

Draft Regional Flying-Fox Management Plan March 2013

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Acknowledgements

Council wishes to thank all contributors and stakeholders involved in the development of this document.

Disclaimer

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1. Introduction

Over sixty different species of bat occur throughout Australia, most of which feed primarily on insects. However, several species feed predominantly on flowers and fruit and are known as fruit bats or, due to their fox-like faces, flying-foxes.

Four species of flying-fox are native to mainland Australia and occur mostly in northern and eastern temperate and sub-tropical coastal areas. Three of those four species, the Little red flying-fox (LRFF), the Black flying-fox (BFF) and the Grey-headed flying-fox (GHFF), occur in south east Queensland and are the subjects of this discussion. The Grey-headed flying-fox is Australia's only endemic flying-fox. The fourth Australian species, the Spectacled flying-fox, is found in north eastern coastal Queensland, islands in the Torres Strait and throughout parts of Papua New Guinea and southeast Asia.

For each species the breeding cycle within a colony is synchronous. The lifecycle calendar is identical for the GHFF and BFF, while the LRFF calendar is the reverse of the former two. This is important in terms of Council's management planning and implementation of on-ground works.

Summary of lifecycle stages for local flying-fox species

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
BFF			Birth and caring for young	Peak conception	Gestation	Gestation	Young left at camp					
GHFF			Birth and caring for young	Peak conception	Gestation	Gestation	Young left at camp					
LRFF	Gestation	Gestation	Gestation	Gestation	Young left at camp	Young left at camp	Young left at camp			Birth and caring for young	Peak conception	Gestation

BFF = Black flying-fox

GHFF = Grey-headed flying-fox

LRFF = Little red flying-fox

Birth and caring for young
Peak conception
Gestation
Young left at camp

2. Purpose

Flying-fox numbers have seriously declined in the last century due to the clearance of eucalypt forests across their range. Their choice of urban roosting sites may be linked to historic connections with the site prior to development, and is also probably influenced by the availability of food within the urban streetscape and backyard plantings. Managing flying-fox colonies is a key challenge facing the Sunshine Coast community and flying-foxes will always be a part of the Sunshine Coast environment. Eighteen camps are currently known and monitored in the local government area on a variety of land tenures. The majority of these camps are relatively isolated from residential areas and the potential for land use conflict is fairly low. However, where large camps occur very close to residential areas, the potential for conflict increases dramatically as the noise and odour associated with large camps disrupt the lifestyles of nearby residents.

Flying-foxes are essential pollinators and seed dispersers for native forests, making a significant contribution to maintaining healthy ecosystems. In turn, native forests provide valuable ecosystem services such as providing essential habitat, acting as carbon sinks, stabilisation of river systems and water catchments. Forests also provide recreational and tourism opportunities worth millions of dollars each year.

This document aims to provide a range of management options available to Council for managing flying-fox camps on Council controlled land. The document also recognises the need for Council participation in a cross-tenure landscape approach to the management of all flying-fox camps in the Sunshine Coast area. With the knowledge that the three flying-fox species currently found in South East Queensland will almost certainly always reside in the region, this document outlines some strategic responses to the management of existing flying-fox camps and incorporates a proactive and predictive response to possible population movements over time.

3. Objectives

With consideration to the above, this Plan is guided by the following key objectives:

- to address and manage the concerns of residents experiencing lifestyle impacts associated with living in close proximity to large or problematic flying-fox camps on Council managed land
- to develop flying-fox management strategies consistent with legislative obligations
- to identify and prevent future residential/flying-fox land use conflict issues where possible
- to develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area
- to increase community understanding and appreciation of the essential ecological role of flying-foxes and the need for conservation efforts, and
- to develop information management strategies to ensure community access to accurate and up to date information relating to perceived health risks.

4. Stakeholders

The management of flying-foxes involves a range of stakeholders with varying roles in relation to regulation, protection and management capacity and responsibility. The following key stakeholders are listed below with details of their respective roles in relation to flying-fox management.

Department of Sustainability, Environment, Water, Population and Community (Federal Government)

The Department of Sustainability, Environment, Water, Population and Community (SEWPaC) has the regulatory responsibility for the protection of federally listed species through administration of the *Environment Protection and Biodiversity Conservation (EPBC Act) 1999*. The Grey-headed flying-fox is listed as Vulnerable under the EPBC Act, which affords protection to the species and its critical habitat.

Under the EPBC Act any controlled action (defined as having an impact on a federally listed species) requires approval from the Federal Minister for the Environment. To date, “critical habitat” has not been defined for the purposes of the Grey-headed flying-fox’s federal listing, although finalisation of that definition is reportedly imminent.

Preliminary advice from SEWPaC (documented in Lorn Flying-fox Management Strategy 2012) indicated that the following criteria would be applied to the classification of a Grey-headed flying-fox camp as significant:

- contain a minimum 2,500 individuals that are present on a seasonal, temporary or permanent basis in five out of ten years, and
- contain over 10,000 individuals or contain breeding individuals for at least one period over the last ten years.

The above criteria are yet to be confirmed as is the suggested inclusion of guidelines that will include consideration of new camps that arise as a result of abandonment of previously long-term maternity camps.

Department of Environment and Heritage Protection (State Government)

All three species of flying-fox addressed in this Plan are protected under the *Nature Conservation Act 1992* and any interference with a flying-fox colony is regulated under the associated *Nature Conservation (Wildlife) Regulation 2006*.

Due to the high mortality and low level of success historically associated with relocation of flying-fox camps, the DEHP's procedure for managing urban flying-fox camps are guided by the following principles:

- complaints regarding flying-fox colonies in urban areas are primarily dealt with through community education and consultation
- any consideration to relocate or disperse a flying-fox colony will be based on a comprehensive assessment of the situation
- the relocation or dispersal of a flying-fox camp will only be considered as a last option
- alternative roosting sites must be made available before any attempt to relocate a flying-fox camp is approved, and
- attempts to move a flying-fox camp will only be carried out with the approval of a Regional QPWS Director or by QPWS staff or persons authorised under a Damage Mitigation Permit.

Sunshine Coast Regional Council (Local Government)

Council has the responsibility for land use planning, management of public land and care of community wellbeing. While SCRC is only directly responsible for the management of flying-fox colonies on Council managed land, it is well placed to assist the community through education and information dissemination relating to flying-fox issues across the broader region.

Biosecurity Queensland

While not specifically involved with flying-fox management, Biosecurity Queensland, within the Department of Agriculture, Fisheries & Forestry (DAFF), is responsible for coordinating the State Government's efforts to prevent, respond to and recover from diseases such as, Hendra virus and Australian Bat Lyssavirus.

Queensland Health

Queensland Health is responsible for the response to outbreaks of notifiable diseases, including Australian Bat lyssavirus and Hendra virus, in the human population. In the event of such outbreaks, Queensland Health works closely with Biosecurity Queensland and other relevant stakeholders.

Community

Community stakeholders can be defined as:

- Primarily affected residents: those whose properties closely adjoin a flying-fox camp or have a colony located on their own land that create a significant impact on the affected residents
- Secondly affected residents: those who are indirectly affected by the presence of a flying-fox camp in moderate proximity to their property, and
- General community: those residents not particularly affected by flying-foxes either directly or indirectly.

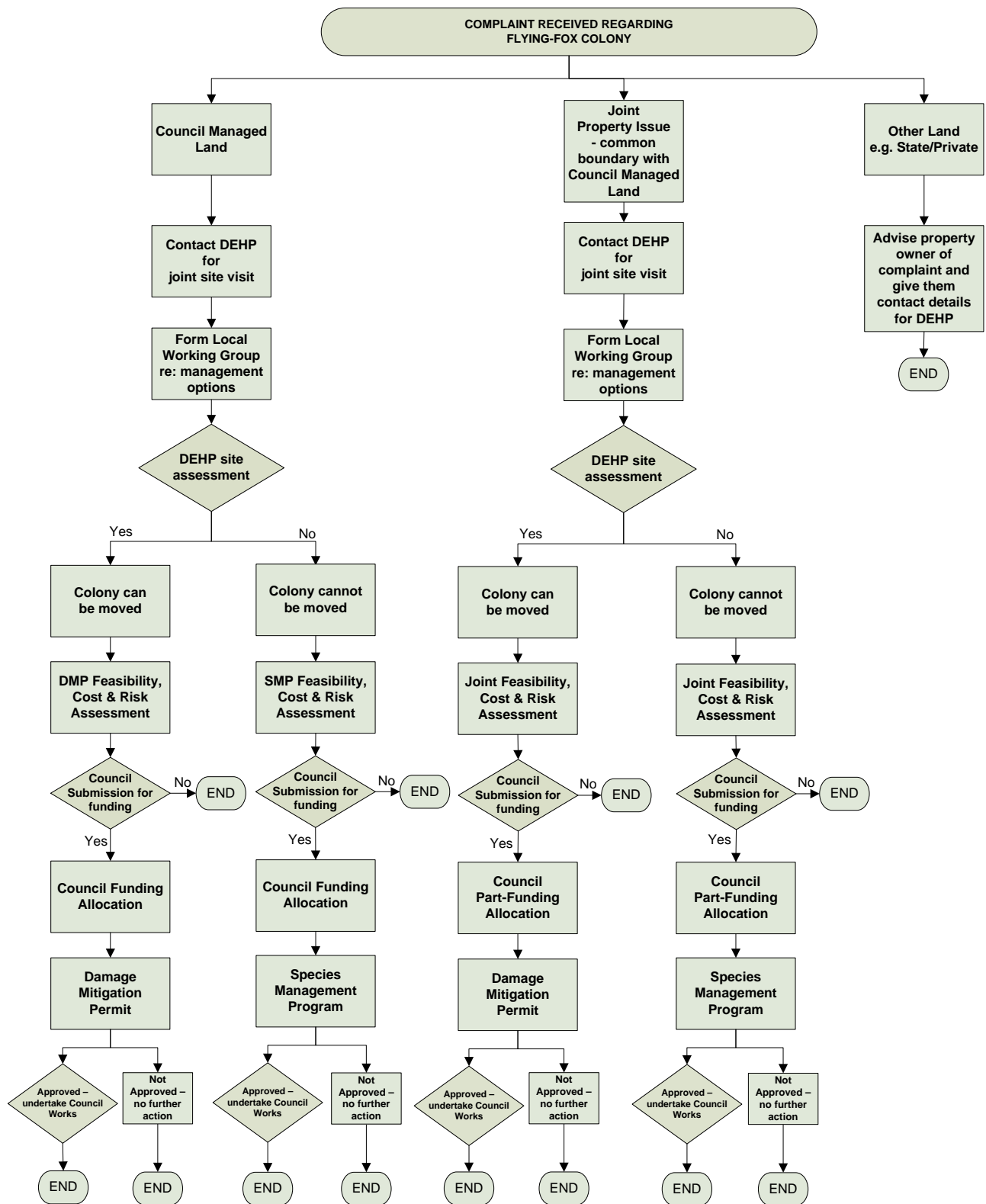
5. Background

In recent years Council has received an increasing number of complaints in relation to a small number of flying-fox colonies found within the Sunshine Coast region. Most complaints relate to excessive smell and noise, mess from faeces and the perception of a potential human health risk.

In managing these complaints, Council recognises the need to be responsive to the social and economic needs of the community, while responding to environmental due diligence requirements for the protection of flying-foxes and the essential ecosystem services they provide.

At its General Meeting of 18 October 2011, Council noted a decision support tool to assist Council staff in relation to customer requests relating to flying-fox colonies (see Fig 1 & Appendix A). The tool was prepared as a short term measure pending the development of this Management Plan.

Fig. 1: Decision Support Tool for flying-fox Issues



Note:

1. DEHP is the regulating authority in relation to flying-fox management in Queensland.
2. Permit/Program process may include Federal referral (EPBC)

6. Regional Overview

The extensive loss of native forests for agriculture and urban development has had a significant impact on food availability for flying foxes throughout most of their range. A 1993 study documented a loss of approximately two thirds of south east Queensland's continuous native vegetation (Catterall & Kingston). The loss included an almost 90% reduction of the region's *Melaleuca quinquinervia* forests, which served as a primary source of winter food for nectar feeding flying-foxes.

There are eighteen known and monitored flying-fox camps within the Sunshine Coast local government area. The colonies are located on a mix of land tenures, including private, local government and state owned lands. These camps cannot be managed in isolation as they are home to a single mobile population following seasonal and fluctuating food resources. Flying-fox camps in coastal south east Queensland usually (but not always) occur in vegetation with the following characteristics:

- **A closed canopy at least 5m high**
Grey-headed and Black flying-foxes do not necessarily require a closed canopy and have frequently been recorded in favoured camps containing dead trees or trees with quite extensive canopy damage.
- **Upper, mid and understorey layers**
All three storeys are thought to play an important role in microclimatic regulation in addition to providing other unique benefits. The elevated position of the upper storey provides cooling benefits and protection from terrestrial predators. The mid storey is thought to be critical in terms of regulating humidity and temperature and providing additional protection during extreme weather conditions. The understorey is thought to be critical to the maintenance of vital microbial action and the restriction of movement of animals and people that might otherwise disturb the camp.
- **Suitable vegetation at least one hectare in size**
Sites of less than 1ha may be occupied on a temporary basis by a small colony.
- **Dense vegetation within 500m of a creek, river or dam**
- **Level topography (<5° incline)**
- **Within nightly commuting distance of sufficient food resources (usually within 20km)**
Depending on the availability of food trees around the camp, individuals may travel up to 50km resulting in a 100km round trip. Smaller commuting distances in some areas have been recorded.

7. Flying-fox Ecology

Flying-fox species are essential for the maintenance of healthy forest diversity. They disperse the pollen and seeds of plants they visit during their foraging trips, and in this way they make a significant contribution to the reproductive and evolutionary processes of forest and woodland communities. Their ability to move freely among habitat types allows them to transport genetic material across fragmented, degraded and urban landscapes. As such, their role as long-distance pollinators is unparalleled.

Conservation of flying-foxes and their role within the natural landscape benefits many plants, other fauna and vegetation communities, including many listed as threatened under various pieces of legislation. Flying-foxes are also regarded as essential to the hardwood timber industry with up to 75% of the pollination of timber species being carried out by flying-foxes.

Flying-foxes are highly adapted for activity at night with well developed physical characteristics and senses for finding their food, including a strong sense of smell and large eyes particularly suited for recognising colour at night.

Extensive vegetation clearing in the past has reduced the area of habitat available to flying-foxes, forcing them to seek out remaining areas of suitable habitat, including remnant bushland in urban areas. Where this bushland borders residential areas, an uncomfortable coexistence between humans and flying-foxes can sometimes be created.

It is anticipated that the loss of flying-fox habitat will continue and remnant bushland in urban areas will become increasingly important as habitat for flying-foxes and a range of other native animals. The combination of habitat loss and the effects of climate change disrupting flowering patterns will serve to increase encounters between flying-foxes and humans.

Urban encroachment into areas historically used by flying-foxes is thought to be a factor influencing a colony's choice of roost site. Fidelity to historic roosting sites and the availability of urban foraging opportunities has resulted in increased conflict between flying-foxes and the general community

8. The Role of flying-fox Camps

Flying-fox camps serve a number of functions. Their primary purpose is to provide suitable resting habitat within nightly commuting distance of food sources. They are also sites of information exchange and social behaviours such as those associated with reproduction and maternal care. For several weeks in late spring and summer, camps provide refuge during the day for lactating females and their young. During the night camps are a safe refuge for flightless young while adults depart to feed. Camps are highly socially structured. The majority of roost trees are occupied by mixed groups of adults which comprises of a single male, who scent-marks and defends a territory shared by one or more females and their dependent young. The roosting positions of individual animals are highly consistent and animals return to the same branch of a tree over many weeks or months. Some Grey-headed flying-foxes are known to occupy a single area within a camp for several years, while others may return to the same branch of a tree after having migrated over large distances. Flying-foxes often have a strong connection to camp sites and can be extremely resistant to relocation efforts.

Locations of camps are generally stable through time and several well-documented camps have histories of use that exceed 100 years. Flying-foxes have well-developed spatial memories to assist them in utilising their complex habitats, enabling individuals to remember the locations of camps and associated feeding sites. Little red flying-foxes appear to also establish ephemeral sites which are used for short periods and not revisited.

Flying-foxes have an undeniable impact on vegetation at a camp site through the death of some trees and the damage and defoliation of others. Such damage is site specific and is a consequence of the simultaneous intensive use of large numbers of

flying-foxes. While such damage can be substantial it is localised and offset by the vital ecological services they provide in relation to pollination and seed dispersal in Australian forests.

9. Grey-headed flying-fox *Pteropus poliocephalus*



Fig. 2: Distribution of the Grey-headed flying-fox

The Grey-headed flying-fox is a canopy feeding nectarivore and frugivore endemic to the east coast of Australia. All the Grey-headed flying-foxes in Australia are regarded as one population that moves around freely within its entire national range (Webb & Tidemann 1996). Grey-headed flying-foxes can travel as far as 50km in a single night in their search for food, resulting in a round trip as great as 100km. They have also been recorded as travelling up to 400km in one night when moving from one camp to another.

In the late 1920s the recorded range of the GHFF extended from Rockhampton in central Qld to Mallacoota on Australia's south east coast (Ratcliffe 1931). In subsequent years their numbers have diminished and their range has shifted south by around 500km, resulting in their current absence from Rockhampton and the establishment of a permanent camp in Melbourne. Like the other *Pteropus* species, the GHFF is protected under Queensland's *Nature Conservation Act 1992*. Due to their declining numbers, the GHFF is also listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*.

Grey-headed flying-foxes generally show a high level of fidelity to roosting sites, returning year after year to the same site, and have even been recorded returning to the same branch of a particular tree. This may be one of the reasons flying-foxes continue to return to small urban bushland blocks that may be remnants of historically used larger tracts of vegetation.

Their primary food source is the blossom of *Eucalyptus* sp but they will also utilise the blossoms and fruits of some rainforest trees and native and introduced species in the urban landscape. They will also feed on commercial orchard fruits and the direct killing on the GHFF in orchards is thought to be a contributing factor in its population decline (Vardon & Tidemann 1995).

10. Black flying-fox *Pteropus alecto*



Fig. 3: Distribution of the Black flying-fox

Black flying-foxes are native to Australia (NSW, QLD, NT and WA), Papua New Guinea and parts of Indonesia. In Australia they are found mostly around the northern coast and inland wherever permanent water is found in rivers.

Black flying-foxes are largely nomadic animals with movement and local distribution influenced by climatic variability and the flowering and fruiting patterns of their preferred food plants. They are intelligent and highly social animals that roost together in large numbers at a camp during the day, then feed individually or in small groups at night.

Feeding commonly occurs within 20km of the roost site but can extend as far as 50km. In urban areas of Queensland they may disperse as little as 8km from their roost site, depending if appropriate food is available. Black flying-foxes usually roost beside a creek or river in a wide range of warm and moist habitats, including lowland rainforest gullies, coastal stringybark forests and mangroves. They usually establish their camps in tall and reasonably dense vegetation, and are not deterred by the proximity of human habitats. Camp sites may be permanent or temporary and can range in size from hundreds up to tens of thousands of individuals. During the breeding season camp sizes can change significantly in response to the availability of food and the arrival of animals from interstate.

In addition to a wide range of native fruits (including quandongs, ficus and lillypillys), they also exploit exotic and cultivated species such as bananas, stonefruit and mangoes (Markus & Hall 2004). However, research has shown that cultivated fruits are not a preferred food source and is utilised only in times of native food scarcity (Parry-Jones & Augee 1992). A range of exotics also serve as alternative food sources, including Cocos palms and Chinese elm.

11. Little red flying-fox *Pteropus scapulatus*



Fig. 4: Distribution of the Little red flying-fox.

The Little red flying-fox has an almost exclusively nectarivorous diet. They are highly nomadic and their movements are closely correlated with the flowering regimes of eucalypts, their main food source.

They are frequently associated with other *Pteropus* species, although the duration of their stay in a camp is often shorter. For example, 2,500 LRFFs joined a small colony of Black flying-foxes at the Goonawarra st colony in 2010 but only stayed at the site for one month. Throughout its range, populations within an area can fluctuate widely and camp occupation can be for as little as 10 days or as long as 10 months.

In some colonies, LRFF individuals can number in the millions and they are unique among *Pteropus* species in their habit of clustering in dense bunches on a single branch.

Through its foraging movements within and between forests, the LRFF provides an essential pollination and seed dispersal service to many bioregional ecosystems. A number of factors are thought to be impacting the LRFF, including habitat destruction and altered fire regimes, both of which influence the availability of nectar.

In the tropical north during the LRFF mating season in early summer, camps can reach up to 1 million individuals.

12. Community Concerns

Complaints about flying-fox camps usually relate to excessive smell and noise, mess from faeces staining walls, driveways, washing or parked cars along with other issues such as damage to domestic fruit trees, constraints on opening windows etc. Community concerns also centre around the loss of property values and the impact on the psychological wellbeing of residents exposed to the persistent impacts of living in close proximity to flying-fox camps and the subsequent deterioration of the amenity of the home.

Importantly the most significant concerns raised by residents relate to the potential human health risks from Australian Bat Lyssavirus (ABL) and Hendra Virus.

Council has actively sought advice from Queensland Health to quantify the degree of risk of becoming infected with ABL, Queensland Health has advised that this risk is

very low. It is estimated that in Australia only one per cent of flying-foxes carry ABL and it can only be transmitted by direct contact through a skin-penetrating bite or scratch. Three people have died from ABL infections in Australia since 1996. The availability of a post-exposure vaccination reduces the risk of contracting ABL even further.

Similarly research carried out by Queensland Primary Industries and Fisheries indicates that while flying-foxes are a natural host for Hendra Virus, which can be fatal to humans, there is no evidence that they can transmit this virus to humans or even to horses (however the virus has been transmitted from horses to humans).

In recognition of the range of concerns articulated by residents Council has facilitated several forums between the regulatory and peak bodies such as Queensland Health, Biosecurity Queensland, and DEHP. These forums were instigated by Council to enable direct dialogue between residents and those regulatory authorities to define the issues and concerns, the steps that residents could initiate if they have concerns and the role of Council in this complex issue.

13. Flying-fox Management Options

A suite of management options are available, although not necessarily appropriate, for the management of flying-fox camps in the Sunshine Coast region. A range of options are defined in the table below (see Table 1) and discussed in the following pages.

Table 1: Management Options for Flying-fox Camps

Management option	Definition
1. No on-ground management	Leave all current flying-fox camps undisturbed and do not undertake any active management or impact mitigation.
2. Disperse flying-foxes by habitat modification	Modify habitat through vegetation trimming or removal to render the camp unattractive to flying-foxes as a roost.
3. Disperse flying-foxes by active disturbance	Disperse flying-foxes from problematic camps through a variety of non-destructive disturbance techniques, including: <ul style="list-style-type: none"> • Water jets, smoke • Visual deterrents such as imitation predators and bright lights • Noise from commercial and improvised products.
4. Reduce flying-fox numbers	Reduce numbers of flying-foxes at problematic roost sites through culling.
5. Early intervention option before a camp is established at locations identified as unsuitable	Undertake monitoring of Council reserves to allow early detection of signs of a new camp establishment (or return of unsuitable, e.g. Tallangatta) and apply for approval to undertake non-destructive dispersal activities to discourage colony establishment.
6. Offer incentives or compensation to residents seriously impacted by roosts.	Consider offering financial benefits to residents seriously affected by the proximity of flying-fox roosts, e.g rate reductions, provision of cleaning services. Modify buildings around problematic camps to alleviate the lifestyle impact on affected residents. These could include the construction of sound and odour barriers, provision of

Management option	Definition
	covers over outdoor living areas.
7. Provision of artificial roosting habitat	The construction of artificial structures within a camp to provide additional roosting opportunities away from residences.
8. Attract flying-foxes to alternative habitat	The identification and enhancement of alternative habitat to encourage flying-foxes to move from more problematic sites.
9. Participate in research to improve knowledge of flying-fox ecology	There are large gaps in our knowledge of flying-fox ecology and roost site selection. Further research and knowledge sharing at local, regional and national levels may enhance our understanding and management of flying-fox camps.
10. Utilise planning instruments to avoid land use conflicts at identified flying-fox roost sites	Incorporate appropriate development buffers around known flying-fox roosts that are currently used by flying-foxes or have historically been known to be used by flying-foxes.
11. Establish buffer areas to prevent future problems with known roost sites	Develop on-ground buffers around existing or historically known flying-fox roosts that are currently appropriately placed but have the potential to become less favourable due to future residential development.
12. Develop and implement community education initiatives	Develop or make educational material available to provide clear and accurate information about flying-fox ecology, perceived health risks and other pertinent flying-fox information.
13. Vacate role as trustee where problematic colonies exist on State owned land in Council's trusteeship	Council can vacate its role as trustee by forwarding signed notice of resignation to the Minister Under Section 50 of the <i>Land Act</i> .
14. Enhance habitat at existing low conflict camps.	Increase service level where colonies exist in Council reserves that have a low potential for community/flying-fox conflict.

14. Management options discussion

14.1. No on-ground management

This approach means that nature would be left to take its course and no reactive or proactive responses would occur from Council in relation to flying-fox camps in the local government area.

Criteria	Suitability Assessment
Legislative Implications	<p>Flying-foxes are currently protected under state and federal legislation. If this approach is adopted there will be no considerations under the following legislation:</p> <ul style="list-style-type: none"> • <i>Nature Conservation Act 1992</i> and associated <i>Nature</i>

Criteria	Suitability Assessment
	<p><i>conservation (Wildlife) Regulation 2006</i></p> <ul style="list-style-type: none"> • <i>Environment Protection & Biodiversity Conservation Act 1999</i>, and • <i>Animal Care & Protection Act 2001</i>.
Animal Welfare	If no action is taken animal welfare will not be a formal issue. However, community frustration in some areas may result in unauthorised dispersal, which will almost certainly create animal welfare issues.
Community Concerns	For most colonies in the SCRC area, this approach will not raise any negative community concerns. However, for those residents impacted by the noise and smell associated with living in close proximity to a camp, this management option is not likely to be satisfactory.
Likelihood of Success	The likelihood of successfully solving issues associated with existing problematic colonies is minimal. The conflict issue will not be resolved and unauthorised dispersal and disturbance from the community is likely to create harm to the colony.
Strengths	No cost to Council
Weaknesses	<ul style="list-style-type: none"> • Issues around problematic colonies will not be addressed • Negative community response to council inaction • Inaction may prompt illegal dispersal or culling activity
Cost	No direct cost but indirect costs from increased resource commitments addressing escalated customer requests.
Consistency with Plan Objectives	Inconsistent with Plan's objective: <ul style="list-style-type: none"> • To address and manage the concerns of residents experiencing lifestyle impacts associated with living in close proximity to large or problematic flying-fox camps.

14.2 Disperse flying-foxes through habitat modification

Criteria	Suitability Assessment
Legislative Implications	<p>If this approach is adopted there will be considerations under the following legislation:</p> <ul style="list-style-type: none"> • <i>Nature Conservation Act 1992</i> and associated <i>Nature conservation (Wildlife) Regulation 2006</i> • <i>Environment Protection & Biodiversity Conservation Act 1999</i> (if the colony includes the GHFF) • <i>Vegetation Management Act 1999</i>, and potentially the • <i>Animal Care & Protection Act 2001</i>.
Animal Welfare	<ul style="list-style-type: none"> • Implications for animal welfare if undertaken at an inappropriate stage in their breeding cycle • Likely to cause stress for colony if undertaken while the camp is occupied

Criteria	Suitability Assessment
	<ul style="list-style-type: none"> • Increased risk of predation if flying-foxes are forced to seek alternative roosts during daylight hours and • May force flying-foxes into sub-standard habitat that will impact on their health and wellbeing.
Community Concerns	<p>The drastic nature of habitat modification required to effectively disperse a colony may carry both positive and negative community implications. For impacted residents this management action is likely to be perceived positively if it results in a successful dispersal. However, the local community may also be concerned about the loss of amenity and habitat for other fauna that will result from this management action.</p>
Likelihood of Success	<p>Based on case studies from around Australia, this type of action is likely to result in the movement of flying-foxes to an equally unsuitable or unexpected site. Identified suitable habitat mapping in the SCRC illustrate a wide range of alternative sites that are likely to cause land use conflict.</p>
Strengths	<p>Short and long term relief for residents if dispersal and habitat modification is effective.</p>
Weaknesses	<ul style="list-style-type: none"> • Depending on the extent of habitat modification, the actions may not be reversible • Possibility of the colony dispersing to another unsuitable site • Impact on other species through loss of habitat • Unsustainable solution due to ongoing actions required if flying-foxes disperse to other unsuitable locations • Complete removal of mature trees would probably be required due to the Australian Standards for Pruning that may prohibit the drastic pruning required to deter flying-foxes and • Will disrupt ecological processes such as pollen dispersal at a local level.
Cost	<p>Very expensive to undertake removal of mature trees, around \$20,000 for 20 trees (GeoLink 2012).</p>
Consistency with Plan Objectives	<p>Consistent with the objective to:</p> <ul style="list-style-type: none"> • Address and manage the concerns of residents experiencing lifestyle impacts associated with living in close proximity to large or problematic flying-fox camps. But inconsistent with other objectives.

The modification of habitat as a means of dispersal would probably require significant vegetation removal to be effective. To minimise the immediate impact on flying-foxes it would be expected that vegetation would be removed or pruned in conjunction with another dispersal technique to discourage recolonisation. Under such circumstance vegetation work would take place immediately following dispersal before the colony make any attempt at re-establishing at the same site. Alternatively, habitat modification can be carried out as soon as the flying-foxes naturally leave a camp in search of other

food sources. Such action would require approval of a Species Management Program (SMP) or a Damage Mitigation Permit (DMP) from DEHP.

For camps that are still occupied, habitat modification can be undertaken incrementally over a number of nights while flying-foxes are out foraging. This would need to be undertaken at a time of the year where young were not present in the camp and would require a Damage Mitigation Permit from DEHP.

14.3 Disperse flying-foxes by active disturbance

Criteria	Suitability assessment
Legislative implications	Dispersal requires approval under a damage mitigation permit (DMP) issued by DEHP under the <i>Nature Conservation Act</i> and approval from SEWPaC under the <i>EPBC Act</i> if <i>P. poliocephalus</i> is present.
Animal welfare	<ul style="list-style-type: none"> • Most methods create high level of stress and fatigue • High infant mortality through dropping of young or separation from mother • Likelihood of stress-induced abortion by pregnant females • Increased risk of predation from diurnal birds of prey and • May force flying-foxes to roost in sub-standard habitat.
Community Concerns	If this management action resulted in the successful dispersal of a problematic colony, the temporary inconvenience associated with active disturbance will probably not be a major concern for residents. If the dispersal is not successful, the community may be less tolerant of the significant noise and light disruption associated with repeated active disturbance attempts.
Likelihood of success	See discussion below. Likelihood of success is variable depending on method chosen but generally low. In NSW, 23 dispersal attempts have been attempted at the Maclean colony in the Clarence River Valley. Not only do flying-foxes still occupy the camp but they have also expanded into surrounding residential areas. Around Australia 80% of dispersal attempts resulted in the problem simply being moved into another conflict area.
Strengths	Short term improvement if dispersal successful.
Weaknesses	<ul style="list-style-type: none"> • Most dispersal programs are protracted exercises with unpredictable results • Usually high mortality associated with dispersal • High level of stress associated with forced dispersal thought to increase flying-fox susceptibility to Hendra virus and • Inability to control where dispersed flying-foxes move to.
Cost	Costs are variable depending on techniques used. The most effective dispersal techniques generally also tend to be the most expensive.

Criteria	Suitability assessment
Consistency with Plan objectives	Consistent with this plan's objective: <ul style="list-style-type: none"> • To address and manage the concerns of residents experiencing lifestyle impacts associated with living in close proximity to large flying-fox camps.

Dispersal of flying-foxes through active disturbance has been attempted at many locations in Australia using the following variety of methods including physical disturbance, smell, noise, taste, visual and a combination of all of the above. Levels of success have been variable in terms of cost, dispersal outcomes and animal welfare considerations. Examination of some known and estimated costs for various methods illustrates the difficulties associated with this option (GeoLink, 2012).

14.4 Noise Disturbance

The generation of temporally and spatially random noise as a dispersal tool has been shown to be effective but expensive due to the high labour intensity of the activity and the follow up monitoring of dispersal success and ensuring recolonisation does not occur. Costs are also difficult to predict as they are dependent on the size of the colony and the dispersal effort required to move the camp on. For example, the dispersal of the colony occupying the Melbourne Royal Botanical Gardens involved 40-50 people for a flying-fox colony of 20,000-30,000 animals. A CD recorded for dispersal purposes used by the Sydney and Melbourne Botanical Gardens reduces the cost of noise generation although the effectiveness of the CD would probably be enhanced through the addition of other human generated noise around the site.

In addition to the cost of actually generating the noise disturbance, the costs of post-dispersal monitoring are substantial and difficult to predict. Such costs would include an initial dispersal plan, an ongoing dispersal maintenance plan and possible additional action if the flying-foxes return or settle in a site that is equally unsuitable.

14.5 Visual Disturbance

The use of visual disturbance techniques alone have traditionally not been very successful, with little more than localised (small areas within a camp) avoidance occurring for short periods of time. Some techniques have included reflective objects hung in trees, strobe-lighting, hanging of plastic bags and high intensity sweeping floodlights. All showed low and usually localised effectiveness and flying-foxes were fairly quick to habituate to the disturbance.

14.6 Smell Disturbance

The use of scent deterrents has met with variable success in some areas. Flying-foxes have been known to avoid the odour of paradichlorobenzene (found in toilet deodoriser blocks) and the odour of D-Ter (a deterrent manufactured by Heiniger). However, in both instances the effect is usually localised and expensive in terms of the quantity of product required and the resources required to apply it at high densities across large areas.

The application of python excrement on the roosting branches of dominant males has been known to be highly effective but this method shares the shortcomings of the previous two smell deterrents and has the additional problem of sourcing large quantities of python excrement.

14.7 Physical Disturbance

The introduction of physical deterrents such as netting, trip wires and rope has also been found to be ineffective. For example, heavy fishing line introduced at the Melbourne Botanical Gardens camp as a trip/ nuisance hazard proved unsuccessful and was eventually used by the flying-foxes as extra roost space.

The netting of an entire camp was costed by the Sydney Botanical Gardens at around \$500,000 but was never trialled due to the high cost and logistical issues. In addition to the high initial cost there would be significant ongoing monitoring costs to minimise flying-fox and bird mortality.

The use of canopy mounted water sprinklers has been rated by the authors of the Lorn flying-fox Management Strategy as likely to be highly successful. Sprinklers mounted and set on automated random cycles may initially be labour intensive but low cost compared to some other options, with an estimate of around \$25,000 plus water usage. That cost would vary according to the size and location of the site as sprinklers would need to be installed in almost every tree.

The use of smoke as a dispersal technique was trialled by the Melbourne Botanical Gardens but appeared to only agitate the flying-foxes. This technique is difficult to control as it can be hugely influenced by wind direction and speed. Labour and material costs are likely to be low but so also is the measure of success.

Regardless which of the above techniques were used it would be necessary to develop a dispersal plan and dispersal monitoring plan when applying for a damage mitigation permit.

14.8 Reduce flying-fox numbers

Criteria	Suitability Assessment
Legislative Implications	Flying-foxes protected under the <i>Nature Conservation Act</i> and some species under the <i>Environment Protection and Biodiversity Conservation Act</i> . Very difficult to humanely cull flying-foxes, hence action likely to be in breach of the <i>Animal Care & Protection Act 2001</i> ,
Animal Welfare	Culling is likely to inflict inhumane injury and significant suffering on animals.
Community Concerns	Culling is not likely to be supported by the community. A community attitudinal study undertaken by the Animal Welfare Scienc Centre (Uni of Melb, Monash Uni & Dept Primary Ind) found a community aversion to culling wildlife. Their study found that even where members of the community are aware of some negative aspects of wildlife encroaching on their environment, they are generally not supportive of culling as a management option.
Likelihood of Success	Culling has been shown to be largely unsuccessful. Despite culling programs undertaken at Maclean and Bellingen Island in NSW, both those sites are still occupied by flying-foxes.
Strengths	Immediate short term population reduction.
Weaknesses	<ul style="list-style-type: none">• Inconsistent with the <i>Animal Care & Protection Act 2001</i>• Inconsistent with the <i>Nature Conservation Act 1992</i>• Inconsistent with the <i>Environment Protection and Biodiversity Conservation Act 1999</i>

Criteria	Suitability Assessment
	<ul style="list-style-type: none"> • Inconsistent with Council's Biodiversity Strategy • Inconsistent with Australia's Biodiversity Conservation Strategy 1010-2020 • Inconsistent with Queensland Biodiversity Conservation Strategy. • Difficult under field conditions to distinguish between <i>Pteropus alecto</i> and <i>P. poliocephalus</i> • Negative publicity and community backlash • National condemnation from states proactively protecting flying-foxes
Cost	Dependent on culling method used.
Consistency with Plan Objectives	<p>Inconsistent with this Plan's objective:</p> <ul style="list-style-type: none"> • To develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area.

As state and national legislation currently stands, culling is not a valid option.

14.9 Early intervention option

Criteria	Suitability Assessment
Legislative Implications	<p>No legislative implications for council in relation to monitoring but early intervention will require application for SMP or DMP through DEHP under the <i>Nature Conservation Act 1992</i> if it is classified as a roost. Will also require compliance with the:</p> <ul style="list-style-type: none"> • <i>Animal Care & Protection Act 2001</i> • <i>Environment Protection and Biodiversity Conservation Act 1999.</i> <p>Early intervention at a previously unknown FF camp site will not require an SMP or a DMP.</p>
Animal Welfare	<p>May be animal welfare issues, depending on method of early intervention. However, these can be minimised by early detection and swift intervention before a colony becomes established.</p>
Community Concerns	<p>This is likely to be a popular management option for residents that may be otherwise impacted by living in close proximity to a large colony.</p>
Likelihood of Success	<p>Unknown likelihood of success. Unable to find documented cases from elsewhere. However, early intervention is supported by Dr Les Hall (pers com) as a management option.</p>
Strengths	<ul style="list-style-type: none"> • Prevents the establishment of a colony before a conflict situation arises • No DMP or SMP required for new sites • Minimises harm to flying-foxes in comparison to the harmful impact of dispersing an established colony
Weaknesses	<ul style="list-style-type: none"> • Would require consistent monitoring of all potentially suitable but undesirable sites • Time lag between detection of early colonisers and approvals to take dispersal action may be problematic • SMP/DMP required for previously and currently occupied roosts.

Criteria	Suitability Assessment
Cost	Operational costs associated with monitoring previously occupied colonies and natural areas potentially capable of supporting colonies. Dispersal costs at the early intervention stage would be minimal compared to the costs associated with dispersing an established colony.
Consistency with Plan Objectives	Consistent with the following objectives of this Plan: <ul style="list-style-type: none"> • To address and manage the concerns of residents experiencing lifestyle impacts associated with living in close proximity to large flying-fox camps.

The capacity to intervene at the earliest sign of recolonisation or the establishment of a new colony in an unsuitable location is an essential tool for council. It will allow a cost effective means to avoid future conflict situations and allow resolution of some existing conflict situations if action can be taken quickly when an existing colony temporarily moves out.

14.10 Incentives/compensation for severely impacted residents

Criteria	Suitability Assessment
Legislative Implications	No legislative considerations as no direct action on colonies would be taken.
Animal Welfare	No animal welfare implications.
Community Concerns	There may be community ambivalence about this management option. The offering of incentives may be viewed with appreciation that something is being done but most incentives are unlikely to address all concerns and may not be enough to compensate for some lifestyle impacts (e.g. odour).
Likelihood of Success	The offering of financial compensation (e.g. rate reduction) is not likely to be a viable long term solution. The “airport syndrome” may occur over time (where people buy cheaper homes near an airport then lobby the government regarding noise). Or residents may feel that any rate reduction is not enough to compensate for the lifestyle impacts. Modification of buildings through air-conditioning, shelters etc have been proven to improve indoor amenity but this is unlikely to be a viable sustainable option in terms of resourcing. It will also fail to address outdoor amenity issues.
Strengths	<ul style="list-style-type: none"> • Fitting of air-conditioning would improve indoor air quality • Provision of shade structures or outdoor roofs could alleviate faecal contamination of outdoor living space • No harm to flying-fox colony • Building modifications such as air-conditioning, insulation, double-glazed windows offer immediate relief
Weaknesses	<ul style="list-style-type: none"> • Would not solve outdoor noise & odour issues • Who pays? • May create precedent for rate reductions or other incentives for other annoying urban wildlife impacts, e.g ibis • Residents may feel “trapped” inside air-conditioned buildings
Cost	Depending on the number of residences affected, the cost

Criteria	Suitability Assessment
	could be quite substantial. In addition to significant upfront infrastructure costs, there would be ongoing expenses relating to electricity use for air-conditioning.
Consistency with Plan Objectives	Consistent with the following objectives of this Plan: <ul style="list-style-type: none"> To address and manage the concerns of residents experiencing lifestyle impacts associated with living in close proximity to large flying-fox camps and To develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area.

Incentives or compensation could take the form of modifying residential buildings and backyards or monetary compensation such as a rates reduction.

In the Clarence River Valley, the installation of air-conditioning in residences proved to effectively reduce odour and noise. The provision of roofs and shade structures over back yards can also be used to minimise the impact of faecal droppings in outdoor living areas.

14.11 Provision of artificial roosts

Criteria	Suitability assessment
Legislative Implications	Approval via an SMP or DMP would be required under the <i>Nature Conservation Act 1992</i> . Other legislation that may need to be considered include: <ul style="list-style-type: none"> <i>Environment Protection & Biodiversity Conservation Act 1999</i> (if the colony includes the GHFF) <i>Vegetation Management Act 1999</i>, and the <i>Animal Care & Protection Act 2001</i>
Animal Welfare	Short term animal welfare issues associated with initial roost construction but long term benefit through provision of habitat.
Community Concerns	Artificial roosts are usually provided in existing camps to increase roosting opportunities in the core area to compensate for loss of roosting sites through habitat modification undertaken to provide a residential buffer. The community are likely to support this management option if it results in establishing or increasing a buffer between the affected residents and the flying-fox colony.
Likelihood of Success	Has been shown to be successful when undertaken in conjunction with habitat modification on camp periphery to provide a buffer between camp and residents.
Strengths	<ul style="list-style-type: none"> Provides a buffer between the camp and impacted residents, which will improve amenity Doesn't reduce habitat opportunity for flying-foxes Designs already developed by Coffs Harbour City Council
Weaknesses	<ul style="list-style-type: none"> Difficult to achieve in small and narrow camp areas, such as Cassia Wildlife Corridor and Current designs only support small numbers of flying foxes
Cost	Difficult to estimate costs.
Consistency with Plan Objectives	Consistent with the following objectives of this Plan <ul style="list-style-type: none"> To address and manage the concerns of residents experiencing lifestyle impacts associated with living in close proximity to large flying-fox camps and

Criteria	Suitability assessment
	<ul style="list-style-type: none"> To develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area.

The provision of artificial roosts is usually used in conjunction with habitat modification or vegetation removal on camp periphery for the purpose of providing a buffer. It provides an opportunity to increase the distance between flying-foxes and residents without reducing roosting opportunities. In NSW, the provision of buffers at a number of urban flying-fox camps has been effective in alleviating some of the concerns of nearby residents.

14.12 Attract flying-foxes to alternative habitat

Criteria	Suitability assessment
Legislative Implications	<p>No statutory considerations for habitat enhancement at alternative sites. However, legislative implications under the following legislation if the action is accompanied by dispersal attempts from the existing roosts:</p> <ul style="list-style-type: none"> <i>Nature Conservation Act 1992</i> and associated <i>Nature conservation (Wildlife) Regulation 2006</i> <i>Environment Protection & Biodiversity Conservation Act 1999</i> (if the colony includes the GHFF) <i>Vegetation Management Act 1999</i>, and potentially the <i>Animal Care & Protection Act 2001</i>.
Animal Welfare	Possible long-term benefits through provision of suitable habitat but significant animal welfare issues likely to arise during associated dispersal efforts.
Community Concerns	This management option is likely to be well received by the community if it results in the successful dispersal of a problematic colony. However, the action will be less enthusiastically received by residents of a newly impacted area if the flying-foxes don't move to where planned.
Likelihood of Success	Large areas of suitable habitat already exist in the local government area and flying-foxes have not chosen to utilise it. In other areas (e.g Coffs Harbour) minor habitat modifications made within existing camps have successfully attracted animals to certain areas of the camp. However, efforts to encourage a camp to relocate from one area to another have been notoriously unsuccessful. For example, in the only partial success story to date, Melbourne spent around \$3m trying to move a colony from the Botanical Gardens to Geelong. In the end two thirds of the camp relocated to Yarra Bend and only a small portion of the colony relocated to Geelong.
Strengths	<ul style="list-style-type: none"> Reduces the likelihood of resident/flying-fox conflict; and Non-invasive management technique that enhances animal welfare.
Weaknesses	<ul style="list-style-type: none"> High likelihood that flying-foxes would not move to the identified alternative habitat Would rely on planning instruments to ensure the long-term suitability of the site was retained Not likely to solve conflict issues in the short-term, e.g. some attempts to attract camps to a new location have run

Criteria	Suitability assessment
	over as long as 10 years.
Cost	Probably minimal cost provided the chosen site was already in public ownership.
Consistency with Plan Objectives	This management option meets the following plan objectives: <ul style="list-style-type: none"> • To develop flying-fox management strategies to protect the three species found in the Sunshine Coast local government area • To develop flying-fox management strategies consistent with legislative obligations and • To identify and prevent future residential/flying-fox land use conflict issues where possible.

14.13 Participate in research to improve knowledge of flying-fox ecology

Criteria	Suitability assessment
Legislative implications	Compliance with the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes is compulsory under Section 91 of the <i>Animal Care & Protection Act 2001</i> .
Animal welfare	Long term animal welfare issues likely to improve with increased knowledge of flying-fox ecology.
Community Concerns	There is not likely to be any community opposition to this management option. Research that increases our understanding of flying-foxes, their ecological role and how we can satisfactorily share the urban environment will be ultimately beneficial for the community.
Likelihood of Success	Research undertaken by council would enhance local knowledge of some aspects of flying-fox ecology and may assist with management of our colonies. Council's participation in research carried out by other organisations will also enhance our knowledge of flying-fox ecology and other flying-fox issues.
Strengths	May provide long term solution to flying-fox/resident conflict issues.
Weaknesses	<ul style="list-style-type: none"> • Will not provide any short term solution to concerns surrounding existing problematic camps and • Knowledge expansion at a national level is required, so it is beyond the capacity of a single local government organisation.
Cost	Difficult to quantify as costs would be dependent on the nature of the research. External funding opportunities could be sought for research opportunities.
Consistency with Plan Objectives	<ul style="list-style-type: none"> • To develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area • To increase community understanding and appreciation of the essential ecological role of flying-foxes and the need for conservation efforts and • To develop information management strategies to ensure community access to accurate and up to date information relating to perceived health risks.

Considering the high level of public interest in the negative impacts of flying-foxes and their role as essential pollinators, there is surprisingly significant gaps in our knowledge of flying-fox ecology. While it is not necessarily Council's role to initiate or fund flying-fox research, it is in its interest to participate in or assist broader research if requested to do so.

14.14 Use planning to avoid future land use conflict

Criteria	Suitability assessment
Legislative Implications	The <i>Integrated Planning Act</i> offers the potential to require a buffer for certain activities, e.g. some agriculture 300m, quarry 400m.
Animal Welfare	Animal welfare benefits would occur through the minimisation of disturbance at relevant sites.
Community Concerns	To the wider community this management option is likely to be seen as appropriate and beneficial in the long term. However, planning restrictions may not be so well received by landowners who may be directly impacted by planning restrictions.
Likelihood of Success	Buffers of around 300m have been shown to alleviate residential/flying fox land use conflict. Even smaller buffers have been effective in Coffs Harbour and Gordon in NSW. However, buffers of the necessary size can be difficult to achieve through planning instruments.
Strengths	<ul style="list-style-type: none"> • The planting or retention of species unsuitable for roosting in the buffer zone can provide habitat for other fauna • Provision or retention of buffers around camps proven to alleviate amenity concerns of residents • May prevent future conflict issues
Weaknesses	<ul style="list-style-type: none"> • Does not address the problems associated with current problematic colonies • May be an unnecessary expenditure as there is no certainty around flying-fox movements and camp selection
Cost	Costs may be significant if the establishment of a development buffer required Council to purchase land or compensate property owner for land isolated from development.
Consistency with Plan Objectives	<p>Consistent with this Plan's objectives:</p> <ul style="list-style-type: none"> • To develop flying-fox management strategies consistent with legislative obligations • To identify and prevent future residential/flying-fox land use conflict issues where possible and • To develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area.

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

The inclusion of a flying-fox overlay and supporting code in Council's new planning scheme may help to alleviate future land use conflict around known permanent flying-fox camps. An overlay could include all known existing flying-fox colonies with

adjoining undeveloped land. Future development could then be designed where possible to provide a buffer around existing camps.

14.15 Provide buffers around existing or historic roost sites

Criteria	Suitability Assessment
Legislative Implications	No legislative implications. However, long term retention of the buffer if it is not Council controlled land would require protection through planning instruments or acquisition.
Animal Welfare	No animal welfare issues.
Community Concerns	This management option is likely to be well received by residents that are directly impacted by living in close proximity to a large colony. Establishment of a sufficient buffer has been shown to alleviate impacts such as noise and odour for previously affected residents.
Likelihood of Success	With appropriate buffer plantings high likelihood of preventing future residential/flying fox conflict issues.
Strengths	<ul style="list-style-type: none"> • The planting or retention of species unsuitable for roosting in the buffer zone can provide habitat for other fauna • Provision or retention of buffers around camps proven to alleviate amenity concerns of residents • Increases the distance between residents and flying-fox camps • Could protect and enhance habitat for other fauna
Weaknesses	<ul style="list-style-type: none"> • Land may not be available for use as a buffer • May be cost prohibitive if available land for buffer sits in private tenure
Cost	Costs may be significant unless buffer land for planting is already available or development conditions can be imposed via covenant or similar agreement.
Consistency with Plan Objectives	<p>Consistent with this Plan's objectives:</p> <ul style="list-style-type: none"> • To develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area; and • To identify and prevent future residential/flying-fox land use conflict issues where possible.

14.16 Community education

Criteria	Suitability Assessment
Legislative Implications	No legislative implications.
Animal Welfare	Some positive animal welfare implications if community education improves understanding and tolerance of flying-foxes.
Likelihood of Success	The likelihood of improving community understanding of flying-fox issues is high. However, the extent to which that understanding will help alleviate conflict issues is probably less so. Extensive education for decision-makers, the media and the broader community is required to overcome the current community perception of flying-foxes. While Council can contribute to that process, it is not feasible for Council to have

Criteria	Suitability Assessment
	sole carriage of that education role.
Strengths	<ul style="list-style-type: none"> • Non-invasive management technique to enhance long term acceptance of flying-foxes • Opportunity to engage sections of the community affected by flying-foxes • Community will gain a better appreciation of flying-fox ecology and management complexities
Weaknesses	<ul style="list-style-type: none"> • Fails to address current conflict issues in the short term • Education may assist in alleviating health fears and enhancing ecological knowledge but it may do little to appease residents experiencing severe amenity impacts • Not all sectors of the community will be receptive to education approach
Cost	Can be incorporated to some extent into current environmental education roles and resources within Council. External funding opportunities could be sought to provide more extensive educational resources.
Consistency with Plan Objectives	<p>Consistent with the objectives of this plan:</p> <ul style="list-style-type: none"> • To increase community understanding and appreciation of the essential ecological role of flying-foxes and the need for conservation efforts and • To develop information management strategies to ensue community access to accurate and up to date information relating to perceived health risks.

14.17 Vacate role as trustee

Criteria	Suitability Assessment
Legislative Implications	Under Section 50 of the <i>Land Act</i> , Council can vacate its role as trustee by forwarding signed notice of resignation to the Minister. Section 50 imposes no registration requirement analogous to that contained in Section 51 concerning a removal of trustee.
Animal Welfare	No direct animal welfare implications associated with this action.
Community Concerns	This option would not be of any benefit to the community. The loss of Council managed open space may, in fact, be viewed as an unacceptable outcome by the community.
Likelihood of Success	May provide short term relief of responsibility at some locations but will not provide a sustainable solution to the issue.
Strengths	Would shift Council's responsibility for flying-fox management on trustee land to the State government.
Weaknesses	<ul style="list-style-type: none"> • Likely to be viewed unfavourably by the State government and may cause tension between Council and State government • May present Council in poor light if community perceives it has abandoned its responsibilities • Not all problematic colonies are located on trustee land (e.g Cassia is freehold) so Council will still need to develop flying-fox management strategies
Cost	Nil cost associated with this action. Cost benefit if it results in

Criteria	Suitability Assessment
	absolution of Council responsibility.
Consistency with Plan Objectives	Not consistent with Plan's objectives.

14.18 Enhance habitat at existing low conflict camps

Criteria	Suitability Assessment
Legislative Implications	No legislative implications
Animal Welfare	Positive impact on animal welfare through habitat improvement.
Community Concerns	Likely to receive community support if it results in flying-foxes remaining in low conflict areas.
Likelihood of Success	Flying-foxes are mobile by nature and there is no guarantee that a colony will stay at any given location. However, habitat enhancement has proved successful at other locations throughout Australia.
Strengths	<ul style="list-style-type: none"> • If successful, colony will remain in a low conflict area; • Will benefit a range of other native species in addition to flying-foxes and • Proactive management likely to be well received by the community.
Weaknesses	<ul style="list-style-type: none"> • No guarantee of success; • Only relevant for two of the eighteen documented camps.
Cost	Minimal cost associated with higher service level.
Consistency with Plan Objectives	<p>Consistent with the following Plan objectives:</p> <ul style="list-style-type: none"> • To develop flying-fox strategies consistent with legislative obligations • To identify and prevent future residential/flying-fox land use conflict where possible and • To develop achievable flying-fox conservation strategies to protect the three species found in the Sunshine Coast local government area.

15. Management Actions

For the purpose of this Plan, flying-fox camps in the Sunshine Coast local government area have been classified into six management categories based on a combination of the site's potential to generate community/flying-fox conflict and Council's land management responsibilities. It is important to note that due to the mobile nature of flying-foxes and the resulting fluidity of colony sizes and locations, an assigned management category may need to be amended if circumstances significantly change. As such the Draft Regional Flying-Fox Management Plan is considered to be a dynamic document.

For any proposed active dispersal intervention for recognised flying-fox roosts or camps, a report detailing the costs, risks and feasibility will be presented to Council for its consideration and endorsement prior to any action being undertaken. Further, any on-ground management action involving habitat modification or dispersal will be undertaken in accordance with the methods outlined in Appendix 2 of this document.

Category	Description
Category 1	Colonies located fully or partially on Council managed land that have a low potential for community/flying-fox conflict.
Category 2	Colonies located fully or partially on Council managed land that have a moderate potential for community/flying-fox conflict.
Category 3	Colonies located fully or partially on Council managed land that have a high potential for community/flying-fox conflict.
Category 4	Emerging, previously unrecorded colonies on Council managed land that have a low potential for community/flying-fox conflict if a colony becomes established on the site.
Category 5	Emerging, previously unrecorded colonies on Council managed land that have a moderate or high level of community/flying-fox conflict if a colony becomes established on the site.
Category 6	Colonies located on private or State government managed land.

Within each of the categories a range of management options will provide a toolbox from which to choose the most appropriate site-specific management actions.

Category	Management Options
Category 1	<ul style="list-style-type: none"> • Education – living with flying-foxes • No on-ground management • Participate in research into flying-fox ecology • Investigate use of planning instruments to avoid future conflict • Establish buffer areas around existing camps to prevent future problems • Provision of artificial roosting habitat • Increase on-ground service level to enhance habitat value
Category 2	<ul style="list-style-type: none"> • Education – living with flying-foxes • No on-ground management • Establish buffer area around camps to alleviate problems • Participate in research into flying-fox ecology • Provision of artificial roosting habitat • Early intervention option (after temporary/seasonal absence from camp)
Category 3	<ul style="list-style-type: none"> • Education – living with flying-foxes • No on-ground management • Establish buffer area around camps to alleviate problem • Disperse flying-foxes through habitat modification • Disperse flying-foxes through active disturbance • Early intervention option (after temporary/seasonal absence from camp)
Category 4	<ul style="list-style-type: none"> • Education – living with flying-foxes • No on-ground management • Participate in research into flying-fox ecology • Investigate use of planning instruments to avoid future conflict • Establish buffer areas around existing camps to prevent future problems • Provision of artificial roosting habitat • Undertake works to enhance habitat value

Category	Management Options
Category 5	<ul style="list-style-type: none"> • Education – living with flying-foxes • Early intervention option
Category 6	<ul style="list-style-type: none"> • Education – living with flying-foxes • Investigate use of planning instruments to avoid future conflict

The following table outlines the recommended management actions for each of the eighteen known colonies in the SCRC area. As required by the State government, the management recommendations are underpinned by DEHP flying-fox management principles, in particular:

- complaints regarding flying-fox colonies in urban areas are primarily dealt with through community education
- any considerations to relocate or disperse a flying-fox colony will be based on a comprehensive assessment of the situation
- the relocation or dispersal of a flying-fox camp will only be considered as a last option, and
- alternative roosting sites must be available before any attempt to relocate a flying-fox camp is approved.

The latter point is particularly important. Council would have little or no influence over where a disturbed colony chooses to relocate and there are many unsuitable sites in the urban footprint that could cause even greater conflict than the original camp.

Colony	Management Recommendations & Rationale
Cootharaba Kinmond Creek Rd Category 6	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Investigate use of planning instruments to avoid future conflict • Landowner to liaise directly with DEHP <p>Rationale – Colony located on private property. Provision of a buffer around existing flying-fox camps may prevent future land use conflict if development occurs adjacent to the site.</p>
Cooran Yellow Belly Hole Reserve Category 1	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Participate in research opportunities if they arise • Increase service level, if necessary, to enhance habitat value <p>Rationale – The cost of increasing the service level of the Council reserve would be relatively small. As a Category 1 camp, it has been identified as having a low potential for generating community/flying-fox conflict. Consolidating the colony on this non-problematic site will benefit the flying-foxes and the community.</p>
Ringtail Creek Tronson Rd Category 6	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Investigate the use of planning instruments to avoid future conflict • Landowners to liaise directly with DEHP <p>Rationale – Colony located on private property. Provision of a buffer around existing flying-fox camps may prevent future land use conflict if development occurs adjacent to the site.</p>
Noosaville	<ul style="list-style-type: none"> • Education – Living with flying-foxes

Colony	Management Recommendations & Rationale
Goat Island Category 6	Rationale – State owned land in protected tenure
Eewah Vale Eumundi-Kenilworth Rd Category 6	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Investigate the use of planning instruments to avoid future conflict • Landowner to liaise directly with DEHP <p>Rationale – Colony located on private property. Provision of a buffer around existing flying-fox camps may prevent future land use conflict if development occurs adjacent to the site.</p>
Coolum Palmer Resort (formerly Hyatt). Category 6	<ul style="list-style-type: none"> • Education – Living with flying-foxes. • Landholder to liaise directly with DEHP <p>Rationale – Colony located on private property</p>
Parklands Nambour Bypass Category 6	<ul style="list-style-type: none"> • Education - Living with flying-foxes <p>Rationale – State owned land in protected tenure</p>
Parklands Tallangatta St Category 3	<ul style="list-style-type: none"> • Early intervention option <p>Rationale – Colony has been absent from the site since June 2011 after it moved over from the Nambour Bypass camp following landscape disturbance at the latter site. The colony relocation resulted in significant impact on the lifestyle of Tallangatta st residents. An early intervention option is imperative for this site at first signs of recolonisation.</p>
Maroochydore Stella Maris/ Tepequar Dve Category 3	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Early intervention option if the colony vacates the site and attempts to recolonise • Continue joint monitoring and liaison with DEHP and Stella Maris School • Participate in joint feasibility investigation if the school chooses to initiate application for dispersal or other on-ground action <p>Rationale – The colony is primarily located on private property (Stella Maris school grounds), with periodic small spillovers onto Council managed reserve. The school manages the risks associated with the colony's proximity as they manage all other risks on the school site. It is not appropriate for Council to initiate a request for an SMP or DMP when the colony sits primarily on private land. However, as a stakeholder, Council should continue to engage with the school's administration and DEHP to monitor and address community impacts.</p>
Maroochydore Eudlo Ck CP Category 6	<ul style="list-style-type: none"> • Education – Living with flying-foxes <p>Rationale – State owned land in protected tenure</p>
Mooloolaba Goonawarra Dve Category 3	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Early intervention option after temporary/seasonal absence from the reserve <p>Rationale – Traditionally low numbers and none recorded since September 2012. Community/flying-fox conflict occurred in 2010 when 2,500 LRFFs moved in for one month. The reserve appears to be able to maintain small numbers of flying-foxes without creating conflict but an early intervention</p>

Colony	Management Recommendations & Rationale
	option will be important if large numbers attempt to re-colonise. Community monitoring by local residents between DEHP formal counts will ensure early detection of any re-colonisation attempt.
Conondale Herron Rd Category 6	<ul style="list-style-type: none"> • Education – living with flying-foxes • Investigate the use of planning instrument to avoid future conflict • Property owner to liaise directly with DEHP Rationale – Colony located on private property. Provision of a buffer around existing flying-fox camps may prevent future land use conflict if development occurs adjacent to the site.
Moffat Beach Tooway Creek Category 2	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Early intervention option Rationale – flying-foxes were absent from the site between Oct 2007 and April 2011. Since then numbers have fluctuated between 70 and 1,500. Only a small number of resident complaints were generated and there has also been acceptance of the colony from other residents. The reserve appears to be able to maintain small numbers of flying-foxes without creating conflict but an early intervention option will be important if large numbers attempt to re-colonise.
Landsborough Vidler Crt Category 2	<ul style="list-style-type: none"> • Education – living with flying-foxes • Investigate the use of planning instrument to avoid future conflict • Potential early intervention option Rationale – The highest number of flying-foxes recorded on the reserve was 10,000 in October 2010. By January 2011 numbers had dropped to 2,000 and have stayed at that level until recently with their complete absence over winter in 2011 and 2012. Counts in Oct and Nov 2012 revealed around 4,000, consisting of many pregnant or lactating females. The colony has recently moved back further into the reserve increasing their distance from houses. The reserve appears to be able to maintain moderate numbers of flying-foxes without creating conflict but an early intervention option may be useful if large numbers attempt to re-colonise. Provision of a buffer around existing flying-fox camp may prevent future land use conflict if development occurs adjacent to the site.
Coolum Cassia Ave Category 3	<ul style="list-style-type: none"> • Education – Living with flying-foxes • Participate in monitoring and liaison with DEHP • Early intervention option Rationale – Few, if any complaints were received while numbers were low. However, some complaints were received when numbers swelled to 2,300 in September 2012. Occupation of this site is likely to be seasonal and spasmodic. Thus, early intervention offers a useful means to prevent recolonisation of large numbers of flying-foxes in this small reserve. The establishment of vegetated buffers is impractical as the entire width of the reserve (approx 90m) is considerably less than what is considered to be an effective buffer.
Weyba Creek	<ul style="list-style-type: none"> • Education – Living with flying-foxes

Colony	Management Recommendations & Rationale
Category 1	<ul style="list-style-type: none"> Joint monitoring with DEHP <p>Rationale – Colony located primarily on State owned land in protective tenure and partially on small Council reserve. The sites are well buffered and isolated from residential areas.</p>
Peachester McDonalds Rd	<ul style="list-style-type: none"> Education – Living with flying-foxes Landowner to liaise directly with DEHP
Category 6	Rationale – Colony located on private land
Palmwoods Dunning St	<ul style="list-style-type: none"> Education – Living with flying-foxes Early intervention option
Category 2	Rationale – A count undertaken in Mar 2012 revealed the presence of 500 flying-foxes. By November 2012 there were none present. There is some potential for conflict due to where the colony sits in the landscape with 5 homes adjoining the reserve. However, this is not a permanent colony and has caused little problem to date.

16. State Government Requirements

Queensland's DEHP require that the management of flying-fox camps be underpinned by the following principles:

- Complaints regarding flying-fox colonies in urban areas are primarily dealt with through community education
- Any considerations to relocate or disperse a flying-fox colony will be based on a comprehensive assessment of the situation
- The relocation or dispersal of a flying-fox camp will only be considered as a last option
- Alternative roosting sites must be available before any attempt to relocate a flying-fox camp is approved, and
- Attempts to move a flying-fox camp will only be carried out with the approval of a Regional QPWS Director, by QPWS staff or persons authorised under a Damage Mitigation Permit (DMP).

17. Species Management Program (SMP)

In circumstances where a proposed activity may modify a flying-fox roost, but without destroying the roost, while the flying-foxes are absent most of the time, a landholder may seek approval for a Species Management Program (SMP). This could include modifying vegetation after flying-foxes have temporarily or permanently vacated a camp (not just the nightly fly-out). Relevant sections of the *Nature Conservation (Wildlife Management) Regulations 2006* will be applied to an SMP approval.

18. Damage Mitigation Permit (DMP)

The relocation or dispersal of a flying-fox camp would require a Damage Mitigation Permit (DMP), which would only be considered by DEHP as a last resort where all other management options have failed. A DMP is normally granted for a maximum period of six months but the completion of an approved Regional Management Plan may allow a DMP to be granted for three years. All costs relating to the DMP and its

implementation are borne by the approved permit holder, including responsibility for ongoing actions associated with the establishment of the dispersed colony into another unsuitable location.

19. Federal Government Requirements

The *EPBC Act* requires a permit for activities which may kill, injure, take, trade, keep or move a member of a listed threatened species. As such, any DMP application to the State government will also require a similar application to the Federal government for any action involving dispersal of habitat modification of the GHFF. All eighteen known colonies in the SCRC area contain, or have contained, the GHFF.

20. Acknowledgements

Sunshine Coast Council acknowledges the authors of GeoLINK's *Draft Lorn Flying-fox Management Strategy* for the use of the management options discussion format within this report.

21. References

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22. Case Studies

Duaringa - 2012

Cost \$150,000

Damage mitigation permit granted to disperse 200,000-300,000 Little red flying-foxes. The colony had been present in the centre of town spread over a small number of private urban backyards and a small council park for a period of seven months.

Drastic habitat modifications occurred over 5 nights with 60% of vegetation modified on the first night. Returning flying-foxes flew around confused for around 2 hours then crammed into remaining 40% of the original vegetation and into some nearby residential trees.

On Day 2 tree lopping resumed immediately after fly-out (approx 7pm) and continued through to 3am. Smoke, gas guns and lights were also introduced from Day 2. Flying foxes finally moved 600m east of camp to an abandoned Council depot site.

The smoke machine produced a smell similar to burning timber, which is a natural deterrent for flying-foxes. Gas guns were also thought to be a crucial component. Both were used during the day to disturb roosting.

Gold Coast - 2011

Cost \$250,000 - \$300,000, which included:

- Consultant fees before and after (Ecosure);
- Vegetation removal 80-90%; and
- Monthly monitoring post dispersal.

This project involved the dispersal of approximately 1,000 GHFF and BFFs from Gold Market Park Reserve, which adjoined the Gold Coast Equine Precinct. The property size was 4 ha but only a portion of the vegetation on the property was cleared. Flying-foxes began to abandon the site when 70% of understory and 30% of canopy were removed.

Gold Coast Council has spent \$500,000 in last 12 months on flying-fox issues and have recently authorised application for a DMP to disperse another colony on private and crown land.

Mackay Regional Council - 2009

Cost approx \$45,000

Council undertook the dispersal of approximately 6,000 BFFs, primarily on one residential property at 20 Mill Street, North Eton (5,000 FFs on one 3,800m block). Numbers had fluctuated on the site between 0-10,000 for a period of 7 years.

Dispersal was originally undertaken over four days and nights and involved tree lopping, smoke machines, spraying with tea tree/eucalypt extracts, noise from fogging machines and Birdfrite and intense lighting from strategically placed flood lights. Works were undertaken for a period of 10 days, with tree trimming on the first 2 nights followed up with the disturbance techniques outlined above.

In April 2010 a new DMP was approved to disperse 1,000 flying-foxes that had settled at an alternate suitable roost site 2km from the original dispersal site in Mill Street.

In May 2010, 600 flying-foxes returned to crown land in Mill Street after the satisfactory alternative roost site mentioned above reached 3,000 before being abandoned. During

26 - 28 May intense lighting and fogging commenced, but resulted in little dispersal success.

In June 2010 approval was given to trim mango trees on crown land after flyout. After flying-foxes left of their own accord the mango trees were trimmed to prevent establishment if they returned.

To date, flying-foxes have not returned but there is no guarantee of long term success. In this instance Mackay Council officers believe habitat modifications to be the key to success.

Melbourne Botanical Gardens - 2003

Cost approx \$2.5 - \$3m

Dispersal of approximately 28,000 GHFF was finally achieved after repeated attempts to disperse flying-foxes to protect iconic vegetation at the Gardens.

A site was prepared at Horseshoe Bend with a plan to relocate the colony from the Royal Botanic Gardens through a combination of two outcomes: scaring them from the Gardens using sound, and attracting to Horseshoe Bend through habitat enhancement. A total of \$110,000 spent on habitat restoration at Horseshoe Bend.

After repeated attempts, dispersal was eventually successful but the colony settled at Yarra Bend, not Horseshoe Bend. The City of Melbourne has allocated \$1.7m (over 5 years) for the implementation of the Yarra Bend Management Plan aimed at consolidating the site to keep the colony in place.

Maclean Rainforest Reserve - 1999

Cost \$750,000+

Approximately 10,000-20,000 GHFF, BFF and LRFFs were dispersed through noise from a variety of sources for short periods of time first before dawn and dusk. Ongoing dispersal efforts were undertaken another 20 times in the following 6 years. Prior to the dispersal, the camp had been occupied since at least 1890.

Appendix 1 Summary Table of Known Colonies in the SCRC Local Government Area

Location	Land Tenure	Species	Colony Size	Colony History	Current Status	Conflict Potential
Catharaba, Kinmond Creek Rd,	Private property	Primarily G HFF some BFF	0 – 12,000	Two colonies within 500m of each other. Usually one or the other occupied but occasionally both at the same time. First formal count 2007 – 7,420 ff, highest number in 2009 – 12,000. Absent in 2010 and 2011. 500 GH recorded July 2012.	18/10/12 – none present at south location, 3,000 at north location.	Low community conflict, high property owner conflict where flying-foxes roost within 10m of one residence.
Yellow Belly Hole Reserve, Railway Rd Cooran	Council reserve	GHFF	0 – 15,000	First formal count 2010 – 15,000 GHFF, absent until October 2012 – 677 GH ff, 35 Black.	18/10/12 – 677 GHFF, 35 BFF	Low conflict if they stay where they are. Pony Club, Straker Park & ovals on northern boundary but well buffered. Residences to the west, northeast and south east are well buffered.
Ringtail Creek, Tronson Rd	Across 2 private properties	Primarily GHFF, some BFF	0 – 10,000	First formal count 2008 – 2,000 FF, mix of GHFF and BFF. March 2012 – 9,000 GHFF, 1,000 BFF. July 2012 60 BFF.	16/11/12 – None present	Low potential for community conflict. Colony spread across two private lots. One owner very supportive of colony, the other owner ambivalent but generally accepting.
Noosaville, Goat Island	State Land, protected tenure, CP	Primarily BFF, small numbers of GHFF and periodic LRFF	0 – 60,000	Formal counts in 2001 revealed BFFs between 4,000-6,000. Jan-June 2002 – 60,000 LRFF. Decline in all species 2005-08. April 2011 – 10,000 GHFF	16/11/12 – None present	Low potential conflict. Well buffered from urban development.
Eerwah Vale, Eumundi-Kenilworth Rd	Private property	Primarily GHFF, some BFF	0 – 2,000	First formal count in 2004 – 500 GHFF. Small numbers periodically to maximum of 2,000 mostly GHFF in 2010. None present since April 2004.	Count no longer undertaken	Low community conflict. Formerly small colony and none recorded since April 2004.

Location	Land Tenure	Species	Colony Size	Colony History	Current Status	Conflict Potential
Palmer Resort (Hyatt), Coolum Beach	Private property	Even mix of GHFF and BFF	0 – 4,000	Formal count in July 2010 recorded 4,000 FF. Number reduced to 1,000 GHFF and 1,000 BFF in November 2010.	16/11/12 – None present	Low community conflict, unknown views of current resort owner if FFs return to resort.
Parklands, Nambour bypass	State Land, protected tenure CP	Primarily GHFF, some BFF	0 – 25,000	Formal monitoring since 2007 – none recorded. Between July 08 and Apr 09 numbers fluctuated between 4,500 & 25,000, the majority GHFF. Mostly absent until Oct 2011 – 3,460 recorded, 50% GHFF & 50% BFF.	16/11/12 – None present	Low community conflict as colony location has been in protected tenure State land.
Parklands, Tallangatta St	Council reserve & private property	Mix of GHFF and BFF	0 – 26,000	Colony moved from the Nambour bypass camp early 2010, when FF numbers were estimated at 26,000. Population dropped to 10,700 by May 2011 but have been absent from the site since June 2011.	16/11/12 – None present	High conflict potential if flying-foxes return to this site. Very close to residences. Numerous complaints and high media coverage when flying-foxes present.
Maroochydore, Stella Maris/Tepequar Dve	Council reserve and private land (catholic school)	Mix of GHFF and BFF	2,000-26,500	Colony small and unproblematic for number of years. In May 2011 numbers were at 2,000 and reached 26,500 in May 2012. Most recent count in Sept 2012 – 10,000, 60% BFF and 40% GHFF	24/9/12 – 10,000	High conflict potential in relation to Tepequar Dve residents. Flying-foxes currently moved closer to the Stella Maris school off the Council reserve land behind Tepequar.
Maroochydore, Eudlo Creek CP	State land, protected tenure CP	Primarily BFF, some GHFF	0 – 3,000	Formal count July 2007 – 3,000 flying-foxes. None present since then.	16/11/12 – None present	Low conflict potential. Colony location in State protected tenure. No FFs present since 2007.
Mooloolaba, Goonawarra Dve	Council reserve	Mix of GHFF, BFF and LRFF	0 – 2,500	First formal count Jan 2010 – 275 BFFs present. Numbers increased in Mar 2010 for a period of one month with	16/11/12 – 200 BFF	High potential for conflict if numbers increase. Previous influx of LRFFs in 2010 triggered significant concern

Location	Land Tenure	Species	Colony Size	Colony History	Current Status	Conflict Potential
				influx of 2,500 LRFFs. Since then small numbers (0–500) of GHFF and BFF have used the reserve .Last count Sept 2012 – none present.		from adjoining residents.
Conondale, Herron Rd	Private property	Mix of BFF and GHFF	0 – 6,000	First formal count in April 2011 – none present. In Sept 2011 2,000 BFF present and by Jan 2012 4,200 BFF and 1,800 GHFF. Last formal count Oct 2012 revealed 7,200 BFF with most adult females pregnant or lactating.	19/10/12 – 7,200	Moderate potential for conflict. Not many complaints about this colony but residents have attempted shooting and other disturbance. Some other residents supportive or neutral attitude to FF presence. Community education being undertaken by local bat carer group has had fairly positive results.
Moffat Beach, Tooway Creek	Council reserve	Mix of GHFF, BFF and LRFF	0 – 10,000	First formal count 2007 – 5,000 BFF and 5,000 LRFF. By Jul 2007 the LRFFs had gone and number of BFFs reduced to 2,500. In Oct 2007, 7,600 predominantly GHFF present. All flying-foxes then absent until Apr 2011 when 300 GHFF returned. Since then numbers have fluctuated between 70 and 1,500. Last count Sept 2012 – 1,000 BFF.	16/11/12 – 300 BFF	Moderate potential for community conflict. Complaints from some residents when FFs on site but some other residents supportive and even protective of the colony.
Landsborough, Vidler Crt	Council reserve	Mostly GHFF, small number of BFF	0 -10,000	First formal count Jan 2010 – 2,170 mostly GHFF. Numbers stayed below this until 10,000 in Oct 2010. By Jan 2011 numbers had dropped to 2,000 and have stayed at approximately that	16/11/12 – 4,000	Moderate potential for conflict due to variable movement of flying-foxes in the reserve. Residents generally accepting of their presence and generally unconcerned when flying-foxes are further back in the reserve,

Location	Land Tenure	Species	Colony Size	Colony History	Current Status	Conflict Potential
				number until recently with their absence over winter in 2011 and 2012. Counts in Oct and Nov 2012 revealed 4,000 flying-foxes, with most adult females pregnant or lactating. Colony have recently moved further back in the reserve putting them further away from houses.		as is currently the case. Potential for conflict situation increases though if the FFs decide to move closer to residences.
Coolum, Cassia Ave	Council freehold	Mostly BFF, small number of GHFF	50 – 2,300	First formal count Nov 2011 – 250 flying-foxes, reduced to 50 in Feb 2012. Aug 2012 count revealed 300 BFFs. Most recent count Sept 2012 revealed 2,300 mostly BFFs and about 150 GHFF. Most adult females pregnant or carrying infants.	28/9/12 – 2,300	High conflict potential. Only a small parcel of Council freehold land surrounded by residences for most of the perimeter. Few, if any, complaints received while numbers are low but recent increase in population is creating conflict.
Weyba Creek	State land (partially protected tenure, CP) and small parcel Council reserve.	Mix of GHFF, BFF and historical influx of LRFF	0 – 25,000	Believed to be the Goat Island colony that had previously been on Goat Island for approx 60 years. The colony currently moves around between an island in the Noosa River south of the football fields to State CP and Council reserve east of the sporting fields.	20/7/12 – none present	Low potential conflict. Colony moving between two State land parcels (one in protected tenure) and one council bushland reserve. Well buffered from residential areas.
Peachester, McDonalds Rd	Private land	Mix of GHFF and BFF	0 – 18,000	Not a permanent colony with flying-foxes generally absent over the winter months. Largest number of flying-foxes recorded was 18,000 in Jan 2009. Flying-foxes move between two private properties.	16/11/12 – none present	Low potential for conflict.

Location	Land Tenure	Species	Colony Size	Colony History	Current Status	Conflict Potential
Palmwoods, Dunning st	Council reserve	Primarily BFF with some GHFF	0 - 500	In Mar 2012 count undertaken following a mild complaint from resident at 66 Dunning st. Found to be 500 flying-foxes present.	16/11/12 – none present	Moderate potential for conflict due to where the colony sits in the landscape with 5 residential houses adjoining reserve area. However, this is not a permanent colony and has caused little problem to date.

Appendix 2 Proposed dispersal and habit modification methods

In the event that non-lethal dispersal and/or habitat modification is required, the following methods will form the basis of on-ground works. If flying-foxes are present at the site, all proposed works will occur during the night after the last flying-fox has left the roost site.

It is important to note that an intervention action associated with any known flying-fox roost or camp sites will only occur when:

1. DEHP have approved the action; and
2. A report outlining the costs, feasibility and risks is presented to Council for its consideration, approval and funding allocation.

All other management options to mitigate the impact on residents will be explored prior to any application for a Damage Mitigation Permit. For example, such options may include the installation of noise attenuation fencing.

Option 1

Option 1 will involve the creation of a buffer zone between the flying-fox camp and adjacent residential properties. This will be achieved through the following actions:

1. Removal of all trees and shrubs located within the buffer zone;
2. Removal of overhanging branches extending from the flying-fox camp into the buffer zone and residential properties; and
3. Environmental weed control where applicable and the restoration of native ground cover/understorey species.

Option 2

Option 2 will involve the removal of all known roost trees from within the flying-fox camp area. This will be achieved through the following methods:

1. Removal/Trimming of all known roost trees within the camp footprint;
2. Environmental weed control where applicable and the restoration of native ground cover/understorey species.

Option 3

Option 3 will involve the removal of all known and potential roost trees from within the flying-fox camp site. This will be achieved through the following methods:

1. Removal / trimming of all known and potential roost trees within the flying-fox camp footprint; and
2. Environmental weed control where applicable and the restoration of native ground cover/understorey species.

Option 4

Option 4 will involve non-contact dispersal techniques either as a stand alone action associated with early intervention or in association with any of the above actions. Option 4 actions will utilise the following methods:

1. Smoke machines;
2. Noise (stock whips, BirdFrite, loud banging of kitchen equipment and heavy music);
3. Gas guns (Zon Bird Scare Guns); and/or

4. Lighting (intensive flood lighting).

Note: Vegetation works undertaken in all options are to be in accordance with the Australian Standards 4373-2007 Pruning for amenity trees.

The employment of any of the above options will be dependant on the nature of the site. Consequently, any or all of the above options may be utilised at any given site.

Activity Participants

The detailed components of any on-ground actions are likely to vary, depending on the landscape setting and other site-specific factors. However, as a general rule the following personnel will be likely to participate in any dispersal activities.

Personnel	Duties
Project Manager	Supervision of all works undertaken under the permit.
Fauna Spotter/Catcher	<ul style="list-style-type: none"> - Monitoring fauna present within corridor - Liaison with project manager to alert of - Liaison with EHP officers
Council Officers	<ul style="list-style-type: none"> - Pruning of vegetation - Early intervention dispersal techniques
Vegetation Contractor	Vegetation management works
Council Education Officer/Media Officer	Crowd control and liaison with observers
EHP Officers	Compliance supervision of permit conditions

In some circumstances there may be additional members of the community who will not be actively involved in the on-ground actions, but have some interest in the process and/or outcomes.

Observer	Reason for attending
Councillors	Key stakeholder
Residents	<ul style="list-style-type: none"> - Key stakeholder - Works to be undertaken directly adjacent to a residential address. - Likely to be disturbed by works
Emergency Services / Police	- Crowd control
Media	To report on action taken and impacts
Wildlife Carers	<ul style="list-style-type: none"> - To assist in welfare component - To protest the action
Other interested community members	<ul style="list-style-type: none"> - Interested party - Incidental attendance - To protest the action
Researchers / University Students	- To record/witness the action

Observer	Reason for attending
Community Groups	<ul style="list-style-type: none"> - Interested party - To protest the action

Potential impacts

While it is not always possible to accurately predict impacts with any degree of certainty, the following impacts have been identified as potential outcomes associated with each option.

Option 1

- Loss of flying-fox and other fauna habitat;
- Increased edge effects;
- Reduction in ecological viability; and
- Reduction in bushland amenity level for adjoining properties.

Option 2

- Loss of flying-fox and other fauna habitat;
- Change to the vegetation structure of the site;
- Reduction of bushland amenity for adjoining properties;
- Potential for temporary water quality issues; and
- Reduction in ecological viability.

Option 3

- Loss of flying-fox and other fauna habitat;
- Reduction/loss of bushland amenity for adjoining properties;
- Change to visual amenity for surrounding community;
- Reduction/loss in ecological viability; and
- Potential for temporary water quality issues.

Option 4

- Increased stress levels for flying-foxes;
- Increased risk of injury or death through accidental collision;
- Potential for decreased breeding success in the following season through social disruption and habitat disturbance;
- Increased risk of injury or death through increased predation; and
- Risk of ongoing disturbance to community through night time noise generation.

Animal Welfare Mitigation Strategies

The following mitigation strategies will be undertaken during proposed works to minimise risks to flying-foxes:

- Vegetation management works are to be undertaken only during the night after the last flying-fox has left the roost site;
- Fauna Spotter/Catcher holding a current EHP Rehabilitation Permit is to be engaged to provide advice and recommendations during proposed works;
- Works are to stop immediately if a flying-fox appears to have been killed, injured or harmed during proposed works. Works can resume only after approval from an EHP officer;

- Where a flying-fox appears injured, an experienced, vaccinated flying-fox handler only is to approach, handle and collect the animal. The animal is to be transported to a veterinary facility immediately; and
- Local wildlife veterinary hospital (Australia Zoo Wildlife Hospital) is to be briefed by the Project Manager of the proposed works and be prepared to receive sick or injured wildlife if required.

Where the following triggers occur, all works on site will cease until further notification by an EHP officer:

- Death or injury to a flying-fox or other fauna;
- Notification from an EHP officer or fauna Spotter/Catcher that unacceptable stress levels are occurring;
- Where pregnant flying-foxes are observed;
- Where dependant young flying-foxes are observed;

Works resume only after approval from an EHP officer.

Human Health Mitigation Strategies

The following mitigation strategies will be undertaken during any proposed works to minimise risks to human health:

- Strictly no non-vaccinated personnel are to come in contact with flying-foxes during works;
- Injured or dead flying-foxes are only to be collected by personnel who are currently vaccinated against Australian Bat Lyssavirus (ABL);
- Personnel are required to observe workplace health and safety requirements;
- Personnel are required to wear personal protective equipment as recommended within workplace health and safety requirements; and
- Where contact (bite or scratch) between a flying-fox and human is reported, the person is to advise the Project Manager and attend a General Practitioner as soon as possible for treatment. First aid treatment should include washing the wound for fifteen minutes with soapy water (not scrubbing) and apply an iodine based solution.

Monitoring

On-site Monitoring

Following on-ground works, monitoring of flying-foxes will be undertaken at the site by the following personnel:

- EHP officers;
- Fauna Spotter/Catcher; and
- Council officers.

Off-site Monitoring

Monitoring of potential alternative roost sites will be undertaken by the following personnel:

- Pre-selected residents at key roost and other locations likely to attract disturbed flying-foxes;
- Council officers;
- Wildlife care community groups; and

- General public.

Offsite monitoring will be undertaken at all known, current and historic flying-fox roosts or reserves that have been identified as suitable flying fox habitat.

Alternative Roost Sites

Potential alternative roost sites will be identified within a 20km radius of the site. The criteria used to identify these sites have been based on the location having the following attributes:

- A closed canopy at least 5m high;
- Dense vegetation within 500m of a river or creek;
- Within 50km of a coastline, or at an elevation less than 65m above sea level;
- Level topography; and
- Be at least one (1) hectare in size.

Early Intervention Dispersal

Where flying-foxes are observed at another high conflict location within the four (4) weeks following the dispersal works, early intervention dispersal techniques will be used.

Early intervention dispersal techniques will be used when the following criteria are met:

1. Flying-foxes attempt to settle within a private urban or peri-urban residence; or
2. Flying-foxes attempt to settle within a reserve adjoining a private urban or peri-urban residence; or
3. Flying-foxes attempt to settle at any other location that is recognised as likely to generate a high level of land use conflict (e.g. hospital, childcare centre, school, aged care facility).

Early intervention dispersal techniques will be non-contact and may include the following methods:

- Smoke machines;
- Noise (stock whips, BirdFrite, loud banging of kitchen equipment and heavy music);
- Gas guns (Zon Bird Scare Guns); and/or
- Lighting (intensive flood lighting).

Communication Plan

Prior to any action the following will occur:

1. For land not under Council's management control or ownership, landowner consent will be obtained;
2. Early consultation with residents likely to be affected by any actions will be undertaken;
3. Information will be disseminated to all adjacent residents and other stakeholders; and
4. Information will be disseminated to the broader community for the purpose of timely notification of relocation on dispersed bats into other inappropriate locations.