Response to Relevant Conditions for DECC Section 95(2) Certificate 1097285

Proposed relocation and ongoing disturbance of Grey-headed Flying-foxes from the Royal Botanic Gardens, Sydney NSW

Background

On 31 October 2008, the Botanic Gardens Trust (BGT) submitted an application to the NSW Department of Environment & Climate Change (DECC) to relocate a colony of primarily grey-headed flying-foxes (*Pteropus poliocephalus)* from the Royal Botanic Gardens, Sydney (RBGS). In November 2008, before a decision had been made by DECC, BGT made some amendments to their application.

On 6 February 2009, DECC determined that the proposed action was 'unlikely to significantly affect threatened species, populations, ecological communities and their habitats' and subsequently issued a certificate approving the proposed action under Section 95(2) of the *Threatened Species Conservation Act 1995* (TSC Act) under certain conditions (**Appendix 1**).

This report provides a detailed response to each of the conditions set by DECC. This information has also been included in a *Reconsideration Proposal 2008/4646: Proposed relocation and ongoing disturbance of Grey-headed Flying-foxes from the Royal Botanic Gardens, Sydney NSW*, submitted to DEWHA 28 April 2009.

RELEVANT CONDITIONS

The BGT will carry out the proposed relocation and ongoing disturbance of Grey-headed Flying-foxes (GHFF) from the Royal Botanic Gardens, Sydney (RBGS) in accordance with the ten Relevant Conditions applied to the Section 95 Certificate.

Condition 1

The proposal will be carried out as described in the application documents (the Proposal), these condition and in the management plans and strategy required to be prepared by Conditions 5 to 8.

Condition 2

Should there be any conflict between the application documents and these conditions, the conditions shall prevail.

Condition 3

The primary relocation will not be undertaken during adverse weather conditions. During May-July, and in the areas with existing or likely new camps, it is extremely unlikely there will be ground frosts and air temperatures will not have exceeded 38 degrees Celsius in the previous day. Temperature and observations of rain and wind intensity at the time of disturbance will be measured and recorded on log sheets; weather data will be compiled and submitted to DECC as part of the fortnightly reports. Designated site-coordinators and/or the flying-fox project officer (if on-site) will decide on the duration of the action, and whether the action continues or not. Disturbance will be halted during periods of strong winds or several hours of heavy rain.

If adverse weather conditions such as heavy rain and strong winds arise during follow-up disturbances (if required), disturbance will be halted for the duration of the particular condition. In the event of a heat wave (prolonged period >40°C, especially when coupled with low humidity and hot drying winds), flying-foxes may suffer from dehydration, heat stress and/or heat stroke; mass mortality can also occur (Pinson 2007). Therefore, no disturbance will occur during a heat wave, and a recovery period will follow, during which site-coordinators and staff will monitor the animals for signs of heat stress, e.g. shade-seeking, panting and saliva-spreading (Pinson 2007). Disturbance will not continue, even if temperatures drop below 38°C, until the animals have recovered, and signs of stress are no longer evident.

Condition 4

While the NSW Wildlife Council does not support relocation of the flying-foxes in principle, or the methods proposed, the Wildlife Council and the two affiliated wildlife rescue and rehabilitation groups for the area relevant to the proposed action (i.e. WIRES, Sydney Metropolitan Wildlife Services) have agreed that individual rehabilitators may assist in the rescue and rehabilitation of any flying-foxes found injured or otherwise debilitated during the relocation process (**Appendix 2**). The University of Sydney's Wildlife Health & Conservation Centre has also offered assistance in the form of 1) aviary space, where rescued flying-foxes can have room to recover before release, in the unlikely event that existing flying-fox aviary spaces reach full capacity at the time of the relocation; and 2) two staff with previous experience as a vet nurse and keeper at Taronga Zoo, respectively. BGT will provide a protocol in the handling of injured flying-foxes and/or abandoned young, as well as contact details of rescue and rehabilitation organisations, to all staff and volunteers involved in the relocation process.

Condition 5

The BGT has developed a Research and Monitoring Plan (**Appendix 3**) to accompany the relocation of grey-headed flying-foxes (GHFF) from the RBGS. The Research and Monitoring Plan is considered a critical and integral component of the project. There are four aims to the plan:

1) to evaluate the long-term success of relocating GHFF from the RBGS;

2) to evaluate the effects of the disturbance on the welfare of the GHFF to guide future relocation efforts;

3) to identify where the relocated bats settle and evaluate impacts at the new sites; and

4) to improve our understanding of the biology of the species across Sydney through research conducted by independent flying-fox experts

Success of the relocation will be measured by the following criteria:

(i) relocation of the bulk of RBGS camp within the May to July period without significant impact on GHFF welfare (i.e. a surge in reports of injury or death from wildlife carers groups);

(ii) reasonable knowledge of areas of visitation and settlement by relocated flying-foxes, with follow up consultation with all land managers of affected sites;

(iii) settlement of GHFF in existing or new sites that adequately cater to their needs without causing unresolvable conflict with people;

(iv) increased knowledge of flying-fox biology, in particular, the reproductive output and stress levels of flying-foxes in disturbed vs. undisturbed sites;

(v) follow up disturbances preventing flying-foxes from future establishment of permanent camps at RBGS. Increased life expectancy and partial to full recovery of the trees damaged as a result of roosting flying-foxes;

(vi) absence of long-term resident bats in the RBGS

The BGT has engaged flying-fox biologists to design, oversee and undertake studies to monitor the movement of flying-foxes before and after the relocation, and to compare reproductive output and stress levels between disturbed and undisturbed sites. Comparative assessments of reproductive output and stress levels will involve treatment populations (i.e. any camps the RBGS flying-foxes are most likely to settle in, i.e. camps in the Sydney metropolitan area) and

control or reference camps. The control or reference camps will include those on the periphery of Sydney, unlikely to be significantly affected by the relocation. Where possible, data collected from each camp will also be compared against existing data from previous research. It is important to monitor these control or reference camps in a similar manner to those potentially impacted by the relocation to identify impacts due to the disturbance and other impacts affecting the flying-foxes more generally. For example, a low birth rate in summer 09/10 in all the camps is unlikely to be due to the relocation, while lower birth rates at the Sydney camps the relocated flying-foxes settle in, compared to those at the outskirt of Sydney, may be attributable to the relocation. The BGT will also collect data on the size of colonies at existing or new GHFF camps to further our knowledge of the impacts of relocation. The monitoring and research program will begin prior to the relocation, via camp surveys, banding and radio-tracking. Progress will be reviewed at the end of the major relocation effort (end of July) and at the end of the first breeding season. Monitoring of camp sizes will occur twice a week prior to, during and after the relocation, until GHFF have joined existing camps or settled in a new, appropriate site. Monitoring frequency will then be decreased gradually (from twice a week to weekly, fortnightly, then monthly intervals), depending on reports of the relocation's impact on GHFF welfare. Monitoring will continue for the life of the batteries on the radio collars (~ 16 months). Research will continue for three years or for as long as required by DEWHA and/or DECC.

The Research and Monitoring Plan provides details of relevant matters including:

- Number of GHFF to be colour-banded or fitted with radio collars (Section 2.1);
- Timing for the fitting of the colour-bands and radio collars, and justification for the two proposed figures (Section 5);
- The identity of the person(s) supervising the monitoring program (Introduction);
- Reporting date for written monitoring reports (Introduction);
- Lengths of the various monitoring programs (Sections 3-8);
- Person(s) for assessing breeding success and fly-out counts, and methods to be used (Section 2.1; Section 6);
- Existing Sydney camp sites that will be monitored (Section 6). Static counts will be used as disturbance may cause modifications in fly-out patterns (Section 4);
- Factors that will be monitored to determine the effects of dispersal on GHFF welfare (Section 6);
- Thresholds of the above-mentioned factors that would indicate that GHFF are suffering unduly as a result of the relocation (Section 5);
- The identity of the person(s) who will make the decision whether or not the dispersal should be amended or halted based on monitoring results (Introduction);

- Line of communication to ensure that both the BGT and DECC are aware of monitoring results (Introduction).

Condition 6

The BGT has developed a communications strategy, outlined in the attached Communication Action Plan and Communication Timeline (**Appendix 4**). The communications strategy provides detailed information, including key messages to be disseminated, methods and frequency of communication with stakeholders the general public and the media, and a time-line for the action plan before and after the relocation.

Other relevant matters addressed by the strategy include:

- Provision of updated information on the GHFF and the proposed relocation to the general public via a Q&A section on its website: www.rbgsyd.nsw.gov.au/welcome_to_bgt/royal_botanic_gardens/garden_features/wildlife/flying-foxes/questions_and_answers
- Methods for the general public to make reports of new GHFF camps or increases in numbers at existing camps amongst other matters;
- Media releases explaining the relocation process at nominated times;
- Timeline for advising relevant authorities and residents of the relocation;
- Preparation of pamphlets, signage etc.

Condition 7

7.1 Disturbance and follow-up dispersal within and outside the RBG

The BGT has received expert advice from managers involved in the relocation of flying-foxes from the Royal Botanic Gardens, Melbourne, and developed a management strategy for on-going disturbance outside the May-July period to minimise impacts on GHFF, especially pregnant females and young. Senior BGT staff and horticulturalists were inducted as site co-ordinators, responsible for the deployment of ground staff for disturbance and dispersal both within and outside the RBG. The action plan is presented in detail in Table 1.

Table 1. Details of types and levels of disturbance at different times of year reproductive/growth stages*

Stage	Action	*Rationale*
Monitoring	- Train staff and volunteers in fly-out and static counts. - Conduct camp size surveys at existing camps in the Sydney metropolitan area (within 30 km from the RBG) on a weekly basis prior to the relocation. - Monitoring will continue during and after the relocation, for as long as the batteries in the radio collars last (~ 16 months), or for as long as required by DECC and/or DEWHA. - Team leaders of the monitoring teams (6-8 members each) will report camp sizes and new camp locations to the project coordinator (Tina Hsu – flying-fox project officer).	Regular and up-to-date data on the size of existing camps may help the BGT determine the movement of bats. Large fluctuations in camp size may be correlated with the number of bats relocated from the RBGS.
Relocation May – July (The first trimester of pregnancy)	- Noise disturbance for 5 – 10 min on the hour from noon until 4 pm. - Noise accompanying evening fly-out, start progressively earlier (by 5 minutes) each night, up to ½ hour before normal fly-out time. - Increase frequency of daytime disturbance (i.e. start earlier than noon). - Conduct pre-dawn dispersal between 1 -3 hours before sunrise. - During evening dispersals, 10-15 ground staff will work in concert to 'herd' the flying-foxes out of the	This is the window of time when the most intense disturbance activity will occur. Camp sizes are generally lowest in Winter (e.g. the Cabramatta Creek camp has dropped from an average of 15,000 to 2000 in May 2009; Megan Haberley pers. comm.[1]), and the animals have mostly finished mating. During daytime disturbance, ground staff will vary noise levels gradually, and periodically, so that the flying-foxes are awake and unsettled. This will be done throughout various parts of the colony. Disturbance will not occur at all parts of the camp at the same time. This is to prevent agitating flying-foxes to the point where they start leaving the Gardens during daytime. The level of disturbance will be increased gradually to incorporate pre-dawn dispersal after 1-2 weeks. This is

[1] Megan Haberley – Environment Officer and camp manager of Cabramatta Creek Flying-fox camp. Fairfield City Council. mhaberley@fairfieldcity.nsw.gov.au

	- Gardens via their usual exit routes to the south and the east. - Site co-ordinators (senior ground staff reporting to Brad Horan and Fran Jackson) will record disturbance duration, frequency, level etc, weather conditions and flying-fox reactions. Data will be submitted to the project co-ordinator, to be compiled and submitted to DECC fortnightly. Site co-ordinators will also use walkie-talkies to plan the sequence of disturbance throughout different parts of the colony during the daytime, co-ordinate staff during evening and pre-dawn dispersal, and modify or halt disturbance based on flying-fox behaviour.	essential to prevent the flying-foxes from roosting in the RBG (Simon Toop pers. comm.[2]). Disturbance will cease at least 1 hour before sunrise to allow the flying-foxes to fly to alternative roosts. (Flying-foxes can fly more than 30 km/hr, and there are many existing sites within 30 km of the RBG). During evening and pre-dawn dispersal, all staff will observe the flying-foxes for signs of disorientation and/or collision, and communicate to the site co-ordinators via walkie-talkies.
Maintenance (within RBG) On-going	- On-going pre-dawn dispersal from 1-3 hours before sunrise 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 (1-3 hours before sunrise) to prevent any flying-foxes from returning. - Ground staff will monitor all areas of the RBG daily and report sightings of flying-foxes to the site co-ordinators and the project co-ordinator. Dispersal teams (5-15 people, depending on the number of flying-foxes) will then be mobilised for dispersal that evening and the following morning (pre-dawn).	From August to September, the flying-foxes will be in the late stages of pregnancy. Birthing will occur from October onwards, and mothers will be carrying dependent young. To reduce stress, pre-dawn and evening dispersals will be used. One to two episodes of brief (10 min) daytime disturbance may be added if animals fail to disperse. Abortion during the later stages of pregnancy may occur. We will search the RBG camp site for aborted young after each disturbance episode, and cease daytime disturbance immediately if aborted foetuses are found. If abortions continue, all disturbance activities will cease. Once too heavy to carry, young separate from mothers but remain dependent and incapable of sustained flight for several weeks (Dec. to first two weeks of Feb.). Staff will survey the grounds daily to search for pups left behind by foraging mothers. Pre-dawn dispersal will only take place if there are

[2] Simon Toop – Manager of RBGM relocation. Project Leader Threatened Species and Communities, Biodiversity and Ecosystem Services Department of Sustainability and Environment Victoria. simon.toop@dse.vic.gov.au

		no dependent, flightless pups. Previous experience has shown that flying-foxes travel in groups; with an on-going monitoring program to ensure that no flying-foxes are allowed to roost in the RBG for more than a one night, a maternity camp will not be able to settle in the RBG (Simon Toop pers. comm.). If groups of adults without young are observed to roost in the RBG, they will be dispersed with evening and pre-dawn dispersals. In the very unlikely event of a maternity camp settling at the RBG, disturbance will cease during the Dec.-Feb. period, and resume once all the young are capable of flying out at night to forage.

* Due to variations in factors such as climate and food availability, and overlap in the reproductive cycle of individuals, all actions will be informed by field observations of the reproductive and growth stages of the flying-foxes present

7.2 Potential negative impacts

There are a range of potential negative impacts that could occur to GHFF during the relocation process. For completeness, we have identified each of the possible outcomes, explained the likely occurrence or severity of the problem, and methods to identify and deal with the issue, such as searches for dead and injured bats. Some of the existing camps have been identified as inaccessible, and/or likely to suffer adverse impacts from visitation due to the flying-foxes' sensitivity to human presence. Therefore, the conditions of each camp was assessed independently, and the frequency of on-ground monitoring, if feasible, will differ between each camp depending on the terrain, sensitivity of the flying-foxes, and agreement with land managers (Table 2).

7.2.1 Abortion of young

Actual stress levels will be inferred through behavioural monitoring in relation to the disturbance level implemented, so as to help identify the level of stress which might trigger an abortion. Aside from monitoring the flying-foxes' welfare, and the level of disturbance used, the disturbance/dispersal team will search for aborted young after disturbance/dispersal activities within the RBGS. We will immediately scale back daytime disturbances if any abortions are detected and attributable to the relocation process, if abortions continue to be detected, all disturbance activities will cease (including dispersal). The BGT has been advised by camp managers that entering some existing camps to search for aborted foetuses will cause undue distress to the GHFF and potentially cause abortions or other negative impacts (Table

2). BGT will consult regularly with camp managers familiar with the camp site, as well as wildlife carer groups, so as to obtain timely information on any negative impacts of the relocation on GHFF welfare, and to determine whether or not to modify or halt disturbance/dispersal activities.

7.2.2 Dropping of dependent pups

Relocation may cause female flying-foxes carrying dependent young to drop them due to high stress levels. This is most likely to occur during October to early February, after which the young become increasingly independent.

Within the RBG, staff will be assigned parts of the Gardens to 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.

Should BGT be required to disperse flying-foxes from inappropriate sites, monitoring teams will use the same method as that used at RBG, i.e. first search 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 dispersal. If it is not possible to enter the site or to check for pups, BGT will not conduct dispersal.

In the event of finding abandoned pup/s, staff and volunteers will follow wildlife rescue protocol in rescuing pups if possible (i.e. removing surrounding threat to the animal, cover with milk crate or box, and contact carers immediately 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. BGT is committed to funding the rehabilitation of injured and/or orphaned animals.

7.2.3 Desertion of semi-dependent young

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. This is a real risk, and we will prevent it from happening by stopping disturbance activities to all but groups of non-breeding adults during December to early February. Staff will survey the Gardens or inappropriate sites with binoculars, to report on the presence of mothers with young.

The BGT will implement an on-going maintenance program to prevent the establishment of maternity roosts in the RBGS. From the end of the primary relocation period (end of July), the RBGS will be monitored by

staff on a daily basis. As soon as flying-foxes are seen roosting in the Gardens, evening dispersal, followed by pre-dawn dispersal will be used. If wildlife carers or the community report any reasonable concern for the desertion of young, either through the use of the bat hotline or RBG website, reports will be collated by the project co-ordinator for discussion with flying-fox researchers and site co-ordinators. On the advice of the flying-fox 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 we have confirmed that all juveniles are large enough to leave the camp at night and be able to fly to alternative camp sites nearby.

7.2.5 Malnutrition, excessive stress and death

The relocation activity has potential to cause stress, malnutrition and death of bats. This may occur if the disturbance by acoustic and visual stimuli is delivered at such intensity and frequency that their normal behaviour is severely disrupted.

Some of the camps are not accessible due to factors such as weed infestation, steep terrain, and high sensitivity of flying-foxes to human presence. It would be difficult to observe for signs of malnutrition, even with binoculars; however, BGT staff will monitor flying-foxes for signs of debilitation and weakness, where possible. We will also liaise with camp managers who are familiar with the site, as well as wildlife carer groups such as WIRES and SMWS. Sightings and reports will also be collated from the bat hotline and the RBG website to provide up-to-date data on GHFF welfare.

7.2.6 Other possible impacts

Cumulative sleep debt will increase stress levels, and may induce the aforementioned negative impacts on flying-foxes. However, day time disturbance will occur only for 10 minutes at hourly intervals, thus allowing the animals time to rest. GHFF may also suffer injury through disorientation because of sudden disturbances. The dispersal team will be co-ordinated by site co-ordinators to stop and start noise disturbances in response to observed GHFF behaviour, such as circling, disorientation and collisions. Staff will search the premises after each dispersal event for injured bats, which will be cared for by professional carers.

BGT will carefully monitoring all stages of the relocation process, and use the minimum level of disturbance necessary (e.g. begin with 4 periods of daytime disturbance and increase the frequency over time). If reproductive output in 2009/10 is significantly lower than expected or

lower than those in camps unaffected by the relocation, we will reduce the intensity of disturbance (see below).

The flying-fox researchers named in the Research and Monitoring Plan (**Appendix 3**) and members of the monitoring team will assess the welfare of GHFF in the various camps, and relay any concerns to the BGT's flying-fox project officer (project co-ordinator). The number of staff and/or volunteers required for the various dispersal activities in the RBGS and off-site are listed in table 11 of *Proposal for the relocation of a flying-fox colony from the Royal Botanic Gardens, Sydney.* The Director of Domain & the RBG and the Executive Director of the BGT will amend or halt dispersal activities based on the frequent update of on-ground observations by the disturbance/dispersal team, monitoring teams, researches, as well as reports from the general public and wildlife care and rehabilitation groups in the Sydney metropolitan area. If any dead flying-foxes are found, we will scale back the frequency of disturbance (i.e. the hourly daytime disturbance, from 6 times a day to 4 times a day, for example). The dead flying-fox will be examined by a vet to determine cause of death. If more than 5 dead flying-foxes 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. If any injured flying-foxes are found, the frequency of disturbance will also be reduced. BGT will consult flying-fox researchers and wildlife carers on the likely cause of the injuries. If more than 10 injured animals are found, disturbance will cease immediately, and the BGT will seek advice from DECC and flying-fox experts.

Table 2. Conditions of existing camps in Sydney, and proposed actions to monitor GHFF without causing additional distress

Camps	***Conditions***	***Actions***
Ku-ring-gai Flying-fox Reserve	The flying-foxes at Ku-ring-gai Flying-fox camp (KFFR) are very sensitive to human presence, and would leave their perches in response to human visitation. There are reports of mothers dropping young when disturbed from their roost. KFFR is administered by a group of dedicated volunteers from the Ku-ring-gai Bat Conservation Society (KBCS), and occasional searches for injured/aborted/abandoned flying-foxes are carried out by volunteers familiar with the camp site, during times that would not place additional stress on the flying-foxes, or after an event such as a heat wave, when the animals are likely to have suffered adverse	Proposed search of the camp for injured/abandoned flying-foxes and aborted foetuses will be co-ordinated with the KBCS and contingent on their advice, due to their familiarity (20+ year management experience) and understanding of the flying-foxes and the site.

	effects and in need of assistance (Marjorie Beck & Nancy Pallin, KBCS, pers. comm.).	
Cabramatta Creek	Cabramatta Flying-fox Reserve is not part of a recreational area so human disturbance is limited. Although the flying-foxes are habituated to traffic noises (the camp is adjacent to Hume Highway), they do get disturbed if people walk underneath their roost trees (Megan Haberley pers. comm.). They are highly stressed by high visibility clothing, loud voices and people walking at a fast pace. However, they appear to have become habituated to the presence of bush regeneration contractors, and regular monitoring may be carried out if care is taken.	Care will be taken to only send small teams (no more than 2-3 people) into the camp at weekly intervals; observers will wear clothing in beige or green, similar to the bush regeneration contractors, and look for injured/abandoned animals etc with binoculars beneath trees with plenty of canopy to minimise disturbance to the flying-foxes
Parramatta Park	The Parramatta flying-fox camp in Parramatta Park lies on a river bank away from trails and human disturbance. The flying-foxes in this camp are sensitive to human presence, as roosting perches can be quite low. Parramatta Park Trust will commence a bush regeneration program in late May 2009. Two bush regeneration contractors will work on areas where the flying-foxes are not currently roosting, or are in low numbers, for 1 day every fortnight. The reaction of the flying-foxes will be closely monitored by the camp manager, Pino Todarello[3].	Subject to guidance from the camp manager at Parramatta Park, BGT staff/volunteers will search the site on the fortnightly regeneration day as animals become habituated to regeneration personnel; this will minimise the frequency of disturbance to the camp.
Kareela	The flying-fox camp is surrounded by residential areas and a sports field. It occupies a very small area, so observers can easily walk around the boundary of the camp and survey for flying-foxes with binoculars. The flying-foxes roost low in the trees and are therefore likely to be disturbed by human presence in the camp site. The thick understorey would also hinder any search efforts.	This camp will be observed by staff with binoculars, as it may be possible to spot abandoned pups during the day time.
Clyde	The flying-fox camp at Clyde lies between Clyde station and	Due to the terrain and the sensitivity of the flying-foxes, BGT proposes to

[3] Pino Todarello – Ranger and camp manager of Parramatta Park Flying-fox camp. todarello.pino@ppt.nsw.gov.au

	RailCorp land; there are irregular surveys of camp size, but there is no management plan in place. The camp has been present for at least 8 years, although flying-foxes vacated the camp 18 months ago in response to construction work on adjacent land. Approximately one-third of the animals returned last summer (currently 3,400 cf. 8-10,000 at the peak). The camp is difficult to access (steep, weed-infested, no trail), and the flying-foxes unaccustomed to human presence.	minimise stress by not entering the camp unless surveys at other camps reveal a pattern of abortion of foetuses or desertion of dependent young.
Wolli Creek	The flying-fox camp at Wolli Creek is bound by a river and free from human visitation. There are no trails in the camp and the understorey is characterised by weed infestation and thick vegetation.	BGT has been advised by the camp representative, Storm Stanford[4] that entering the camp to search for injured/abandoned flying-foxes will only distress the flying-foxes. Therefore, BGT will infer the impact of the relocation and base decisions on the duration, frequency and continuation of disturbance and/or dispersal through information gathered from more accessible sites.

Condition 8

The management strategy presented below expands on the previously available information by detailing methods for assessing site suitability; results of negotiation with land managers; the BGT's commitment to dispersing GHFF from inappropriate sites; methods and thresholds for dispersing GHFF from inappropriate sites; resources the BGT is willing to commit to the managers of a new camp site; and dispute resolution mechanism to resolve disagreement between the BGT and other land managers.

The proposed relocation will use the methods successfully employed by RBGM, modified to adapt to the Sydney environment of multiple existing camps. The major modification will be not selecting and preparing a single preferred 'target site'. RBGM expended considerable time and resources on a preferred relocation site, which in the end was not visited or settled by any flying-foxes. The RBGM has advised the BGT to identify criteria for suitable and unsuitable sites (as per *Proposal for the relocation of a flying-fox colony from the Royal Botanic Gardens, Sydney*), and then assess any settled area on a case-by-case basis. In addition, the experience at RBGS from the 1992-

[4] Storm Stanford – representative of Wolli Creek Flying-fox camp. miss_megan@internode.on.net

1997 relocation is that the flying-foxes joined existing camps and no new camps were established in the Sydney area. It is considered that the Ku-ring-gai Flying-Fox Reserve (KFFR) in Gordon is the most likely 'target site' for our relocation, but we have also identified some additional areas that would be suitable and acceptable for flying-fox camps (**Appendix 5**).

The BGT will provide a hotline for land managers and the general public to report sightings. Reports of sightings from land managers and the community will be collated, mapped, and assessed on a case-by-case basis. The BGT will assess the impacts of new arrivals and work with the relevant land and wildlife managers to ensure new and expanded camps are both appropriate and remain viable.

Monitoring teams consisting of BGT staff and volunteers will conduct static or fly-out counts at new and existing sites prior to, during and after the relocation. Independent flying-fox researchers will also coordinate research and monitoring at existing and new camps, and inform the BGT of GHFF movements. Results from monitoring will form the basis for decisions regarding whether new camps or increased numbers at existing camps are the direct result of the action (**Appendix 3 – Research and Monitoring Plan**).

8.1 Assessment of new camp sites

The preferred site for relocated GHFF to settle in is the Ku-ring-gai Flying-fox Reserve. The KFFR is a sheltered valley with permanent water-bodies that offers cooler roosting habitat for the flying-fox colony in the summer months and shelter from seasonal extremes such as southerly and south westerly winds. The KFFR contains an average of 27,000 flying-foxes, and numbers can reach 70,000, suggesting an abundance of food resources in the region at certain times for the flying-foxes (www.sydneybats.org.au). Habitat restoration has been carried out at this site since 1987, and in 1991, Ku-ring-gai Council entered into a voluntary conservation agreement with the Minister for the Environment to manage the reserve to aid the conservation of the grey-headed flying-fox (Ku-ring-gai Municipal Council 1999). BGT has obtained 'in principle' agreement with managers of the reserve, which allows for the settlement of 4000-7000 flying-foxes relocated from RBGS (**Appendices 6, 7, 8**). If this site becomes the preferred camp site for most or all of the flying-foxes from the RBGS, support will be provided as outlined in the original proposal. BGT will assist in the dispersal of GHFF if requested by the council. BGT will not conduct any disturbance in within the camp/reserve; rather, low intensity pre-dawn dispersal will be used to nudge animals found in inappropriate sites on the periphery of the camp (e.g. backyards) towards the reserve. This method was used successfully in Melbourne to push a colony of flying-foxes along the Yarra River until they eventually settled at an appropriate site (Yarra Bend).

Five additional target sites have also been approved as appropriate roosting and maternity habitat for 4,000-7,000 GHFF by Parks and Wildlife Group of

DECC and the Director of Domain and Royal Botanic Gardens, BGT (**Appendix 9**). The approved sites provide continuous vegetation close to watercourses, do not contain existing flying-fox camps considered to be at capacity, and settlement of GHFF is considered unlikely to pose a threat to threatened species or vegetation communities. In order to reduce the possibility of conflict, the Parks and Wildlife Group deemed the sites to be suitable where the animals settle at a distance >300 m from an urban interface or high visitation area (**Appendix 9)**. The sites all lie within national parks and are protected from clearing and development. They are continuously vegetated, and in close proximity to at least one watercourse. The approved sites and their vegetation resources are presented in Table 2.

Table 3. Sites approved by the Parks and Wildlife Group, and the vegetation resources

Approved sites	Vegetation resources
Botany Bay NP	Source: DECC GIS layers (unknown author) Veg: Eucalypt dry schlerophyll woodland, grassy woodland and various scrub and heath types. These veg resources would provide foraging and sheltering habitat for the GHFF.
Garigal NP **(i.e. North of Morgans Rd)**	Souce: DECC GIS layers (unknown author) Veg: Euc Sandstone Gully Forests, Turpentine, Bloodwood Forests, Euc Tall Open Woodlandand Angophora Woodlands, Variety of heathlands and swamps. These veg resources would provide both foraging and sheltering habitat for the GHFF.
Ku-ring-gai Chase NP **(i.e. eastern sections/Lambert Peninsula)**	Souce: DECC GIS layers (unknown author) Veg: Rainforests, various Eucalypt/Corymbia/Angophora forests & woodlands, Swamp Forests, various heath types and riparian scrubs.These veg resources would provide both foraging and sheltering habitat for the GHFF.
Lane Cove NP in conjunction with Hornsby Shire Council (i.e. camp below Pennant Hills Park)	Souce: DECC GIS layers (unknown author) Veg: Euc/Angophora Tall Open Forest, Euc/Mallee Open Woodlands, Swamp forests, closed shrublands and riparian veg. These veg resouces would provide both foraging and sheltering habitat for the GHFF.
Royal NP **(i.e. in the vicinity of Graham's Point and Gundamaian)**	Souce: DECC GIS layers (Keith 1994) Veg: Various Euc Forests, various heathlands, rainforests, Mangroves, Riparian scrubs and swamps. These veg resouces would provide both foraging and sheltering habitat for the GHFF.

However, BGT is aware that dispersed flying-foxes may not settle in approved sites. Thus, BGT will closely follow the movements of dispersed GHFF through radio-tracking, searches for colour-banded individuals and camp surveys, and collate reports from land managers and the general public, so as to investigate the impact of relocated GHFF on existing sites and new sites

(see **Appendix 3 – Research and Monitoring Plan**), and to determine the appropriateness of any new sites. For the purpose of this proposal, an inappropriate site is defined as either: 1) one that is not accepted by nearby neighbours due to proximity within 300 m of residences. This applies to newly established sites, as existing flying-fox camps in the Sydney metropolitan area are surrounded by residential areas and flying-foxes are often found in close proximity to residents (i.e. within 50-100 m); 2) one that is not accepted by land owners/managers due to incompatible land use on or adjacent to the site; 3) one that contains other threatened species or EECs that will be adversely affected by the roosting flying-foxes; or 4) one that contains vegetation that will not survive permanent occupation by a flying-fox camp (e.g. 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). A site is deemed inappropriate if it fulfils any one of the aforementioned criteria. However, BGT will first consult land managers and the community, and provide advice and/or donations to assist in the management of GHFF in new sites.

8.2 Follow-up dispersal from inappropriate sites

During the relocation, if any flying-foxes roost in a location considered suitable, the BGT will consult with land managers and the community, and leave the flying-foxes undisturbed if their settlement is deemed acceptable. Any flying-foxes that arrive in inappropriate locations will continue to be disturbed to encourage them to join up with the undisturbed flying-foxes (Table 3). If any flying-foxes 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 the animals along that corridor closer to the suitable site, without scattering them. This will be done using a modified pre-dawn disturbance, where the intensity of stimuli is reduced compared to the level of pre-dawn disturbance required to prevent the return of flying-foxes. This is a similar technique to that used in Melbourne, when flying-foxes were pushed along the Yarra River towards the preferred Yarra Bend site using very low levels of disturbance at dawn when they are returning to camp in the area that they left the previous evening, as well as a little further away from the site they are being pushed towards. This will make the flying-foxes nervous about returning to the locations where they have been disturbed, and will encourage them to roost a little closer to the preferred site where there is no disturbance. Alternatively, if considered appropriate and the land manager is agreeable, the animals may be temporarily left in such a location in an attempt to get other scattered flying-foxes to join up with them before nudging them closer to the preferred site.

If flying-foxes disperse into inappropriate places within the Sydney metropolitan region, they will be dispersed in the evening followed by pre-dawn dispersal, using the techniques described above, to prevent the development of preference or affinity for the site. Daytime disturbance will be used if animals fail to disperse. The exception to methods described above applies to flying-foxes found in inappropriate sites that do not pose the risk of long-term settlement, such as suburban backyards. The flying-foxes will not

be disturbed in such locations unless they persist for longer than a couple of days or if there are 50 or more animals present.

The BGT will commit to on-going dialogue with land managers and re-dispersing flying-foxes from inappropriate sites. However, to avoid causing harm to the welfare of GHFF at a particularly vulnerable stage of their reproductive cycle (when young are separated from mother but incapable of sustained flight), no dispersal activity will take place during December to early February, or later pending on-ground observations, with the exception of non-breeding adults. 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 flying-foxes into new or existing sites immediately following the relocation is likely to be directly attributable to the relocation, exchanges of flying-foxes between camps will continue to occur as part of their natural pattern of movement in response to food resources. BGT will disperse flying-foxes from inappropriate sites for as long as we can track the animals (~16 months). The decision on BGT's responsibility for flying-foxes in inappropriate sites after 16 months will be made by EPRG/DECC on the advice of researchers and other experts.

Flying-fox researchers (**Appendix 3**) will provide monitoring data to the BGT and DECC. BGT will also collate data on camp sizes at existing and new sites (if any); reports from land managers and the public, to be submitted to DECC fortnightly.

Table 3. Dispersal strategy at appropriate and inappropriate sites outside the RBGS.

Dispersal outside the RBG *Inappropriate sites*[5]	- Evening dispersal to accompany fly-out, followed by pre-dawn dispersal. Daytime disturbance may be added if necessary and permitted by land managers. - No dispersal if there are flightless young. - Monitoring teams outside the RBG will map the location of new camps and report to the project officer. The project officer will contact site co-ordinators to mobilise dispersal teams.	**Flying-foxes will self-regulate camp populations in accordance with the carrying capacity of the site, both within and outside of Sydney. However, BGT will assist in the dispersal of flying-foxes (e.g. from the residential areas at the periphery of the KFFR camp further into the KFFR reserve) if council requests.**

[5] For the purpose of this proposal, an inappropriate site is defined as either: 1) one that is not accepted by nearby neighbours due to proximity within 300 m of residences; 2) one that is not accepted by land owners/managers due to incompatible land use on or adjacent to the site; 3) one that contains other threatened species or EECs that will be adversely affected by the

Appropriate sites	- Discussions with land managers to come to a management agreement. - BGT to provide assistance through expert advice on horticulture, bush regeneration etc, and/or monetary contributions. - The Executive Director of BGT (Tim Entwisle) and the Director of Domain & RBG (Mark Savio) will enter into negotiations with land managers regarding management of the flying-foxes. 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 flying-foxes in sites that adequately cater to their needs without causing unresolvable conflict with people. The BGT is committed to assisting land managers in community education, and through contributions, financially or in kind, to ensure that the flying-foxes are managed to the satisfaction of the land managers and the community.

* Due to variations in factors such as climate and food availability, and overlap in the reproductive cycle of individuals, all actions will be informed by field observations of the reproductive and growth stages of the flying-foxes present

8.3 Provision of assistance from the BGT

The BGT is committed to supporting land managers with resources such as: interpretive signage or other management priorities for new camps up to the value of $5000; provision of expertise and advice in seed collection, horticulture and ecology; assistance in revegetation through nursery production and bush regeneration, to the total value of $10,000 p.a. for up to five years, subject to negotiations. Some camps already have limited funds and in-kind support but supplementation is likely to be needed in most cases. Should there be a disagreement between the BGT and other land managers over a new or larger GHFF camp site, BGT will seek independent arbitration from the Environment Protection and Regulation Group under DECC.

8.4 Positions and responsibility of BGT staff

Please see Figure 1.

roosting flying-foxes; or 4) one that contains vegetation that will not survive permanent occupation by a flying-fox camp (e.g. 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).

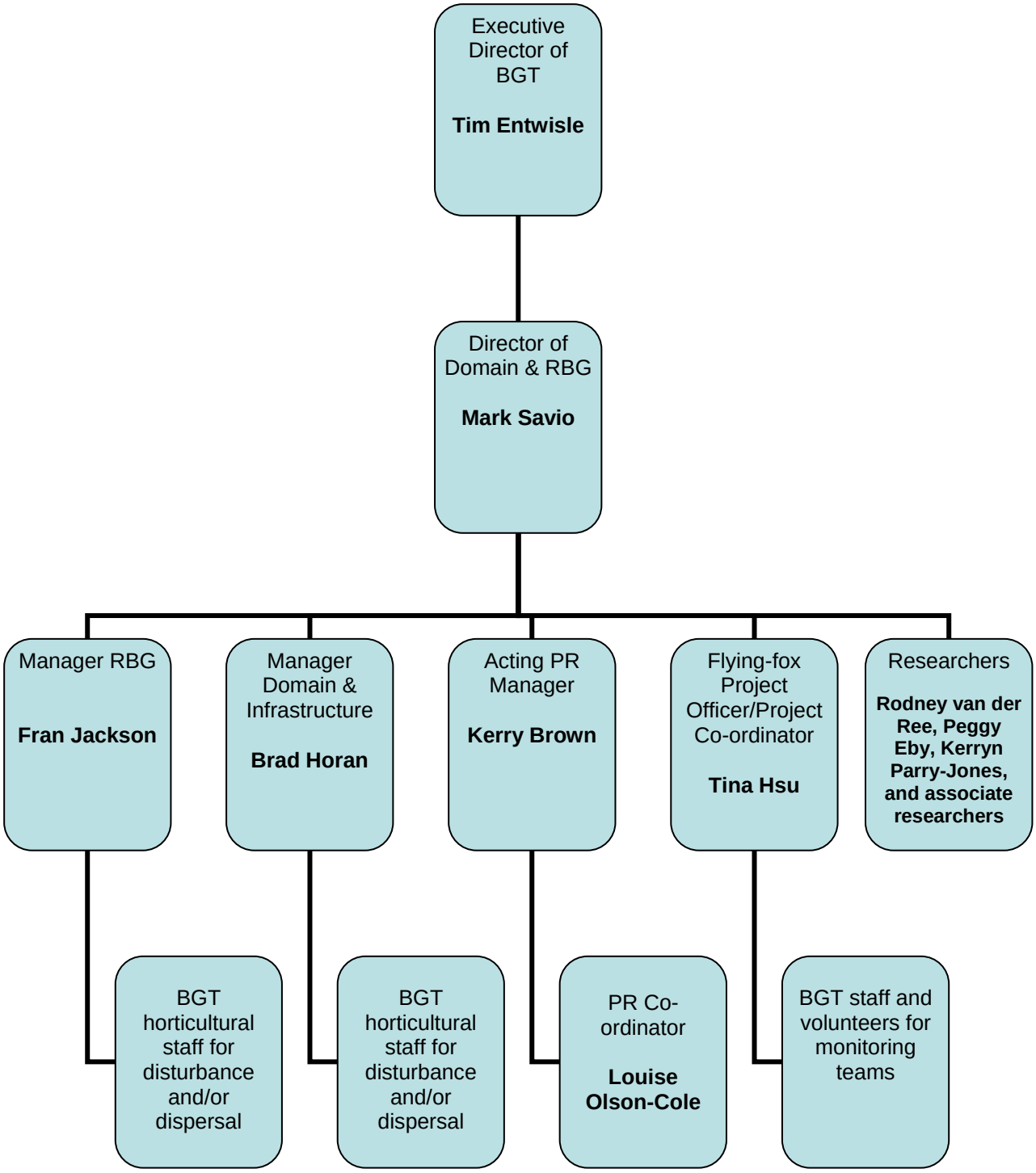

Figure 1. Positions and responsibility of BGT staff involved in the relocation project.

Condition 9

The management plans and strategy required by Conditions 5 to 8 are provided here, more than two weeks prior the commencement of the dispersal action.

Condition 10

The management plans and strategy required by Conditions 5 to 8 will be published on the BGT web site once they are approved by DECC.

References

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