Application for a

Section 91 Licence

under the *Threatened Species Conservation Act 1995* to harm or pick a threatened species, population or ecological community* or damage habitat.

1. Applicant's Name ^: *(if additional persons require authorisation by this licence, please attach details of*	Refer to Section 1.1 of the Proposed Relocation Plan.	
2. Australian Business Number (ABN):	Refer to Section 1.1 of the Proposed Relocation Plan.	
3. Organisation name and position of applicant ^: *(if applicable)*	Refer to Section 1.1 of the Proposed Relocation Plan.	
4. Postal address ^:	Refer to Section 1.1 of the Proposed Relocation Plan.	Telephone ^: B.H. Refer to Section 1.1 of the Proposed Relocation Plan. A.H.
5. Location of the action *(including grid reference and local government area and delineated on a map).*	Refer to Section 2.3 & 4 of the Proposed Relocation Plan.	

* A threatened species, population or ecological community means a species, population or ecological community identified in Schedule 1, 1A or Schedule 2 of the *Threatened Species Conservation Act 1995.*

^The personal details of all Section 91 licences will be displayed in the register of Section 91 licences required under Section 104 of the *Threatened Species Conservation Act 1995.* See notes.

6. Full description of the action and its purpose *(e.g. environmental assessment, development, etc.)*	Refer to Sections 2 & 3 of the Proposed Relocation Plan.
7. Details of the area to be affected by the action *(in hectares)*.	Refer to Sections 2.3.2 of the Proposed Relocation Plan.
8. Duration and timing of the action *(including staging, if any).*	Refer to Sections 3.3 of the Proposed Relocation Plan.
9. Is the action to occur on land declared as critical habitat*? *(tick appropriate box)*	☐ Yes ☒ No

* Critical habitat means habitat declared as critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*.

10. Threatened species, populations or ecological communities to be harmed or picked.	Scientific name ***Pteropus poliocephalus***	Common name *(if known)* **Grey-headed Flying-fox**	Conservation status *(i.e. critically endangered, endangered or vulnerable)* **Vulnerable**	Details of no. of individual animals, or proportion and type of plant material *(e.g. fertile branchlets for herbarium specimens or whole plants or plant parts)* **Number varies between 500-800 individuals at the ABG to be relocated**

11. Species impact: *(please tick appropriate box)* a) For action proposed on land declared as critical habtat; or b) For action proposed on land not declared as critical habitat.	an SIS is attached ☐ Yes ☒ No Items 12 to 25 have been addressed ☒ Yes ☐ No

N.B: Provision of a species impact statement is a statutory requirement of a licence application if the action is proposed on critical habitat.
The provision of information addressing items 12 to 17 is a statutory requirement of a licence application if the action proposed is <u>not</u> on land that is critical habitat. Information addressing any of the questions below must be attached to the application.

12. Describe the type and condition of habitats in and adjacent to the land to be affected by the action.	Refer to Sections 2.3 & 4 of the Proposed Relocation Plan.
13. Provide details of any known records of a threatened species in the same or similar known habitats in the locality *(include reference sources).*	Refer to Sections 5 & 6 of the Proposed Relocation Plan.
14. Provide details of any known or potential habitat for a threatened species on the land to be affected by the action *(include reference sources).*	Refer to Sections 5 & 6 of the Proposed Relocation Plan.
15. Provide details of the amount of such habitat to be affected by the action proposed in relation to the known distribution of the species and its habitat in the locality .	Refer to Sections 5 & 6 of the Proposed Relocation Plan.

16. Provide an assessment of the likely nature and intensity of the effect of the action on the lifecycle and habitat of the species.	Refer to Sections 5 & 6 of the Proposed Relocation Plan.
17. Provide details of possible measures to avoid or ameliorate the effect of the action.	Refer to the 'Mitigation' Section 7 of the Relocation Plan, but also Section 3 which carefully outlines the methods to be used to avoid and minimize impacts as much as possible.
N.B: The Director-General must determine whether the action proposed is likely to significantly affect threatened species, populations or ecological communities, or their habitats. To enable this assessment the Applicant is required to address items 18 to 24. Any additional information referred to in addressing these items must be attached to the application.	
18. 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.	For the Grey-headed Flying-fox, refer to Section 6 of the Proposed Relocation Plan. For other threatened flora or fauna species identified as potentially being affected by the action refer to 5.3.1 & 5.3.2.

19. 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 existing within the subject area, thus the activity will not affect any endangered population.
20. 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 activity will not affect an endangered ecological community. Refer to Tables 8 & 9 and Section 5.3.3 of the Proposed Relocation Plan.
21. 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 (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.	
22. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	No critical habitat exists within the study areas, thus no critical habitat will be affected by the action.

23. Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	The objectives of the Grey-headed Flying-fox camp management policy are: 1) To assist OEH and others in managing flying-foxes and their camps in a manner that will ensure the maintenance of a network of flying-fox camps throughout their range, and the conservation of the flying-fox population. 2) To provide a consistent approach when managing flying-fox camps so: o Public health and safety are not compromised; o Legislation, animal welfare and conservation objectives, including recovery planning, are considered; o The extent to which people feel that their interactions with flying-fox camps are negative is reduced; o Relevant agencies and organizations are jointly engaged in resolving the issues associated with flying-fox camp management; and o Accessible, best practice management tools to guide policy implantation are provided by OEH and other stakeholders. **3) The above guidelines and policies have been followed in accordance to providing a detailed monitoring and relocation plan of the GHFF (and LRFF) to allow for the above to the best of our knowledge for the species'.**
24. Whether the action	The key threatening process for the Grey-headed Flying-fox (GHFF) is loss of foraging habitat (Eby and Law 2008) and habitat fragmentation (DOE 2014). There will be no loss of foraging habitat for the GHFF (and LRFF). ABG will still be available as foraging habitat for the FF's within the Albury area; they are also capable of rapid flight and are able to forage at least 10–20 km from their roost. The likely locations for new camps and the location of the existing camp (Wodonga Creek Camp within the Albury area will still allow FF's to access food resources within the ABG and adjacent areas. The GHFF forages on ~100 species of trees and vines; and the LRFF forages on a subset of these but not rainforest species (Eby 2008). If the proposed action commences during autumn (March/April), this is the time when flowering foraging species usually decrease the more inland and south NSW one gets (Eby 2008). Hence it is expected that the FF's will be migrating towards the coast and north around this time until spring.

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.	

Important information for the applicant

Processing times and fees

The *Threatened Species Conservation Act 1995* provides that the Director-General must make a decision on the licence application within 120 days where a species impact statement (SIS) has been received. No timeframes have been set for those applications which do not require a SIS. The Director-General will assess your application as soon as possible. You can assist this process by providing clear and concise information in your application.

Applicants may be charged a processing fee. The Director-General is required to advise prospective applicants of the maximum fee payable before the licence application is lodged. Therefore, prospective applicants should contact the Office of Environment and Heritage (OEH) prior to submitting a licence application.

A $30 licence application fee must accompany a licence application.

Protected fauna and protected native plants*

Licensing provisions for protected fauna and protected native plants are contained within the *National Parks and Wildlife Act 1974.* However, a Section 91 Licence may be extended to include protected fauna and protected native plants when these will be affected by the action.

If you are applying for a licence to cover both threatened and protected species please provide the information requested in Item 10 *as well as* a list of protected species and details of the number of individuals animals or proportion and type of plant material which are likely to be harmed or picked.

Request for additional information

The Director-General may, after receiving the application, request additional information necessary for the determination of the licence application.

Species impact statement

Where the application is not accompanied by a SIS, the Director-General may decide, following an initial assessment of your application, that the action proposed is likely to have a significant effect

* Protected fauna means fauna of a species not named in Schedule 11 of the *National Parks and Wildlife Act 1974.*
Protected native plant means a native plant of a species named in Schedule 13 of the *National Parks and Wildlife Service 1974.*

on threatened species, populations or ecological communities, or their habitats. In such cases, the *Threatened Species Conservation Act 1995* requires that the applicant submit a SIS. Following initial review of the application, the Director-General will advise the applicant of the need to prepare a SIS.

Director-General's requirements for a SIS

Prior to the preparation of a SIS, a request for Director-General's requirements must be forwarded to the relevant OEH Office. The SIS must be prepared in accordance with section 109 and 110 of the TSC Act and must comply with any requirements notified by the Director-General of OEH.

Disclosure of Personal Information in the Public Register of s91 Licences

The Public Register provides a list of licence applications and licences granted. A person about whom personal information is contained in a public register may request that the information is removed or not placed on the register as publicly available.

Copies of all applications and licences issued under section 91 and certificates issued under section 95 of the Act are available on the OEH website at
www.environment.nsw.gov.au/threatenedspecies/S91TscaRegisterByDate.htm
or in hardcopy form from The Librarian, OEH, 59 Goulburn St, Sydney.

Certificates
If the Director-General decides, following an assessment of your application, that the proposed action is not likely to significantly affect threatened species, populations or ecological communities, or their habitats, a Section 91 Licence is not required and the Director-General must, as soon as practicable after making the determination, issue the applicant with a certificate to that effect.

N.B: An action that is not required to be licensed under the Threatened Species Conservation Act 1995, may require licensing under the National Parks and Wildlife Act 1974, if it is likely to affect protected fauna or protected native plants.

I confirm that the information contained in this application is correct. I hereby apply for a licence under the provisions of Section 91 of the *Threatened Species Conservation Act 1995.*

Applicant's name *(Please print)* JAMES JENKINS

Applicant's Position & Organisation *(if relevant)* *(Please print)* DIRECTOR Community + Recreation Albury City.

Applicant's signature

Date 16/4/14

For more information or to lodge this form, contact the nearest branch of OEH's Conservation and Regulation Division:

Metropolitan
Branch P: 02
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ta NSW
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Prepared for Albury City and Albury Botanic Gardens

Proposal to relocate Grey-headed Flying-foxes and Little Red Flying-foxes from the Albury Botanic Gardens, NSW (April 2014)

Prepared by Australian Research Centre for Urban Ecology:
Royal Botanic Gardens Melbourne

Date: April 2014

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Final draft for comment	21st March 2014	Steering Committee members
Final sent to AC: for Public Comment	10th April 2014	

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Executive Summary

The Albury Botanic Gardens (ABG) is Crown land with AlburyCity Trustee. The Gardens is a regional attraction with around 350,000 visitors per year. The Gardens includes a section established a Children's Garden which alone attracts and estimated 55,000 visitors a year.

Many visitors are attracted to the site purely for the botanical aspect including the rainforest collection palm collection and other significant plant species. The Gardens also hosts a number of community events such as various community programs, as well as music, cinema and open air theatre in the grounds.

Since September 2013, the ABG has been home for a small camp of Flying-foxes (FF's) typically around 500 individuals of which ~80% are Grey-headed Flying-fox (GHFF) and 20% Little Red-Flying-fox (LRFF). The peak number has reached close to 800. This is the first season the bats have used the ABG as a roosting and birthing location.

The GHFF is listed as a threatened species under the Threatened Species Conservation Act 1995 and is also listed as threatened under the Environment Protection and Biodiversity Act 1999. Although the LRFF is not listed as threatened under any state or federal laws, it is protected under the NSW National Parks and Wildlife Act 1974 and is included in this proposal.

The FF's are roosting in two main trees (Queensland Kauri Pine and Liquidambar), however, a range of trees are used, particularly when the temperature exceed35˚C. Some of these trees are directly above the Children's Garden, staff work zone and Gardens Cottage. This has resulted in the intermittent closure of the Children's Garden and potential health risks to staff and tenants. The presence of the FF's has also resulted in the closure of the community and entertainment events, which attracts around 10,000 people during this season. This use of the ABG as a FF camp site is damaging a number of significant trees including the most significant tree (Queensland Kauri Pine). The main outcome of this project is to relocate the entire camp and not allow any further roosting. Flying-foxes will be able to return for feeding only. The ABG will be monitored daily and ongoing maintenance disturbance deployed to prevent resettlement and establishment of a FF colony.

ABG/AC proposes to relocate the colony of FF's from the ABG to an appropriate target site located south of the ABG. This is an existing seasonal camp in the region, referred to as the Wodonga Creek Camp (WCC). While the preferred site is WCC, the FF's may choose to roost in other areas within the region. It is expected that some of the FF's currently roosting in the ABG will join the other existing camp; some may establish a new camp or individuals may leave the area completely. The location of any new camps will be assessed, and if deemed appropriate for FF's and the community, they will be permitted to stay. If the site is deemed inappropriate by land managers and the community, the camp will be re-disturbed until the FF settle in an appropriate sites. Three other main parks in the area have been mentioned as potential appropriate sites (Wonga Wetlands, Padman Park and Mungabareena Reserve) all three sites are managed by AlburyCity.

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This Relocation Plan (RP) is required by the NSW Office of Environment and Heritage (OEH) because the proposed relocation has the potential to harm a species of State and National Significance, and it is a requirement of the ABG/AC to demonstrate to the OEH the process for the proposed action following a process outlined in the Flying-fox management policy (2007). This RP outlines the proposed relocation methods, timing, communication, the potential impacts on the GHFF and LRFF, and other threatened species and communities and critical habitats in the area. It also outlines efforts to minimise and mitigate any significant impacts on the FF and other threatened species.

Flying-foxes will be dispersed from the ABG and other inappropriate sites using acoustic stimuli, including noises played through loud-speakers mounted on vehicles. The relocation of FF's from the ABG incorporates three key phases: (1) Initial dispersal; (2) 'defending' and 're-disturbance' from the ABG and other inappropriate sites; and (3) 'on-going' maintenance from the ABG. The initial dispersal stage will occur in March to April or as soon as approval is granted, and this will be for four (4) weeks. It is expected here that FF's will leave the ABG during this time and also be preparing to leave for their winter camps, which is a normal seasonal occurrence. The second stage will be defending any FF's that attempt to re-settle back at the ABG post the initial dispersal and may also include re-disturbing FF's at sites outside of the ABG where they are deemed to be roosting in inappropriate sites. Stage three (3) will be the on-going maintenance at the ABG if in late September, FF's attempt to re-settle when they return to the area. The timing, frequency, intensity and impacts of disturbance/dispersal effort will vary depending on the relocation stage, time of year, and behaviour of the FF's so as to minimise impacts on the reproductive output of the species.

Pre-dawn dispersal, to be conducted in the darkness of early morning as the FF's return to camp so as to encourage returning FF's to seek alternative roosting locations for that day; and evening-dispersal, is to be undertaken just before the FF's fly out to feed, so as to create an association of the camp with unpleasant stimuli so that FF's would seek alternative roosts for the next day. A monitoring program has been designed to attempt to assess the size of FF camps across the study areas (i.e. ABG and WCC) and the movement of individuals from the ABG, and FF welfare at all stages of the proposed relocation. (1) Direct monitoring of FF behaviour during all disturbance events within and outside of the ABG; (2) assessing and mapping the sizes and locations of new and existing camps within the study area where possible, before, during and after the relocation. The relocation has been designed to minimise potential impacts on the nationally threatened GHFF, and the protected species, LRFF. ABG will reduce or suspend dispersal activities during certain times in the life-cycle of the FF's if mortalities are found such as foetuses and young to minimise potential impacts. For example, dispersal activities will cease if dependent young that are separated from mothers are found but not yet capable of sustained flight are present.

In relation to the nationally and state listed species the GHFF, the loss of the ABG as a roosting site is unlikely to threaten the species or local population. Both LRFF and GHFF are a highly mobile species, regularly changing camps throughout the year in response to food availability, climate and stages of the reproductive cycle. Therefore, it is likely that most GHFF have roosted in multiple camps and know of their locations (Tidemann and Nelson 2004). The

proposed relocation is timed to commence at the time of mating for GHFF, however, breeding activity takes place during the daytime and hence the disturbance events will not interrupt directly interrupt this; the LRFF's will be in their late stages of pregnancy and/or birthing, however monitoring will be in place to manage this potential impact and the use of adaptive noise on the ground in response to FF behaviour. The timing of the proposed relocation is also approaching the seasonal migration period to leave the area, thus also could reduce the number of FF's likely to be directly affected by the relocation.

The ABG will still be available as foraging habitat for the FF's within the Albury area; they are also capable of rapid flight and are able to forage at least 10–20 km from their roost. The likely locations for new camps and the location of the existing camp WCC within the Albury area will still allow FF's to access food resources within the ABG and adjacent areas.

Glossary

ABG	Albury Botanic Gardens
ACC	Albury City Council - The ACC is the manager of ABG and within the document the responsibility of the proposed action will be referred to as AC (AlburyCity)
GHFF	Grey-headed Flying-fox
LRFF	Little Red Flying-fox
FF	Flying-foxes – The proportion of bats in the ABG is predominantly GHFF of ~75-80% with ~20-25% LRFF's. Although LRFF's are not listed as a threatened species, they are still protected in NSW, thus the document will refer to both GHFF and LRFF's in terms of the proposed action, as combined FF's unless specifically requiring them to be referred to separately.
WCC	Wodonga Creek Camp
ARCUE	Australian Research Centre for Urban Ecology
RBGM	Royal Botanic Gardens Melbourne
RBGS	Royal Botanic Gardens Sydney
DEPI	Department of Environment and Primary Industries
OEH	Office of Environment and Heritage (NSW)
MRC	Murray River Corridor – This refers to the section of the Murray River in between Wonga Wetlands, Padman/Mates Park, and Mungabareena Reserve in the east, south of Albury.
EC	Ecological community
EVC	Ecological Vegetation Community
WIRES	Wildlife Information Rescue and Education Services
Appropriate site	• a site that is considered 'suitable' by the FF's; • where no impact is likely on state and nationally threatened flora, fauna, or ecological communities; • one that is accepted by any potential nearby neighbours due to a minimum distance of 300 m from residences; • one that is accepted by land owners/managers due to compatible land use on or adjacent to the site; and • one that is large enough and contains enough vegetation that will survive permanent occupation by the GHFF camp (ideally, the site should be large enough to allow the camp

	to occupy no more than one third of the available roost vegetation at any one time, so that the camp may shift in time, in response to canopy degradation).
Inappropriate site	• a site that could be considered 'suitable' by the FFs, but has not been agreed upon by AC or other land managers (i.e. residential gardens, urban parks and reserves, parks and reserves other than south of Albury on the MRC); ○ FF's will not be re-disturbed from urban parks and gardens unless they return to roost at these locations for more than three (3) days. • one that is likely to impact on either state and/or nationally threatened flora, fauna, or ecological communities; • one that is not accepted by nearby neighbours due to the FF camp being situated within 300 m of residences; • one that is not large enough and/or does not contain enough vegetation that will survive permanent occupation by the Flying-fox camp. (Ideally, the site should be large enough to allow the camp to occupy no more than one third of the available roost vegetation at any one time, so that the camp may shift in time, in response to canopy degradation).
Initial disturbance	The initial dispersal refers to the noise disturbance event that will take place in the ABG for the first four weeks when the relocation program commences. It involves the noise events at the ABG and could also involve re-disturbance events from 'inappropriate' sites outside of the ABG if FF's settle in these sites.
Re-disturbance or re-disturb	Re-disturbance is a noise event that will take place if FF's settle in an inappropriate site once 'initially disturbed' from the ABG.
Follow-up defending	The follow-up 'defending' involves any noise events that are required post the initial dispersal within the ABG if FF's are still attempting to settle there; and at sites outside the ABG if necessary if FF require moving on from inappropriate sites or nudging on to a more appropriate location within an appropriate site.
On-going disturbance maintenance	This refers to any time of year that noise events can take place (with reference to the sensitive times of year for the FF's) that AC may require to be vigilant about FF's returning after the main initial dispersal has been successful in relocating the FF's. This is likely to be late September onwards when FF's are likely to return from their winter camps.
Nudge/Nudging	Nudging is the more gentle form of a noise disturbance event whereby it is used to gently and slowly guide the already roosting FF's at a site to adjacent habitat within the same

PART 1:

1. General information

The following relocation proposal is divided into two main parts. The first section includes all background information of the action and its purpose, which includes locations, methods and techniques, timing and processes, the types of potential negative impacts on flora, fauna or ecological communities, and monitoring. This is outlined from sections one to three. The second part of the proposal outlines the impact assessment covering the study areas involved for threatened flora, fauna or ecological communities that may be impacted due to the proposed action, including Grey-headed Flying-fox (GHFF) and Little Red Flying-fox (LRFF). Although the LRFF is not a threatened species under the TSC Act 1995, it is still a protected species under the National Parks and Wildlife Act 1974, and therefore related to in relevant sections in this proposal.

1.1 Title of action and name of applicant

Project title: Relocation of a Grey-headed Flying-fox and Little Red Flying-fox camp from the Albury Botanic Gardens.

Table 1 Applicant details proposing to take action

Name:	AlburyCity – Mr. James Jenkins
Title:	Director of Community & Recreation
Organisation:	AlburyCity & Albury Botanic Gardens (ABG)
ACN / ABN:	92 965 474349
Postal Address:	PO Box 323, Albury NSW 2640
Telephone:	[redacted]
Email:	**Contact person:** Paul Scannell-Albury Botanic Gardens Curator-pscannell@alburycity.nsw.gov.au

2. Background information of the action and its purpose

2.1 Project aims and objectives:

The aim of this project is to relocate a small camp of typically ~200-500 of FF's from the Albury Botanic Gardens, Albury; and to allow for the regeneration and replacement of significant plant specimens through prevention of roosting of any FF's in the Gardens. The aim is also to relocate the FF's because the roost location within the Botanic Gardens are directly above the Children's Garden, staff work zone and Gardens Cottage. This has resulted in the intermittent closure of the Children's Garden and potential health risks to staff and tenants

The Children's Garden is currently closed when high temperatures (~35°C) cause increased bat activity; there are exclusion zones surrounding the main roost trees for the general public, staff and volunteers. If staff and volunteers need to enter the roost zone, they are required to wear personal protective clothing.

The Gardens also offer recreational events, particularly over spring summer and autumn, many of which have been cancelled due to the FF's. Such events include:

- Community Events Program
- Music in the Gardens series
- Cinema Under the Stars
- "Midsummer Night's Dream" - four performances awaiting information and decision on bats
- These events attract around 10,000 people

The objectives are:

1) To ensure the viability and sustainability of the significant mature tree specimens within the ABG
2) To allow for ongoing horticulture, education programs and recreation and other actions outlined in the Conservation and Management Plan
3) To relocate the FF's camp from ABG to other existing appropriate sites within the region;
4) To minimise impacts on the FF's camps across Albury/Wodonga and to ensure the species remains viable in this area.

Success of the relocation will be determined by:

1) The relocation of 100% of GHFF and (LRFF') from the ABG camp within four weeks of commencement of the relocation activities without significant impact on FF's welfare (i.e. surge in reports of injury or death from wildlife carer groups);
2) Reasonable knowledge of areas of visitation and settlement by relocated GHFF, with follow-up consultation with all land managers of affected sites;
3) Settlement of GHFF in existing or new sites that adequately cater to FF's needs without causing unresolvable conflict with people;
4) Partial to full recovery of the trees damaged as a result of roosting FF activities;
5) Not closing the Children's Garden again due to FF's within the ABG; and
6) Absence of long-term roosting of FF's in the ABG.

2.2 Background development for the proposed action

Grey-headed flying-foxes are the predominant species of FF in the ABG, , with a few Little Red Flying Foxes occurring (~80% to 20% ratio). 2013 is the first known instance of a substantial colony of flying foxes establishing camp in the Gardens. The proceeding sections will refer to GHFF mainly but LRFF's will be acknowledged in appropriate sections when discussing the proposed action plans for avoiding negative impacts during their biological sensitive time when considering the relocation action (i.e. reproductive and birthing). Where relevant, both GHFF and LRFF will be referred to as FF's.

The proposal also considers that by the time approvals are assessed and potentially gained, GHFF may have naturally dispersed to their winter camps from April/May, which is their natural seasonal movement. For the LRFF, they are highly nomadic in their range and move in response to food resources. Therefore approval may be obtained, but the relocation action may not be necessary and therefore become a lesser action of defending the ABG if bats attempt to re-settle in the ABG when they return to the region in September 2014. If the bats do not show any signs of dispersing, then this proposed action for relocation (see Section 3) will be necessary and applicable.

FF's were first recorded roosting in the ABG in September 2013. Sixty FF individuals were recorded on the 29th September and the camp size has slowly increased and typically fluctuates between 200 and 500 bats (Figure 1). A recent survey from 28th February indicated that the camp had increased to ~750 FF's (Rodney van der Ree pers. com.). Only very occasionally have GHFF been seen roosting in small numbers of <10 individuals at the ABG during the day prior to this. As at 28th February 2014, there were 570 GHFF and <50 LRFF roosting in the ABG. Female GHFF at the camp have given birth to young and at the end of November 2013, ~90% of females were carrying young (Rodney van der Ree pers. com.). Crècheing behaviour was also occurred, which mean the pups were too heavy to carry by the female, but not yet strong enough to be able to fly even short distances. Juvenile GHFF's are generally able to fly significant distances from about the end of February to mid-March (Department of Sustainability and Environment 2012).

The colony at the ABG has established within the trees around the entrance to the Children's Garden. Upon arrival at the ABG in September, the bats initially roosted in the Queensland Box, Date Palms and Gingko, (Figure 2 and Table 2). In October 2013 the bats began roosting in the Liquidambar and the most significant tree in the gardens, Queensland Kauri Pine (QKP). Table 2 outlines the roosting trees and colony numbers since September 2013.

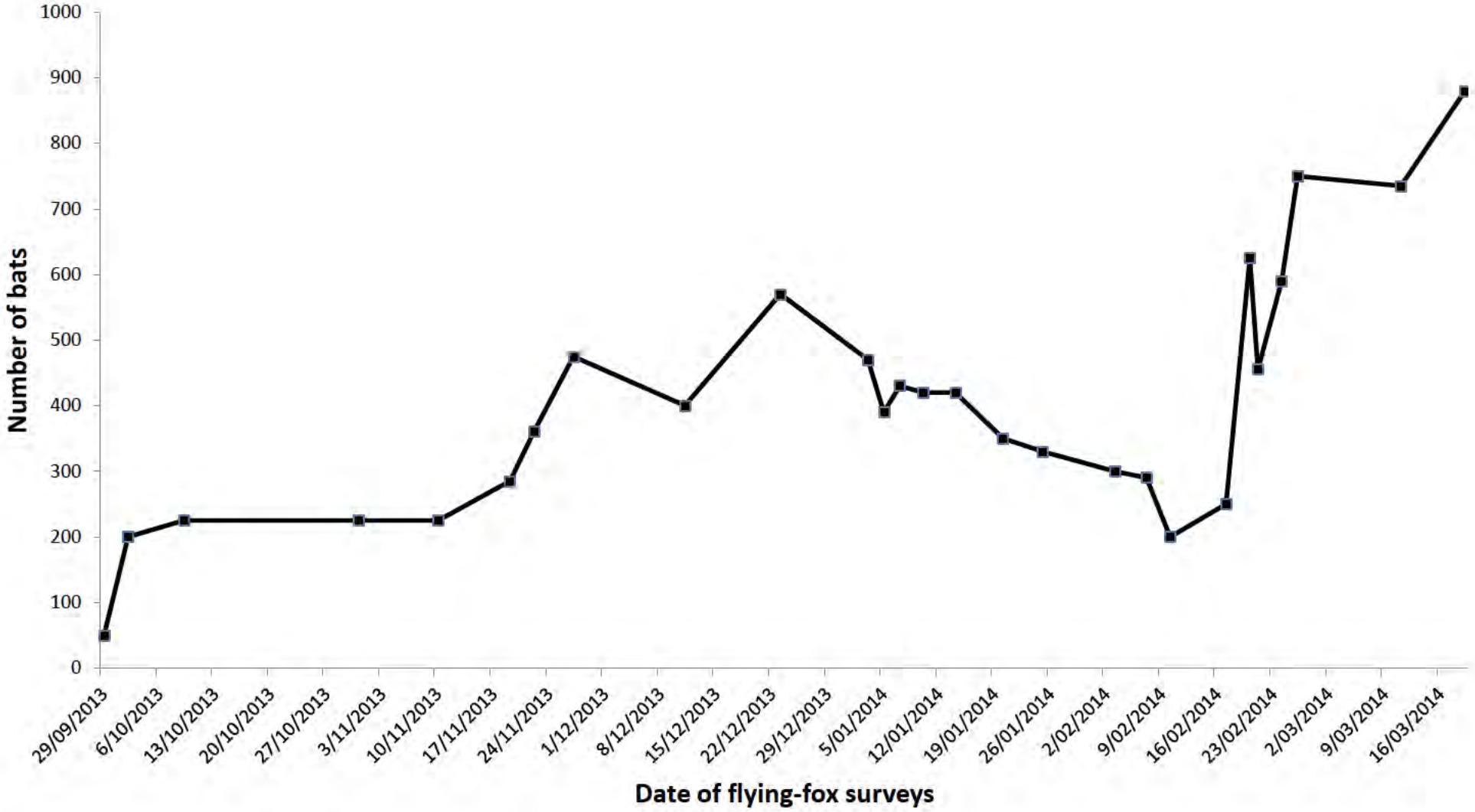

Figure 1 FF's population size at the ABG 29th September 2013 to 16th March 2014

There is an existing camp nearby known as the Wodonga Creek camp (WCC) (~3 km south of the ABG). This camp has been monitored by Victorian Department of Environment and Primary Industries (Glen Johnson) () since March 2012. GHFF numbers have fluctuated from ~2000 during summer to zero in the winter months. No FF's were present between July 2012 and February 2013. During 5th March 2013 to 16th May 2013 the following season the camp was between 250 and 1700; from 23rd May onwards zero bats were recorded (Glen Johnson pers. com.). This indicates that FF's from the region leave, and is likely to be migrating north for the winter.

GHFF's in the region appear to be regionally dynamic, and have occupied seasonal camps in the region for at least 40 years, including a camp below the Hume Weir (currently not active); and the WCC has been seasonally active since 2009. The WCC is also quite mobile where FF's move up and downstream of its current location, including locations along Flanagan's Creek, and Diamond Park, where LRFF's have also been recorded (Glen Johnson pers. com.) In addition to these, there has occasionally been <5 GHFF's roosting in the ABG. It appears that GHFF's in the region are therefore regionally dynamic, are likely to interact and interchange with each active camp at the time, therefore moving the small number of bats from the ABG (i.e. ~250-500) is unlikely to impact greatly on the GHFF population.

Figure 2 Roost trees and locations used by the FF's at the ABG

Legend:
Yellow – Roost trees on arrival 29th September 2013;
Red - Most common roost trees: Liquidambar and Californian Date Palm to the north and not currently being used; Queensland Kauri Pine to the south (current roost tree);
Blue – FF spread across this zone in hot temperatures;
Red dots – public areas such as garden offices, toilet block, staff cottage, and workshop;
Pink – Exclusion zone

2.3 Location of the action

2.3.1 Current Flying-fox campsite at the ABG

The Albury Botanic Gardens is the location where the proposed disturbance event will take place to disperse the current FF's camp (Figure 3). It is located within the City of Albury (AC), approximately 200 metres north of the Murray River and bounded by Wodonga Place to the east, Monument Hill to the west, and Dean Street to the north. The ABG is bounded predominantly by an urban residential/shops area, with a sports oval directly to the south which adjoins the Murray River immediately to the south (Figure 3). The grid reference taken from the centre of the ABG is 491823 (Easting) and 6007051 (Northing).

The ABG covers an area of approximately 4 ha, with the FF's predominantly choosing to roost in seven main tree species (Queensland Box, Canary Island Date Palms, Douglas Fir, Maidenhair Tree, Liquidambar, Queensland Kauri Pine, Claret Ash). Besides these, they have also been recorded occasionally roosting in the Lemon Scented Backhousia, Lilly Pilly, Desert Ash, Red Cedar, Dawn Redwood and Box Elders (Scannell pers. com.) (Figure 2 & Table 2). The closest water bodies are the Murray River, which is approximately 200 metres to the south of the ABG, and Bungambrawatha Creek which borders the Gardens to the north and west and has seasonal flows and occasional ponding.

Current roosting by the FF's is placing pressure on some of the individual significant tree species (Table 2). Approximately 50% of defoliation had occurred to the Liquidambar by 18th December 2013, thus only taking around six weeks for this to occur (Table 2). Although roosting is confined to a few species, when temperatures rise the bats spread themselves over more trees in an attempt to cool down; however tree damage is more prominent in the Queensland Kauri Pine and the Liquidambar.

2.3.2 The significance of the trees used as a roost by the Flying-foxes

Queensland Kauri Pine (*Agatha robusta*)

This tree has been noted by many Directors of Capital City Botanic Gardens as the best specimen they have seen. It was planted in 1910, is 103 years old and is of paramount importance to the heritage 'Australian Rainforest Collection'. This tree appears to be a preferred roost tree for the bats; and is being impacted by the bats roosting pressure causing young branches to snap, leaving open wounds and currently has lost at least 55% of its canopy. This tree is the most significant and important and requires the most protection; with short term action required if necessary.

Liquidambar (*Liquidambar styraciflua*)

The Liquidambar is located adjacent to the Children's Garden entry gate, but not actually inside the Children's Garden. It is approximately 85 years old and is showing around 50% defoliation damage currently, as well as receiving storm damage wounds in the last few years. The roosting has caused branches to tear away from the trunk, which has exposed the

cambium layers leaving small numerous wound sites. The current defoliation is also exposing some branches to sunburn and subsequent bark failure.

Claret Ash (*Fraxinus oxycarpa raywoodii*)

This tree is 40 years old and is has sustained a 30% defoliation rate since December 2013. However, this tree has no heritage concern as such but significantly influences the autumn foliage colour combinations of the collection of autumn specimens in this particular garden zone.

Other species

The remainder of the trees used for roosting (Table 2) appear to sustain the roosting pressure with little to no damage so far. The bats roost in these trees less frequently and also use them on hotter days as they spread out to find denser cooler shade areas. However, if the QKP and Liquidambar continue to be defoliated, these other trees will likely be used by the FF, with subsequently increasing rates of defoliation.

The ABG/AC aims to present the living plant collection in good health and form, not stunted, deformed, or uncharacteristic of the taxon. Although no 'severe' damage has been done so far, the ABG/AC is committed to preventing any potential further damage by wanting to relocate the bats as soon as possible. Given the close proximity of the Children's Garden to the roost, the health risks and amenity values are also a significant concern. As mentioned previously, the relocation of the small number of bats is unlikely to have a significant impact on the population due to the regionally dynamic nature of the camps in the area, therefore the move is considered to be an easy action. However, the methods of stimuli to be used, timing of the action and other species and communities has been considered in this licence application.

Table 2 GHFF roost size and roost trees used from first observations in September 2013

Date	Number	Location
29/09/2013	50	QLD Box and 2 date palms
2/10/2013	200	QLD Box and Ginkgo
9/10/2013	200-250	QLD Kauri
31/10/2013	200-250	Liquidambar
10/11/2013	200 -250	Liquidambar
19/11/2013	285	Liquidambar
22/11/2013	360	Liquidambar
27/11/2013	475	Liquidambar
11/12/2013	400	Liquidambar
23/12/2013	570	QLD Kauri
3/01/2014	470	QLD Kauri and Liquidambar
5/01/2014	390	Liquidambar
7/01/2014	430	QLD Kauri and Liquidambar
10/01/2014	420	Swirling between trees in arvo
14/01/2014	420	QLD Kauri
20/01/2014	350	QLD Kauri
25/01/2014	330	QLD Kauri
3/02/2014	300	QLD Kauri
7/02/2014	290	QLD Kauri
10/02/2014	200	QLD Kauri
17/02/2014	250	QLD Kauri
20/02/2014	625	QLD Kauri and Liquidambar
21/02/2014	455	QLD Kauri and Liquidambar
24/02/2014	590	Qld Kauri, Liquidambar & Claret Ash
26/02/2014	750	Qld Kauri, Liquidambar & Claret Ash
11/03/2014	735	Kauri, L/ambar, Cl. Ash & Gingko
19/03/2014	879	Kauri, L/ambar, Cl. Ash & Gingko

2.3.2 Target site and potential relocation sites

For the purpose of this proposal, it is unknown where the FF's will attempt to settle once dispersed from the ABG. However, based on FF expert advice, the ABG expect the FF's will join up with the known existing seasonal camp, the Wodonga Creek Camp (WCC). It is likely that this existing camp, named as the 'target site' will be where the dispersed FF will go to (Figure 4). WCC is considered an appropriate site (see criteria: page 19).

There are three other main parks and reserves that exist along the MRC, which are Wonga Wetlands, Padman Park and Mungabareena Reserve, which have been considered in this report (Figure 3). Only desk top assessments have taken place with no ground assessments at any of the sites; sites will be assessed as and when needed according to the criteria explained below on page 19.

These additional sites may contain threatened species (see Section 5). If threatened species are identified from the desktop assessment, it may be required for an on-ground assessment to be undertaken prior to the proposed relocation to determine the presence and location of any such species (i.e. Barking Owl). See Section 5 for further information.

In summary, the ABG (disturbance site) is 4 ha in size (John Patrick Pty. Ltd 1998); FF's may temporarily roost anywhere available within the AC LGA boundary (i.e. residential parks and gardens, street trees etc). This is a total size of 313 km^2. Furthermore, the total size of Wonga Wetlands is 80 ha; Padman Park 15 ha (Albury City Council 2004); Mungabareena Reserve 42 ha (Albury City Council 2005); and Wodonga Creek Camp (< 1 ha). Additionally, the habitat existing in-between these named parks and reserves, was also assessed for threatened flora and fauna via the Victorian Wildlife Database. Multiple one kilometre point buffer areas were plotted as the search areas using the southern edge of the Murray River as the most northern edge of the search area (MRC) (Figure 3).

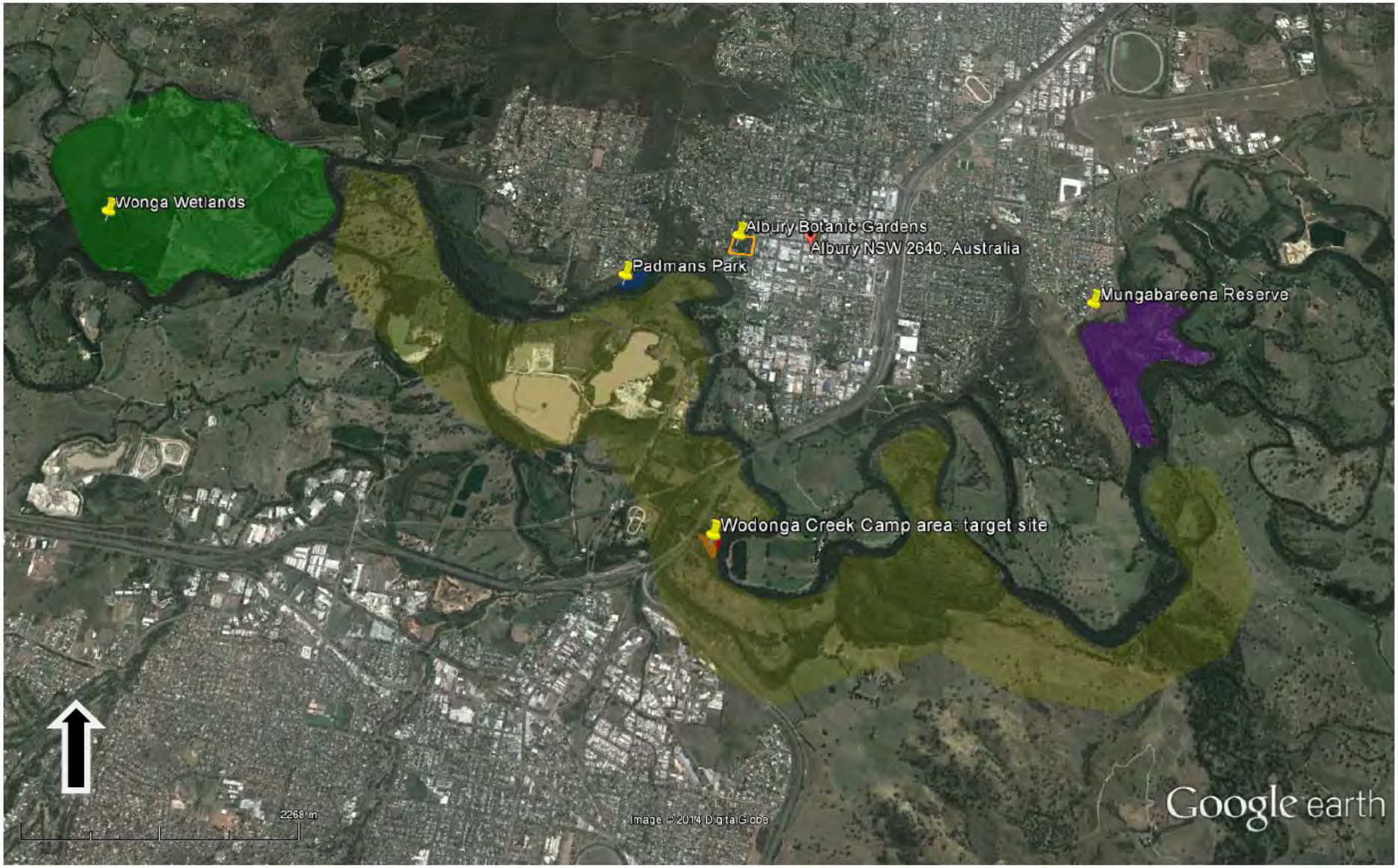

Figure 3 Landscape context showing the location of Albury Botanic Gardens in relation to Wonga Wetlands, Padman Park, Wodonga Creek Camp, Mungabareena Reserve, and the remaining Murray River Corridor (MRC in yellow) in-between

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Figure 4 The target site – Wodonga Creek Camp: this camp is mobile along the Murray river and Flanagan's Creek (Source of map: Glen Johnson)

Appropriate site

An 'appropriate' site is defined as:

- a site that is considered 'suitable' by the FF's;
- where no impact is likely on state and nationally threatened flora, fauna, or ecological communities;
- one that is accepted by any potential nearby neighbours due to a minimum distance of 300 m from residences;
    - FF's will not be re-disturbed from urban parks and gardens unless they return to roost at these locations for more than three (3) days.
- one that is accepted by land owners/managers due to compatible land use on or adjacent to the site; and
- one that is large enough and contains enough vegetation that will survive permanent occupation by the FF camp (ideally, the site should be large enough to allow the camp to occupy no more than one third of the available roost vegetation at any one time, so that the camp may shift in time, in response to canopy degradation); and
- is in accordance with the Flying-fox camp management policy (DECCW 2007) (See Associated document 1).

Inappropriate site

An 'inappropriate' site is defined as:

- a site that could be considered 'suitable' by the FFs, but has not been agreed upon by AC or other land managers (i.e. residential gardens, urban parks and reserves, parks and reserves other than south of Albury on the MRC);
- one that is likely to impact on either state and/or nationally threatened flora, fauna, or ecological communities;
- one that is not accepted by nearby neighbours due to the FF camp being situated within 300 m of residences;
- one that is not large enough and/or does not contain enough vegetation that will survive permanent occupation by the Flying-fox camp. (Ideally, the site should be large enough to allow the camp to occupy no more than one third of the available roost vegetation at any one time, so that the camp may shift in time, in response to canopy degradation); and
- does not meet sufficient needs from the Flying-fox camp management policy (DECCW 2007) (See Associated document 1).

The potential impacts of the proposed relocation will differ in severity and duration depending on where the action is taking place (i.e. on-site – ABG, or off-site). Inappropriate sites may be subject to noise disturbance activities in order to disperse the FF's; impact is likely to be short-term only, as FF's are known to quickly join con-specifics in undisturbed locations (as seen with the relocations at the Melbourne and Sydney Botanic Gardens). Potential impacts may include:

- Noise disturbance on identified threatened fauna species occurring nearby, which may disrupt nesting, foraging or resting etc;

- Trampling of identified threatened flora present;
- Introduction of weeds by ABG staff and volunteers to a site.

Settlement of GHFF at appropriate sites may subject threatened flora, fauna and ecological communities at the site to the following impacts:

- Competition with GHFF resulting in loss of habitat (i.e. trees for roosting, nesting, foraging etc);
- Increased nutrient loads from the faeces and urine of FF's, which could damage the understorey, and lead to increased weed diversity and growth;
- Introduction of exotic vegetation from seeds in FF's droppings;
- Canopy damage/defoliation from FF's roosting and scent-marking behaviour
- Tree death due to canopy defoliation over the longer term.

The ABG/AC are committed to the relocation plan with the responsibility to ensure all FF's dispersed from the ABG are to the best of our knowledge relocated to sites identified as suitable and appropriate. This may mean few or multiple re-disturbance events (off-site the ABG) if FF's attempt to settle at sites deemed inappropriate from the offset; and also could mean on-ground assessments may have to be carried out in the occurrence of a FF's attempting to settle where threatened species have previously been detected and need clarification of presence or absence prior to a new seasonal FF camp determined appropriate or not.

For an assessment of threatened flora, fauna and ecological communities present at or near the ABG, inappropriate and appropriate sites, within the Albury/Wodonga area see Sections 4 to 6.

2.4 Community attitudes

Step three (3) of the Flying-fox Management Camp Policy (2007) requests an assessment of community attitudes in relation to flying-foxes in general and the proposed action the ABG/AC wished to take, such as the relocation action. Even though a formal process of collecting community attitudes has not been currently undertaken; staffs at the gardens have had informal conversations with gardens users and the general community.

Since the establishment of the Flying Fox camp in the Botanic Gardens, Council has received correspondence (written and verbal) from residents and visitors regarding their future management. The main comments received relate to the impact Flying Foxes are having on the significant trees, and the forced closure of the Children's Gardens; and that generally the gardens is no place for the flying foxes. Council has communicated to all the correspondence that Flying Foxes are a protected species and Council is working with Office of Environment and Heritage and Flying Fox experts in developing a proposal to relocate the Flying Foxes to a more suitable location. This message has also been communicated through the media.

On the other hand, garden users and the general community are not adverse to the new camp in the gardens but on the contrary. Although they are posing a difficult situation, there has also been positive feedback about the animal in general, even though the ABG is not the best location for them.

Since the FF camp arrived in September 2013, the ABG/AC has engaged with a number of agencies in relation to effectively communicating and educating the community and public about FF's. Three local television events took place to interview ABG/AC staff (Director of Communications and Recreation) about the arrival of the bats to the gardens and what they were proposing to do with them. Additionally, volunteers and WIRES staff was also interviewed on separate occasions, in relation to FF's in general and caring for them. These TV events are perceived by the ABG as positive which informed the community in a direct and informative way. WIRES also provided the ABG with FF information pamphlets.

Currently, AC staffs are liaising with relevant persons relating to addressing the Aboriginal community and hearing their views in relation to this proposed action by the ABG/AC.

2.5 Legislative background for the proposal

2.5.1 State requirements

National Parks and Wildlife Act 1974

It is an offence under the National Parks and Wildlife Act (NP&W Act) to harm protected species without appropriate approval. FF's are protected under s. 98 of the NP&W Act, and there are significant penalties for harming protected fauna, for harming threatened animals or damaging their habitat, or for picking threatened flora, without an appropriate licence, consent or approvals.

The NP&W Act provides for prosecution of persons who do not hold a relevant licence under s. 132C for undertaking an activity for scientific, educational or conservation purposes that is likely to result in one or more of the following:

- Harm to any protected fauna, or to an animal that is a threatened species or is part of an endangered population or an endangered ecological community under the Threatened Species Conservation Act (TSC Act)1995;
- The picking of any protected native plant or of any plant that is a threatened species; or is
- Part of an endangered population or an endangered ecological community under the TSC Act.

All NSW Flying-Fox species are protected under the NP&W Act. The Office of Environment and Heritage are responsible under the NP&W Act for protecting and caring for all FF's on public land. GHFF are further protected under the TSC Act as the species is considered to be threatened and are listed as 'vulnerable' under Schedule 2 the TSC Act 1995.

Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) requires impacts on protected and threatened species to be considered when assessing and approving development proposals. It provides an assessment and approvals procedure for major infrastructure and other projects where the Minister for Planning, who is the approval authority, has declared these to be 'major projects', either through a state environmental planning policy or through an order published in the NSW Government Gazette.

The introduction of the TSC Act resulted in amendment of the EP&A Act so the impact of development and its activities on threatened species, populations, ecological communities or their habitats could be assessed. The licence application assessment procedure of the proposed FF's relocation was conducted in accordance with TSC Act and specifically the Flying-fox Camp Management Policy.

Threatened Species Conservation Act (TSC) 1995

The NSW Threatened Species Conservation Act 1995 identifies and protects native plants and animals in danger of becoming extinct. The TSC Act replaced earlier laws and updated existing regulatory procedures under the NP&W Act 1974 and the Environmental Planning and Assessment Act 1979 (EP&A Act). This allowed for the integration of threatened species assessment into the State's planning system and removed the requirement to obtain a separate threatened species licence in addition to development consent under the EP&A Act.

The purpose of the Act is to:

- Conserve biological diversity and promote ecologically sustainable development;
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- Protect the critical habitat of those species, populations and ecological communities that are endangered;
- Eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- Ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.

There are three schedules, two of which define threatened species:

- Schedule 1 of the TSC Act lists threatened species, populations and ecological communities and species that are endangered or presumed extinct.
    - The TSC Act defines 'endangered' as a species, population or ecological community that is likely to become extinct or is in immediate danger of extinction.
    - A species that is 'presumed extinct' has not been located in nature during the preceding fifty years despite the searching of known and likely habitats.
- Schedule 2 lists vulnerable species; and
    - A 'vulnerable' species is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate.
- Schedule 3 lists key threatening processes.

The TSC Act provides the conditions of assessment and licensing of any action that may affect or harm any of the threatened species and/or communities listed under the Act.

An impact assessment was conducted into the likely impacts of the proposed relocation on the FF's, following the process presented in Chapter 6 of the Flying-fox Camp Management Policy (**Associated document 1**). The Flying-fox Camp Management Policy was designed by OEH to address the often contentious issues associated with the three species of FF's that inhabit NSW. It aims to:

- Help stakeholders to understand and meet their legal responsibilities in regard to FF camps in NSW, and appropriately conserve and manage these camps ;
- Advise on ways of dealing with public complaints about FF's;
- Outline strategies for a FF education and communication strategy;
- Provide guidelines to assist in forward planning, so conflicts caused by locating inappropriate land uses near FF camps are avoided or mitigated;
- Provide recommended procedures for relocating FF camps;
- Inform those wishing to relocate FF camps how to obtain and meet licence conditions.

The proposed steps in Chapter 6 allow OEH to assess the project's impact, ensure that the best outcome for FF's and the community is planned for, and increase its knowledge of planning, conduct and evaluation of the relocation exercises so it can continue to improve outcomes for wildlife and the community. ABG/AC complied with the following steps in the formulation of the relocation proposal, which also covers nationally threatened species:

- Establish a Steering Committee (**Associated document 2**)
- Assess characteristics of the existing camp (ABG)
- Assess community attitudes
- Justify exceptional circumstances
- Identify options for alternative campsites
- Identify relocation methods
- Assess and plan for animal welfare
- Plan for contingencies
- Design and establish monitoring and feedback mechanisms

2.5.2 Commonwealth requirements

Environment Protection Biodiversity Conservation Act (EPBC) 1999

The EPBC Act is the Commonwealth legislation which aims to protect nationally listed species in any proposed actions (i.e. GHFF). It is the process for assessment of proposed actions that are likely to have a significant impact on matters of national environmental significance, or on Commonwealth land.

Matters of National Environmental Significance (NES) include:

- World Heritage properties
- National heritage places
- Ramsar wetlands of international significance
- Threatened species and ecological communities
- Migratory and marine species
- Commonwealth marine area
- Nuclear actions (including uranium mining)

An action (i.e. project, development, undertaking, activity, or series of activities), unless otherwise exempt, requires approval from the Commonwealth Environment Minister if the action is:

- Likely to have an impact on any matters of national environmental significance (i.e. in this case the GHFF);
- Carried out on Commonwealth land and is likely to have a significant impact on the environment;
- Carried out outside Commonwealth land and is likely to have a significant impact on the environment on Commonwealth land; or
- Carried out by the Commonwealth Government.

3. Description of the proposed action

This section focuses on the type of impacts, methods, timing, monitoring and feedback of the action in accordance with the Flying-fox management plan (2007).

There are certain elements of the proposed relocation of the FF camp from the ABG that may impact on a number of State-listed and EPBC-listed threatened flora and fauna species (including migratory birds), and ecological communities, either within or outside the ABG. The target and potential relocation sites are identified in Section 2 and described in detail in more Section 4.

3.1 The proposed methods and techniques for disturbance

3.1.1 Introduction

The proposed method to be used by the ABG/AC to relocate the FF's from Gardens is based on the experience gained during the successful relocation programs carried out by the Sydney and Melbourne Botanic Gardens in 2012 and 2003, respectively. The Public Environment Report which was written for the purpose of the Sydney relocation has been largely referenced throughout this proposal for the successful methods, techniques and action plans which have been modified for the ABG context.

3.1.2 The type of stimuli to be used

Noise

The stimuli to be used by the ABG/AC are based on a series of trials undertaken by RBG Melbourne prior to the relocation of the Melbourne GHFF camp; and have been successfully used at the Sydney Botanic Gardens relocation. These are a combination of human-generated sounds (e.g. whipper snipper's, chainsaws, starter pistols, banging metallic objects) as well as a series of computer generated noises, which the ABG/AC will play from a large speaker mounted on the back of a vehicle. To avoid habituation by the FF's, ABG/AC plans to play the range of noises in a random manner. Other noises will be produced by people on foot, e.g. deep, percussive noises from banging metal objects together or hand clapping. Another effective method which can be used if necessary is BirdFrite to assist the disturbance of potentially immovable individuals. If this proposal is approved, the necessary approvals (i.e. licences) will be obtained and staff training.

A major finding from the Melbourne relocation was that the FF's did not become habituated to the noise disturbance as long as the actual noise was varied and the direction of propagation continually changed. Therefore, producing different and unexpected sounds in response to the location of the FF's, either from the back of a vehicle or by the personnel is essential. The reactions of the FF's to all stimuli will be monitored and the level and variety of disturbance will be adjusted as necessary to ensure that the FF's do not become desensitised to the noise.

3.1.3 Frequency and duration of two disturbance approaches

Two approaches to disturbance will be used to disperse the FF's from ABG and potential inappropriate locations. Each type of disturbance will be suited to particular sites and life-cycle stages (Table 3). These approaches are evening dispersal and pre-dawn dispersal.

Evening dispersal

Evening dispersal activities will commence just before their usual fly-out time. Evening dispersal will consist of a coordinated effort to 'herd' FF's out of the ABG using people on foot and/or recorded noises being played from a stereo from the back of a vehicle. ABG/AC will decide this depending on resources available at the time. Noise generation will start away from the roost trees and slowly move towards them, driving the FF's from the trees towards their main exit routes, which are primarily in a southerly direction towards the Murray River (Scannell pers. com.). This is also the direction of the target site (WCC). Disturbance will start at a relatively low level to prevent FF's taking to flight in a panic, or milling/circling in confusion, which may increase the probability of collision and injury. Disturbance levels will only increase if FF's are observed to be flying out of the ABG without exhibiting obvious signs of distress.

Pre-dawn dispersal

Pre-dawn dispersal was highly successful at both the RBG Melbourne and RBG Sydney relocations and is an essential component to the dispersal. Pre-dawn dispersal will consist of staff being positioned in and around the roost trees prior to FF's returning in the early morning, and preventing roosting through the use of noise (vehicle mounted sound and manual generated sound, spotlights and potentially BirdFrite (if appropriate approvals are obtained). Pre-dawn dispersal will be carried out prior to sunrise, depending on what time bats from the ABG begin returning to their roost site. It is important to leave sufficient time for the FF's to find alternative roosts, which will be considered based on real time observation in the field, as the ABG/AC does not wish to disperse FF's into surrounding parklands and adjacent neighbours' gardens. If bats settle at inappropriate sites, the ABG/AC will liaise/communicate with land managers of these sites to determine the most efficient and acceptable method of dispersal depending on surrounding land uses; for example, restrictions in intensity or duration may apply to pre-dawn disturbances in the vicinity of hospitals and residential areas (**Communication Plan: Associated document 3**).

Table 3 Details of types and levels of disturbance at different times of year reproductive/growth stages for GHFF and LRFF

Time of year / reproductive condition	Type of disturbance / dispersal	Comments
February and into March	Begin with evening dispersal, followed by a pre-dawn dispersal	**GHFF**: Disturbance during this time will only occur if all young leave the camp at night and are capable of flying to Wodonga Creek Camp or a new formed camp. If monitoring reveals any young being left behind, dispersal will cease until young are big enough to fly independently. **LRFF**: Disturbance at this time for the LRFF will be carefully monitored. Females are in their third trimester of pregnancy and if monitoring reveals abortion of young and potential dropped newborns; the noise disturbance will be scaled back appropriately.
March to April (GHFF: conception; LRFF: birthing)	Pre-dawn and evening	**GHFF**: Males will be establishing territories so it is important not to allow any to roost on return from foraging – pre-dawn disturbance is important. All must be encouraged to relocate so they can establish territories elsewhere (i.e. hopefully Wodonga Creek). **LRFF**: Abortions during the later stages of pregnancy may occur. The ABG staff will search the ABG grounds and any other sites where disturbance occurs for aborted young after each disturbance episode. If aborted young are found, the Steering Committee will be notified for discussion.
May to July (GHFF: first trimester of pregnancy; LRFF: birthing and dependent young)	Pre-dawn and evening	**GHFF:** This is the window of time where the most intense disturbance activity can occur with the least impact on animal welfare. However, ABG/AC will search for potential aborted foetuses after each disturbance event. It is likely that the GHFF will leave the ABG at this time and migrate north to their winter camps; but the ABG/AC will remain vigilant for any small numbers that remain. **LRFF**: There is potential for dropped newborns and or flightless young to occur at this period, but with a low likelihood. ABG/AC staff will search for dropped newborns after each disturbance event. In the event of finding a newborn – the relevant wildlife carer will be contacted. ABG/AC will also

		ensure no flightless young at being crèche at this time so to avoid being abandoned.
August to September (GHFF: later stages of pregnancy; LRFF: independent young)	Pre-dawn and evening	**GHFF**: There is potential for GHFF to start returning from their winter camps from late September and attempt to re-settle at the ABG from this period onwards, therefore the ABG/AC will be prepared to activate their operational plan. Abortions during the later stages of pregnancy may occur. The ABG/AC will ensure searches are carried out within the ABG grounds and any other sites where disturbance occurs for aborted foetuses after each disturbance episode. If aborted foetuses are found, the Steering Committee will be notified and disturbance activities will cease. **LRFF**: Young are independent at this stage and are capable of sustained flight but still are dependent on the mother for milk. This is the time where the least likely impact will be for this species as mother and young should be able to locate each other. ABG staff will still be vigilant to monitor for potential abandoned young.
October to January (GHFF: young not flying, dependent on mother; LRFF: mating) #	Pre-dawn and evening	**GHFF**: Pre-dawn dispersal will deter mothers carrying young from roosting at the ABG, while evening dispersal will encourage mothers carrying young to leave the camp and seek alternative campsites. During this period the ABG/AC will note the date of first births if they occur on site and monitor any crèche events if applicable. **LRFF**: Mating will be occurring at this time; however the timing of the noise events are unlikely to disrupt mating given that this will be occurring during the daytime where no disturbance will be taking place.
December to February (GHFF: young beginning to fly, still dependent; LRFF: mating) #	Minimal follow-up disturbance within ABG if absolutely necessary. No disturbance elsewhere.	**GHFF**: Once too heavy to carry, young separate from mothers but remain dependent and incapable of sustained flight. The risk of separating young from mothers is high, and disturbance will be avoided. Females with young may still attempt to settle at the ABG during this critical period. Therefore, staff will survey the grounds daily for the presence of a crèche. Pre-dawn dispersal will only take place if there are no dependent, flightless pups left behind in trees. Disturbance will cease as soon as any flightless young are

		found. If a group of non-breeding adults are found to roost in the ABG, i.e. no mothers with young amongst them, or in the near vicinity, they will be dispersed with low-level noise disturbance as they fly out. **LRFF**: Mating will be occurring at this time; however the timing of the noise events are unlikely to disrupt mating given that this will be occurring during the daytime when no disturbance will be taking place.

It is important not to have strict cut-off dates for administering the types of disturbance, but to observe and monitor the growth stages of the FF's at ABG and act accordingly in relation to any presence of flightless young that are not capable of sustained flight. Seasonal variation of reproductive and growth stages based on real-time observations of both the GHFF and LRFF present in ABG will be used to inform the relocation process if this should occur during this sensitive period, if re-settling occurs from September 2014 onwards.

3.3 The timing and process of the relocation

3.3.1 Summary of timing of relocation

The proposed relocation is planned to commence from March 2014, or when all FF young are capable of sustained flight and not displaying crècheing behaviour. However, if the relocation process is not approved until after this date and FF's disperse naturally in April/May, the action will become a 'defending' (3) action instead of an 'initial disturbance' action (2). There are four main stages to the relocation, which are:

1) The monitoring and planning
2) The initial disturbance
3) 'Defending' of the ABG and 're-disturbance' from 'inappropriate' sites until FF's have re-settled in 'appropriate' sites
4) Ongoing maintenance of the ABG
5)

There will be no more than four weeks of twice daily noise disturbance in the ABG, which should be sufficient to disperse all GHFF and LRFF from the ABG. After this period, the ABG/AC will 'defend' and 're-disturb' with potential noise events at the ABG and/or surrounding inappropriate sites until FF's have settled in the existing camp or formed a new one. It is envisaged that the main relocation event will conclude after the four weeks of initial disturbance, hopefully by end of April 2014 if approvals are granted to match this time frame. There will be further 'defending' at the ABG from September 2014 onwards if required when FF's return from their winter camps. Pre-dawn noise will be used initially in this instance; however evening noise will be implemented if this is insufficient. The relocation event has been carefully timed to minimise any adverse impacts on the reproductive cycle and output of both species (Table 3 & 4). The disturbance activities will be modified at crucial times, such as when conception takes place for GHFF (March – May), and when females are heavily pregnant (August – September); disturbance will cease when young are independent but incapable of sustained flight (December – February). LRFF's will also be carefully monitored during these periods according to their corresponding sensitive times (Table 3). The ABG/AC has committed their staff to undertake follow-up re-disturbance within and outside the ABG until all FF's are settled in appropriate sites; or if appropriate, will train non-ABG staff to re-disturb bats from their land (i.e. private land owners who agree to FF settling on their land).

3.3.2 Initial dispersal from the ABG

The initial dispersal period is proposed to commence from when all young are capable of sustained flight (end of February/ early March). Disturbances are planned to operate on a twice daily basis for no more than four weeks from commencement. Previous relocations by RBGM and RBGS demonstrated no more than two weeks was necessary for the 'initial disturbance' to relocate FF's from the permanent roost location (Martin and van der Ree pers. com.). All bats had been relocated from the RBGS after one week of disturbance, with all tagged bats relocating to existing camps (John Martin pers. com.). If for any reason the FF population cannot be moved by noise disturbance after four weeks, disturbance will cease and ABG will seek further advice on alternative management methods, however this is very unlikely.

Evening dispersal at the ABG will commence at around dusk, up to 30 minutes before the FF's usually leave the ABG camp to forage. This will consist of a coordinated effort to drive them out of the ABG using a mix of noise types and levels of disturbance (e.g. vehicle mounted sound and/or manual generated sound). Noise generation will start away from the camp or roost trees to be targeted from the sides so that the FF's are driven towards their main exit routes (i.e. towards the south and south west and Murray River). This will be maintained for each evening thereafter until, in combination with pre-dawn disturbance, all the FF's vacate the site.

At inappropriate sites

If any number of FF's settles for at least three days at inappropriate sites outside the ABG, re-disturbance will occur, site conditions permitting. For example, the timing and duration of pre-dawn disturbances near a school, hospital or residential area will be negotiated with stakeholders if necessary for the best outcome. Also, ABG may want the FF's to settle in a location if it is near to a site where they could 'nudge' them along to a nearby section of habitat which is more appropriate.

Pre-dawn dispersal at the ABG will commence the morning after the first evening dispersal. Pre-dawn dispersal will consist of staff being positioned prior to FF's returning in the early morning and using acoustic stimuli to prevent settling. Pre-dawn dispersal will cease 10 minutes before sunrise to allow time for the FF's to find alternative roosting sites along the Murray River without being forced to fly long distances during daylight (FF's fly at speeds of approximately 25-30 kilometres per hour, and several potential roost sites and an existing camp lie within 5-10 minutes flight time – i.e. Wodonga Creek).

The process of both evening and pre-dawn dispersal over four weeks should be sufficient to disperse the FF's from ABG. Following this, there could be a period of dispersing FF's from inappropriate sites, as well as defending the ABG from FF's re-settling.

3.3.3 Defending ABG and disturbance from inappropriate sites – post initial four week dispersal (if necessary)

After the initial relocation, assuming that the FF's leave the ABG, the ABG will most likely require ongoing maintenance to prevent re-establishment of a camp, by commencing disturbance and dispersal activities as soon as any FF's are detected attempting to roost. This would give the FF's the immediate message that the ABG is not a suitable place to stay, and encourage them to seek alternative roost sites. ABG/AC will consider the sensitive reproductive cycle when following up re-disturbance which is outlined in Table 3. An Action Plan has also been adopted which also outlines monitoring required and is detailed in Table 4.

The primary methods of disturbance will be pre-dawn and evening disturbance. Pre-dawn disturbance will only be used outside of months when GHFF young are still carried by their mothers and are not able to fly to prevent separation of mother and young (i.e. December – February). Pre-dawn disturbance, if initiated immediately when roosting FF's in the ABG are

detected, should prevent mothers with young from landing, while still allowing them enough time to return to another camp nearby. Evening dispersal will also only be used if young are still attached to their mothers and/or are old enough to fly strongly and independently on their own. Disturbance will discontinue if dependent or non-flying FF young are found without their mothers.

3.3.4 Follow-up dispersal from ABG if necessary: September 2014 onwards – GHFF dependent young; LRFF independent young

Although it is possible that such follow-up disturbance may not be required on an ongoing basis (as was the case following the Melbourne relocation), there is a need to be vigilant, and to be prepared to reinforce the notion that the ABG is no longer a suitable site for a FF camp. It is important that no FF's are left to roost undisturbed in the ABG as that will attract other FF's to view the ABG as a suitable roosting site. FF's will still be able to use the ABG as a foraging ground at night, as disturbance will only target those GHFF's attempting to use the ABG as a daytime roost site. ABG/AC wants to prevent the situation from ever escalating to the point of camp relocation again. This means that disturbance may have to occur in the later stages of the breeding season for GHFF (i.e. August/September), to prevent resettlement attempts at the ABG when FF's migrate back to their summer camp locations.

Table 4 Action plan for different stages of the relocation program, including monitoring, relocation from ABG (and inappropriate camp sites), and on-going maintenance from August onwards (within ABG only)

Stage	Action	Rationale
Monitoring:	Conduct camp size surveys at the existing camps (ABG, Wodonga Creek and Hume Weir) weekly in the month prior to the relocation. Monitoring will continue during and after the relocation. During the relocation and for a couple of months afterwards, monitoring will occur at least twice a week, then decrease in frequency to weekly, then monthly, as FF's settle into existing and/or new camps. Leaders of the monitoring teams will report camp sizes to the project coordinator, and Steering Committee.	Regular and up-to-date data on the size of existing camps will help the ABG/AC determine the movement of FF's during the relocation. An increase in camp size is likely to be correlated with the number of FF's relocated from the ABG. ABG/AC staff and volunteers are being trained in fly-out and static counts.
Relocation March and April	Noise accompanying evening fly-out, start up to half an hour before normal fly-out time. Care will be taken to gently start with lower volumes not to panic the FF's, particularly LRFF's who may have newborns attached. Conduct pre-dawn dispersal. During evening dispersals, staff members and volunteers will work in concert to 'herd' the FF's out of the ABG via their usual exit routes. Senior ground staff will record duration, frequency, and level of disturbance; equipment used; weather conditions and FF's reactions. Data will be submitted to the Project Co-ordinator, to be compiled and submitted to OEH fortnightly. Site co-ordinators will also use walkie-talkies or mobile phones to plan the sequence of disturbance throughout different parts of the colony during evening	This is the period when the most intense disturbance activity will occur. If there are bats still remaining during the daytime, the FF's must not be disturbed during the day as **GHFF** could potentially be mating; and **LRFF** could potentially be giving birth to a newborn. Pre-dawn dispersals are an essential part of the relocation to prevent the FF's from roosting in the ABG. Disturbance will cease at sunrise to allow the FF's to fly to alternative roosts. FF's can fly on average 25-30 km/hr, and there is Wodonga Creek Camp only 3 km to the south of the ABG, where both GHFF and LRFF have previously roosted. During evening and pre-dawn dispersal, all staff will observe the FF's for signs of disorientation and/or collision, and communicate to the site co-ordinators via walkie-talkies or mobile phones.

Stage	Action	Rationale
Monitoring:	Conduct camp size surveys at the existing camps (ABG, Wodonga Creek and Hume Weir) weekly in the month prior to the relocation. Monitoring will continue during and after the relocation. During the relocation and for a couple of months afterwards, monitoring will occur at least twice a week, then decrease in frequency to weekly, then monthly, as FF's settle into existing and/or new camps. Leaders of the monitoring teams will report camp sizes to the project coordinator, and Steering Committee.	Regular and up-to-date data on the size of existing camps will help the ABG/AC determine the movement of FF's during the relocation. An increase in camp size is likely to be correlated with the number of FF's relocated from the ABG. ABG/AC staff and volunteers are being trained in fly-out and static counts.
	and pre-dawn dispersals, and modify or halt disturbance based on FF's behaviour, if necessary. **LRFF**: ABG/AC staff will conduct post ground searches for potentially dropped newborns. ABG/AC will also scan the camp daily with binoculars to determine the presence of newborns if possible.	
Maintenance (within ABG) On-going	Post the initial four week disturbance, on-going pre-dawn dispersal before sunrise may be necessary until there are no signs of re-establishment. At first sign of roosting, deploy evening dispersal to accompany fly-out. Follow evening dispersal with pre-dawn dispersal to prevent any FF's from returning. Ground staff will monitor all areas of the ABG daily and report sightings of FF's to the site co-ordinators and the Project Co-ordinator. Dispersal teams will then be mobilised for dispersal that evening and the following	**GHFF**: From August to September, the GHFF will be in the late stages of pregnancy. Birthing may occur from late September onwards, and mothers will be carrying dependent young. To reduce stress, pre-dawn and evening dispersals will be used. Abortion during the later stages of pregnancy may occur, but have been found to not occur so far during previous relocations (i.e. Melbourne and Sydney Botanic Gardens). ABG/AC will search the ABG camp site for aborted young after each disturbance event, disturbance will cease if aborted foetuses are found to discuss further action. Once too heavy to carry, young separate from mothers but remain dependent and incapable of sustained flight for several weeks (Dec –

Stage	Action	Rationale
Monitoring:	Conduct camp size surveys at the existing camps (ABG, Wodonga Creek and Hume Weir) weekly in the month prior to the relocation. Monitoring will continue during and after the relocation. During the relocation and for a couple of months afterwards, monitoring will occur at least twice a week, then decrease in frequency to weekly, then monthly, as FF's settle into existing and/or new camps. Leaders of the monitoring teams will report camp sizes to the project coordinator, and Steering Committee.	Regular and up-to-date data on the size of existing camps will help the ABG/AC determine the movement of FF's during the relocation. An increase in camp size is likely to be correlated with the number of FF's relocated from the ABG. ABG/AC staff and volunteers are being trained in fly-out and static counts.
	morning (pre-dawn).	Feb). Staff will survey the grounds daily to search for the presence of a crèche each evening. Pre-dawn dispersal will only take place if there are no dependent, flightless pups. Staff will also search the grounds for pups left behind by foraging mothers after each disturbance event. Previous experience has shown that FF's travel in groups; with an on-going monitoring program to ensure that no FF's are allowed to roost in the ABG for more than one night, a maternity camp will not be able to settle in the ABG between September and February. In the very unlikely event of a GHFF maternity camp re-settling at the ABG, disturbance will cease during the December - February period, and resume once all the young are capable of flying out at night. **LRFF**: From this time onwards, LRFF young are independent; capable of sustained flight but still dependent on the mother for milk. This is the time where least likely impact will occur as mother and young generally will be easily located. However, ABG staff will still be vigilant to monitor for potential abandoned young. Noise will cease if abandoned young are detected and reunited with the mother.

3.3.5 Response to Flying-foxes arriving and setting up a new camp; and follow up re-disturbance from inappropriate sites

If any FF's roost in a location considered suitable and acceptable by the community and land managers, they will be left undisturbed. If approval is dependent upon on-ground assessment, the ABG/AC will consult with land managers and the community, and leave the FF's undisturbed if their settlement is deemed acceptable and 'appropriate'. Any FF's that arrive in inappropriate locations (other than residential zones) will be immediately re-dispersed to encourage them to join up with the undisturbed FF's (Table 5). They will be dispersed in the evening followed by pre-dawn disturbance, using the techniques described above on pages 27 & 28, to prevent the development of an affinity for the site. The exception to methods described above applies to FF's found in inappropriate sites that do not pose the risk of long-term settlement, such as suburban backyards. The FF's will not be disturbed in such locations unless they persist for longer than three (3) days.

If any FF's roost in a vegetation corridor that contains a site that is identified as a suitable potential roost site, attempts will be made to carefully nudge, if necessary, the FF's along that corridor closer to the suitable site, without scattering them. This will be done using a 'post-dawn' disturbance method of a reduced intensity. This is a technique that was used in Melbourne, when GHFF were gently pushed along the Yarra River towards the preferred Yarra Bend site (Ivanhoe), using very low levels of disturbance. This method has also been used to 'nudge' the existing Yarra Bend colony within the boundaries of their own camp to increase the distance between the camp boundary and residential zones.

In the event of FF's attempting to settle in inappropriate sites, ABG/AC will commit to on-going dialogue with land managers and disperse FF's from these sites. However, FF welfare will be taken into account, particularly at the vulnerable stages of their reproductive cycle and appropriate action will be taken (Tables 3 & 4). In the case of birthing season, observations will first be made with binoculars to ensure there are not mothers with young within the group or in the vicinity, prior to any disturbance.

Although the movement of FF's into new or existing sites immediately following the relocation is likely to be directly attributable to the relocation, exchanges of FF's between camps is likely to occur as part of their natural pattern of movement in response to the availability of food resources. ABG/AC will disperse FF's from inappropriate sites for as long as necessary. The ABG/AC will commit to re-disturbance into the 2014-2015 FF season as re-settling attempts may occur. The Sydney Royal Botanic Gardens relocation of their FF's has been successful in dispersing the original camp size of ~5000 bats. The initial disturbance only took one week to disperse 90% (Federal Condition) of the camp. It is now 18 months since the initial dispersal and staff members are still conducting a pre-dawn noise event for a very small number of bats attempting to settle; however, the scale of this relocation and FF camp size was much larger in size than that proposed for ABG and was well established as a maternity camp for many years.

Table 5 Re-disturbance strategy at appropriate and inappropriate sites outside the ABG

Inappropriate sites[1]	Either pre-dawn and/or evening dispersal depending on the context of the surrounding environment (i.e. residential or parkland) and pending permission by land managers. No dispersal if there are flightless young. ABG/AC monitoring staff will map location of new camps and report to the Project Co-ordinator and Steering Committee (Associated document 2). The Project Co-ordinator will contact site co-ordinators to organise and mobilise dispersal teams.	FF's will self-regulate camp populations in accordance with the carrying capacity of the site. However, ABG/AC will assist in the dispersal of FF's from sites deemed to be inappropriate by any land manager. ABG/AC will assist in nudging FF's roosting in residential areas at the periphery of the camp further into the reserve, if requested by the land manager. This could be the case at Padman Park for instance, but is unlikely to occur at other potential camp sites which are not close by to residential areas.
Appropriate sites	ABG/AC to provide assistance through expert advice on horticulture, bush regeneration etc, and/or monetary contributions; whichever is negotiated at the time. The Curator of the ABG (Paul Scannell) and the Team Leader of Park and Recreation at Albury City Council (David Armstrong) will enter into negotiations with land managers regarding management of the FF's, whether any is required or not. No negotiations may be necessary and will be a case by case scenario. The Project Co-ordinator will assist with community consultation and education.	One of the criteria of success for the relocation project is the settlement of FF's in sites that adequately cater to their needs without causing unresolvable conflict with people. The ABG/AC is committed to assisting land managers in community education, and through contributions, financially or in kind, to ensure that the FF's are managed to the satisfaction of the land managers and the community, if so required.

1 For the purpose of this proposal, an inappropriate site is defined as either: 1) a site that could be considered 'suitable' by the FF, but impact is likely on either state and/or nationally threatened flora, fauna, or ecological communities; 2) one that is not accepted by nearby neighbours due to the FF camp being situated within 300 m of residences; 3) one that is not accepted by land owners/managers; and 4) one that is not large enough and/or does not contain enough vegetation that will survive permanent occupation by a FF camp.

3.4 Potential negative impacts

There are a range of potential negative impacts that could occur to FF's during the relocation process. The following identified negative impacts below are taken from the Sydney Public Environment Report, identified by the Sydney Royal Botanic Gardens. Each of the possible outcomes is explained along with the likely occurrence or severity of the problem, and proposed methods to identify and deal with the issue, such as searches for dead and injured FF's. Liaising with the land manager of WCC has confirmed a potential issue for monitoring due to the location of the camp requiring a boat/kayak to assess numbers and location. ABG will enter into negotiations to clarify the feasibility and frequency of the on-ground monitoring (Table 6).

3.4.1 Abortion of young: September – this will only apply to GHFF if they attempt to re-settle later in the year; and to LRFF during the initial disturbance

There is potential for FF's to abort their young if they experience excessive levels of stress during the disturbance. Mass abortions have been recorded during periods of food shortage and inclement weather (Eby and Lunney, 2003), however not during a noise event. FF camps that have been located at previous Botanic Gardens have been subject to various noises and public activities, therefore they are used to a relatively high level of human activity and disturbance. The ABG/AC will conduct behavioural monitoring in relation to the disturbance so as to help identify the level of stress which might trigger an abortion, if found. The ABG/AC team will immediately scale back disturbances if any abortions are detected and attributable to the relocation process; if abortions continue to be detected, all disturbance activities will cease and the Steering Committee will be notified for discussion. ABG/AC will also consult regularly with the Wodonga Creek Camp manager, and any other potential new camp managers, as well as wildlife rescue and carer groups, so as to obtain timely information on any negative impacts of the relocation on FF welfare, and to determine whether or not to modify or halt disturbance/dispersal activities.

Abortions were not detected during the relocation of GHFF from RBGM, or the follow-up disturbance, despite the Melbourne relocation involving more FF's and occurring over a longer period of time (i.e. 30,000 FF's were relocated over 6 months). Isolated incidences of abortion can be expected, as young females (2 year olds) often do not carry to term (Eby and Lunney, 2003). Furthermore, the impact of abortions on the FF's population as a whole is unlikely to be significant for several reasons – during this sensitive time for the FF's, the level of noise will be minimal (pre-dawn) used as the defensive disturbance by ABG/AC staff if attempting re-settling occurs; and no pregnant females will be present when the most intensive noise events take place (i.e. March/April).

An influx of new FF's to an existing camp is unlikely to result in abortion of young by either the resident FF's or the incoming individuals. Camps of FF's fluctuate in size very quickly and in large numbers. It is not uncommon for camps to change in size by tens of thousands of animals within periods of a week(s), and historically, some camps included hundreds of thousands of

individuals. As an example, the Kuringai Flying-Fox Reserve, north Sydney usually contains an average of ~27,000 Flying-foxes, but numbers have reached ~70,000; which was attributed to animals moving south in response to a mass flowering event of Spotted Gum (*Corymbia maculata*) in that area. Finally, the small number of FF's (~200-300) is not expected to cause high levels of stress to existing FF's at the existing camp of Wodonga Creek.

3.4.2 Dropping of dependent pups: GHFF (September to early February) and LRFF (May to July) - this will only occur if FF's successfully re-settle at the ABG or re-settle at an inappropriate site

Relocation may cause female FF's carrying dependent young to drop them through stress induced responses such as panicked flight. This is most likely to occur during October to January, after which the young become increasingly independent. However, as the pups are solely responsible for staying attached to the mother when she is in flight, staff will be trained to begin with low-level disturbance/dispersal so the females can be prepared for flight and not be panicked into sudden movements that may result in the dropping of pups.

Within the ABG, staff and volunteers will conduct one survey per day with binoculars and/or spotlights. Staff will search all the trees in their designated area for pups separated from their mothers, or pups that are unable to fly out with their mothers in the evening. Upon finding any independent but flightless pups, dispersal will cease until all pups are capable of fly-out. Monitoring for flightless pups will be carried out all sites in and outside of the ABG before confirming a disturbance event can occur.

Should ABG be required to disperse FF's from inappropriate sites, monitoring teams will search first for independent but flightless pups with binoculars and/or spotlights to ensure there are no vulnerable young incapable of sustained flight prior to commencement of a noise event.

In the event of finding abandoned pup/s on the ground, ABG staff and volunteers will follow wildlife rescue protocol to assist trained and licensed wildlife rescuers where possible. These include: removing any surrounding threat to the animal, covering with a milk crate or box, and contacting wildlife rescue such as WIRES for advice and rescue; the pups will be turned over to trained and licensed carers and reared until they are old enough to be released. ABG/AC is committed to funding the rehabilitation of injured and/or orphaned animals, including costs incurred for food, housing, and medical care, if required.

Females are unlikely to drop or reject their dependent young during the relocation from the ABG because:

1) The most intense initial disturbance will occur outside of this sensitive period for GHFF's.
2) Actual disturbance during the September to February period (for GHFF) will only consist of pre-dawn 'defending disturbance'; hence it is a lower intensity of noise level; and between April to May (for LRFF) noise levels will be planned so not to panic the FF's.

3) Mothers have a strong maternal instinct. Even on very hot days, the rate of mortality of dependent young is low, suggesting that mothers that are still carrying young will take their young with them to seek out cooler conditions. It is those FF's that are in the intermediate stage (i.e. too large to be carried by their mother, too small to fly strongly) that are most at risk and no noise events will take place during this time.

3.4.3 Desertion of semi-dependent young (GHFF: December to February) and (LRFF: May to July)

This period is considered the most sensitive to cause stress to mothers and young. It is when the pups are too heavy to carry but are still dependent on their mother. It is possible that stress associated with the relocation may cause mothers to desert young that are too large for them to carry, but are not yet fully independent. It is noted that there is an overlap here between carried young and crèche young, therefore ABG staff will survey the ABG or inappropriate sites, to determine the presence of mothers with young, and if flightless young are found (i.e. survey for crèche young post a fly-out), disturbance will not go ahead.

ABG/AC will implement an on-going maintenance program to prevent the establishment of a GHFF maternity camp in the ABG from late September onwards (Table 4). From the end of the initial disturbance stage (four weeks from commencement), the ABG will be monitored by staff and volunteers on a daily basis. As soon as FF's are seen roosting or attempting to roost in the ABG, evening dispersal, followed by pre-dawn dispersal will be used, or vice versa, whichever is more relevant. If wildlife carers or the community report any reasonable concern for the desertion of young, either through the use of the FF Hotline or ABG website, reports will be collated by the Project Co-ordinator for discussion with the Steering Committee. On the advice of the FF researchers and on-ground staff, the Project Managers will modify or halt disturbance until safe to recommence (i.e. absence of vulnerable pups prior to dispersal; absence of deserted pups after evening or pre-dawn dispersal). Normal follow-up relocation activities (i.e. evening and pre-dawn dispersal) will recommence after the ABG confirm that all juveniles are large enough to leave the camp at night.

3.4.4 Malnutrition, excessive stress and death

The relocation activity has the potential to cause some level of stress in the FF's, and at the most severe case could result in malnutrition or death, particularly to either the older and younger individuals. This may occur if the disturbance by acoustic stimuli is delivered at such intensity and frequency that their normal behaviour is severely disrupted.

3.4.4.1 Malnutrition

Malnutrition is impossible to monitor and would only be detected if individuals have been found and taken into care to be assessed. ABG/AC will liaise with camp Managers (i.e. Glen Johnson and/or Stuart Robertson for the Wodonga Creek Camp) who are familiar with the site, as well as wildlife rescue and care groups such as WIRES often receive the first indications of disease or welfare issues from the animals they receive. Sightings and reports will also be collated from the FF Hotline.

The likelihood of malnutrition occurring is unlikely because all disturbances will occur during dawn or dusk when FF's either returning or heading out to forage. Furthermore, the most intense periods of dispersal will occur during the autumn months, leading into winter, when daylight hours are shortest, leaving the longest periods for feeding.

3.4.4.2 Stress

Disturbance is likely to cause some stress to the FF's. Stress is unlikely to cause mortality. FF's are intelligent animals and quickly learn to adapt to a changing environment. The semi-nomadic nature of their behaviour is an indication of their willingness to move and change camps in response to environmental stimuli. Thus, we expect that they will do likewise during the relocation and move away from unpleasant stimuli to camps that are undisturbed, such as the Wodonga Creek Camp, which is only ~3 km's south of the ABG. See also Section 3.5.5.

3.4.4.3 Death

Death of adults is unlikely because ABG/AC will be disturbing or dispersing FF's for only very short periods of time. FF's camps are rarely quiet and restful, and FF's are accustomed to regular disturbances within their camp during the day, particularly camps in highly urbanised locations. This may be in the form of fights between con-specifics, disturbance by predators, or other human forms of disturbance such as lawn mowing, street sweeping, garden maintenance and people activity.

If any dead Flying-foxes are found, and can be attributed to the relocation action, ABG/AC will scale back the frequency of disturbance. The dead FF's will be examined by a vet to determine cause of death. If more than five dead FF's are found, all disturbances (including dispersal activities) will cease immediately until the bodies have been examined by a vet and the cause of death resolved.

3.4.5 Disruption to mating: March to May

The relocation activity may result in disruption to the mating cycle of FF's by the arrival of the dispersed FF's from the ABG to the residing FF's if they join up with the existing Wodonga Creek Camp. However, this is unlikely because there are frequent movements of large numbers of FF's; and the ABG/AC is only moving a very small number.

This impact can only be detected during the birthing season, some months later, and can only be detected if previous birthing proportions have been documented at the camps. No birthing records to date have been documented at the Wodonga Creek Camp; however, ABG/AC will organise for this to occur if the outcome of the relocation is that the ABG bats join the WCC.

If noise events are necessary to continue into June 2014, the number of FF's involved will likely be even fewer as it will be defending disturbance from the ABG, to prevent the FF's from re-settling.

3.4.6 Cumulative sleep debt

Cumulative sleep debt from disturbance activities may potentially increase stress levels, and may induce the aforementioned negative impacts on FF's. However, it is likely that initial dispersal will only take between one week and four weeks; the existing camp is only 3 km's

south of the ABG, therefore the relatively short disturbance to roosting and being able to settle nearby will reduce this risk. Furthermore, noise events will not occur during the day, which is when bats rest and sleep.

3.4.7 Disorientation-injury

There is potential for FF's to suffer injury through disorientation because of sudden disturbances. The dispersal team will be co-ordinated by site co-ordinators (via hand held radios or mobile phones) to stop and start noise disturbances in response to observed FF's behaviour, such as circling, disorientation and collisions. The lowest level of noise required to facilitate disturbance and dispersal will be employed and escalated slowly to prevent FF's taking to flight in panic. Staff and volunteers will search the premises after each dispersal event for injured FF's. Injured FF's will be cared for by professional wildlife carers.

If any injured FF's are found, the frequency of disturbance will also be reduced. ABG/AC will consult FF's camp Managers and wildlife carers on the likely cause of the injuries. If more than 5 injured animals are found, disturbance will cease immediately, and ABG/AC will seek advice from OEH and the Steering Committee. This is considered unlikely to happen.

3.5. Monitoring

3.5.1 Aims of the monitoring program

The criteria to measure the success of the relocation (as outlined under the objectives in Section 1, will be determined by):

1) The relocation of all the FF's of the ABG camp within the March to June 2014 period without significant impact on FF's welfare (i.e. an increase in reports of injury or death from wildlife carer groups);
2) Reasonable knowledge of areas of temporary settlement by relocated FF's, with follow up consultation with all land managers of affected sites;
3) Settlement of FF's in existing or new sites that adequately cater to their needs without causing unresolvable conflict with people;
4) Follow up disturbances preventing FF's from future establishment of permanent camps at ABG will allow increased life expectancy and partial to full recovery of the trees damaged as a result of roosting FF's; and
5) Absence of long-term resident FF's in the ABG.

3.5.2 Monitoring disturbance techniques

All staff and volunteers involved in all noise events will keep a log of every disturbance activity, including location, date, time, duration, equipment used, frequency (if applicable), method, names of the people involved, and their roles. Staff will be instructed to apply acoustic stimuli of the lowest intensity at the start of each disturbance event, so as to prevent FF's from taking to flight in panic, particularly in the most sensitive stages of their reproductive cycle. The level of disturbance will be increased gradually, until FF's begin to wake up and signs of unease (e.g. flying to another roost tree, squabbling with con-specifics etc).

Ms Joanne Ainley and Dr Rodney van der Ree, from the Australian Research Centre for Urban Ecology, Royal Botanic Gardens Melbourne have offered assistance with on-ground activity training, and will advise ground-staff on effective and safe disturbance methods.

3.5.3 Monitoring camp size

The number of FF's within a camp is counted or estimated using static or fly-out counts. Static counts are conducted during the day, where an observer walks around or through the camp and counts or estimates the number of roosting FF's. Fly-out counts are conducted at dusk, where observers strategically positioned around the camp count or estimate the number of FF's as they fly out from the roost. Fly-out counts require multiple people, and the minimum number depends on the size of the camp and the number of streams that the FF's form as they leave the camp. The number of observers would be dependent on how the FF's are spread across the ABG and other camps at the time of the count. Neither counting method produces an accurate

estimate of camp size, however if conducted consistently, and any biases are held constant, they should provide a reasonable estimate that can provide a trend in camp size.

Both fly-out and static counts have been conducted at the ABG since they arrived in September 2013. A range of count methods including static, fly-out, direct count adjacent to the camp and photo with counting, have been carried out at the active existing WCC nearby. Counting has been occurring since 20th March 2012 by the Department of Environment and Primary Industries (DEPI); however counts are difficult to carry out at WCC for reasons such as:

- Inability to conduct land based assessments;
- Need regular access to boat to carry out water based assessments;
- Sometimes the Murray River is fast flowing, hence can be difficult counting FF's from a stable position. Two persons would be ideal for stability and more accurate assessment;
- FF are usually in thick Willow foliage so can be hard to count;
- FF's from other colonies such as Bendigo and Nurmurkah also transit through the Wodonga Creek Camp. This is known from previous radio tracking data (Glen Johnson pers. com.).

Currently, land managers from WCC and ABG/AC are in negotiation regarding monitoring effort required at the WCC and its feasibility.

Counts at the ABG will continue to take place daily, up until the initial dispersal commences, after which they will be replaced by the counts as part of the relocation plan (Tables 4 to 6). Fly-out counts are unlikely to be reliable or effective as the fly-out pattern is likely to be affected by evening dispersals and movement of FF's to different areas within the ABG or into adjacent properties. Therefore, only static counts will be conducted at the ABG after the relocation begins.

Based on the outcomes of the monitoring feasibility at WCC, the following ideal monitoring will apply to be able to gauge a rough estimate of where FF's have relocated to. The counts will take place at the ABG since the camp arrived in September and records from the WCC since March 2012 will help facilitate comparisons of camp sizes before and after the relocation. Camp surveys of the both camps will be undertaken (as best as possible regarding the WCC), until the relocation commences. Once the relocation has started, daily static counts will take place at the ABG; surveys will be conducted at least twice a week at each location where the FF's from the ABG are known to have gone or are likely to have gone. Once disturbance stops, the counts in locations where the FF's remain will continue twice a week with survey teams for as long as considered necessary in consultation with the landholder, and then will gradually be reduced in frequency to that of fly-out counts.

Thus, once the dispersal commences, we will be relying on both static and fly-out counts to monitor camp sizes. However, regular counts at other known campsites (e.g. WCC) currently undertaken by DEPI will continue to provide an independent assessment of camp size.

3.5.4 Monitoring distribution of FF's

A number of scenarios may happen when the relocation occurs. The FF's dispersed from ABG may temporarily roost in a location across the Albury/Wodonga area until they join up with the WCC, or establish a new camp in a suitable location; or leave the local area entirely. The most likely scenario is that the FF from the ABG joins up with those at Wodonga Creek, either immediately or after temporarily roosting elsewhere. In the unlikely event of a new camp forming, the location of each camp will be identified and mapped accordingly. The 'Bat Hotline' will be used for the public to call in on if any new camp is suspected; plus the 'potential' sites will be scoured for bat numbers if an increase of bats is not recorded at the WCC site. The ABG/AC will collate records and forward the details to NSW OEH.

The location and size of each camp will be recorded and mapped using a combination of aerial photos and on-site mapping with a GPS. The location of all temporary roosts that the FF's use during the relocation will also be mapped, including the spatial extent of each roost and the number of FF's occupying the site. Large increases or decreases in the spatial extent of a camp (in combination with the counts) will be used as an indicator of the movement of FF's among camps and temporary roosts.

ABG/AC will also use the Bat Hotline for people to report new groups of roosting FF's or large increases or decreases in the size of existing camps.

3.5.5 Monitoring the impacts of the relocation on FF's welfare

There have now been two known major relocations (Melbourne and Sydney Botanic Gardens) which have used the same methods and protocols and neither have found any negative impacts on the welfare of the FF's that could be attributed to the relocation action; therefore the same is expected at the ABG considering it also only a small number rather than thousands.

Furthermore, the level of stress has been previously monitored across ten camps in Queensland and three in New South Wales. The large scale study which took place over 12 months was initiated by Dr Hume Field looked at the impact of a colony when they were dispersed. They found that the level of stress was similar levels to that of the natural occurrence of mating (Department of Agriculture, Fisheries and Forestry 2013). Therefore, FF's can withstand a reasonable amount of disturbance and stress; however care will still be taken as outlined in Section 3.

ABG/AC will also liaise closely with local wildlife rescue and care groups to ensure that the ABG/AC receives rapid feedback on any increase on numbers of FF's coming into care during and immediately after the relocation, and what situations they are found in (e.g. injured on powerlines, malnourished, orphaned young, etc.).

3.5.6 Monitoring the number of FF's that relocate to unsuitable site(s) and how long they remain

ABG/AC will communicate its wish to be informed of the locations of relocated FF's to as many people within the Albury/Wodonga area as possible (including key stakeholders such as local councils and wildlife rescue and care groups). A FF Bat Hotline will be established for people to inform ABG/AC if FF's start to roost in sites other than those named in this proposal. In each case, ABG/AC will attempt to ascertain details of the site (e.g. roost tree species, land use, etc.) and its location, how many FF's are there, what species they are, and how long they remain. Records will be kept of all such sightings, and those reporting them will be contacted to discuss the appropriate next steps (i.e. if the site is appropriate or inappropriate, hence the need to re-disturb). If the site is considered potentially suitable and appropriate, a site visit may be required to confirm suitability, and if confirmed, negotiations with the landholder and consultation with neighbours will take place if it has not been done already.

3.5.7 Monitoring follow-up disturbance at sites other than the ABG

Each new camp will be mapped with a GPS, and static or fly-out counts conducted to determine the camp size prior to disturbance. ABG/AC will consult with land managers on disturbance and dispersal methods, so as to minimise potential impact on the community. ABG/AC will also request assistance from land managers in identifying areas of concern within the disturbance site, e.g. sites with known threatened species or ecological communities; disturbance/dispersal staff will be instructed to avoid such areas if possible.

3.5.8 Monitoring methods and plan

Table 6 Summary of monitoring methods to determine the distribution and welfare of FF's

Stage	Action	Methods
Pre-relocation (February to March)	Estimates of camp size	• Current static or fly-out counts at ABG's and the Wodonga Creek Camp will continue prior to the actual relocation. • Counts will be done on a daily basis at the ABG and weekly at the WCC. The distribution of the bats will be mapped at the ABG and WCC and forwarded to the OEH on either a fortnightly or monthly basis.
Relocation – initial disturbance (March to April) & Defending disturbance	Estimates of camp size	• Static and fly-out counts will continue at the camps. • Static counts will be conducted daily at ABG's from the start of the relocation. • Static or fly-out counts will be carried out at least twice per week at WCC during and after the relocation; the frequency will be gradually reduced to weekly, then monthly, as determined by the need for real-time information on FF's distribution across the local area. • The distributions of all known camps will be mapped; and roost locations within the ABG if necessary.
	Stress levels	• ABG/AC will monitor general FF's behaviour during all noise events at the ABG and re-disturbance from inappropriate sites and adapt the noise levels and intervals accordingly.
On-going defending at the ABG/re-disturbance at external sites	Estimates of camp size	• The number of FF's roosting in the ABG will be monitored on an ongoing daily basis via static counts. • Monitoring of other existing camps (i.e. WCC) will also continue on an ongoing usual basis (i.e. twice weekly if possible).
	Reproductive output	• If any FF's re-settle within the ABG during subsequent breeding seasons, surveys of the timing of births and proportion of females with young will be assessed. ABG will also liaise with relevant land managers to coordinate a possible monitoring of first births and reproductive success, if accessible.
	Stress levels	• ABG/AC will monitor general FF's behaviour during all noise events at the ABG and re-disturbance from inappropriate sites; and act accordingly using on-ground adaptive management.

*The ABG/AC will document every count data in spreadsheet format throughout the duration of the relocation, noting how many bats roosting; and an estimate of the number of bats attempting to settle (i.e. flying over and/or swirling but not landing).

PART 2:

4. General descriptions of the study areas

4.1 The disturbance site: ABG

Albury Botanic Gardens is managed by Albury City Council, is approximately 4 hectares in size and is situated adjacent to the central commercial area of the City of Albury. It is bounded by Wodonga Place in the east, Dean Street to the north, Thurgoona Place to the west and Smollett Street to the south. The ABG are on the northern edge of the river flats adjacent to the Murray River, at the foot of Monument Hill to the west and with a mix of parkland and bushland including Padman Park along the river to the west and with the sports ground and municipal pool opposite south of Smollett Street. Two major traffic routes are next to the ABG - Wodonga Place forms an extension to the inter-state Hume Highway and Smollett Street turns into Riverina Highway which is a major regional route to the west. The ABG's soils are typically heavy alluvial deposits on clay but the soil profiles vary greatly (ABG 1998).

The ABG hold a number of different roles as a heritage asset, horticultural collections, an educational resource (with tours and a Children's Garden) and as a recreational venue (picnics, walking, looking and relaxing, weddings). There are over 1000 species representing some 450 genera and 95 plant families, and rainforest and palm collections which are very extensive for a southerly location. The ABG were accorded "Classified" status by the National Trust of Australia (NSW) in 1987 and have local heritage recognition and are also of State Significance. The major tree species from earlier plantings are listed in Table 7.

The listed trees are of primary significance as remnants of the early planting of the Gardens and as major components of the ABG's character. The major trees have been recommended to be retained, as part of the heritage and structure of the ABG (with a planned program for tree replacement as necessary). Some of the outstanding tree specimens include the following.

Landscape Architects]:Queensland kauri (*Agathis robusta*); Bunya bunya pine (Araucaria bidwilli) – near south-east entrance; Flame tree (*Brachychiton acerifolius*) – Creek Lawn; Atlas cedar (*Cedrus atlantica*) – near main entrance; Deodar cedar (*Cedrus deodar*) – near sundial; Lemon scented gum (*Corymbia citriodora*) – near main entrance; Native teak (*Flindersia australis*) – near Wishing Well; Liquidamber (*Liquidamber styraciflua*) – Central Ponds Lawn; Pin oak (*Quercus palustris*) – near statue of Melpomene; Swamp cypress (*Taxodium distichum*) – Fern Walk; Australian red cedar (*Toona australis*) – Fern Walk; English Elm (*Ulmus procera*) – first tree planted in the ABG (ABG 1998).

Some of the older more impressive trees are showing senescence or signs of decline and work continue on regeneration or replanting – this is the case for the elms of Elm Avenue. In light of the risk of loss due to Dutch elm disease or Elm Leaf Beetle, alternative replacement species to elm have been considered including Hackberry (*Celtis occidentalis*), Japanese zelkova (*Zelkova serrata*), Honey locust (*Gleditsia triacanthos*) and Maiden Hair Tree (*Gingko biloba*). Replanting decisions of elms are placed in the wider context of all other elms in Albury.

The Camellia collection is mostly in the north-west of the ABG. The Australian collection of Australian and indigenous plants is on the western side of Bungambrawatha Creek. There is a Ponds Lawn and a Rose Bed Lawn.

The Conservation and Management Plan of Albury Botanic Gardens (1998) includes extending and enhancing the rainforest and fern collections; retaining the dense perimeter planting; retaining the major trees, the single species of Elm Avenue and the palm collections and managing senescent and declining tree species with appropriate replacements.

In terms of threatened fauna in the ABG; there is the current Grey-headed Flying-fox and the Gang-gang Cockatoo has previously been recorded (2009). According to the current Wildlife Atlas, no other threatened fauna occur at the ABG. See Sections 5.3 & 5.4 for a more detailed description of these threatened fauna.

Table 7 The major tree species from earlier plantings in the ABG

Original plantings 1877-1900	***J. E. R. Fellowes plantings (1901-36)***	***Rainforest plantings (1937-60)***	***Conifer plantings (1937-60)***
English Elm (*Ulmus procera*)	Queensland Kauri (*Agathis robusta*)	Yatay Palm (Butia yatay)	Dawn Redwood (*Metasequoia glyptostroboides*)
Bunya Bunya Pine (*Araucaria bidwilli*)	American Cotton Palm (*Washington filifera*)	Chilean Wine Palm (*Jubaea chilensis*)	Douglas Fir (*Pseudotsuga menziesii*)
Senegal Date Palm (*Phoenix reclinata*)	Indian Bean Tree (*Catalpa bignonioides*)	Palm spp.	Swamp Cypress (*Taxodium distichum*)
Canary Island Date Palm (*Phoenix canariensis*)	Skyduster Palm (*Washingtonia robusta*)	Slender Lady Palm *(Rhapis humilis)*	Cedar of Lebanon (*Cedrus libani*)
Liquidamber (*Liquidamber styraciflua*)	Chinese Elm (*Ulmus parvifolia*)	Senegal Date Palm (*Phoenix reclinata*)	Weeping Norway spruce (*Picea abies "Pendula"*)
Atlas Cedar (*Cedrus atlantica*)	Cabbage Tree (*Cordyline australis*)	Queensland Brush Box (*Lophostemon confertus*)	White Spruce *(Picea glauca)*
	Maidenhair Tree (*Ginkgo biloba*)	Plum Pine (*Podocarpus elatus*)	California Intense Cedar (*Calocedrus decurrens*)
	Australian Red Cedar (*Toona australis*)	*Syzgium ventenatti*	
	Deodar Cedar (*Cedrus deodar*)	Rosewood (*Dysoxylum fraserianum*)	
	Swamp Cypress (*Taxodium distichum*)	Chinese Photinia *(Photinia serratifolia)*	
	Holm Oak (*Quercus ilex var.* Ballota)	Brush Cherry (*Syzgium australe*)	
	Honey Locust (*Gleditsia triacanthos*)	Firewheel Tree (*Stenocarpus sinuatus*)	
	Coast Redwood (*Sequoia sempervirens*)	Queensland Bean Tree (*Castanospermum australe*)	
	European Fan Palm (*Chamaerops humilis*)	Smooth Rambutan (*Alectryon subcinerius*)	
	Ash (*Fraxinus oxycarpa*)	Water Gum (*Tristaniopsis laurina*)	
	Swamp White Oak (*Quercus bicolor*)	River Casuarina (*Casuarina cunninghamiana*)	
	White Ash (*Fraxinus americana*)	Lilly Pilly (*Waterhousea floribunda*)	
	Pin Oak (*Quercus palustris*)	Native Teak (*Flindersia australis*)	

Original plantings 1877-1900	***J. E. R. Fellowes plantings (1901-36)***	***Rainforest plantings (1937-60)***	***Conifer plantings (1937-60)***
	Greek Strawberry Tree (*Arbutus andrachnea*)		
	Golden Elm (*Ulmus procera* "Louis Van Houtte")		
	Flame Tree (*Brachychiton acerifolius*)		
	Spanish Oak (*Quercus canariensis*)		
	Quercus sps.?		
	Lone Pine (*Pinus halepensis var.* brutia)		
	Bur Oak (*Quercus macrocarpa*)		
	Lemon Scented Gum (*Corymbia citriodora*)		

4.2 The 'target site': Wodonga Creek Camp

The Wodonga Creek Colony is a mobile colony where FF individuals move up and down areas of habitat running from the Murray River, along Flanagan's Creek to Diamond Creek, with the Hume Freeway intersecting above. The WCC cannot be seen from a terrestrial view point and a boat is needed to access the camp to undertake monitoring, and even then visibility is poor. Therefore the proportion of each species is unknown, but there are currently ~1500 GHFF's and LRFF's. The last survey conducted by kayak was carried out on 19th February 2014 (Glen Johnson pers. com.). A reasonable number of advanced young approaching independence and hence sustained flying capacity was also noted (Glen Johnson pers. com).

The camp is located at the southern end of a mid/edge of stream island which is dominated by exotic Crack Willows which are considered very low environmental significance. There are few River Red Gums at the periphery of the camp that no or very little impact has occurred to date. There are no significant vegetation classes that occur at this camp. There is additional very low considered significance vegetation surrounding this location which will support an additional ~500 individuals if necessary, in accordance with the Flying-fox management plan (2007) and the criteria for being 'appropriate' (Figure 4). This island is also located in a quiet protected location along Flanagan's Creek; the Willows are dense and the camp site does not pose a risk or social problem to human and residential zones and uses.

Other threatened species other than the Grey-headed Flying-fox include: Barking Owl (six records; most recent 1999); Murray Cod (one record: 2011); and Bluenose Cod (one record: 2011). Although the Barking Owl has previously been recorded at this site; there are no individuals nesting or roosting currently as informed by Glen Johnson who manages and conducts FF counts at the WCC. Therefore, if the relocated FF's settle at this site, it is unlikely to cause harm or damage to other threatened species and habitats. See Section 5.

4.3 Other potentially appropriate parks and reserves

4.3.1 Wonga Wetlands

Wonga Wetlands is located on the western outskirts of Albury, NSW, along the Riverina Highway and is in the floodplain of the Murray River. It is an area of approximately 80 hectares, previously farmed and grazed, and is an ecosystem of seven lagoons and also billabongs (predominantly man-made with some naturally occurring). Wonga Wetlands only flood rarely now because of the building of the Hume Dam and regulation of the Murray River for irrigation (ACC 2014). This resulted in many of the floodplain wetlands and billabongs drying out, destroying breeding habitats of birds and fish – Wonga Wetlands is now being restored and helping with the natural flow of water by using water from Albury City's treated wastewater systems. Albury City Council is responsible for the management of the wetlands (ACC 2014).

Wonga Wetlands is a haven for wildlife and popular with birdwatchers, photographers, bushwalkers (three walking trails exist) and families and is also important for a variety of research projects. There is a Visitors Centre (once a 1890s homestead and due to be expanded), an Aquatic Environment Education Centre, picnic and barbecue facilities and six bird hides for

watching wildlife in a natural setting (ACC 2014). There is also a working Indigenous campsite, the Wiradjuri Cultural and Education Centre (established by the local Wiradjuri people with a grant from the NSW Government and support from AlburyCity) that helps visitors to better understand Wiradjuri history and culture. An Indigenous Scar Tree can be found in the area (ACC 2014).

There is diverse native flora at Wonga Wetlands including River Red Gum (*Eucalyptus camaldulensis*) trees (some mature and ancient, others young) and aquatic and semi-aquatic plants.

As many as 154 bird species have been recorded in Wonga Wetlands, including Little Black Cormorant, Yellow-billed Spoonbill, Great Egret, Straw-necked Ibis, White-faced Heron and Black Swan. The White-bellied Sea-eagle has also been recorded just south of the Wonga Wetlands nearby Cooks Lagoon (NSW Wildlife Atlas & MDFRC 2007). Mammals recorded include Echidna, Eastern Grey Kangaroo, Little Mastiff Bat, Sugar Glider and Fox.

Fish recorded at Wonga Wetlands include Crimson-spotted Rainbow Fish, Golden Perch, Murray Cod, Redfin, European carp. Frogs recorded include Barking Marsh Frog, Common Froglet, Growling Grass Frog, Peron's Tree Frog and Pobblebonk. Invertebrates include yabby, pond snail, caddis fly, mayfly, water boatman, midge, diving beetle and dragonfly. Reptiles recorded at the wetlands include Blue-tongue Lizard, Eastern Snake-necked Turtle, Eastern Brown Snake, Tiger Snake and Red-bellied Black Snake.

Threatened species occurring at Wonga Wetlands include: Brown Treecreeper (2009); Purple-Crowned Lorikeet (2012); Speckled Warbler (1999); Rainbow Bee-Eater (2008); Little Lorikeet (2007); White-bellied Sea-eagle (2004); Australian Bittern (1994); Great Egret (1994); Sloanes Froglet (1999); River Swamp Wallaby Grass (1996). The Brown Treecreeper, Purple-crowned Lorikeet, Little Lorikeet, and White-bellied Sea-Eagle are discussed in Section 5.3.1 because key habitat and resources may be impacted by the proposed action. The remaining species' key habitat requirements are not considered likely to be affected.

4.3.2 Padman Park

Padman Park as well as Mates Park is 15 hectares in size, located adjacent to the Murray River, below Monument Hill Parklands and bordered by Day Street. It is approximately one kilometre west of the ABG. It is Crown land and managed by Albury City Council (AC). Padman Park is used by walkers (tracks present), dog walkers, picnickers, bike riders, birdwatchers, photographers, and for fishing and relaxing. There is also a children's playground for families (Albury City Council 2004).

The vegetation is riparian bushland with no threatened EVC's occurring at the site. Management of Padman Park includes long term extensive weed removal and control, revegetation and habitat restoration; and AC will consider FF habitat restoration if they choose to settle at this site but on-ground assessments would still need to be carried out (David Armstrong pers. com.). One main management objective is to create a significant flora and fauna link between Hovell Tree Park, Monument Hill Parklands, Wonga Wetlands, Murray River Corridor and Gateway

Island. Some exotic trees are being retained for cultural and historical reasons and removal of others is being staggered, and certain pest harbouring vegetation such as hawthorn will be removed to help eliminate rabbits (Albury City Council 2004).

More than 40 species of bird have been recorded in Padman Park (Parklands: Albury Wodonga website), two threatened bird species are known which are Gang-gang Cockatoo and the Barking Owl (NSW OEH 2014) (see Sections 5.3 & 5.4); six reptiles; and two mammals (Albury City Council 2004). If FF's attempt to settle at this site, on ground assessments would need to be considered for suitable habitat, and the presence of the Barking Owl, as it is considered a likelihood that FF's may disturb this threatened species, see Section 5.

4.3.3 Mungabareena Reserve

Mungabareena Reserve is a 42 ha reserve located off Mungabareena Road, between Eastern Hill and the Murray River, East Albury, NSW. It is Crown land with Albury City Council as Trustees.

The Reserve is located on a floodplain and consists of degraded natural wetland and billabong areas. It is used by leisure walkers, dog walkers and cyclists and has numerous other uses such as fishing, boat launching, bird watching/ feeding, kite flying, model plane flying, cross country running, Army manoeuvres, photography, art, book reading, public events, student research projects and school activities. The area also has great cultural significance for the Wiradjuri and other Indigenous peoples and there are some Aboriginal Scarred Trees along the Murray River.

The Reserve's higher ground, which is only infrequently flooded, consists largely of pasture species and herbaceous weeds and has River Red Gum seedlings and scattered rushes as the only native species present. The low-lying areas have a mixture of native aquatic and semi-aquatic species common to the area.

Existing known flora in the Reserve include River Red Gum trees (some large specimens and some hollow-bearing) with some regeneration, a plantation of native Eucalypt trees, Willows and environmental weed trees, a stand of Plane trees (in the Southern/boat ramp area, to be actively managed with deadwooding and thinning), Poplars, robinias, thistles, paspalum, blackberry and aquatic plants (including rushes, Water Couch and Flat Sedge) (Albury City Council 2005)

Sixty-four different species of birds have been recorded; with the Black-chinned Honeyeater (*Melithreptus gularis*) a known threatened species, the Barking Owl and the White-bellied Sea-eagle has also been recorded ~1 km north-east of the reserve adjacent to a lagoon (NSW Wildlife Atlas) (see Section 5.3 & 5.4). The floodplain billabongs and depressions are frequented by waterbirds (ducks, herons, egrets, waders, darters, pelicans etc.), the large River Red Gums are used by hollow dependent animals (including kingfishers, parrots, treecreepers, pardalotes, martins, possums and gliders) and the River Red Gum tree regeneration is utilised by small insect feeding birds (thornbills, warblers, whistlers, honeyeaters etc.), often from the Eastern Hill area (ACC 2005).

At least four species of frog have been found amongst the rushes (including the Common Froglet (*Crinia signiferia*) and the Plains Froglet (*Crinia parinsignifera*)) and at least two species of turtle live in the billabongs (the Snake necked Turtle (*Chelodina longicollis*) and the Macquarie Turtle (*Emydura macquarii*) have been recorded) (ACC 2005). Reptiles recorded have been the Eastern Blue-tongued Lizard (*Teliqua scincoides*), the Common Brown Snake (*Pseudonaja textilis*) and the Red-bellied Black Snake (*Pseudechis porphyriacus*) (ACC 2005).

Management of the Mungabareena Reserve focuses on habitat restoration with full recognition and attention to: i) Indigenous and European cultural heritage, ii) natural water flows and water quality, iii) biodiversity impact, iv) aesthetics and community recreation, v) improved access to and views of the river. There are two broad management areas – the low lying parts of the reserve subject to flooding where the natural processes are being enhanced, and the areas above the regular flood line where management is concentrating on the strategic links with the low lying habitats and revegetation. The gradual systematic removal of willow trees through the reserve has been recommended, and the peninsula area is being kept as mown open space. Control burns are considered an essential part of management of the site on the higher areas and tree hazard assessments are carried out in the peninsula area (ACC 2005).

Currently, on-ground assessments are being carried out by an independent consultant to verify the presence and location of the recently recorded breeding pair of Barking Owls (Davidson 2014). If FF's attempt to settle at this site, it is considered a likelihood that FF's may disturb this threatened species depending on if and where it's roosting and potential nesting site is, see Section 5. Additionally, depending on the timing of the burning, this reserve may not be suitable for FF's to settle, Based on this assessment, Mungabareena Reserve may not be considered an appropriate site taking into account threatened species and current management actions.

5. Threatened Flora, Fauna, (other than GHFF) and Ecological Communities

5.1 Introduction

The AC is required to identify and assess the potential significant impacts on threatened flora, fauna, and ecological communities that may occur as a result of the proposed FF relocation action. This section considers the environment of the disturbance site, the Albury Botanic Gardens (ABG), the 'target site' (Wodonga Creek Camp: WCC) and the general area of habitat along the section of Murray River Floodplain zones between Wonga Wetlands (WW) and Mungabareena Reserve (MR). This latter section will be referred to hereafter as MRC, referring to the Murray River Corridor. No habitat assessments have been carried out at any sites mentioned in this proposal however, FF's are known to roost in riparian vegetation types therefore it has been considered as an option here. For the target site (WCC) as the preferred relocation site, AC has liaised with the land managers to confirm support for an approximate additional 500 FF's to WCC (**Associated document** 4).

5.2 Sources of information

A review of existing information on threatened species and communities at the aforementioned sites is presented in this section. More specifically, the following requirements are addressed:

1. Review of existing information (e.g. OEH NPWS Wildlife Atlas; and the Environment Protection and Biodiversity Conservation Act Protected Matters Search Tool – hereafter referred to as EPBC PMST);
2. Victorian Biodiversity Atlas (VBA);
3. The nature and extent of remnant patches of nationally threatened ecological communities that may potentially be affected by the relocation, based on existing EC/EVC mappings;
4. Threatened Species and Communities Recovery Plans (see references)
5. Relevant Legislative Documents
6. Albury City Council Consultant Reports
7. Albury City Council Biodiversity Strategy (2012-2016)

The presence of threatened flora and fauna was determined across the Albury LGA, the target site (WCC), and along the MRC to the south of Albury, including Victoria.

The Albury LGA region was selected as the search geographic region to search for threatened species and ecological communities from the NSW Wildlife Atlas. A ten kilometre buffer was selected in all directions from the centre of the ABG to search for EPBC-listed species from the PMST. The Victorian Biodiversity Atlas (VBA 2014) was also accessed to search for national and state threatened flora and fauna species between and including Wonga Wetlands, Padman Park and Mungabareena Reserve. The riparian section (MRC) in-between Wonga Wetlands and Mungabareena was also considered for threatened species in the desk-top search (Figure 3).

All threatened species and ecological communities identified at 'inappropriate' sites (i.e. urban backyards; parks and gardens; and any other vegetation patches not existing along the MRC are considered unlikely to be impacted upon by the proposed relocation of FF's. The AC is committed to immediately moving FF's on from these sites and the potential impact at these sites is extremely short term and therefore unlikely to have long term effects on species persistence. From previous experience from the Melbourne Botanic Gardens relocation, GHFF at re-disturbance sites readily left and joined with GHFF at undisturbed sites.

All threatened species and ecological communities that may occur at 'appropriate' sites such as WCC have the potential to be impacted upon by the proposed relocation. An assessment of the likelihood of occurrence of these threatened species and communities at potentially appropriate sites, and the potential impact from the establishment of a FF camp was conducted and is presented in Section 5.3.

5.3 Assessment of Impact for Flora, Fauna and Ecological Communities

5.3.1 Summary of types of impact

Short-term – inappropriate sites

The potential impacts of the proposed relocation will differ in severity and duration depending on where the action is taking place (i.e. on-site – ABG, or off-site). Inappropriate sites may be subject to noise disturbance activities in order to disperse the Flying-foxes. Impact is likely to be short-term only, as FF's are known to quickly join con-specifics in undisturbed locations, seen by the Melbourne and Sydney Botanic Gardens relocations.

Potential impacts may include:

- Noise disturbance on identified threatened fauna species occurring nearby, which may disrupt nesting, foraging or resting etc;
- Trampling of identified threatened flora present;
- Introduction of weeds by ABG/AC staff and volunteers to a site.

The above impacts are short-term only with a noise disturbance event only requiring one pre-dawn or evening visit to re-disperse the bats from a site.

ABG/AC staff will take the necessary care to avoid the trampling of any threatened flora potentially present and the introduction of weeds to a site by checking and cleaning footwear and gaiters before and after visiting the sites.

Long-term – appropriate sites

Settlement of FF's at appropriate sites may subject threatened flora, fauna and ecological communities at the site to the following impacts:

- Competition with FF's resulting in loss of habitat (i.e. trees for roosting, nesting, foraging etc);
- Increased nutrient loads from the faeces and urine of FF's, which could damage the understorey, and lead to increased weed diversity and growth;
- Introduction of exotic vegetation from seeds in FF's droppings;
- Canopy damage/defoliation from FF's roosting and scent-marking behaviour
- Tree death due to canopy defoliation over the longer term.

The scale of the impact is considered minimal due to only a small number of FF's which require habitat in these areas. Based on ~50 FF's per tree, there is a possibility of ~10 trees/tall shrubs to be taken up as additional habitat by the FF's.
There is also a potential reduction in:

- daytime foraging resources for diurnal birds;

- daytime hollows for nesting for hollow-dependent birds and mammals;

FF relocation could alter understorey habitat which may:

- alter nesting suitability;
- alter foraging resources (i.e. could decrease or increase for some fauna species);
- create competition for flora species by change in composition; and
- lead to the introduction of weeds which may be beneficial for some fauna species.

The ABG/AC are committed to the relocation plan with the responsibility to ensure all FF's dispersed from the ABG are to the best of our knowledge relocated to sites identified as suitable and appropriate. This may mean few or multiple re-disturbance events (off-site the ABG) if FF's attempt to settle at sites deemed inappropriate from the offset; and also could mean on-ground assessments may have to be carried out in the occurrence of a FF's attempting to settle where threatened species have previously been detected and need clarification of presence or absence prior to a new seasonal FF camp determined appropriate or not.

Table 8 Threatened flora, fauna and ecological communities considered for either no or short-term impact only in the study areas

Key:
Threatened Species Conservation Act 1995 (TSC): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
National Parks and Wildlife Act 1972 (NPW): **P**-Protected
Environment Biodiversity and Conservation Act 1999 (EPBC): **Cr En** Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
K: Known records from the Wildlife Atlas; **P:** Predicted to occur from the EPBC PMST

- Those species identified in blue are listed under Schedules 1 and 2 of the Threatened Species Conservation Act 1995 (updated to 20th December 2013)

Scientific Name	Common Name	TSC, NPW status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Fauna species								
Maccullochella peelii	Murray Cod	Vu		Wodonga Creek	K	Nearby WCC - Aquatic	Yes	Key habitat elements would not be affected
Maccullochella macquariensis	Bluenose Cod (Trout)	Cr	En	Wodonga Creek	K	Nearby WCC - Aquatic	Yes	Key habitat elements would not be affected
Macquarie australasica	Macquarie Perch	P	En	No records	P	Neither-Aquatic	No	No records
Delmar Impar	***Striped Legless Lizard***	***Vu***	***Vu***	***No records***	***P***	***Inappropriate/Short-term***	***No***	***Unlikely to occur***
Aprasia parapulchella	***Pink-tailed Legless Lizard***	***Vu***	***Vu***	***Nail Can Hill***	***K***	***Inappropriate/Short-term***	***Yes***	***Key habitat elements would not be affected***

Scientific Name	Common Name	TSC, NPW status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Burhinus grallarius	*Bush Stone-curlew*	*En*		*Near Thurgoona & ~15 km north of ABG*	*K*	*Inappropriate/Short-term*	*No*	*Key habitat elements not affected*
Neophema pulchella	*Turquoise Parrot*	*Vu*		*~2 km west of ABG Nail Can Hill Reserve (2006); ~10 km north of ABG*	*K*	*Inappropriate/Short-term*	*Yes*	*Key habitat elements not affected*
Melanodryas cucullata cucullata	*Hooded Robin (south-eastern form)*	*Vu*		*~6-10 km north and north-east of ABG*	*K*	*Inappropriate/Short-term*	*Yes*	*Key habitat elements not affected*
Petroica boodang	*Scarlet Robin*	*Vu*		*Thurgoona ~6 km north-east & 2 km north-west Nail Can Hill Reserve*	*K*	*Inappropriate/Short-term*	*Yes*	*Key habitat elements not affected*
Petroica phoenicea	*Flame Robin*	*Vu*		*~6-10 km north and north-east of ABG*	*K*	*Inappropriate/Short-term*	*Yes*	*Key habitat elements not affected*
Stagonopleura guttata	*Diamond Firetail*	*Vu*		*~6 - 15 km north-east of ABG - outer urban habitats*	*K*	*Inappropriate/Short-term*	*Yes*	*Key habitat elements not affected*

Scientific Name	Common Name	TSC, NPW status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Dasyurus maculatus	***Spot-tailed Quoll***	***P***	***En***	***No records***	***P***	***Neither***	***No***	***Extinct from the region***
Additional Fauna identified from the EPBC PMST								
Apus pacificus	Fork-tailed Swift	P	C/J	one record from 1996 - urban north Albury	K	None	Yes	Rare occurrence, almost exclusively aerial-unlikely
Hirundapus caudacutus	White-throated Needletail	P	C/J	No records	P	Both	No	Almost exclusively aerial but will roost in trees to rest, very rare occurrence, unlikely
Monarcha melanopsis	Black-faced Monarch	P	Bonn	No records	P	None	No	Very rare occurrence, unlikely
Flora species								

Scientific Name	Common Name	TSC, NPW status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Caladenia concolor	Crimson Spider Orchid	En	Vu	~7 km Forest Hill Reserve; north-west of Albury (2009)	K	Inappropriate/Short-term & Appropriate/Long-term	Yes	Introduction of weeds and additional nutrient levels from FF faeces (See section 5.4.2)
Senecio garlandii	Woolly Ragwort	Vu	Vu	2 records from 2001 in the north-west Forest Hill Reserve	K	Inappropriate/Short-term	Yes	Introduction of weeds and additional nutrient levels from FF faeces (See section 5.4.2)
Ecological Communities								
Weeping Myall Woodlands			En	Not in the study area	P	NA	No	Does not occur in or near the study area, no impact
Natural Grasslands of the Murray Valley Plains			Cr En	Not in the study area	P	NA	No	Does not occur in or near the study area, no impact

Table 9 Threatened flora, fauna and ecological communities considered for potential long-term impact types where species may occur at the target site or potentially appropriate sites within the MRC

Key:
Threatened Species Conservation Act 1995 (TSC): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
National Parks and Wildlife Act 1972 (NPW): **P**-Protected
Environment Biodiversity and Conservation Act 1999 (EPBC): **Cr En** Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
J: Japan-Australia Migratory Bird Agreement
K: Known records from the Wildlife Atlas; **P:** Predicted to occur from the EPBC PMST

- Those species identified in blue are listed under Schedules 1 and 2 of the Threatened Species Conservation Act 1995 (updated to 20th December 2013)

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Fauna species								
Crinia sloanei	***Sloane's Froglet***	***Vu***		***North-eastern urban fringe waterways & near Wonga Wetlands***	***K***	***Appropriate/Long-term***	***Yes***	***Key habitat elements would not be affected***
Limnodynastes interioris	Giant Bullfrog	P		Murray River	K	Appropriate/Long-term	Yes	Key habitat elements would not be affected

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Haliaeetus leucogaster	White-bellied Sea-Eagle	P	C	Near Wonga wetlands & ~5 km upstream from Albury ABG	K	Appropriate/Long-term	Yes	Reduction in nesting and roosting availability- Section 5.4.1
Stictonetta naevosa	***Freckled Duck***	***Vu***		***MRC***	***K***	***Appropriate/Long-term***	***Yes***	***Key habitat elements not affected***
Porzana pusilla palustris	Baillon's Crake	Vu		MRC	K	Appropriate/Long-term	Yes	Key habitat elements not affected
Egretta garzetta nigripes	Little Egret	En		MRC	K	Appropriate/Long-term	Yes	Key habitat elements not affected
Ardea intermedia	Intermediate Egret	En		MRC	K	Appropriate/Long-term	Yes	Key habitat elements not affected
Botaurus poiciloptilus	***Australasian Bittern***	***En***	***En***	***Wonga Wetlands (Jan 1994)***	***K***	***Appropriate/Long-term***	***Yes***	***Key habitat elements not affected***
Polytelis swainsonii	***Superb Parrot***	***Vu***	***Vu***	***Known within the catchment***	***P***	***Appropriate/Long-term***	***No***	***Very rare, unlikely to occur***

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Rostratula australis	*Australian Painted Snipe*	*En*	*En*	*No records*	*P*	*Appropriate/Long-term*	*No*	*Very rare occurrences, unlikely*
Callocephalon fimbriatum	*Gang-gang Cockatoo*	*Vu*		*ABG (2009); Padman Park (2008); ~1 km north of ABG*	*K*	*Appropriate/Long-term*	*Yes*	*Reduction in roost sites- Section 5.4.1*
Glossopsitta porphyrocephala	*Purple-crowned Lorikeet*	*Vu*		*Wonga wetlands (2012)*	*K*	*Appropriate/Long-term*	*Yes*	*Uncommon in the area, unlikely impact*
Glossopsitta pusilla	*Little Lorikeet*	*Vu*		*Wonga Wetlands (1994-2007); Thurgoona (2007); ~5 km east of ABG (2004)*	*K*	*Appropriate*	*Yes*	*Reduction in foraging and access to hollows- Section 5.4.1*
Lathamus discolor	*Swift Parrot*	*En*	*E*	*Urban streets in Albury (1996-2004); Wirlinga Estate near Thurgoona (2004); and MRC*	*K*	*Appropriate/Long-term*	*Yes*	*Foraging habitat no impacted, does not breed on mainland*

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Neophema pulchella	*Turquoise Parrot*	*Vu*		*~2 km west of ABG Nail Can Hill Reserve (2006); ~10 km north of ABG*	*K*	*Inappropriate/Short-term*	*Yes*	*Key habitat elements not affected*
Ninox connivens	*Barking Owl*	*Vu*		*Padman Park (June 2009); on island south of Willow Band Reserve (1999), and at WCC (1999)*	*K*	*Appropriate/Long-term*	*Yes*	*Daytime roosting and nesting may be impacted- Section 5.4.1*
Merops ornatus	Rainbow Bee-eater	P	J	Wonga Wetlands & Thurgoona ~5 km east of ABG	K	Appropriate/Long-term	Yes	Key habitat elements not affected
Climacteris picumnus victoriae	*Brown Treecreeper (eastern subspecies)*	*Vu*		*Wonga Wetlands & ~6-15 km north of ABG*	*K*	*Appropriate/Long-term*	*Yes*	*Reduction in foraging and hollow availability- Section 5.4.1*

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Chthonicola sagittata	Speckled Warbler	Vu		~7-10 km north-east and north-west of ABG & Wonga Wetlands	K	Appropriate/Long-term	Yes	Key habitat elements not affected, usually associated with drier woodland inland areas
Anthochaera phrygia	***Regent Honeyeater***	***CE***	***E***	***~7 km north-west of ABG Nail Can Hill (Feb 2005)***	***K***	***Appropriate/Long-term***	***Yes***	***Rare visitor, unlikely to occur***
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Vu		Mungabareena Reserve; ~6-20 km north east of the ABG	K	Appropriate/Long-term	Yes	Reduction in foraging and nesting habitat- Section 5.4.1
Pteropus poliocephalus	***Grey-headed Flying-fox***	***Vu***		***Albury Botanic Gardens & Wodonga Creek Camp***	***K***	***Appropriate/Long-term***	***Yes***	***See Section 6***

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Petaurus norfolcensis	***Squirrel Glider***	***Vu***		***~7 km south-west of ABG; Thurgoona area ~12 km north-east***	***K***	***Appropriate/Long-term***	***Yes***	***Reduction in hollow availability- Section 5.4.1***
Additional migratory species identified from the EPBC PMST								
Myiagra cyanoleuca	Satin Flycatcher	P	Bonn	Urban north Albury (1992)	K	Appropriate/Long-term	Yes	Reduction in foraging and nesting habitat- Section 5.4.1
Rhipidura rufifrons	Rufous fantail	P	Bonn	North urban parkland (1996)	K	Appropriate/Long-term	Yes	Reduction in foraging and nesting habitat- Section 5.4.1
Ardea alba	Great Egret	P	C/J	6 records from Wonga Wetlands (1980-1994)	K	Appropriate/Long-term	Yes	Key habitat elements not affected
Ardea ibis	Cattle Egret	P	C/J	5 records from 1980 to 1996; all north of ABG	K	Appropriate/Long-term	Yes	Key habitat elements not affected

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Gallinago hardwickii	Latham's Snipe	P	C	No records for the area	P	Appropriate/Long-term	No	No records for the area, unlikely to occur
Flora species								
Caladenia concolor	***Crimson Spider Orchid***	***En***	***Vu***	***~7 km Forest Hill Reserve; north-west of Albury (2009)***	***K***	***Inappropriate/Short-term & Appropriate/Long-term***	***Yes***	***Introduction of weeds and additional nutrient levels from FF faeces-Section 5.4.2***
Amphibromus fluitans	River Swamp Wallaby Grass	Vu	Vu	12 records, mostly historical (1940's); one nearby Wonga Wetlands (1996)	K	Appropriate/Long-term	Yes	Introduction of weeds and additional nutrient levels from FF faeces-Section 5.4.2
Ecological Communities								

Scientific Name	Common Name	TSC, NPW Status	EPBC Status	Record locations	Known (K) or predict (P) to occur	Potential to occur in either study areas (inappropriate or appropriate sites)	Records within 10 km	Potential impact
Box-Gum Woodland		En	Cr En	Scattered patches (differing qualities) Nail Can Hill; and Albury landscape	K	Inappropriate/Short-term	Yes	Introduction of weeds and nutrients from GHFF faeces; defoliation by roosting pressure- Section 5.4.3
Seasonal Herbaceous Wetland			Cr En	MRC Floodplain	K	Appropriate/Long-term	Yes	This EC exists in highly disturbed and degraded states along the MRC floodplain. It is also generally treeless, thus impacts from FF's is unlikely due to not suitable habitat.

5.4 Justifications for identified potential impacts on species (other than FF's) and ecological communities

5.4.1. Fauna

A total of 15 fauna species are known to occur or predicted to occur in inappropriate sites (Table 8). Impact on these species is considered unlikely due to them being subject only to a potential short-term disturbance, such as noise from a re-disturbance event. Most of these species also would not be impacted due to minimal overlap with key habitat elements such as nesting and foraging resources (Table 8).

A total of 28 fauna species are known to occur or predicted to occur at sites considered potentially appropriate, with 10 considered to potentially have an effect on some elements of their key habitat requirements such as for nesting/foraging and roosting availability (Table 9). These species are discussed below. There are 18 species considered to not be at risk of any impact due to no or minimal overlapping with key habitat elements (Table 9).

White-bellied Sea-eagle: reduction in nesting and roosting availability

The White-bellied Sea-eagle is a large bird of prey with a wing span of 180-220 cm (DSE 2003). When birds form pairs they usually pair for life and are mostly sedentary once they have established a nest and roost tree with their home range. Their preferred nest trees include the River Red Gum (*Eucalyptus camaldulensis*) (Emison and Bilney 1982) and they usually maintain their nests and use them year after year, producing eggs between April and August (DSE 2003). This time of year is when FF's will be migrating from the region; however when they return in spring, there could be disturbance of young still dependent on the nest and roost site.

This species is considered of Conservation Concern in NSW (Debus 2008). The population in Victoria had been estimated around 100 breeding pairs, with two very distinct populations, one in Gippsland Lakes and one in Corner Inlet, and also scattered pairs are spread around Victoria in general, near inland waterways (DSE 2003). Recently, the conservation status in Victoria has gone from 'vulnerable' in 2013 to 'threatened' in 2014 (DSE 2003).

In the study areas, there are three (3) records for breeding WBSE's, one nearby Wonga Wetlands at Cooks Lagoon (2004); one ~5 km upstream from Albury ABG along the MRC; ~1 km north east of the Mungabareena Reserve next to a lagoon (2006), and one from 1993 ~8 km upstream from the ABG near Hume Dam (NSW OEH 2013).
More recent sightings for the WBSE are unknown. These birds are known to be easily disturbed, and therefore, if the FF's do attempt to settle at these sites, the ABG will

commit to carrying out an on-ground assessment to determine the presence of the WBSE nearby before a decision is made on the suitability of the site for a new seasonal FF camp. If the WBSE is recorded, the ABG will move the FF's on. Based on this assessment, no adverse effects are likely for the life cycle of this species; such a viable local population is unlikely to be threatened with extinction.

The ABG/AC are committed to re-disturbing FF's from such sites until they are settled in a considered 'appropriate' site at either the 'target site' or a new seasonal FF camp.

Gang-Gang Cockatoo: reduction in nest and foraging sites

The Gang-Gang Cockatoo is distinguished from other cockatoos by their grey and scarlet colouring with salmon pink underparts (Simpson and Day 1999).

In NSW and Victoria, the Gang-Gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales (NSW). In NSW, this species is known from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes.

This species carries out seasonal movements. In the summer months, it is found in more heavily timbered and mature wet sclerophyll forests, and in winter it occurs in the lower altitudes areas in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages (NSW Scientific Committee 2008). It's during this time (winter) that it can be seen in urban areas and urban parks and gardens, as it has been documented in the main study site of the ABG in 2009.

The key habitat requirements for nesting and foraging are hollows in large mature trees (Gibbons and Lindenmayer 2000), which are usually nearby water, with breeding occurring between October and January (NSW Scientific Committee 2008). The main threat to this species is the loss of nesting resources and hence tree hollow availability.

There are nine records for this species from the area; one of which is from the ABG (May 2009). Other records occur in Padman Park (2008); one record ~1 km north of ABG, which is likely to be a foraging record in the urban area. There are also increased sightings of this species in the local area with recent sightings inspecting hollows at Nail Can Hill, west of the ABG (Matt Cameron pers. com).

There is potential for the proposed action to reduce the number of available tree hollows along the MRC if they do not join up with the existing seasonal camp at WCC. However, the ABG considers the proposed action is unlikely to adversely affect the life cycle of this species; such a viable local population is unlikely to be threatened with extinction. This is due to the extent of other available habitat such as tree hollows and foraging resources in the local area; and an increase in local population sightings.

Little Lorikeet and Purple-Crowned Lorikeet: reduction in foraging and access to hollows

1. Little Lorikeet

The Little Lorikeet is a small green parrot with a red face ranging from 16-19 cm (Simpson and Day 1999).

In NSW it is distributed across the coastal and Great Divide regions and found as far westward to Dubbo and the Albury region. Overall, NSW is where its main core habitat occurs throughout its range from Cape York to South Australia (NSW OEH 2014). Its movements are very nomadic and are usually in response to available foraging resources sometimes long distances or locally nomadic movements. In Victoria it also occurs across the Great Divide range through to South Australia.

The key habitat for the Little Lorikeet is mostly dry, open eucalypt forests and woodlands. They use hollows for nesting between May and September, visiting the riparian forests in summer coinciding with River Red Gum flowering (Davidson 2011). They usually travel in small flocks and forage predominantly on available fruits and flowers of trees and shrubs, particularly eucalypts and tea-tree (NSW OEH 2014). Known preferred food sources are from White Box Eucalyptus albens and Yellow Box E. melliodora (Courtney & Debus 2006). These are particularly important food sources for pollen and nectar respectively, for this species

There are nine (9) records for Little Lorikeets from the study area; one from the Wonga Wetlands (1994), the remainder from Forest Hill Reserve to the north-west of the ABG, or north-east nearby Thurgoona (2004 and 2007) (NSW OEH 2014). Two records have also been documented by an independent consultant, Davidson (2011) during an on-ground survey which took place along the MRC, where they were observed in River Red Gum habitat.

The main impact for this species is the loss of foraging and hollow resources; however, loss of foraging habitat is considered negligible with the broader habitat available. Nesting sites are considered likely to be in the drier open forests such as Nail Can Hill and Forest Hill Reserve; therefore there is potential for short-term impacts of a re-disturbance event to disrupt potential breeding in September, but this is minimal. No long-term impacts are likely for this species that will have any adverse effect on the life cycle of this species, such as the viable local population is unlikely to be threatened with extinction.

2. Purple-Crowned Lorikeet

The Purple-crowned Lorikeet is also a small parrot (17-18.5cm), with a distinct dark (purple) crown. They are often more heard than seen, and records are scarce for the local area.

In NSW it is uncommon with the majority of recordings scattered along the River Red Gum Forests of the MRC and the wider woodlands of the Riverina district. Albury is at the northern edge of this species range. In Victoria it is more widely distributed across the southern parts extending to south-west Australia. The species is very nomadic and in NSW is usually recorded in response flowering events associated with River Red Gum and Box-Ironbark Forests (NSW OEH 2012).

The key habitat for this species is mainly open forests and woodlands, and large flowering trees for foraging as they feed primarily on nectar and pollen. Depending on urban street tree species, they can be found feeding from these also. They are also known to roost and nest several kilometres away from feeding sites, therefore any records of foraging for this species in the local area will indicate their nest sites will be located elsewhere. Nesting takes place similar time as the Little Lorikeet between August and December (NSW OEH 2012).

There is only one record for this species from the NSW Wildlife Atlas recorded from nearby the Wonga Wetlands in 2012. An additional record for this species is from Davidson (2008) with a pair observed in the study area in 2000 feeding on mature flowering eucalypts near Pearsall Street, which is located north of the ABG.

Based on the nomadic nature and lack of records for this species in the local area, it is not considered to have a viable local population and therefore the proposed action of the relocation of the FF's from the ABG is unlikely to have an adverse effect on the life-cycle of the Purple-crowned Lorikeet such that a viable local population is likely to be threatened with extinction.

Barking Owl: daytime roosting and nesting may be impacted

The Barking Owl is a large Owl with bright yellow eyes, no facial mask with brownish grey upperparts (Simpson and Day 1999). Males are typically larger than the female, and their call is dog-like with the males being a deeper tone than the female (NSW OEH 2014). This Owl is also known as the 'screaming-woman bird' because of a high-pitched scream that it sometimes calls.

In the broader context in NSW, this Owl occurs quite widely but generally in sparse distributions with core areas populations on the western slopes and plains and in some northeast coastal and escarpment forests. Populations have decreased due to clearing of woodlands therefore many pairs utilise riparian woodlands and remnant patches for habitat. Urban areas have also been quite useful in some cases which are adjacent to remnant patches or riparian woodlands, where they can forage on urban dwelling birds and possums (NSW OEH 2014). Within Victoria, the species is scattered throughout the state only in treed areas, and in areas where rainfall is between 400-700mm north of the Great Dividing Range (DSE 2003). They occupy large home ranges up to 6000

hectares, but usually around 2000 hectares in NSW; they require large hollows, and will forage on birds, possums, gliders, and other small mammals (Recovery Plan 2003).

In the study areas, this species has been recorded near Padman Park (June 2009); on the island south of Willow Band Reserve (1999) (NSW OEH 2014), and at WCC (1999) (VBA 2014). These records are the WCC are old and recent correspondence with DEPI have documented that this species has not been present at the site for some years (Glen Johnson pers. com.). Davidson (2011) has also documented several known breeding pairs along the MRC between the Hume Weir and Wonga Wetlands, with a very recent sighting from Eastern Hill at Mungabareena Reserve (Davidson 2014). There are also anecdotal records from ABG staff who have heard this Owl in the vicinity of Monument Hill in 2013 and 2012, to the north west of the ABG (Paul Scannell pers. com.). This means that there are now at least four known breeding pairs that exist within the study area, which form part of a local population. In Victoria, this owl is the most threatened with ~50 breeding pairs documented in Silveira et al (1997) and is considered rare (DSE 2003).

Given the rare status of this highly sensitive Owl, and is dependent on large hollow-bearing trees for nesting, the ABG/AC will therefore consider any such site where this species has known nesting trees as inappropriate for FF's to attempt to establish a new seasonal FF camp. Therefore, to determine and clarify the presence of this species at the above aforementioned sites; the ABG/AC will conduct on-ground surveys before making a decision on the suitability of the site.

If the Barking Owl is recorded, the ABG/AC will move the FF's on. Based on this assessment, no adverse effects are likely for the life cycle of this species; such a viable local population is unlikely to be threatened with extinction.

The ABG/AC are committed to re-disturbing FF's from such sites until they are settled in a considered 'appropriate' site at either the 'target site' or a new seasonal FF camp.

Brown Tree-creeper: reduction in foraging and hollow availability

The Brown Tree-creeper is the largest tree-creeper ranging 16-18 cm, where the male is black-chested and the female rufous (Simpson and Day 1999). Their distribution ranges from Cape York through to Victoria and South Australia in eucalypt forests and woodlands, and on the inland plains and slopes of the Great Dividing Ranges (NSW OEH 2012). In NSW, the eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. (NSW OEH 2012). In the study areas there are records from nearby Wonga Wetlands (1984/2005/2009); one record ~2 km west of ABG on the MRC (2012); and four records ~6-15 km north of the ABG (NSW OEH 2012).

Declines of the population density have been recorded particularly in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, which have been isolated or fragmented for more than 50 years (NSW OEH 2012). An experimental re-introduction program commenced in 2009, with the release of seven family groups of brown tree-creepers to Mulligans Flat and Goorooyarroo Nature Reserve. To date survival rates have been lower than expected but stable (Integrating research and restoration: ANU website. Accessed 22/02/2014).

The key habitat requirements for this species are hollows for nesting in dead or live trees, and these can occur in a range of eucalypt woodlands including Box-Gum Woodland, Mallee and River Red Gum Forest near water bodies, and usually with a dense shrub layer with fallen timber which is important for foraging insects. In its habitat site it is usually sedentary and present in most or all seasons (NSW OEH 2012).

There is potential for the proposed action to reduce the number of available tree hollows and foraging resources in the study areas. However, the ABG considers the proposed action is unlikely to adversely affect the life cycle of this species; such a viable local population is unlikely to be threatened with extinction. This is due to the extent of other available habitats for this species to access, such as tree hollows and foraging resources in the Albury/Wodonga area; in either Box-Gum and/or River Red Gum habitats.

Black-Chinned Honeyeater: reduction in foraging and nesting habitat

The Black-chinned Honeyeater is a 15-17 cm sized bird with a black head, white throat, with a golden back (Simpson and Day 1999). In the broader context, this bird is widespread in NSW, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina (NSW OEH 2012). This species is a known resident in the Albury region (Davidson et.al, 2004), predominantly in remnant grassy woodland with flowering Yellow Box (Davidson et.al, 2004 & 2006), but is also associated with other eucalypt species and forages in other riparian zones along the MRC (NSW OEH 2012).

The key habitat requirements for this species are in the drier open forests or woodlands dominated by box and ironbark eucalypts but its nesting habitat is primarily in River Sheoaks and Tea-Trees, where patches of this type are large enough for it to cover a foraging range of at least five hectares. Breeding occurs between June to December with nests built high in the crown of the nest trees (NSW OEH 2012).

There is potential for the proposed action to reduce the number of available tree hollows and foraging resources in the study areas. However, the ABG considers the proposed action is unlikely to adversely affect the life cycle of this species; such a viable local population is unlikely to be threatened with extinction. This is due to the extent of

available habitat resources for this species to access in Albury/Wodonga area.

Satin Flycatcher: reduction in foraging and nesting habitat

The Satin Flycatcher is listed under the EPBC Act 1999 as a marine and migratory species; it is not listed as threatened under either NSW or Victorian laws. It occurs widespread across Australia and within NSW and Victoria, with population densities ranging from 0.08 birds per hectare near Armidale to 1.25 birds per hectare near Bathurst (DOE SPRAT 2013).

It is a medium to large flycatcher (15 to 18 cm's) with a glossy blue-black above on the chest with a darker under-tail (Simpson and Day 1999). Its main habitat is in heavily vegetated gullies of eucalypt dominated woodlands and usually near water. Satin Flycatchers nest in the fork of outer branches of trees, such as paperbarks, eucalypts, and banksias (DOE SPRAT 2013). Nests are generally high in the tree, and they use the same nests each year, with trees including Tasmanian Blue Gum, Manna Gum, Broad-leaved Peppermint, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate, Mountain Gum, Snow Gum, Broad-leaved Stringybark, Sydney Peppermint and Yellow Box, Blackwood, and Broad-leafed Paperbark.

Records from the study area only show one record from 1992 in the north urban area of Albury (NSW OEH 2013). The lack of records is unlikely to represent the 'real local population' and is likely for additional individuals to occur within the study area, but undocumented. However, the ABG considers the proposed action is unlikely to adversely affect the life cycle of this species; such a viable local population is unlikely to be threatened with extinction. This is due to the extent of available habitat resources for this species to access in Albury/Wodonga area.

Rufous Fantail: reduction in foraging and nesting habitat

The Rufous Fantail is listed under the EPBC Act 1999 as a marine and migratory species but is not considered threatened in either NSW or Victoria. It is documented to be safe and secure in population, and occurs in wet sclerophyll forests, often in gullies dominated by a range of eucalypts (DOE SPRAT 2013). They can also occur in subtropical and rainforest vegetation; and urban parks and gardens when on the move.

Key habitat requirements for the Rufous Fantail are nest plants that have large leaves to protect the nest from view from predators (Huggett 2000 in DOE SPRAT 2013). Such plants may include Rose Walnut (*Endiandra discolor*) and Bangalow Palm (*Archontophoenix cunninghamiana*), along with Blackberries (*Rubus fruticosa*), Musk Daisybush (*Olearia argophylla*), eucalypts (e.g. Swamp Mahogany (*E. robusta*)), *Coprosma* spp. (e.g. Prickly Currant Bush (*C. quadrifida*)), *Bursaria* spp. (e.g. Sweet Bursaria (*B. spinulosa*)), tree-ferns such as *Cyathea* spp., and many other genera (Higgins et al. 2006 in DOE SPRAT 2013).

In the study areas there is only one record for this species from north Albury urban parkland, which is likely to have been a bird in passage. The lack of records is unlikely to represent the 'real local population' and is likely for additional individuals to occur within the study area, but undocumented. However, the ABG considers the proposed action is unlikely to adversely affect the life cycle of this species; such a viable local population is unlikely to be threatened with extinction. This is due to the extent of available habitat resources for this species to access in Albury/Wodonga area.

Squirrel Glider: reduction in hollow availability

The Squirrel Glider is a medium-sized glider ranging from 17-24 cm body length and 22-30 cm tail length; and weighing 190-330g (NSW Scientific Committee 2008). It is currently listed as Vulnerable in NSW under the Threatened Species Conservation Act 1995 (TSC Act). Two distinct endangered populations exist in NSW but not near the study areas; they are Barrenjoey Peninsula and Wagga Wagga LGA's. In Victoria, the Glider is listed as Threatened under the Flora and Fauna Guarantee Act 1988.

Their suitable habitat elements generally occur on inland slopes of the GDR and along watercourses, where much of this habitat has significantly declined in NSW and VIC and many populations now exist in remnant patches of suitable habitats (NSW Scientific Committee 2008), such as near Thurgoona north east of the ABG. This population near Thurgoona is considered an important local viable population (van der Ree 2003).

The key habitat requirements for the Squirrel Glider are an abundance of tree hollows within their range to den and raise young which are born between April and November. Their foraging resources include nectar, pollen, sap from eucalypts and acacias, and insects. Menkhorst and Collier (1988) found, in a study based on the Murray River near Echuca, that the diet of Squirrel Gliders indirectly suggested that gum from River Red Gum and Silver Wattle were important components of the animal's diet.

The minimum area required by Squirrel Gliders in high quality fertile habitat is approximately 3 – 5 ha, which increases as habitat quality decreases (van der Ree et al. 2003); and they also rely on habitat patches being a minimum distance apart to glide between not exceeding 70 m (van der Ree et al. 2003). A relatively recent study by Davidson (2011) identified suitable habitat for the Squirrel Glider along sections of the MRC south of the ABG from Wonga Wetlands to the Hume Weir. They identified a potential continuous tree canopy along the MRC which would enable gliders to move through the landscape to Nail Can Hill, via Monument Hill and Padman Park (west of ABG) to or from Thurgoona.

There are 75 records for this species occurring across the Albury region, with most records except for two occurring from the Thurgoona population, between 7 and 15 km's north-east (NSW OEH 2014). There is one record from a section along the MRC

just south of Cooks Lagoon recorded in 2009, with no other records south of ABG to which GHFF are expected to move to.

The main threats to this species are a reduction in tree hollows. If FF's attempt to settle at sites located in optimal Squirrel Glider habitat (i.e. Thurgoona locations), the ABG will move the FF's on. Therefore, impact would only be short-term. The ABG/AC considers the proposed action of the occurrence of additional FF's within this species home range unlikely to have any adverse effects on the life cycle such that the viable local population is unlikely to be threatened with extinction.

Little Red Flying-fox: reduction in foraging/roosting availability and reproductive/stress induced impacts

The Little Red Flying-fox is not a threatened species in New South Wales or Victoria, however it is protected under the National Parks and Wildlife Act 1972. It is the smallest of the Australian fruit bats (Pastorelli 1990; NSW OEH website: Flying-foxes) weighing an average of 220 g compared to 700 g that of a Grey-headed Flying-fox (Churchill 1998). In the broader context they occur in the northern and eastern parts of Australia, from Shark Bay in Western Australia, through Queensland and into north-eastern Victoria (Churchill 1998). They also travel more inland than other Australian fruit bats. They are also one of the more nomadic by nature and are very sporadic in their movements outside of the birthing season (April to May), which is in response to nectar and pollen resources. At these times when they are more static, they congregate in large numbers and often with other flying-fox species (Churchill 1998). Due to their wide use of flowering resources over a wide area, their habitat resources are also wide covering from semi-arid to monsoon forests (Churchill 1998). This species mates in November to January and birthing is usually between April and May, which is the opposite cycle from other flying-fox species by six (6) months. After birth, the young are usually ~ 2 months before they are semi-independent to fly short distances (Churchill 1998).

The wider population for this species is great with some camps in excess of 200,000 individuals, such as those in the Northern Territory (Roberts et al. 2010). In NSW, LRFF camps can vary from a few individuals to tens of thousands. The local population for the study area is unknown. In early January, 20% of the ABG FF camp was LRFF with total FF numbers being ~400 bats (Table 2). However, since the 10th January when the hot days occurred, no LRFF's have been roosting at the ABG (Christine Fowler pers. com.). A further survey carried out by CSIRO at the ABG on 20th February concluded still no records of LRFF's (Jason Kimball pers. com.). A recent survey (February 2014) was carried out by DEPI at the WCC, which is the target site for the relocation and ~3 km south of the ABG. The estimated count was a mix of 1500 GHFF and LRFF with no defined proportion for either species, thus the local population for LRFF is currently unknown, and could be zero to a few hundred at the WCC. There is also a likelihood that

this species has gone from the area in response to food resources but this is only speculation.

The ABG considers the proposed action is unlikely to adversely affect the life cycle of this species; such a viable local population is unlikely to be threatened with extinction. This is due to the extent of available habitat resources for this species to access in Albury/Wodonga area, such as foraging and roosting availability. Flying-foxes will still be able to forage in the ABG so a reduction in foraging is negligible. Furthermore, the detailed relocation plan specifically identifies methods, timing and monitoring to allow for avoiding and minimising negative impacts for this species on its sensitive reproductive cycle (see Sections 3 and 6.4 for detailed information on types of impacts and mitigation measures).

Table 10 Summary of threatened fauna species in the Albury region (NSW Wildlife Atlas)

Key:
Threatened Species Conservation Act 1995 (TSC): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
National Parks and Wildlife Act 1972 (NPW): **P**-Protected
Environment Biodiversity and Conservation Act 1999 (EPBC): **Cr En** Critically Endangered; **E**-Endangered; **Vu**-Vulnerable
J: Japan-Australia Migratory Bird Agreement

Scientific Name	Common Name	TSC/NPW Status	EPBC Status	Records	Record Locations	Last record
Crinia sloanei	Sloane's Froglet	Vu		36	North-eastern urban fringe waterways	Jun-13
Aprasia parapulchella	Pink-tailed Legless Lizard	Vu	Vu	10	Forest Hill Reserve, north west of ABG	Oct-08
Haliaeetus leucogaster	White-bellied Sea-Eagle	P	C	2	Nearby Wonga wetlands & ~5 km up stream on the Murray from Albury ABG	Sep-06
Burhinus grallarius	Bush Stone-curlew	En		2	Near Thurgoona & ~15 km north of ABG	Aug-08
Callocephalon fimbriatum	Gang-gang Cockatoo	Vu		7	ABG (2009); Padman Park (2008); and ~1 km north of ABG	May-09
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	Vu		1	Nearby Wonga wetlands (2012)	Jun-12
Glossopsitta pusilla	Little Lorikeet	Vu		7	Nearby Wonga Wetlands (1994-2007); Thurgoona (2007); ~5 km east of ABG (2004)	Aug-07

Scientific Name	Common Name	TSC/NPW Status	EPBC Status	Records	Record Locations	Last record
Lathamus discolor	Swift Parrot	En	E	3	Urban streets in Albury (1996-2004); Wirlinga Estate near Thurgoona (2004)	Jun-04
Neophema pulchella	Turquoise Parrot	Vu		4	~2 km west of ABG Monument Hill (2006); ~10 km north of ABG	Sep-08
Ninox connivens	Barking Owl	Vu		1	Southern Rivers Area - nearby Padman Park (June 2009)	Jun-09
Merops ornatus	Rainbow Bee-eater	P	J	8	Nearby Wonga Wetlands (2008); Thurgoona (2007); ~5 km east of ABG (2004)	Nov-08
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vu		11	Nearby Wonga Wetlands (2005/2009); remaining records ~6-15 km north of ABG	May-09
Chthonicola sagittata	Speckled Warbler	Vu		8	~7-10 km north-east and north-west of ABG & Wonga Wetlands (2009)	May-09
Anthochaera phrygia	Regent Honeyeater	CE	E	1	~7 km north-west of ABG in Forest Hill Reserve (Feb 2005)	Feb-05
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Vu		3	~6-20 km north east of the ABG	Jun-04
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Vu		2	~6-10 km north and north-east of ABG	Mar-06
Petroica boodang	Scarlet Robin	Vu		2	Thurgoona ~6 km north-east & 2 km north-west on Monument Hill	Sep-08

Scientific Name	Common Name	TSC/NPW Status	EPBC Status	Records	Record Locations	Last record
Petroica phoenicea	Flame Robin	Vu		2	~6-10 km north and north-east of ABG	Jul-09
Stagonopleura guttata	Diamond Firetail	Vu		5	~6 - 15 km north-east of ABG - outer urban habitats	Dec-07
Petaurus norfolcensis	Squirrel Glider	Vu		30	~7 km south-west of ABG along Murray River; & Thurgoona area ~12 km north-east	May-10

Table 11 Summary of threatened fauna species south of the Murray River region (Victoria Biodiversity Atlas)

Key:
Flora and Fauna Guarantee Act 1988 (FFG): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable; L-Listed as Threatened
Environment Biodiversity and Conservation Act 1999 (EPBC): **Cr En** Critically Endangered; **E**-Endangered; **Vu**-Vulnerable
J: Japan-Australia Migratory Bird Agreement; **C**: China-Australia Migratory Bird Agreement; **Ma**-Marine species

Scientific Name	Common Name	FFG Status	EPBC Status	Records	Location	Last record (VBA)
Maccullochella peelii	Murray Cod	L	Vu	1	Wodonga Creek	Dec 2011
Maccullochella macquariensis	Bluenose Cod (Trout Cod)	L	E	2	Wodonga Creek	Dec 2011
Limnodynastes interioris	Giant Bullfrog	L	-	1	Residential gardens-Albury/Wodonga; Albury Golf Course	Dec 2011
Lathamus discolor	Swift Parrot	L	E	1	LaTrobe University Wodonga	Aug 2008
Ninox connivens	Barking Owl	En	-	7	Island South of Murray River; Doctors Point: Albury; Mungabareena Reserve	Dec 2000
Stictonetta naevosa	Freckled Duck	En	-	6	Wodonga Sewage Ponds	Dec 2005
Ardea modesta	Eastern Great Egret	L	J/C	1	La Trobe University, Albury-Wodonga Campus; Lower Kiewa River 8km E of Wodonga	Nov 1999
Porzana pusilla palustris	Baillon's Crake	L	-	1	La Trobe University, Albury-Wodonga Campus	Sept 2006
Egretta garzetta nigripes	Little Egret	Cr En	-	7	Wonga Wetlands; Ryans Lagoon; Murray Valley	Jan 2009

Scientific Name	Common Name	FFG Status	EPBC Status	Records	Location	Last record (VBA)
					Highway-Killara	
Ardea intermedia	Intermediate Egret	L (En)	Ma	1	Wonga Wetlands; Lower Kiewa River 8km E of Wodonga	Nov 1999
Stagonopleura guttata	Diamond Firetail	L	-	12	Bandiana Military Camp: Wodonga; Albury various locations	Mar 2004
Pteropus poliocephalus	Grey-headed Flying-fox	Vu	Vu	3 records of 'many'	80m upstream of new Internal Freeway bypass. Roost Site amongst Red Gum and Willow (WCC)	May 2013
				2 records of 'many'	Banks of Wodonga Creek, 75m East of Hume Freeway near Bandiana Link on ramp (WCC)	May 2013

5.4.2. Flora

A total of three flora species are known from the Albury LGA (NSW Wildlife Atlas and EPBC PMST) (Table12). A total of two species were recorded from the south of the Murray River (VBA 2012 &EPBC PMST 2014) (Table13).

In the Albury region, two of these species are unlikely to occur at sites where FF's will settle, if not join up with the WCC, but may roost short term. These are the Crimson Spider Orchid, and Woolly Ragwort. Both these species prefer habitats not suited to wetter areas, but more rocky, granite country such as the Nail Can Hill Reserve and Forest Hill Park, located north- west of Albury. Crimson Spider Orchid and Woolly Ragwort are known to occur at Nail Can Hill Reserve. The third species, the Floating Swamp Wallaby Grass has recently been recorded in both NSW and Vic; in NSW lagoons near Cooks Lagoon and Wonga Wetland, which is beside the Murray River; and also at Mungabareena Reserve, south-east of Albury (DOE SPRAT 2013). Based on the occurrences of this species, they are discussed below.

Crimson Spider Orchid

The Crimson Spider Orchid is listed as Vulnerable under the EPBC Act 1999; in NSW it is listed as Threatened under the TSC Act 1995; and in Victoria it is listed as Threatened under the Flora and Fauna Guarantee Act 1988.

The only known populations known in NSW are ~85 individuals from 10 different locations on Nail Can Hill Crown Reserve outside, north-west of the ABG (NSW NPWS 2003). There is no suitable habitat for this species to occur along the MRC, however there is a low likelihood of FF's settling at Nail Can Hill which could subject the area to a re-dispersal event. ABG/AC will ensure no trampling of this species occurs if they are required to enter an area containing the Crimson Spider Orchid.

It is therefore unlikely any short-term noise and/or relocation of a small number of FF's will impact on the persistence of this species in the area. This action is unlikely to have any adverse effect on the life cycle of this species, such as a viable local population is likely to be threatened with extinction.

Floating River Swamp Wallaby Grass: introduction of weeds and additional nutrient levels from FF faeces

Floating River Swamp Wallaby-grass (FRSWG) is listed as Vulnerable under the EPBC Act 1999. In NSW it is listed as Vulnerable under the Threatened Species Conservation Act 1995. It is not listed as threatened in Victoria. It is an aquatic perennial grass approximately up to or sometimes more than one metre tall, where flowering and fruiting occurs between November and March (NSW OEH 2012). It's usually found on the surface of shallow wetlands, natural drainage systems and dams, both in natural and man-made water-bodies.

In NSW, there are many historic collections, and for the local population from the Albury area, it includes Howlong Road and Waterworks Reserve; along the MRC, it has been collected from Cooks Lagoon (Shire of Greater Hume), Mungabareena Reserve, East Albury, Ettamogah, and at Charles Sturt University in Thurgoona (NSW OEH 2012). Although the local population numbers are unknown, it is known to occur at the aforementioned sites with likely undocumented records elsewhere. It has been observed covering several hectares in area and also recorded as occasional to common in its populations. As identified from the NSW Wildlife Atlas, twelve records exist for this species, of which eight (8) are historical (1947-1950), one record along Splitters Creek ~6km from ABG (1996); one record ~10 km north east of the ABG near Ettamogah; and two records exist in Vic (2004) near Mitta Junction which is more than 10 km east of Albury ABG on Lake Hume.

The main identified threats to this species are a potential change in water regimes, disturbance and modifications and the invasion of weed species (NSW OEH 2012). Given that local populations are recorded as occasional and/or common, it is considered unlikely that the small number of flying-foxes that could potentially establish a new camp where this species occurs would pose a risk to the persistence of this species in the local area. This action is unlikely to have any adverse effect on the life cycle of this species, and as such a viable local population is unlikely to be threatened with extinction.

Woolly Ragwort: introduction of weeds and additional nutrient levels from FF faeces (short-term); potential trampling to re-disturb

Woolly Ragwort is listed as Vulnerable in NSW under the Threatened Species Conservation Act 1995 and listed as Threatened under the Flora and Fauna Guarantee Act 1988. It is a many-branched perennial herb or shrub growing to 1.2 m tall with woolly stems, and large toothed edged leaves. The flowers are small and clustered in sprays (NSW OEH 2013).

The wider distributions for this species are between Temora, Bethungra and Albury. Within Albury, it is known from Nail Can Hill to the west of the ABG, with the NSW Wildlife Atlas reporting on two known records for the area.

It is unlikely that FF's will attempt to permanently settle at Nail Can Hill, however they may roost temporarily and pose a short term impact (Section 5.3.1). The ABG will ensure that if necessary, this species will be surveyed for at locations where FF's may need to be re-disturbed and moved on. This will enable persons to be aware of the presence of the Woolly Ragwort and to avoid any potential trampling by ABG/AC staff and volunteers. It is therefore considered that action is unlikely to have any adverse effect on the life cycle of this species, and as such a viable local population is unlikely to be threatened with extinction.

Table 12 Summary of threatened flora species in the Albury LGA region (NSW)

Key:

- Threatened Species Conservation Act 1995 (TSC): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
- Environment Biodiversity and Conservation Act 1999 (EPBC): **Cr En** Critically Endangered; **E**-Endangered; **Vu**-Vulnerable

Scientific Name	Common Name	TSC/NPW Status	EPBC Status	Recs	Location	Last record
Caladenia concolor	Crimson Spider Orchid	En	Vu	18	Forest Hill Reserve	2009
*Amphibromus fluitans**	River Swamp Wallaby	Vu	Vu	12	~3 km ENE of Wodonga West (outside of study areas) see also text in 5.3.2	2000
Senecio garlandii	Woolly Ragwort	Vu	Vu	2	Nail Can Hill	2001

*This species was also identified from the EPBC PMST

Table 13 Summary of threatened flora species south of the Murray River (Victorian Biodiversity Atlas)

Key:

- Flora and Fauna Guarantee Act 1988 (FFG): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable; L-Listed as Threatened
- Environment Biodiversity and Conservation Act 1999 (EPBC): **Cr En** Critically Endangered; **E**-Endangered; **Vu**-Vulnerable

Scientific Name	Common Name	FFG Status	EPBC Status	DSE Advisory List	Records	Location	Last record (VBA)
Swainsona reticulata	Kneed Swainson-pea	Vu	Vu		2	~4 km NE of Wodonga	1884
*Amphibromus fluitans**	River Swamp Wallaby		Vu	En	2	Near Mitta Junction (~10 km east of ABG)- outside of study area	2004

*This species was also identified from the EPBC PMST

5.4.3. Ecological Communities

A total of three threatened ecological communities are known or predicted to occur in study area (Table 5). Two of these communities either do not occur in the study area or they do not contain suitable habitat for the FF's, therefore no impact is likely. These are the Weeping Myall Woodlands and Natural Grasslands of the Murray Valley. The remaining threatened EC is the Box-Gum Woodland, which occurs at an inappropriate site within the study area – Monument Hill, north-west of the ABG; this is discussed below. No threatened EVC's occur south of the Murray River in which impacts could occur.

No impact is considered likely to occur at any site containing a nationally threatened ecological community. A new FF camp will not be permitted to establish in a remnant patch of vegetation containing a nationally threatened ecological community. The AC will move the FF on with further noise disturbance from these sites if necessary, thus no long-term impact is likely for any EC at any site.

Box-Gum Grassy Woodland and Derived Grassland

Box-Gum Grassy Woodland and Derived Grassland is an amalgamation of previous other box-gum ecological communities, which have been refined into this broader category due to similarities between them, and the currently highly fragmented nature of them. These other communities are Yellow Box – Red Gum Grassy Woodland and Grassy White Box Woodlands (DECCW 2010). Collectively, the range of Box-Gum Woodlands once ranged over several million hectares but is now highly fragmented; with current estimates reveal around 405, 000 hectares in different conditions.

In NSW it is now found within the North Coast, New England Tablelands, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, South East Corner and South Western Slopes bioregions, with only approximately 12 % remaining as larger than 10 ha remnants that have 20 % canopy cover (DECCW 2010). In Victoria, this ecological community occurs predominantly within the Northern Inland Slopes as well as the Highlands–Northern Fall, Central Victorian Uplands, Victorian Riverina, Goldfields, Dundas Tablelands, Greater Grampians, Highland–Southern Fall, East Gippsland Lowlands, East Gippsland Uplands, Otway Plains and Murray Fans bioregions and may occur in the Wimmera bioregion (DECCW 2010).

No study sites falling south of the Murray River contain this EVC (Appendix 1-Victorian EVC's). In the study areas, there are no known intact remnants for this community; however Monument Hill north-west of the ABG has degraded patches of Box-Gum Woodland (Davidson 2008).

This community is an open woodland community, with the main species being one or more of the White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*), and co-dominated species may occur and not limited to Drooping She-oak (*Allocasuarina verticillata*), Black Cypress Pine (*Callitris endilcheri*), Apple Box (*E. bridgesiana*); intact stands are generally characterised by Kangaroo Grass (*Themeda triandra*) (See DECCW 2010 for full description).

The AC will ensure that FF's will be moved on from any locations where this EVC exists. As It is considered unlikely that FF's will try to settle at these sites. If this occurs, AC will ensure the FFs are moved on according to the required outlined plan.

Table 14 Summary of threatened ecological communities in the study areas combined

Key:

- Threatened Species Conservation Act 1995 (TSC): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
- Flora and Fauna Guarantee Act 1988 (FFG): **Cr**-Critically Endangered; **En**-Endangered; **Vu**-Vulnerable; **L**-Listed as Threatened
- Environment Biodiversity and Conservation Act 1999 (EPBC): **Cr En** Critically Endangered; **En**-Endangered; **Vu**-Vulnerable
- **K**: Known in the area; **P**: Predicted to occur in the area from the EPBC PMST

Name	Predicted or Known	TSC/NPW Status	FFG	EPBC Status	Location of Records
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	K	En	Not listed	Cr En	Monument Hill and Nail Can Hill (NSW)
Seasonal Herbaceous Wetland	K		L	Cr En	Disturbed and degraded patches along MRC
Weeping Myall Woodlands	P			En	Does not occur in study area
Natural Grasslands of the Murray Valley Plains	P			Cr En	Does not occur in study area

5.5 Summary of suitability for potential relocation sites

Table 15 Concluding summary of actions required to further determine the appropriateness of a site if not clearly defined post the above impact assessment

Site	Threatened species of concern previously recorded (not FF's)	>300 m buffer to residential zones	Accepted by land owner/manager (AlburyCity)	Habitat size adequate	Suitability	Comments/Actions
Wodonga Creek Camp (target site)	Yes: Barking Owl	Yes	Yes	Yes	Appropriate	(1) The Barking Owl records from this site are from 1999 and recent correspondence with DEPI have documented that this species has not been present at the site for some years (Glen Johnson pers. com.). (2) DEPI have also provide a letter of acceptance for additional FF's to roost at the existing seasonal camp (Associated document 4)
Wonga Wetlands and surrounds	Yes: White-bellied Sea-eagle nearby	Yes	Yes	Yes	Potential	1) An on-ground assessment will be carried out to determine the presence of any potential WBSE nesting sites due to a nearby record from Cooks Lagoon (2004). ABG will do

Site	Threatened species of concern previously recorded (not FF's)	>300 m buffer to residential zones	Accepted by land owner/manager (AlburyCity)	Habitat size adequate	Suitability	Comments/Actions
						this before a decision is made on the suitability of this site for a new seasonal FF camp if necessary. 2) If the WBSE is recorded, the ABG will move the FF's in accordance with the proposed methods.
Padman Park	Yes: Barking Owl	No	Yes	Yes	Potential	1) The Barking Owl records from this site are from 2009 and there are more recent anecdotal records from nearby Monument Hill in 2012/2013. 2) An on-ground assessment will be carried out to determine the presence of any potential Barking Owl nesting sites before a decision is made on the suitability of this site for a new seasonal FF camp if necessary. 3) If the Barking Owl is recorded, the ABG/AC will move the FF's on in accordance with the

Site	Threatened species of concern previously recorded (not FF's)	>300 m buffer to residential zones	Accepted by land owner/manager (AlburyCity)	Habitat size adequate	Suitability	Comments/Actions
						proposed methods. 4) The distance between the closest habitat patch (near water) and to the residential zone ranges between 150-250 metres. This buffer distance would require discussion with community and OEH to determine the level of appropriateness.
Mungabareena Reserve	Yes: Barking Owl	Yes & No	Yes	Yes	Potential	1) The Barking Owl records from this site are recent: 2014 and from the Eastern Hill section within the reserve. 2) An on-ground assessment will be carried out to determine the presence of any potential Barking Owl nesting sites before a decision is made on the suitability of this site for a new seasonal FF camp only if FF's attempt to settle at this site. 3) If the Barking Owl is recorded,

Site	Threatened species of concern previously recorded (not FF's)	>300 m buffer to residential zones	Accepted by land owner/manager (AlburyCity)	Habitat size adequate	Suitability	Comments/Actions
						the ABG/AC will move the FF's on in accordance with the proposed methods. 4) The distance between the closest habitat patch (near water) and to the residential zone ranges from 150 to >300 metres. Any buffer zones < 300 m would require discussion with community and OEH to determine the level of appropriateness.

6. Detailed assessment of the nature and extent of the likely short-term and long-term impacts on the EPBC/TSC/FFG-listed GHFF

6.1 Potential short-term effects of noise disturbance on FF

Firstly, potential noise disturbance will be carefully designed so not to cause any short-term or long-term negative impacts on FF's and other threatened species. This will be done in the following ways:

- First, the main initial disturbance will be undertaken during March and April, when GHFF are in not in any stages of pregnancy;
    - LRFF's females will be in their late stages of pregnancy and also birthing during April and May (See Table 3 and 4; Section 3.2.3)

- Mating takes place for GHFF during the daytime, therefore the noise events will not affect mating;

- Maximum volume will be approximately 85 dB when measured from the noise source (approximately 7 m);

- From experiences in both Melbourne and Sydney relocation, the GHFF became sensitised to the noise and became more responsive, thus reducing the necessary exposure to the acoustic stimuli to elicit the desired response.

6.2 Long-term decrease in the population size and area of occupancy of an important population of a species

A study by Chan (2007) found that due to the highly mobile nature of the GHFF (and LRFF), there is only one population of the species throughout its range, with no genetic distinction between sub-populations.

The few trees at the ABG that are currently being used will effectively be made unavailable as roosting habitat for the GHFF, but will remain as foraging habitat, as will other trees within the 4 ha area of the ABG. The target site of WCC is the likely site where the FF's will relocate to, which is obviously suitable as are locations surrounding the WCC and along Flanagan's Creek, where the FF's naturally move along to access suitable roosting habitat.

Any additional sites that may be chosen by FF's to settle will be assessed in accordance with the Draft Recovery Plan for GHFF (DECCW 2009), to be able to have either the same or greater level of functionality; and also in accordance with the 'appropriate' site criteria described in Section 2.

The extent to which habitat is removed or modified is negligible as the loss of the ABG as roosting habitat would be compensated by the 'provision' of habitat elsewhere. FF's will be able to return to the ABG, or use other local areas to forage. As alternative habitat is available and the aim of the program is that this alternative habitat be utilised, it is considered that the ABG is not essential to the long-term survival of the species. Therefore, the proposed action would not lead to a long-term decrease in the size of this species' population.

6.2.3. Potential to fragment the local GHFF population into two or more populations

The dispersal of the FF camp from the ABG will not result in the population being fragmented into two or more populations. The "local" GHFF population is composed of currently two known active camps, the ABG and WCC. Given the mobile nature of the GHFF (and LRFF), it is likely that the two camps interact as it is known that multiple satellite colonies do so. Studies carried out by Augee and Ford (1999) and Burton (2006) found that GHFF regularly moved between the RBGS and other regional camps such as the Gordon colony and Cabramatta Creek Camp. GHFF are capable of travelling hundreds of kilometres, stopping at various camps along the way (Tidemann and Nelson 2004).

6.2.5. Adversely affect habitat critical to the survival of GHFF

The few trees occupied by FF's within the ABG are not considered to be critical to the survival of this species or its population at a local or national level. The current location of the WCC along with other sections of the Murray River could provide potential roosting and breeding habitat for the FF's. Continual consultation with land managers will be undertaken to ensure relocated FF's settle in site/s that provide long-term habitat and are acceptable to surrounding land users.

6.2.6. Potential for disruption of the breeding cycle of GHFF

The Steering Committee established to oversee the planning and implementation of the relocation includes representatives of WIRES (NSW Wildlife Information Rescue and Education Service Inc); a Veterinary Surgeon qualified to deal with bats; OEH and AC representatives, as well as FF experts (Associated document 2).

Consultation has occurred with these committee members, where a decision was made to attempt to gain approval to commence the relocation before FF's naturally migrate the area as opposed to waiting until September onwards to see if they attempted to re-settle at the ABG. Carrying this out sooner also requires that no dependent FF young will be negatively impacted (as required by the DECCW Flying-fox Camp Management Policy). The plan has been carefully planned to avoid or minimise impacts to the breeding cycle of the GHFF (and LRFF). This proposed timing of relocation (March to April 2014) also corresponds with the time that many FF's may be starting to leave the

region, therefore numbers may be lower than the already small number of ~600.

Following the initial disturbance, re-disturbance and defending the ABG during the breeding season may be necessary to prevent the GHFF from returning to the roost site at ABG. The most likely harm that could potentially be caused to GHFF through noise disturbance would be the abortion of foetuses, and the separation or dropping of young from panicked mothers (refer to Section 2).

6.2.7. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that FF's are likely to decline

The "loss" of a few trees of roosting habitat from the ABG will be compensated for by the "provision" of similar habitat that is available for long-term conservation and management. The ABG is not a sustainable long-term habitat for FF's. The proposed action would not decrease or adversely affect the overall quality of habitat for FF's, and is therefore not considered to cause a significant population decline.

6.2.8. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

GHFF may spread invasive weeds through their droppings or spats, and these weeds may become established in the 'target site' or other potential relocation site not yet determined. Once the GHFF are settled at a site considered to be appropriate and sustainable, ABG will consult with and assist managers in the management of the site through revegetation and/or removal of weeds, if necessary.

6.2.9. Interfere substantially with the recovery of the GHFF

The proposed action of relocating a very small number of GHF will not have an adverse impact on the overall recovery of this species. Any adverse impacts of disturbance will be minimised through the numerous mitigation measures detailed in this report.

6.2.10. The effect of the proposed action on the ecosystem functions currently performed by FF's

FF's play an important role in dispersing seeds and pollinating trees and shrubs along the east coast of Australia. Within an urbanised landscape (i.e. ABG, adjacent parkland and urban/suburban land-uses); the importance of seed dispersal is likely to be small. This is because these landscapes are so intensively managed that most trees and shrubs are cultivated, not wild. The ABG itself is not a natural landscape and does not provide vegetation suitable for long-term use by FF's. The role of FF's as seed dispersers in natural bushland may be more important, especially in rural landscapes as they are capable of travelling between isolated woodland remnants, and cover greater distances

than smaller pollinators such as birds and insects (over 30 km roundtrip within a night of foraging, and hundreds of kilometres when dispersing or migrating (Tidemann and Nelson 2004). The FF's would continue to forage and disperse seeds within and across the Albury/Wodonga region and beyond and the re-distribution of the FF's from the ABG is not considered to negatively affect ecosystem functions across and within the region.

6.3. Summary of potential impacts on FF's

The proposed relocation of the FF's from the ABG through noise disturbance poses direct and indirect potential impacts on the state and nationally threatened species GHFF and state protected species LRFF:

- *Direct impacts:*

Noise disturbance activities at the ABG and any site considered 'inappropriate' for the establishment of a new camp within the Albury/Wodonga region. These potential impacts are also outlined in Section 3.4, such as:

- Abortion of young
- Dropping of dependent young; desertion of semi-dependent young
- Malnutrition; death
- Disruption to mating
- Cumulative sleep debt
- Disorientation and injury

- *Indirect impacts:*

Noise disturbance activities at the ABG will potentially have adverse effects at sites outside of the ABG, such as the existing camp WCC, and potentially others. These potential impacts may include:

- Increased stress caused by increased numbers of FF's, through competition for roost sites within the camp
- Although noise disturbance activities would not be conducted at these sites, it may be possible that the above mentioned direct impacts could occur on FF's at external sites as a consequence of the proposed action
- Increased heat stress/dehydration from increased FF numbers
- Reduced breeding success due to increased stress levels from additional numbers of FF's (however, this has not occurred at the two previous larger scale relocations from Melbourne and Sydney Botanic Gardens).

It is considered that the indirect impacts discussed above would be short term only as GHFF populations within relevant camps of the region would naturally self-regulate as mentioned throughout this report.

6.4 Mitigation measures to avoid or minimise impacts

Table 16 Summary of potential relevant direct, indirect and consequential impacts on GHFF and LRFF

The level of risk is derived from previous relocation activities in Melbourne (2003-2004) and Sydney (2012).
Direct impacts: impacts associated with activities at ABG and 'inappropriate' sites; indirect impacts: impacts at off-sites locations associated with the proposed relocation of FF's from ABG.

Potential impact	***Direct/Indirect impacts***	***Level of risk***	***Action to mitigate/minimise impact***	***Relevant section for more information***
Initial disturbance stage – noise disturbance				
Mating (GHFF);	Indirect	Neg-Low	1) Noise disturbance events will take place during pre-dawn and evening, which coincides with a part of the day that GHFF will be least likely to carry out mating (i.e. GHFF mating occurs during the daytime roost period. 2) ABG will stop noise allowing enough time for GHFF to fly to another camp to settle for the daytime (i.e. WCC which is <3 km south) 3) GHFF are likely to join up with WCC due to their colonial nature, rather than attempt to settle elsewhere.	3.2; 3.3; and 3.4.5
Abortion of young/dropped newborns (LRFF)	Direct	Low-mod	1) Noise disturbance will commence at lower levels and at pre-dawn so not to panic the adults and hence potentially drop newborns or abort foetuses. 2) Searches for aborted young will be conducted by ABG staff after each noise event, documented and reported to the Steering Committee.	3.3 & 3.4.1; 3.5.5

Potential impact	*Direct/Indirect impacts*	*Level of risk*	*Action to mitigate/minimise impact*	*Relevant section for more information*
			3) ABG will liaise with the WCC camp Manager to monitor any potential impact.	
Follow-up defending – late September onwards				
Abortion of young (GHFF)	Direct/Indirect	Low	1) This may only occur if GHFF attempt to re-settle at the ABG from late September onwards. 2) If so, noise disturbance will commence at lower levels and at pre-dawn to defend the roost trees at the ABG 3) Searches for aborted young will be conducted by ABG staff after each noise event, documented and reported to the Steering Committee 4) ABG will liaise with the WCC camp Manager to monitor any potential impact	3.3 & 3.4.1; 3.5.5
Semi-independent young – abandonment (LRFF)	Direct/Indirect	Low	1) Young will be semi -independent at this stage where they are capable of sustained flight but could still be suckling from their mother. 2) ABG/AC ground staff will be vigilant to the potential occurrence of abandoned pups (i.e. calling for mother), and act accordingly until mother and pup are reunited.	3.4; 3.4.3
General health/malnutrition; cumulative sleep debt; death	Short-term/Direct	Low	1) Noise events are not conducted during the foraging period 2) ABG will liaise with WCC (or other potential managers) about the general health of GHFF 3) ABG will collate all reports from wildlife carers and the 'Bat Hotline' 4) Cumulative sleep debt is unlikely to occur due to an existing camp being <3 km to the south and other nearby available habitat along the Murray	3.3; 3.4.4-3.4.6

Potential impact	*Direct/Indirect impacts*	*Level of risk*	*Action to mitigate/minimise impact*	*Relevant section for more information*
			River Corridor 5) If any dead Flying-foxes are found, they will be examined by a vet to determine the cause of death; ABG will also liaise with other camp Managers to monitor for potential welfare issues and deaths	
Dropping of dependent young and desertion of semi-dependent young (GHFF)	Direct	Low	1) This will only occur if GHFF are successful at re-settling at the ABG from late September which is unlikely 2) Noise disturbance will commence at low levels and gradually increase from GHFF behavioural cues 3) ABG will liaise with the WCC camp Manager and wildlife rescuers and carers for reports and sightings of incidents of abandoned young 4) In the event of discovering abandoned young – ABG will halt disturbance until the juveniles are large enough to leave the camp at night, hence some nightly monitoring will be required to detect when young are flying out of the camp.	3.3; 3.4.2; 3.4.3; 3.5.5
Disorientation; collision and injury	Short-term direct	Low	1) Noise disturbance will commence at low levels and gradually increase from GHFF behavioural cues 2) GHFF behaviour will be observed and monitored by ABG staff during noise disturbance activities, and in the event of GHFF showing distress; disorientation; and/or collision, ABG staff teams will liaise via radio or mobile contact to reduce or	3.3; 3.4.7

Potential impact	*Direct/Indirect impacts*	*Level of risk*	*Action to mitigate/minimise impact*	*Relevant section for more information*
			suspend disturbance activities as required 3) In the unlikely event of an injury – a vet/wildlife carer will be on call for immediate contact	

7. Contingencies

7.1 FF's do not leave the camp, regardless of disturbance

Based on previous experiences from the Melbourne and Sydney Botanic Garden Relocation programs, ABG believes this to be an unlikely scenario. However, if the strategically planned disturbance events do not cause the FF's to leave the ABG after four weeks of evening and pre-dawn noise events, then disturbance will cease. ABG will then seek advice from the Steering Committee; and potentially other wildlife experts regarding the best options for management from that point on.

7.2 FF's only abandon the camp temporarily

The ABG will stay vigilant regarding returning FF's if there is any that attempt to return for roosting. This has been accounted for in this proposed strategic disturbance plan as the ABG will be vigilant regarding 'defending' and then conduct ongoing maintenance disturbance the following season (usually from late September until the following Autumn) if and when FF's attempt to return to the ABG. Approval to conduct this ongoing disturbance will be required into perpetuity to prevent any FF's from re-establishing the ABG campsite.

The RBGM has maintained an effective monitoring program over the last five years to ensure the GHFF do not return to the Royal Botanic Gardens, Melbourne. There have been occurrences recently (February 2014) at the RBGM where GHFF have settled to roost for more than one week with fluctuating numbers ranging between <50 to ~200 (McDonnell pers. com). RBGM staff carried out pre-dawn disturbance to deter them from landing at Fern Gully in the Gardens. One week of such disturbance was sufficient to cause the small group to re-join the Yarra Bend camp. These events may continue to occur in the future, however, the action required is efficient with minimal impact. The RBG in Sydney are also maintaining vigilance from the initial relocation 18 months ago, and still carry out necessary disturbance occasionally when necessary.

7.3 GHFF occupy sites other than those selected, and occupation of these new sites creates conflict

Although the ABG has selected a 'target site' with an existing FF camp, it is possible that the FF's may relocate to other sites that may or may not have been considered.
If FF's roost in sites that have already been identified as inappropriate (see Section 2.3.2 & 4), with the permission of the land owner/manager(s), they will be moved on using the methods described in Section 3 for inappropriate locations outside the ABG.

If FF's occupy sites not mentioned in proposal, the site will be quickly assessed, in consultation with the land owner/manager, to determine whether it is an 'inappropriate site' as defined in this proposal. If it is, the FF's will be moved on as above. The ABG will take into consideration the sensitive reproductive cycles of the FF's if this occurs, which

is outlined in this document. For example, all FF young will be independent and observed to leave the camp at night to forage before a disturbance event will occur.

7.4 Strategies to manage the GHFF if relocation fails

If the relocation does not succeed in removing the FF's from the ABG, the ABG will explore further alternative options. However, the options for the ABG are very limited. If the relocation fails, ABG would take advice from OEH and wildlife experts regarding other options. Other options from previous relocations have been explored such as an 'Event-man' (large inflatable tube man), plastic bags in trees, and fluorescent vests in trees. These were put in place at the RBGS to protect some of the high priority trees before the actual relocation could take place, however these types of deterrents were only short term answers. At this stage, relocation is considered the best option.

To reiterate: The options for the ABG/AC are very limited. If the relocation fails, ABG/AC would take advice from the Steering Committee to explore other options. At this stage, relocation is considered the best option; with there being either no or minimal impacts on existing threatened species that occur in the study areas.

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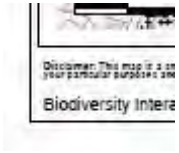
9. Appendix 1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