one aural tool that can be used at different locations on different days (and preferably swapped regularly for alternate tools). Exact location of these and positioning of personnel will need to be determined on a daily basis in response to flying-fox movement and behaviour, as well as prevailing weather conditions (e.g. wind direction for smoke drums).

Active dispersal will be disruptive for nearby residents given the timing and nature of activities, and this needs to be considered during planning and community consultation.

This method does not explicitly use habitat modification as a means to disperse the camp, however if dispersal is successful, some level of habitat modification should be considered. This will reduce the likelihood of flying-foxes attempting to re-establish the camp and the need for follow-up dispersal as a result. Ecological and aesthetic values will need to be considered for the site, with options for modifying habitat the same as those detailed for buffers above.

Early dispersal before a camp is established at a new location

This management option involves monitoring local vegetation for signs of flying-foxes roosting in the daylight hours and then undertaking active or passive dispersal options to discourage the animals from establishing a new camp. Even though there may only be a few animals initially using the site, this option is still treated as a dispersal activity, however it may be simpler to achieve dispersal at these new sites than it would in an established camp. It may also avoid considerable issues and management effort required should the camp be allowed to establish in an inappropriate location.

It is important that flying-foxes feeding overnight in vegetation are not mistaken for animals establishing a camp.

Maintenance dispersal

Maintenance dispersal refers to active disturbance following a successful dispersal to prevent the camp from re-establishing. It differs from initial dispersal by aiming to discourage occasional over-flying individuals from returning, rather than attempting to actively disperse animals that have been recently roosting at the site. As such, maintenance dispersal may have fewer timing restrictions than initial dispersal, provided that appropriate mitigation measures are in place (**Section 9**).

Unlawful activities

Culling

Culling is addressed here as it is often raised by community members as a preferred management method; however, culling is contrary to the objects of the TSC Act and will not be permitted as a method to manage flying-fox camps.

Table 11: Analysis of management options

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Level 1 actions					
Education and awareness programs	Fear of disease Noise Smell Faecal drop	Low	Low cost, promotes conservation of FFs, contributes to attitude change which may reduce general need for camp intervention, increasing awareness and providing options for landholders to reduce impacts can be an effective long-term solution, can be undertaken quickly, will not impact on ecological or amenity value of the site.	Education and advice itself will not mitigate all issues, and may be seen as not doing enough.	Coffs Creek Barcoo Court Woolgoolga Lake Temporary Camps Community workshop feedback indicated the need for more information and regular communication from Council on flying-fox camp management. Requested by, and strongly support by the community. Initially recommended in the Strategy for Coffs Creek and adopted by Council, (CHCC, 2007). Actions not fully implemented (see Table 1).
Property modification	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	Low-Med	Property modification is one of the most effective ways to reduce amenity impacts of a camp without dispersal (and associated risks), relatively low cost, promotes conservation of FFs, can be undertaken quickly, will not impact on the site, may add value to the property.	May be cost-prohibitive for private landholders, unlikely to fully mitigate amenity issues in outdoor areas.	Coffs Creek Barcoo Court Woolgoolga Lake Council to document cases where advice on property modification is provided and acted upon by local residents. Supported by some members of the community.
Fully-fund/subsidise property modification	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	Low-Med	Potential advantages as per property modification, but also overcomes issue of cost for private landholders.	Costs to the land manager will vary depending on the criteria set for the subsidy including proximity to site, term of subsidy and level of subsidy. Potential for community conflict when developing the criteria, and may lead to expectations for similar subsidies for other issues.	Cost of car and washing line covers to be subsidised by Council for use at Coffs Creek and Barcoo Court. No other property modification subsidies recommended for any camp at this stage or requested by the community. Other lower cost methods to be attempted and reviewed first.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Service subsidies including rate rebates	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	Low-Med	May encourage tolerance of living near a camp, promotes conservation of FFs, can be undertaken quickly, will not impact on the site, would reduce the need for property modification. Suggested action is to subsidise or exempt affected parties from water rates and remove limitations on water use during water restrictions.	May be costly across multiple properties and would incur ongoing costs, may set unrealistic community expectations for other community issues, effort required to determine who would receive subsidies.	Some form of reduction in the cost of, or limitation to water usage for neighbouring residents of Coffs Creek Possibility to extend to residents of Barcoo Court, if required. Unlikely to be required at Woolgoolga Lake, dependent upon feedback following public exhibition of draft plan. May be suitable for some temporary camps. Requested by the community.
Routine camp management	Health/wellbeing	Low	Will allow property maintenance, likely to improve habitat, could improve public perception of the site, will ensure safety risks of a public site can be managed. Weed removal has the potential to reduce roost availability and reduce numbers of roosting FFs. To avoid this, weed removal should be staged and alternative roost habitat planted, otherwise activities may constitute a Level 3 action.	Will not generally mitigate noise, smell, faecal drop impacts for nearby landholders.	Coffs Creek Barcoo Court Woolgoolga Lake Existing VMPs for Coffs Creek and Woolgoolga Lake to be implemented and updated. VMP for Barcoo Court to be prepared. Council seek ongoing funding for implementation of VMPs. Supported by the community.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Alternative habitat creation	All	Med-High	Will only reduce pressure on existing habitat if successful in attracting FFs away from high conflict area, promotes FF conservation, and relieves pressure on exiting habitat. Regeneration of selected potential flying-fox habitat at sites buffered (300m minimum) from sensitive receivers is likely to be a more practical and faster approach than habitat creation (See Appropriate land-use planning option below)	Generally costly, long-term approach so cannot be undertaken quickly, previous attempts to attract FFs to a new site have not been known to succeed.	Coffs Creek Barcoo Court Woolgoolga Lake Long-term solution to be investigated by Council once potential flying-fox habitat modelling / mapping is released by OEH. Selection of areas to rehabilitate dependent upon (spring/winter) foraging and roosting preferences, away from sensitive receivers, appropriate land use planning required in support (See Appropriate land-use planning option below). Supported by some members of the community
Provision of artificial roosting habitat	All	Low-Med	If successful in attracting FFs away from high conflict areas, artificial roosting habitat in low conflict areas will assist in mitigating all impacts, generally low cost, can be undertaken quickly, promotes FF conservation.	Would need to be combined with other measures (e.g. buffers/alternative habitat creation) to mitigate impacts, previous attempts have had limited success.	Not recommended due to limited success of artificial roosting habitat in other camps (OEH, 2015b) Not supported by the community due to lack of success elsewhere.
Protocols to manage incidents	Health/wellbeing	Low	Low cost, will reduce actual risk of negative human/pet/aircraft–FF interactions, promotes conservation of FFs, can be undertaken quickly, will not impact the site.	Will not generally mitigate amenity impacts.	Coffs Creek Barcoo Court Woolgoolga Lake May be suitable for some temporary camps. Recommended for discussion with WIRES and CHRA before adoption Supported by some members of the community.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Research	All	Low	Supporting research to improve understanding may contribute to more effectively mitigating all impacts, promotes FF conservation.	Generally cannot be undertaken quickly. Staff time (Council) to collate and provide data and feedback to researchers.	Coffs Creek Barcoo Court Woolgoolga Lake Provision of data / information to researchers requesting feedback on management actions and impacts.
Appropriate land-use planning	All	Low	Likely to reduce future conflict, promotes FF conservation. Identification of degraded sites that may be suitable for long-term rehabilitation for FFs could facilitate offset strategies should clearing be required under Level 2 actions. Rehabilitation of degraded habitat that is likely to be suitable for FF use is a priority recovery action for the GHFF and is supported by both state and Federal governments.	Will not generally mitigate current impacts, land-use restrictions may impact the landholder. Increasing the condition of, and availability of potential foraging and roosting habitat throughout the range of flying-foxes requires a co-ordinated approach across tenures and from multiple agencies.	Coffs Creek Barcoo Court Woolgoolga La Long-term solution to be investigated by Council once potential flying-fox habitat modelling / mapping is released by OEH. Selection of areas to rehabilitate dependent upon (winter) foraging and roosting preferences, away from sensitive receivers, appropriate land use planning required in support. Supported by some members of the community.
Property acquisition	All for specific property owners Nil for broader community	High	Will reduce future conflict with the owners of acquired property.	Owners may not want to move, only improves amenity for those who fit criteria for acquisition, very expensive.	Not recommended, Level 1 management actions discussed above should be implemented and evaluated as a priority. No community member has indicated that they wish to permanently vacate/sell their residence.
Do nothing	Nil	Nil	No resource expenditure.	Will not mitigate impacts and unlikely to be considered acceptable by the community.	Not recommended because no solutions are provided and no measure of change or success can be obtained. Not supported by the community.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Level 2 actions					
Buffers through vegetation removal	Noise Smell Health/wellbeing Property devaluation Lost rental return	Low - Med	Will reduce impacts, promotes FF conservation, can be undertaken quickly, and limited maintenance costs.	Will impact the site, will not generally eliminate impacts, vegetation removal may not be favoured by the community.	No new buffers recommended for Coffs Creek or Woolgoolga Lake. Maintenance of existing buffers at Coffs Creek and Woolgoolga Lake recommended to ensure they function as required. Supported by the community. Barcoo Court VMP to be produced which will outline the management of vegetation within the easement between residences and the camp and within the Reserve at this location. Option of trimming or removal of trees within easement from within 5m of the property boundary of residential properties on north side of Barcoo Court to be discussed with residents. OEH consultation and approval required in preparation of Barcoo Court VMP to ensure impacts of any proposed tree trimming or tree removal are assessed and adequately addressed.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Buffers without vegetation removal	Noise Smell Health/wellbeing Damage to vegetation Property devaluation Lost rental return	Med	Successful creation of a buffer will reduce impacts, promotes FF conservation, can be undertaken quickly, options without vegetation removal may be preferred by the community. Vegetated buffer created at Coffs Creek camp with	May impact the site, buffers will not generally eliminate impacts, maintenance costs may be significant, often logistically difficult, limited trials so likely effectiveness unknown.	No new buffers recommended for Coffs Creek or Woolgoolga Lake. Maintenance of existing buffers recommended to ensure they function as required. Supported by the community. Barcoo Court VMP to be produced which will outline the management of vegetation within the easement between residences and the camp at this location. OEH consultation and approval required in preparation of Barcoo Court VMP to ensure impacts of any proposed tree planting are assessed and adequately addressed.
Noise attenuation fencing	Noise Smell Health/wellbeing Property devaluation Lost rental return	Med	Will eliminate/significantly reduce noise impacts, will reduce other impacts, limited maintenance costs.	Costly, likely to impact visual amenity of the site, will not eliminate all impacts, may impact other wildlife at the site.	Not recommended. No requests from community for this action, other management actions to mitigate these impacts will be implemented and evaluated over time.
Level 3 actions					
Nudging	All	Med-High	If nudging is successful this may mitigate all impacts.	Costly, FFs will continue attempting to recolonise the area unless combined with habitat modification/ deterrents.	Not recommended, Level 1 and 2 actions will continue to be used to mitigate impacts. No justification for elevation to Level 3 actions. Community has not requested this action.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Passive dispersal through vegetation management	All at that site but not generally appropriate for amenity impacts only (see **Section 8**)	Med-High	If successful can mitigate all impacts at that site, compared with active dispersal: less stress on FFs, less ongoing cost, less restrictive in timing with ability for evening vegetation removal.	Costly, will impact site, risk of removing habitat before outcome known, potential to splinter the camp creating problems at other locations (although less than active dispersal), potential welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see **Section 7.1**), potential to impact on aircraft safety.	Not recommended, Level 1 and 2 actions will continue to be used to mitigate impacts. No justification for elevation to Level 3 actions. Community does not support this action because of loss of amenity.
Passive dispersal through water management	All at that site but not generally appropriate for amenity impacts only (see **Section 8**)	Med-High	Potential advantages as per with passive dispersal through vegetation removal, however likelihood of success unknown.	Potential disadvantages as per passive dispersal through vegetation removal, however likelihood of success unknown.	Not recommended, Level 1 and 2 actions will continue to be used to mitigate impacts. No justification for elevation to Level 3 actions. Unknown probability of success, not trials of this action to gauge results. Community has not requested this action.
Active dispersal	All at that site but not generally appropriate for amenity impacts only (see **Section 8**)	High	If successful can mitigate all impacts at that site, often stated as the preferred method for impacted community members.	May be very costly, often unsuccessful, ongoing dispersal generally required unless combined with habitat modification, potential to splinter the camp creating problems in other locations, potential for significant animal welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see **Section 7.1**), potential to impact on aircraft safety.	Not recommended, Level 1 and 2 actions will continue to be used to mitigate impacts. No justification for elevation to Level 3 actions. Community has not formally requested this action.

Management option	Relevant impacts	Cost	Advantages	Disadvantages	Camps applicable
Early dispersal before a camp is established at a new location	All at that site	Med-High	Potential advantages as per other dispersal methods, but more likely to be successful than dispersal of a historic camp.	Potential disadvantages as per other dispersal methods, but possibly less costly and slightly lower risk than dispersing a historic camp. Potential to increase pressure on FFs that may have relocated from another dispersed camp, which may exacerbate impacts on these individuals.	If a camp establishes in a sensitive location*, Council will monitor the camp weekly and undertake a targeted education and awareness program with neighbouring residents. Council will also consult with OEH to discuss suitable triggers for an increased level of action. In cases where flying-foxes establish a camp in a sensitive location and weekly monitoring indicates increased camp size and increasing complaints and/or impacts, this will be the trigger point for moving to higher level actions with the approval of OEH. In planning for higher level actions Council must consult with OEH, local flying-fox experts, WIRES and affected / impacted parties to determine the most appropriate response. The Federal government has recommended that a decision making tool be developed to assist land managers navigate a pathway for the management of flying-fox camps. This decision making tool may incorporate scenarios associated with new camps in sensitive locations. Review plan and update once this tool has been produced.

*Sensitive locations include but are not limited to;

Flying-foxes roosting within 50m of a school, day care centre, aged care facility, centre for the care of people with intellectual/physical disabilities, hospitals, playgrounds, horse stables. Flying-foxes roosting within 200m of the runway of an airport.

Appendix E Heat Stress Response Data Sheet

Flying-fox heat stress data sheet

If you have witnessed a flying-fox heat stress event, please fill out the details in the form below. Your data will help in the management of the impacts of these events in the future. If you feel you cannot confidently separate the species by age and/or by sex then the total number, or the number for each species, still provides very important information.

Characteristics of affected colony	
Date:	
Time:	
Location (include map on separate sheet if possible):	
Characteristics of site: (including vegetation structure, access to water and any other relevant information)	
Details of heat stress event: (including any recorded temperatures and behavioural observations)	
Details of methods or management approaches used during the heat stress event. This will help inform future management to ensure it is as effective as possible in reducing the impact of such events in the future.	

Observer name:	
Phone:	
Email:	

ALIVE			
Estimated total number of flying-foxes present:			
Estimated number of flying-foxes present by species:	Grey-headed	Black	Little Red
DEAD			
Estimated total number of flying-foxes that died:			
Estimated number of flying-foxes that died by species, age and sex:	Grey-headed	Black	Little Red
Adult females			
Adult males			
Juveniles			
Unknown			
Comments:			

If you are experienced and qualified in taking morphometric measurements, and have taken the proper precautions, please provide details of the species, sex, forearm length and weight of individuals that died. This should be done soon after death to account for post-mortem changes in weight. If too many individuals have died to measure them all, please provide details from a representative sample.

Please send a copy of completed data sheets to:	Dr Justin A. Welbergen, email: j.welbergen@uws.edu.au Hawkesbury Institute for the Environment, UWS Hawkesbury Campus, Locked Bag 1797, Penrith, NSW 2751

Post-mortem Measurements

Date:	
Time:	
Location:	
Observer name:	
Phone:	
Email:	

Species (B-GH-LR)[5]	Sex (M-F)	Forearm (mm)	Body mass (grams)	Comments
Add more rows if necessary				

OEH 2015/0725

[5] B: Black Flying-fox, GH: Grey-headed Flying-fox, LR: Little Red Flying-fox

Appendix F OEH Heat Stress Fact Sheet

http://www.environment.nsw.gov.au/animals/flying-fox-heat.htm

Responding to heat stress in flying-fox camps

Heat stress affects flying-foxes when temperatures reach 42°C or more. Over the past two decades, a number of documented heat stress events have resulted in significant flying-fox mortality.

While there is conflicting advice about how or whether to intervene during a heat stress event at a flying-fox camp, it should be noted that human presence in a camp at such times can increase the stress and activity levels of flying-foxes present, potentially leading to greater harm.

The following advice is provided for people who choose to respond to heat stress events in flying-fox camps, which should be undertaken as an organised and monitored response. It is recommended that data is collected after the heat stress event and provided to scientists able to analyse the data and to help the Office of Environment and Heritage share best practice management techniques as they are developed. The data collected will help improve future advice on intervention during these events.

What is heat stress?

Heat stress or hyperthermia occurs when the body produces more heat than it can dissipate. Post-mortems suggest that flying-foxes mainly die from resulting heat shock i.e. the body can no longer function effectively.

How can I tell whether flying-foxes are affected by a heat stress event?

When ambient temperatures rise above 35°C flying-foxes tend to alter their behaviour to reduce exposure to heat. A range of behaviours may be exhibited, depending on multiple variables in their environment. The impacts of heat stress events are likely to vary site by site, and can depend on conditions in the preceding days. Ambient temperature alone may thus not be a sound indicator of a heat stress event, and flying-fox behaviour may provide more reliable information. As flying-foxes experience heat stress, they are likely to

exhibit a series of behaviours indicating progressive impact of that stress, including clustering or clumping, panting, licking wrists and wing membranes, and descending to lower levels of vegetation or to the ground. Some of these behaviours may occur outside of heat stress events.

Black Flying-foxes tend to start dying above ~42°C, and Grey-headed Flying-foxes above ~43°C.

What factors affect the severity of heat stress on flying-foxes?

Impact is likely to be reduced by the presence of:

- understorey and mid-storey vegetation so that flying-foxes can shelter from heat
- dense crown vegetation to provide shade
- access to water.

Impact is likely to be increased when camps are disturbed at critical times during a heat stress event, potentially forcing individuals to leave their cooler microhabitats and become fully exposed to the extreme heat.

Do I need approval to help flying-foxes during a heat stress event?

Yes. You will need to be licensed to rehabilitate fauna under the *National Parks and Wildlife Act 1974*. You may be licensed as an individual or be a current member of a **licensed fauna rehabilitation group**. Alternatively, you have a job which lawfully entitles you to intervene in animal welfare issues (e.g. with the council, Department of Primary Industries, Office of Environment and Heritage including National Parks and Wildlife Service, RSPCA or you are a registered veterinarian). In either case, the licence or role must specifically endorse the person or group as being able to care for flying-foxes. If you are not sure about your coverage under a current licence, contact your local fauna rehabilitation group or, for individual licences, the Biodiversity and Wildlife Team in Office of Environment and Heritage on 9585 6404 or at **Wildlife.Licensing@environment.nsw.gov.au**.

A requirement of being licensed is that you must be immunised against Australian Bat Lyssavirus (ABLV) and you will need to source and wear suitable protective equipment and clothing. It is also recommended that you undertake training in handling flying-foxes. See more information on **licensed rehabilitation groups**.

The **Code of practice for injured, sick and orphaned protected fauna** is designed for those involved in the rescue, rehabilitation and release of native fauna and outlines how they can protect the welfare of the animals in their care. The Code contains both

standards and guidelines for the care of native animals that are incapable of fending for themselves in their natural habitat. Compliance with the standards is a condition of all Office of Environment and Heritage rehabilitation licences. If groups intend to take action in heat events Office of Environment and Heritage encourages prior planning to ensure that the group has the resources necessary to meet the standards.
Office of Environment and Heritage has also produced a series of species-specific codes to complement the general code of practice, including a **Code of practice for injured sick and orphaned flying-foxes** (PDF 86KB). This code provides details on standards for rescue, transport, euthanasia, care procedures, husbandry, housing and release.

If I am a licensed fauna rehabilitator do I have a right to enter someone's property to aid flying-foxes during a heat stress event?

Access to sites where animals are affected needs to be negotiated with the relevant land holder.

For national parks refer to the state duty officer (9895 6444).

For **Crown Lands** refer to customer service during business hours (1300 886 235).
For state forests refer to **Forestry Corporation of NSW**.
For council managed land check the relevant **local council website** for contact details.

Can I get approval to take heat-stressed flying-foxes interstate for rehabilitation?

Not immediately. Office of Environment and Heritage, specifically National Parks and Wildlife Service, cannot provide immediate approval to transport heat-stressed flying-foxes across state borders for care because of the potential biosecurity and health risks involved. Authorisation will also be required from other interstate agencies to approve the importation of animals. Securing these approvals takes time and may require testing of affected animals to establish their health status and quarantine requirements. Endeavours should be made to treat affected animals within NSW using the **network of available fauna rehabilitators**. You can contact the Biodiversity and Wildlife Team in Office of Environment and Heritage on 9585 6406 to discuss obtaining an import/export licence if needed.
Office of Environment and Heritage is working with other state jurisdictions to facilitate cross-state emergency measures for flying-fox rehabilitation in the future.

In the meantime, if injured flying-foxes are moved during a heat stress event for rehabilitation, they should be released in accordance with the fauna and flying-fox codes of practice.

Who do I call if I am concerned about flying-foxes being affected by heat stress?

People concerned about potential heat stress events on flying-foxes may report their concerns to a **local fauna rehabilitation group** or the **RSPCA**. Local councils or the Local Area National Parks and Wildlife Service Duty Officer can also be contacted. It may not always be possible or appropriate to intervene in such events depending on the circumstances. Intervention is not mandatory. It is recommended that wildlife carer groups develop an incident response protocol relevant to the local area that will be used by their members when flying-fox camps suffer heat stress.
If a heat stress event occurs outside of business hours, the National Parks and Wildlife Service state duty officer (9895 6444) may be able to assist with local contacts.

What to do during a heat stress event?

During a heat stress event, flying-foxes will likely occupy the coolest microhabitats available to them at that temperature, and disturbance may move flying-foxes into less desirable locations. Great care should be taken to avoid unnecessarily disturbing flying-foxes at this time.

General health and safety issues must be identified beforehand and appropriate measures implemented during the event.

Spraying animals in the camp

Spraying of specific individuals by hand can cool highly distressed animals. However, care must be taken not to disturb other flying-foxes, as this may cause them to leave the shelter of their relatively cool microhabitats and increase their body temperature, further stressing them.

Flying-foxes should not be approached if they show any indication that they are trying to move away or escape from the presence of the sprayer. Highly heat-stressed individuals that do not respond to spraying should be observed for 15 minutes before undertaking a second round of spraying. The individual may then be removed from the camp after a period of observation by an experienced wildlife carer for further treatment.

Removing animals from a camp and rehydration therapy

Animals that are severely affected by a heat stress event may need intensive cooling and rehydration. In some cases this may necessitate removal of the animal from the camp to a quiet and shady location.

People dealing with these animals must be vaccinated, wear protective clothing and have experience and training in administering fluid therapy.

After a heat stress event

If flying-foxes have died during a heat stress event, care should be taken to ensure domestic dogs and cats do not enter the camp. While preliminary research indicates the likelihood of cats and dogs becoming infected following contact with a bat infected with Australian bat lyssavirus (ABLV) is low, it is theoretically possible that a pet that contacted an infected bat could become infected with ABLV and could then transmit that infection to a human.

Collecting data about mortality and effectiveness of strategies

After the heat stress event is over, it will be important to collect information that can provide a better understanding of the nature and severity of heat stress events on flying-foxes, and contribute to more effective management responses to these events. Information should include observations of the camp during the heat stress event, what treatments were applied, numbers of each species present, and relevant injury and mortality data. Monitoring of the site in the days following the heat stress event will be important as flying-foxes may exhibit the impacts of stress for several days after the event.

When collecting these data, volunteers handling dead flying-foxes must be vaccinated against ABLV (with current titre) and wear personal protective clothing.

Download the **Responding to Heat Stress in Flying-fox Camps - Monitoring Data Sheet** (DOC 90KB).
Any dead flying-foxes which are banded should be reported to the **Australian Bird and Bat Banding Scheme**.
Having completed any mortality and post-mortem assessment, carcasses should be disposed of. As with any animal waste, flying-fox carcasses should be disposed of by people wearing appropriate protective clothing. Carcasses should be picked up using a shovel or by hand while wearing thick gloves, double-bagged and dropped at a registered

landfill site. If you have concerns or questions about disposing of dead flying-foxes, contact your local council for advice on waste management in your area.

Completed data sheets should be sent to:

Dr Justin A. Welbergen
Senior Lecturer | Hawkesbury Institute for the Environment | UWS Hawkesbury Campus
Locked Bag 1797, Penrith, NSW 2751, Australia
Direct: +61 2 4570 1496 | Mobile: +61 4 5733 8189 | Fax: +61 2 4570 1103
E-mail: **j.welbergen@uws.edu.au**
Website: **www.uws.edu.au/hie/justinwelbergen**

Appendix G Desktop ecological assessment guideline

Buffer

Desktop assessments should include the camp and a suitable buffer area. The suggested buffer for ecological assessments is 10 km, however this may be reviewed on a case by case basis.

Sources of information for database searches

Depending on the location and extent of the project, the following databases may provide information on flora and fauna species and ecological communities for the site and surrounds.

Sources of ecological information

Source	Description	Links
Atlas of Living Australia	Biodiversity knowledge contributed by Australia's academic, scientific, environmental and general communities	www.ala.org.au, page provides a link to a mapping and analysis page where you can view records within an area of interest
Protected Matters Search Tool	Used to generate a list of matters of national environment significance within an area of interest	www.environment.gov.au/epbc/protected-matters-search-tool
NSW BioNet	Contains government-held information about plants and animals in NSW. The following organisations provide data: Office of Environment and Heritage; National Parks and Wildlife Service; Royal Botanic Gardens and Domain Trust; Department of Primary Industries; Forests NSW; Australian Museum. Users can register for a log-in version which provides additional detail and functionality.	www.bionet.nsw.gov.au/
Critical Habitat Register – Office of Environment and Heritage	Declarations of critical habitat and maps of these sites for species listed under the TSC Act	www.environment.nsw.gov.au/criticalhabitat/criticalhabitatprotectionbydoctype.htm
Vegetation Information System: Maps	Statewide regional scale vegetation map, and for some areas, a local fine-scale map	www.environment.nsw.gov.au/research/PlantCommunityIDsoftware.htm
OEH – Spatial data portal	Spatial datasets available for download, supplied in GDA	data.nsw.gov.au/data/dataset/nsw-oeh-spatial-data-portal
SIX maps	Provides maps showing cadastral and topographic information	six.nsw.gov.au/wps/portal/
Threatened Species Profile Database	Provides a search tool for NSW threatened species including a description and indicative distribution	www.environment.nsw.gov.au/threatenedspecies/
SEPPs 14 & 26	Available on the OEH spatial data portal	data.nsw.gov.au/data/dataset/nsw-oeh-spatial-data-portal

Other sources of data

Depending on the type of project and location, the local council, or National Parks and Wildlife Service may hold more detailed vegetation mapping than publicly available. The relevant authority should be contacted to confirm if the most detailed mapping and data records have been obtained.

Appendix H Additional human and animal health information

This information is provided in the Plan to ensure the community is aware of the actual (low) risk of disease transfer, and prevention measures. This information should also be communicated to anyone working in and around the camp (contractors and council staff), and used to inform risk management protocols (development of Safe Work Method Statement or the like).

Australian bat Lyssavirus

ABLV is a rabies-like virus that may be found in all flying-fox species on mainland Australia. It has also been found in an insectivorous microbat and it is assumed it may be carried by any bat species. The probability of human infection with ABLV is very low with less than 1% of the flying-fox population being affected (DPI 2013) and transmission requiring direct contact with an infected animal that is secreting the virus. In Australia three people have died from ABLV infection since the virus was identified in 1996 (NSW Health 2013).

Domestic animals are also at risk if exposed to ABLV. In 2013, ABLV infections were identified in two horses (Shinwari et al. 2014). There have been no confirmed cases of ABLV in dogs in Australia; however, transmission is possible (McCall et al. 2005) and consultation with a veterinarian should be sought if exposure is suspected.

Transmission of the virus from bats to humans is through a bite or scratch, but may have potential to be transferred if bat saliva directly contacts the eyes, nose, mouth or broken skin. ABLV is unlikely to survive in the environment for more than a few hours, especially in dry environments that are exposed to sunlight (NSW Health 2013).

Transmission of closely related viruses suggests that contact or exposure to bat faeces, urine or blood does not pose a risk of exposure to ABLV, nor does living, playing or walking near bat roosting areas (NSW Health 2013).

The incubation period in humans is assumed similar to rabies and variable between two weeks and several years. Similarly the disease in humans presents essentially the same clinical picture as classical rabies. Once clinical signs have developed the infection is invariably fatal. However, infection can easily be prevented by avoiding direct contact with bats (i.e. handling). Pre-exposure vaccination provides reliable protection from the disease for people who are likely to have direct contact with bats, and it is generally a mandatory workplace health and safety requirement that all persons working with bats receive pre-vaccination and have their level of protection regularly assessed. Like classical rabies, ABLV infection in humans also appears to be effectively treated using post-exposure vaccination and so any person who suspects they have been exposed should seek immediate medical treatment. Post-exposure vaccination is usually ineffective once clinical manifestations of the disease have commenced.

If a person is bitten or scratched by a bat they should:

- wash the wound with soap and water for at least five minutes (**do not scrub**)
- contact their doctor immediately to arrange for post-exposure vaccinations.

If bat saliva contacts the eyes, nose, mouth or an open wound, flush thoroughly with water and seek immediate medical advice.

Hendra virus

Flying-foxes are the natural host for Hendra virus (HeV), which can be transmitted from flying-foxes to horses. Infected horses sometimes amplify the virus and can then transmit it to other horses, humans and on two occasions, dogs (DPI 2014). There is no evidence that the virus can be passed directly from flying-foxes to humans or to dogs (AVA 2015). Clinical studies have shown cats, pigs, ferrets and guinea pigs can carry the infection (DPI 2015a).

Although the virus is periodically present in flying-fox populations across Australia, the likelihood of horses becoming infected is low and consequently human infection is extremely rare. Horses are thought to contract the disease after ingesting forage or water contaminated primarily with flying-fox urine (CDC 2014).

Humans may contract the disease after close contact with an infected horse. HeV infection in humans presents as a serious and often fatal respiratory and/or neurological disease and there is currently no effective post-exposure treatment or vaccine available for people. The mortality rate in horses is greater than 70% (DPI 2014). Since 1994, 81 horses have died and four of the seven people infected with HeV have lost their lives (DPI 2014).

Previous studies have shown that HeV spillover events have been associated with foraging flying-foxes rather than camp locations. Therefore risk is considered similar at any location within the range of flying-fox species and all horse owners should be vigilant. Vaccination of horses can protect horses and subsequently humans from infection (DPI 2014), as can appropriate horse husbandry (e.g. covering food and water troughs, fencing flying-fox foraging trees in paddocks, etc.).

Although all human cases of HeV to date have been contracted from infected horses and direct transmission from bats to humans has not yet been reported, particular care should be taken by select occupational groups that could be uniquely exposed. For example, persons who may be exposed to high levels of HeV via aerosol of heavily contaminated substrate should consider additional PPE (e.g. respiratory filters), and potentially dampening down dry dusty substrate.

Menangle virus

Menangle virus (also known as bat paramyxovirus no. 2) was first isolated from stillborn piglets from a NSW piggery in 1997. Little is known about the epidemiology of this virus, except that it has been recorded in flying-foxes, pigs and humans (AVA 2015). The virus caused reproductive failure in pigs and severe febrile (flu-like) illness in two piggery workers employed at the same Menangle piggery where the virus was recorded (AVA 2015). The virus is thought to have been transmitted to the pigs from flying-foxes via an oral–faecal matter route (AVA 2015). Flying-foxes had been recorded flying over the pig yards prior to the occurrence of disease symptoms. The two infected piggery workers made a full recovery and this has been the only case of Menangle virus recorded in Australia.

General health considerations

Flying-foxes, like all animals, carry bacteria and other microorganisms in their guts, some of which are potentially pathogenic to other species. Direct contact with faecal material should be avoided and general hygiene measures taken to reduce the low risk of gastrointestinal and other disease.

Contamination of water supplies by any animal excreta (birds, amphibians and mammals such as flying-foxes) poses a health risk to humans. Household tanks should be designed to minimise potential contamination, such as using first flush diverters to divert contaminants before they enter water tanks. Trimming vegetation overhanging the catchment area (e.g. the roof of a house) will also reduce wildlife activity and associated potential contamination. Tanks should also be appropriately maintained and flushed, and catchment areas regularly cleaned to remove potential contaminants.

Public water supplies are regularly monitored for harmful microorganisms, and are filtered and disinfected before being distributed. Management plans for community supplies should consider whether any large congregation of animals, including flying-foxes, occurs near the supply or catchment area. Where they do occur, increased frequency of monitoring should be considered to ensure early detection and management of contaminants.

Appendix I Dispersal results summary

Roberts and Eby (2013) summarised 17 known flying-fox dispersals between 1990 and 2013, and made the following conclusions:

1. In all cases, dispersed animals did not abandon the local area[6].
2. In 16 of the 17 cases, dispersals did not reduce the number of flying-foxes in the local area.
3. Dispersed animals did not move far (in approx. 63% of cases the animals only moved <600 m from the original site, contingent on the distribution of available vegetation). In 85% of cases, new camps were established nearby.
4. In all cases, it was not possible to predict where replacement camps would form.
5. Conflict was often not resolved. In 71% of cases conflict was still being reported either at the original site or within the local area years after the initial dispersal actions.
6. Repeat dispersal actions were generally required (all cases except where extensive vegetation removal occurred).
7. The financial costs of all dispersal attempts were high, ranging from tens of thousands of dollars for vegetation removal to hundreds of thousands for active dispersals (e.g. using noise, smoke, etc.).

Ecosure, in collaboration with a Griffith University Industry Affiliates Program student, researched outcomes of management in Queensland between November 2013 and November 2014 (the first year since the current Queensland state flying-fox management framework was adopted on 29 November 2013). An overview of findings[7] is summarised below.

- There were attempts to disperse 25 separate roosts in Queensland (compared with nine roosts between 1990 and June 2013 analysed in Roberts and Eby (2013)). Compared with the historical average (less than 0.4 roosts/year) the number of roosts dispersed in the year since the Code was introduced has increased by 6, 250%.
- Dispersal methods included fog8, birdfrite, lights, noise, physical deterrents, smoke, extensive vegetation modification, water (including cannons), paintball guns and helicopters.
- The most common dispersal methods were extensive vegetation modification alone and extensive vegetation modification combined with other methods.
- In nine of the 24 roosts dispersed, dispersal actions did not reduce the number of flying-foxes in the LGA.
- In all cases it was not possible to predict where new roosts would form.

[6] Local area is defined as the area within a 20 km radius of the original site = typical feeding area of a flying-fox.

[7] This was based on responses to questionnaires sent to councils; some did not respond and some omitted responses to some questions.

[8] Fog refers to artificial smoke or vapours generated by smoke/fog machines. Many chemical substances used to generate smoke/fog in these machines are considered toxic.

- When flying-foxes were dispersed, they did not move further than 6 km away.
- As at November 2014 repeat actions had already been required in 18 cases.
- Conflict for the council and community was resolved in 60% of cases, but with many councils stating that they feel this resolution is only temporary.
- The financial costs of all dispersal attempts, regardless of methods used were considerable, ranging from $7, 500 to more than $400, 000 (with costs ongoing).

Appendix J Section 91 licence application form

At the time the Plan is submitted to OEH for approval, it should include a completed section 91 licence application form. The form can include information already contained in the Plan.

Note that OEH is obliged to place licence application forms on its website, and the application, accompanying documentation and approval, form part of the public register for the TSC Act. The licence application is available at: Section 91 Licence.

This section has been left blank intentionally as actions within the plan are assessed as Level 1, or a continuation of previously assessed Level 2 actions. Should the scope of works be extended through the review/production of Vegetation Management Plans an assessment will be undertaken leading to a possible section 91 application if required.

Appendix K Example flying-fox rescue protocol

We do not anticipate the requirement for a flying-fox rescue protocol to be included with a section 91 licence for this Plan because there are no dispersal actions proposed. A standard protocol has been included here as a reference only.

Note that a protocol does not negate the requirement to have a licensed carer present at times specified above. When developing such a protocol you should seek input from the carer you plan to work with to ensure the protocol aligns with their preferred rescue approach.

Reference documents:

OEH 2012a, *NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes*, Office of Environment and Heritage, Sydney.

OEH 2011b, *NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna*, Office of Environment and Heritage, Sydney.

Purpose

These work instructions are intended for Australian bat lyssavirus (ABLV)-vaccinated fauna spotter catchers (FSCs) or wildlife rescue personnel on site during dispersal activities to monitor, capture or provide first aid treatment for sick or injured flying-foxes that may require human intervention for their survival. Flying-fox rescue must only be attempted by personnel trained and experienced in flying-fox rescue and handling.

This work instruction provides rescuers with information regarding capture and first aid until a flying-fox is in the specialist care of a veterinarian or person qualified in wildlife rehabilitation.

Requirements

FSC and wildlife rescue personnel involved in flying-fox rescue must:

- be trained and experienced in rescue and handling
- be vaccinated against ABLV (titre levels checked at least once every two years)
- be aware of the hazards and risks of coming into contact with all bats
- utilise appropriate PPE and equipment for capture, transport and treatment of flying-foxes
- undertake a risk assessment before carrying out a rescue – do not endanger yourself or others during a rescue
- have the contact details for a local veterinarian or bat carer who will accept the sick or injured flying-fox.

Human first aid

All bats in Australia should be viewed as potentially infected with ABLV. If bitten or scratched by a bat, immediately wash the wound with soap and water (do not scrub) and continue for at least five minutes, followed by application of an antiseptic with anti-viral action (e.g. Betadine), and immediate medical attention (post-exposure vaccinations may be required). Similarly medical attention should be immediately sought if exposed to an animal's saliva or excreta through the eyes, nose or mouth.

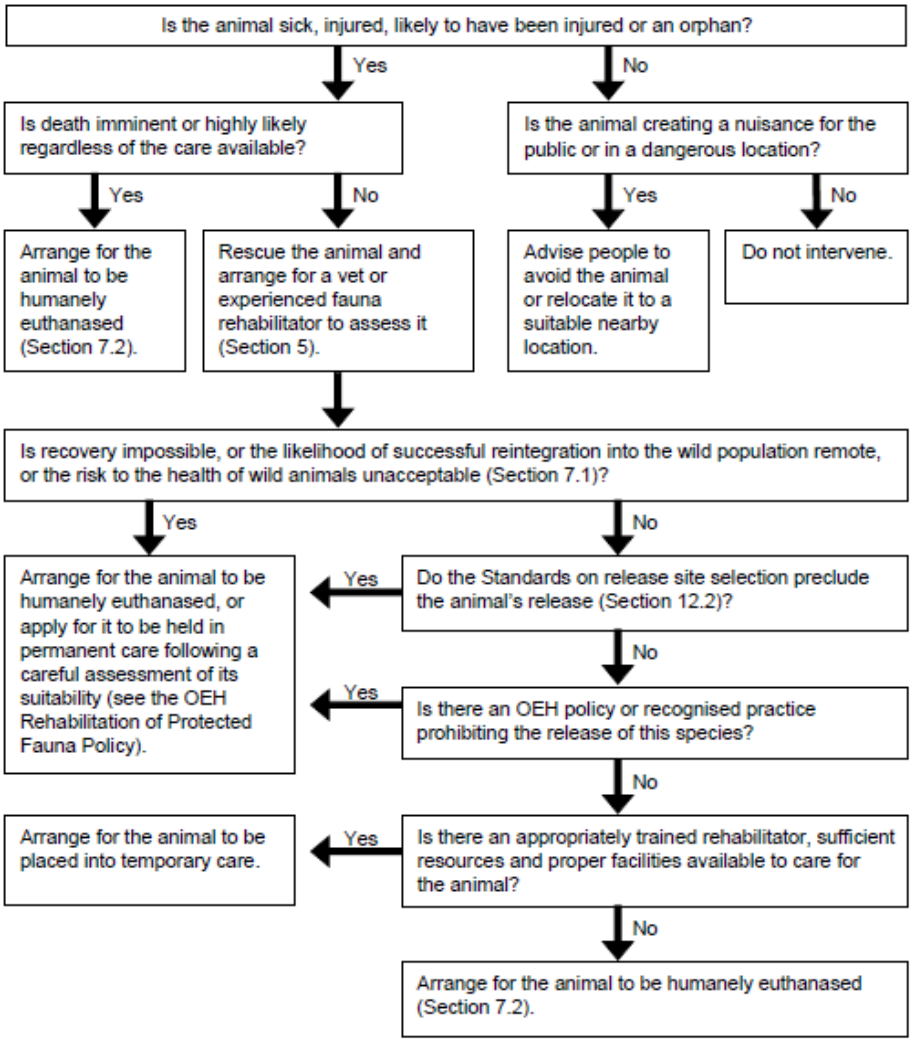
Equipment

- lidded plastic carry basket or 'pet-pack' with bedding (juveniles) / transport container with hanging perch, tall enough for bat to hang without hitting its head (in accordance with Section 5.1 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012a)
- warm water bottle / cold brick
- wraps /towels
- teats for small bottle
- extension pole or broom
- bat first aid kit – juice drink/glucose powder, syringes, cloths for wounds, Betadine/saline, dummy for baby bats. FFs only to be offered liquids under advice from a licensed wildlife carer.

Work instructions

Case assessment

Observe, assess and then determine if/what intervention is required using the decision tree in the NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna (OEH 2011), included below.



Personnel should approach stressed flying-foxes cautiously. If flying-foxes panic or fly this will waste energy; retreat and continue to monitor behaviour.

1. Dehydration: Eyes dull or depressed in skull, change to skin elasticity, skin stays pinched, animal cold, wing membranes dry, mouth dry.
2. Heat stress: wing fanning, shade seeking, clustering/clumping, salivating, panting, roosting at the base of trees, on the ground, falling from tree.
3. Obvious injury: bleeding, broken bones.

Rescue instructions

As per Section 4 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012a):

i. The objective is to rescue a flying-fox while minimising further stress and injury to the animal.
ii. Before a rescue attempt, rescuers must assess the risks to the flying-fox from environmental hazards and from capture.
iii. Rescuers must employ the correct rescue equipment for the condition and location of the flying-fox, and be trained in its use.

Example scenarios

1. Bat low in tree:
    - quickly place towel around bat before it can move away
    - grab hold of feet, toes may curl over rescuers fingers
    - place in carry basket / transport container.
2. Bat high in tree:
    - place pole wrapped in towel in front of bat
    - coax bat onto towel
    - once on towel, quickly move away from branches and lower to ground
    - once on ground, cover with towel and place into carry basket / transport container.
3. A bat caught on barbed wire fence:
    - two people only – one to restrain with towel, while the other untangles
    - put towels on the wire strands under or around to avoid further entanglement
    - if the membrane has dried onto wire, syringe or spray water onto wing
    - use pliers or wire cutter if necessary.

Animal first aid

Physical assessment: Keep animal wrapped and head covered, only expose one part at a time. Examine head. Unwrap one wing and extend. Wrap and extend other wing. Check legs. Examine front and back of body.

Dehydration: Offer water/juice (low acid juice only, e.g. apple/mango) orally with syringe (under supervision/advice from licensed wildlife carer ONLY).

Heat stress: Reduce temperature in heat exhausted bats by spraying wings with tepid water.

Hypothermia: May be seen in pups separated from mother – keep head covered and warm core body temperature slowly by placing near (not on) warm water bottle covered by towel.

Bleeding: Clean wounds with room temperature saline or diluted Betadine.

Transport to veterinarian / wildlife carer

See Section 5 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012a) summarised below.

Objective

To transport a flying-fox so as to minimise further stress and injury to the animal.

Standards

a. The transport container must be tall enough for the flying-fox to hang by its feet without hitting its head on the floor.
b. The container must be designed, set up and secured to prevent injuries to the flying-fox. The sides of the container must prevent the flying-fox from poking its head or wings out.
c. The container must be designed to prevent the flying-fox from escaping.
d. The flying-fox must be allowed to hang by its feet from the top of the container or if it is unable to hang, wrapped in material (e.g. sheet or flannel) and placed in a sling so its feet are higher than its head.
e. The container must be kept at a temperature which is appropriate for the age and condition of the flying-fox. A range of 25–27°C is appropriate for an adult. A temperature of 28°C is appropriate for an orphan. A cool or warm water bottle may be required.
f. The container must be ventilated so air can circulate around the flying-fox.
g. The container must minimise light, noise and vibrations and prevent contact with young children and pets.
h. During transport, a container holding a flying-fox must have a clearly visible warning label that says 'Warning – live bat'.
i. A flying-fox must not be transported in the back of an uncovered utility vehicle or a car boot that is separate from the main cabin.

Guidelines

- Flying-fox transport should be the sole purpose of the trip and undertaken in the shortest possible time.
- The fauna rehabilitation group's contact details should be written on the transport container in case of an emergency.

ecological AUSTRALIA

ISO 14001 Environmental Management

AS/NZS 4801:2001 Occupational Health and Safety Management

ISO 9001 Quality Management

HEAD OFFICE
Suite 2, Level 3
668-672 Old Princes Highway
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA
Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 0145
F 02 9542 5622

COFFS HARBOUR
35 Orlando Street
Coffs Harbour Jetty NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH
Suite 1 & 2
49 Ord Street
West Perth WA 6005
T 08 9227 1070
F 02 9542 5622

DARWIN
16/56 Marina Boulevard
Cullen Bay NT 0820
T 08 8989 5601
F 08 8941 1220

SYDNEY
Suite 1, Level 1
101 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9542 5622

NEWCASTLE
Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 0125
F 02 9542 5622

ARMIDALE
92 Taylor Street
Armidale NSW 2350
T 02 8081 2685
F 02 9542 5622

WOLLONGONG
Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2200
F 02 9542 5622

BRISBANE
Suite 1, Level 3
471 Adelaide Street
Brisbane QLD 4000
T 07 3503 7192
F 07 3854 0310

HUSKISSON
Unit 1, 51 Owen Street
Huskisson NSW 2540
T 02 4201 2264
F 02 9542 5622

NAROOMA
5/20 Canty Street
Narooma NSW 2546
T 02 4302 1266
F 02 9542 5622

MUDGEE
Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1234
F 02 6372 9230

GOSFORD
Suite 5, Baker One
1-5 Baker Street
Gosford NSW 2250
T 02 4302 1221
F 02 9542 5622

ADELAIDE
2, 70 Pirie Street
Adelaide SA 5000
T 08 8470 6650
F 02 9542 5622

1300 646 131
www.ecoaus.com.au