FLYING-FOX MANAGEMENT STRATEGY

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SCENIC RIM
Regional Council

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1. PURPOSE OF THE STRATEGY

THE PURPOSE OF THIS STRATEGY IS TO PROVIDE DIRECTION FOR THE MANAGEMENT OF FLYING-FOXES WITHIN THE SCENIC RIM.

The Strategy will achieve the following key objectives:

- Address and manage the concerns of residents and/or community groups experiencing lifestyle impacts associated with the close proximity of large and/or problematic flying-fox roosts within the Scenic Rim Urban Flying-fox Management Area (Figure 1) and/or on Council managed lands
- Develop flying-fox management strategies consistent with legislative obligations
- Identify and prevent, where possible, future community/flying-fox conflicts, whilst conserving and co-existing with flying-fox populations within the Scenic Rim Region

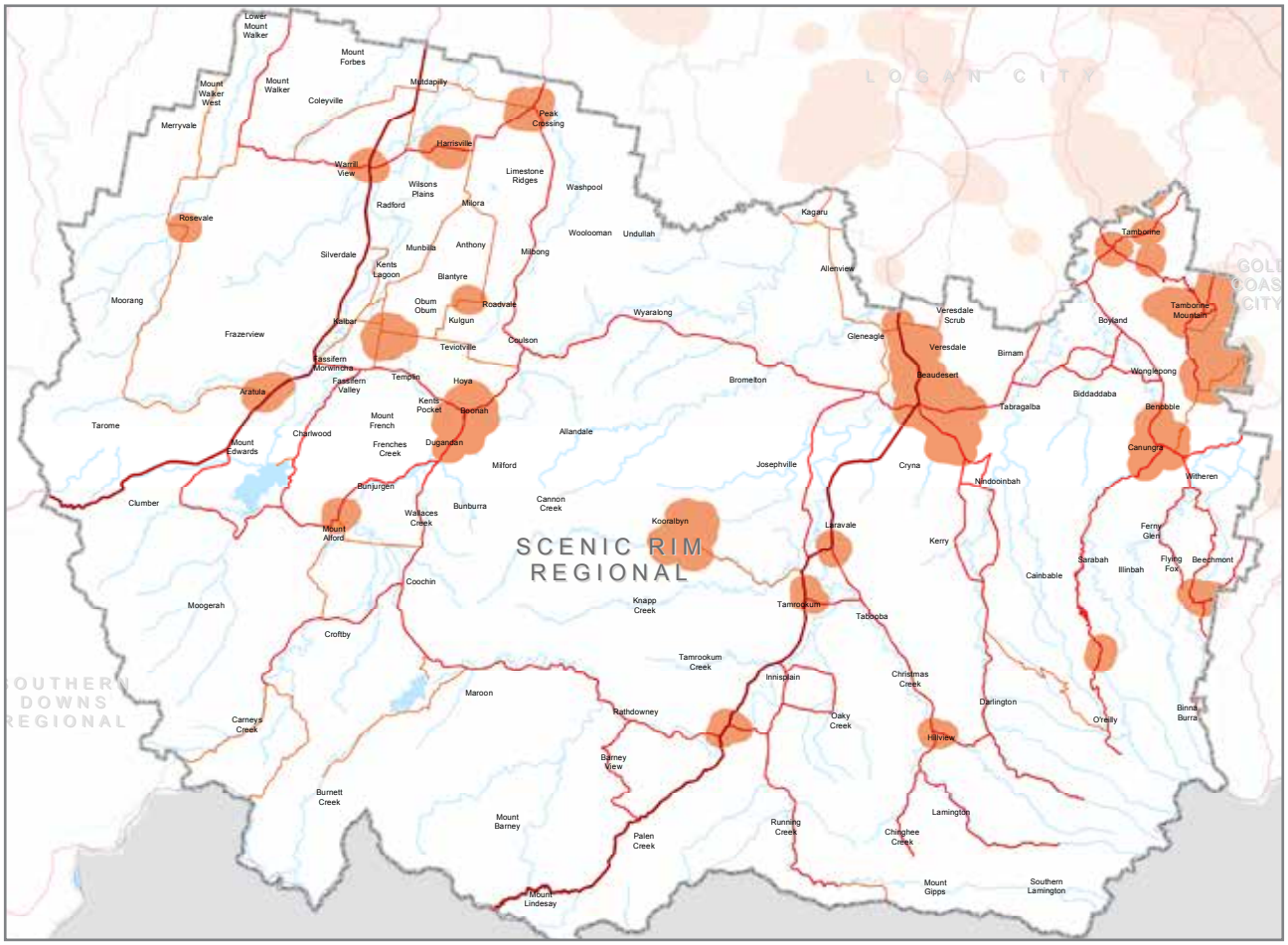


FIGURE 1: SCENIC RIM REGIONAL COUNCIL URBAN FLYING-FOX MANAGEMENT AREA.

The Queensland State Government defines the Urban Flying-fox Management Area as areas designated within Council's planning scheme as having a residential or commercial purpose including a 1km buffer.

2. FLYING-FOX ECOLOGY AND BIOLOGY

The Australian mainland is home to four species of flying-fox (Pteropus species), three of which inhabit Southeast Queensland. Flying-foxes (often incorrectly referred to as fruit bats) are complex, highly social and mobile native bats. They make a significant contribution to environmental health and the economy through their roles as essential pollinators and seed dispersers of native forests. In turn, these forests provide valuable timber, act as carbon sinks and stabilise our river systems and water catchments. Flying-foxes forage at night and congregate during the day in large groups (often numbering in the thousands or tens of thousands) commonly called roosts or camps.

2.1 SOUTHEAST QUEENSLAND SPECIES

BLACK FLYING-FOX (PTEROPUS ALECTO)

Mainly roost in wet and dry eucalypt forests, mangroves, melaleuca swamps and casuarinas. They typically form continuously occupied roosts, often with grey-headed flying-foxes. They feed on nectar, flowers and fruits of native trees and on cultivated fruits such as bananas, pawpaws, mangoes, lychees when native food is sparse.

GREY-HEADED FLYING-FOX (PTEROPUS POLIOCEPHALUS)

This species has declined by more than 30% from 1989 to 1999 causing it to be listed nationally as 'vulnerable' under the Environmental Protection and Biodiversity Conservation Act 1999. They move in response to the patterns of flowering eucalypts and paperbarks but will also forage on fruits of native trees and on cultivated fruits when native food is sparse.

LITTLE RED FLYING-FOX (PTEROPUS SCAPULATUS)

A nomadic species feeding preferentially on nectar. They move seasonally in response to the patterns of flowering eucalypts and paperbarks. They form only temporary roosts, frequently sharing roosts with black and grey-headed flying-foxes.

Black Flying-Fox (Pteropus Alecto)

Grey-headed Flying-fox (Pteropus Poliocephalus)

Little Red Flying-fox (Pteropus Scapulatus)

2.2 DIET

Australian native trees have evolved with flying-foxes as the main pollinators. Flying-foxes carry seeds and pollinate plants across thousands of kilometres playing a major role in ensuring the ongoing survival of Australian rainforests and eucalypt forests.
Due to their ability to carry large fruit and move it over considerable distances, flying-foxes are also responsible for maintaining genetic diversity amongst remnant patches of forests. The nocturnal feeding habits and extensive feeding ranges of flying-foxes enables them to pollinate tree species which produce most of their nectar at night and are thus less easily serviced by day-feeding birds and bees. A big misconception surrounding the pollination of native trees is that honey bees are primarily responsible; however the honey bee was only introduced into Australia with European settlement.

Flying-foxes will preferentially feed on pollen, nectar, flowers and fruit of native plants but will feed on introduced plant species when native species are scarce. Native flowering trees which flying-foxes will forage on include eucalypts, bloodwoods, ironbarks, paperbarks, grevilleas, bottlebrushes and banksias. Native fruit trees which flying-foxes will feed on include figs, palms, lillypillies and quandongs; introduced fruit trees include cocos palms, mangoes, lychees, pawpaw, banana, guava and mulberry trees.

Flying-foxes visiting backyards during the night to feed will leave once the food source (e.g. flowering/ fruiting trees) has been exhausted; this is considered normal foraging behaviour. Single flying-foxes remaining in backyards during the day may indicate an injured animal or a dropped baby incapable of flight and as such a wildlife carer experienced in bat handling may need to be contacted (see Appendix A).

2.3 ROOSTS

A flying-fox roost is a tree or other place where flying-foxes congregate during the daytime to rest, breed and rear young. Roosts can often consist of a mix of flying-fox species. There are four broad categories of roost:

- Continuously occupied - a roost that has been utilised by flying-foxes continuously for at least 12 months
- Irregularly occupied - a roost that has been utilised by flying-foxes intermittently (e.g. Little Red Flying-fox roosts at times of flowering)
- Seasonally occupied - a roost that has been utilised by flying-foxes on a seasonal basis (e.g. winter or summer roost)
- Temporarily occupied roost - a roost which is deemed to only be occupied on a temporary basis, such as a little red flying-fox roost where the animals are expected to move on once local flowering ceases

Vegetation clearing in eastern Australia since European settlement has resulted in a substantial reduction of flying-fox foraging and roosting habitat. Consequently, destruction of flying-fox habitat frequently causes the animals to establish roosts in urban areas. This can cause conflicts between humans and flying-foxes and may give the false impression that flying-fox numbers are increasing. Some roosts are located in threatened ecological communities and appropriate site-specific management options must consider this. The specific factors influencing why flying-foxes set up roosts in certain places rather than others is poorly understood.

Roosts are vital to the conservation of flying-foxes as they provide access to food, sites for mating, and raising young as well as stopover sites for nomadic/ migratory animals. It is critical that the network of roosts used by flying-foxes is maintained across the landscape, allowing the animals to move throughout their range in response to food availability.

Flying-foxes are only considered to be territorial during the mating season and territory is generally only a branch or two within a roost. Therefore,

FLYING-FOXES ARE COMPLEX, HIGHLY SOCIAL AND MOBILE NATIVE BATS. THEY MAKE A SIGNIFICANT CONTRIBUTION TO THE ENVIRONMENT AND ECONOMY THROUGH THEIR ROLES AS ESSENTIAL POLLINATORS AND SEED DISPERSERS OF NATIVE FORESTS.

individual flying-foxes may have a large home range and frequent multiple roosts over as many days with limited or no territorial concerns. Individual roosts must therefore be managed from the perspective that they are an integral part of a larger network of roosts.

Flying-foxes are known to have strong fidelity to roost sites and are known to regularly return to the same roost site annually (and in some cases the same tree branch) when food resources are locally available. The high roost fidelity of flying-foxes can create difficulties in the management of roost sites and dispersal efforts may, in some circumstances, prove challenging and resource intensive. This is typically due to the fact that whilst the number of flying-foxes utilising a particular roost on a day-to-day basis may be the same, the actual individuals making up those numbers can significantly change. Additionally, while the average number of flying-foxes within a roost is 10,000 (for example) the actual number of individuals who utilise the roost on a regular basis could be 20-50,000.

Roost dispersal attempts may therefore need to be conducted until such time as all individuals have been 'notified'. In much the same way that humans travel around the country staying at hotels and eating at favourite restaurants, flying-foxes will travel across the landscape stopping at 'favourite' roost and foraging locations. Individuals who have just flown hundreds of kilometres to reach a roost location will not disperse easily and consideration needs to be given to recovery times.

2.3.1 KNOWN ROOST LOCATIONS IN THE SCENIC RIM REGION

There are currently 11 known locations within the Scenic Rim Regional Council area where flying-foxes have or are presently roosting (Figure 2). The occupancy status of these roosts varies (Table 1).

FIGURE 2: KNOWN LOCATIONS OF ACTIVE AND NON-ACTIVE FLYING-FOX ROOSTS WITHIN THE SCENIC RIM REGIONAL COUNCIL AREA.

TABLE 1: OCCUPANCY STATUS OF 11 KNOWN FLYING-FOX ROOSTS WITHIN THE SCENIC RIM REGIONAL COUNCIL AREA

FLYING-FOX ROOST	OCCUPANCY STATUS	FLYING-FOX SPECIES OCCUPYING ROOST (CURRENTLY OR PREVIOUSLY)		
		Black	Grey-headed	Little Red
Beaudesert	Temporary	Yes	Yes	Yes
Boonah	Decommissioned* (June 2014)	Yes	Yes	Yes
Canungra (Beechmont Rd)	Continuous	Yes	Yes	No
Canungra (Township)	Irregular	Yes	Yes	No
Flinders Peak	Continuous	Yes	Yes	No
Hillview	Irregular	Yes	Yes	No
Kooralbyn	Irregular	Yes	Yes	No
Peak Crossing	Irregular	Yes	Yes	Yes
Mount French	Irregular	Yes	Yes	No
Rathdowney	Irregular	Yes	Yes	No
Tamborine National Park	Continuous	Yes	Yes	No

**Decommissioned roost - roost vegetation removed to prevent roosting by flying-foxes.*

2.4 MOVEMENT

Flying-foxes can easily fly 50km from a roost each night searching for food and can travel hundreds of kilometres over several nights, moving between roosts depending upon the availability of food resources. Individual flying-foxes have been tracked moving > 1,000km in 7-10 days. While each species of flying-fox is capable of large movements, little red flying-foxes are the most nomadic (followed by grey-headed flying-foxes) and can arrive in large numbers overnight in response to local flowering. Current research data indicates that black flying-foxes tend to move more locally than little red and grey-headed flying-foxes.

Their high mobility and frequency of roost changes means that each night flying-foxes leave their respective roosts and spread out across the landscape in a weblike effect. This means that even if a roost location is not in an urban area flying-foxes are highly likely to visit urban areas during the night to feed if suitable food resources are available. Furthermore, flying-foxes may travel great distances from roosts returning to the same food tree each night until flowering/fruiting finishes.

2.5 LIFE CYCLE

Flying-foxes have a low reproduction rate and become sexually mature at 2-3 years. They have a six month pregnancy, females give birth to a single young (pup) per year and suckle that pup for up to six months (Table 2). Unlike many other mammalian species flying-foxes do not have a period of lactational anoestrous and females can become pregnant whilst still suckling their current pup. It is physically impossible for flying-foxes to breed at “plague proportions” and a local increase in numbers is likely to be an influx of animals to the area in response to a local flowering event.

Females will carry their young while foraging until the pup becomes too heavy (typically around 4-5 weeks of age), at which time the pup is left in the roost overnight. The female may return throughout the night to suckle her young. Older pups are placed in crèches overnight where they interact with each other, learning valuable social skills. Young are cared for over a period of four to six months after which they are considered independent. In urban environments, life-threatening hazards to flying-foxes include goannas, snakes, crows, powerful owls and eagles, as well as introduced hazards such as humans, dogs, cats, powerlines, barbed-wire fences and backyard fruit tree netting. Provided these can be avoided successfully, a flying-fox may reach 8-10 years of age; captive animals have been known to live for 25-30 years.

TABLE 2: APPROXIMATE BREEDING CYCLES OF FLYING-FOXES IN SOUTHEAST QUEENSLAND.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BFF												
GHFF												
LRFF												

Peak Conception *Mid-pregnancy* *Final Trimester* *Birthing* *Lactation* *Crèching*

Note: BFF = Black Flying-fox, GHFF = Grey-headed Flying-fox, LRFF = Little Red Flying-fox

In order to safely manage a flying-fox roost, roost management activities need to consider the ecology and biology of flying-foxes and the important time periods in the breeding cycles of the black flying-fox, grey-headed flying-fox and little red flying-fox. Restricting management actions in the periods of final trimester are considered paramount due to the high risk of abortion associated with stress from dispersal efforts. Additionally, management actions should also be restricted during the crèching period when young pups are incapable of flight.

3. IMPACTS OF FLYING-FOXES AND THEIR ROOSTS

The occurrence of a flying-fox roost can result in many different impacts on the local community. These impacts range from direct nuisance including noise and odour through to stress from the perceived health impacts from misleading information (Table 3).

TABLE 3: POTENTIAL FLYING-FOX ROOST IMPACTS ON THE LOCAL COMMUNITY.

POTENTIAL IMPACT	COMMENT
Business Patronage	The noise, odour and perceived health risks of a roost may deter some patrons from visiting nearby businesses.
Fruit Crop Damage	Flying-foxes can cause damage to commercial fruit crops, especially in drought years when eucalypt blossoms are scarce. Damage isn't considered directly associated with an individual roost as multiple roosts may be within flying distance. Rats, possums and birds are also known to damage fruit crops.
Health Risks	Although the health risks are surprisingly low, local residents' perception of health risks associated with flying-foxes can increase stress levels creating potential health concerns.
Noise	Nearby residents may suffer disturbed sleep due to roost noise which may (at times) be in excess of the recommended background levels for daytime noise as specified in Australian Standards AS 1055.2-1997.
Odour	The odour associated with roosts is typically that of the flying-foxes and not their faeces. All animals (including humans) have distinct body odours. Many Scenic Rim houses are "Queenslander" styles that rely on passive cooling to ventilate the home. Most residents gain relief by shutting up their homes and running the air conditioner.
Property Damage	Flying-fox faecal material can frequently land on houses and cars of nearby residents and may damage paint work if not removed in a timely manner.
Public Usage of Parks	When flying-fox roosts occur in public parks these areas may no longer be accessible by the public due to health and safety concerns. Some people may choose not to visit parks due to the noise, odour and/or perceived health risks of the roost.
Vegetation Damage at Roost Sites	Continual heavy usage of roosts due to a reduction in the availability of suitable roost habitat can result in damage to trees and reduces the opportunity for vegetation to recover from the effects of roosting flying-foxes.
Vegetation Management by Council	Flying-fox roosts may increase the maintenance requirements of roost vegetation especially in any associated parks where damaged vegetation may need to be removed for public safety.
Vegetation Management by Residents	Some residents may incur additional costs by undertaking vegetation management practices to limit roosting ability on private properties.
Veterinary Costs	Many horse owners feel that due to the close proximity of a roost there is an increased need to vaccinate their horse(s) against Hendra virus thus incurring veterinary fees. The need for this is the same whether or not there is a roost nearby because all horses in southeast Queensland are within flying distance of multiple flying-fox roosts.
Water Tank Contamination	Contamination of water tanks is not exclusive to flying-foxes. Queensland Health recommends all water tanks have filters to eliminate faecal contamination by mammals, birds, reptiles (geckos) and frogs.

3.1 HUMAN HEALTH AND FLYING-FOXES

Several viruses capable of causing diseases in humans and animals have been linked to flying-foxes in recent years. Of these, Australian bat lyssavirus and Hendra virus are the most notable. Research by Biosecurity Queensland and others have shown that some species of bats act as a natural reservoir of infection for these viruses. Therefore, only people who are trained and protected by rabies vaccination (for ABLV) and using suitable equipment should handle bats including flying-foxes.

3.1.1 AUSTRALIAN BAT LYSSAVIRUS (ABLV)

Australian bat lyssavirus is a virus that can be transmitted via the saliva of infected bats (including flying-foxes) when they bite or scratch humans. Infection with ABLV causes a rabies-like disease in humans that is usually fatal. However, since discovery in 1996 there have only been three documented cases of ABLV infection in humans. In May 2013, two horses were confirmed as being infected with ABLV. These were the first known cases of ABLV in an animal other than a bat. Experience with other closely related viruses, including classical rabies virus, suggests that contact or exposure to bat faeces, urine or blood does not pose a risk of exposure to ABLV, nor does living, playing or walking near flying-fox roosting areas.

There are three simple steps to avoid ABLV disease:

- Only people trained and vaccinated against rabies should handle bats.
- Bat bites or scratches should be washed thoroughly with soapy water for at least five (5) minutes and an antiseptic with anti-virus action such as povidone-iodine, iodine tincture, aqueous iodine solution or alcohol (ethanol) applied after washing.
- Medical advice (see Appendix A) should be sought as soon as possible following a bite or scratch to discuss the possibility of post-exposure vaccine injections to protect against the potential on-set of infection.

The rabies vaccine is used to protect against ABLV infection. However, even if you have been previously vaccinated, you should seek medical advice immediately after any potential exposure to ABLV (bite, scratch or mucous membrane exposure) as further vaccinations will be required.

3.1.2 HENDRA VIRUS

Australian flying-foxes are considered to be the natural reservoir of Hendra virus which is transmitted to humans via close contact with the body fluids of infected horses. Only seven people have been confirmed to have contracted Hendra virus following high levels of exposure to infected horses. Four of these people died, the most recent in 2009. The seven confirmed human cases all became infected following high level exposures to respiratory secretions and/or blood of an infected horse without the use of appropriate personal protective equipment (PPE). Other people have reported similar contact with infected horses but have remained well and their blood tests have shown no evidence of infection.

While the exact route of infection is unknown, it is believed that horses contract Hendra virus from flying-fox urine, saliva or birth products. Two dogs are confirmed as having been infected with Hendra virus, transmission is believed to have occurred following exposure to body fluids of deceased Hendra infected horses. There is no evidence that the virus can be passed directly from flying-foxes to humans, from dogs to humans, from the environment to humans, from humans to horses or that the virus is airborne. Testing of flying-fox carers who have had frequent close contact with flying-foxes has shown no evidence of exposure to the virus. There is also no evidence of human to human transmission. People who have had contact with a person with Hendra virus infection, including health care workers and family members, have been tested and shown no evidence of the virus.

There is no known specific treatment for Hendra virus infection. Three people have recovered from infections with general medical support. Experimental treatment with a type of antibody that may prevent infection may be offered to people who have had high level exposure to the body fluids of an infected horse.

A vaccine for horses against Hendra virus is available

and is currently the best way to prevent disease transmission to humans. Unwell horses should be isolated and children, dogs, cats and other horses should be kept away from the sick horse(s) to prevent further disease spread. Appropriate personal protective equipment which prevents contamination of the skin, eyes, nose and mouth of people by the horse's body fluids should be worn if close contact with the sick horse is considered essential.

Hendra virus is a notifiable disease and as such suspected cases of infection in horses should be notified urgently to Biosecurity Queensland on 13 25 23 (during business hours) or 1800 675 888 (24-hour Emergency Animal Disease Watch Hotline). Also see Biosecurity Queensland (http://www.biosecurity.qld.gov.au/) and Workplace Health & Safety Queensland (http://www.deir.qld.gov.au/workplace/index.htm) for more information about protecting horses and humans where vaccination may not be an option.

3.1.3 OTHER PATHOGENS

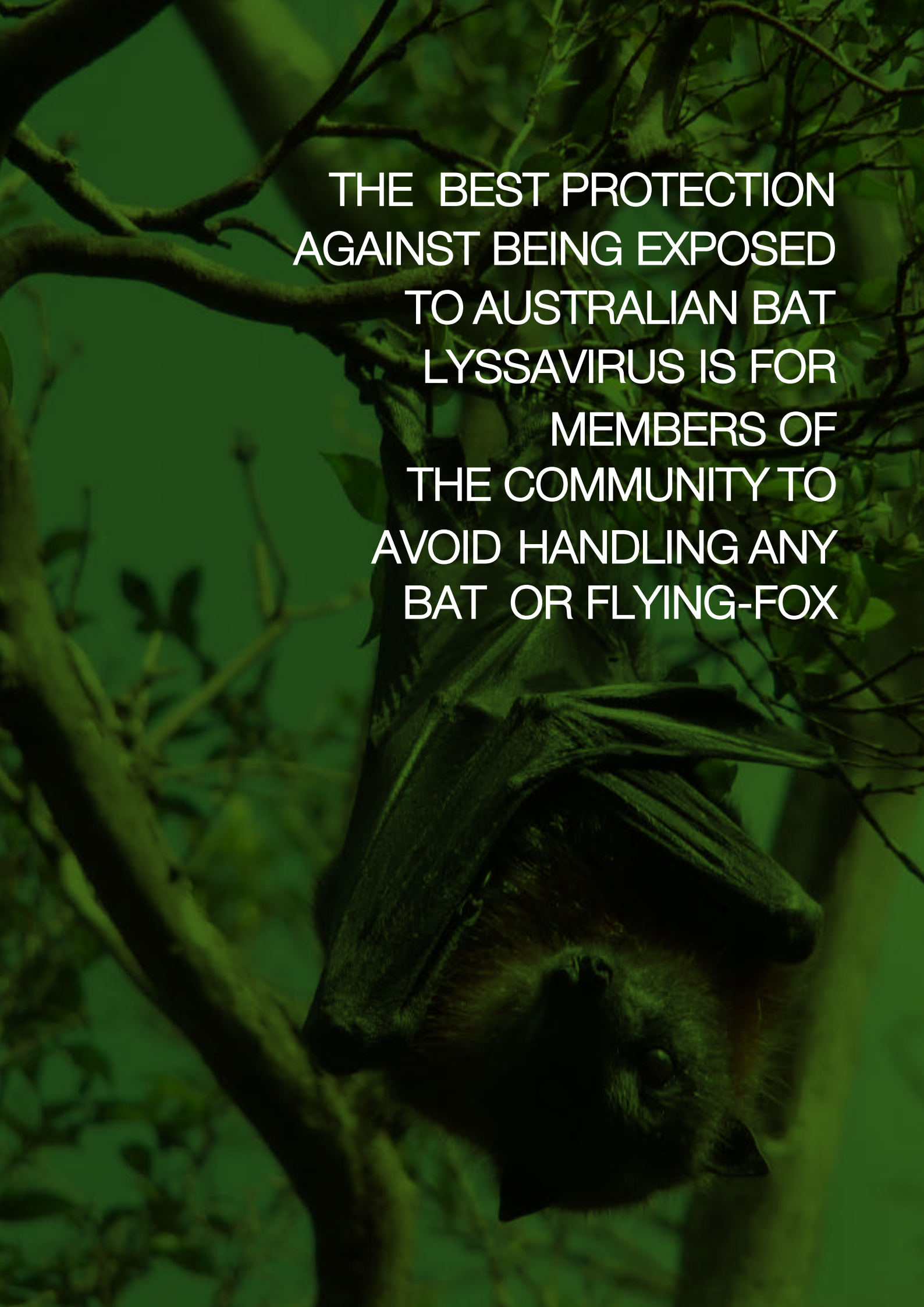
Other zoonotic pathogens which may be of concern to the community are histoplasmosis, leptospirosis and salmonella. However, to date there have been no documented cases of these diseases infecting humans as a direct result of contact with flying-foxes and/or their biological excretions such as faeces and urine. Many other wildlife and domesticated animals including household pets are considered a greater potential source of human infection.

Histoplasmosis is a very rare lung infection. Bats, dogs, cats, cattle, horses, rats and other animals can be infected and can excrete the organism in their faeces. People who have contact with bat caves and/or bats, for work or recreation, should avoid exposure to dust in environments likely to be contaminated with bat faeces. It is advisable to wet down potentially contaminated areas with water before cleaning. People working in these areas should also use protective equipment such as face masks, gloves and overalls.

Leptospirosis is a bacterial disease transmitted via the urine of infected animals. In very rare cases, leptospirosis can be fatal to humans. Although rodents and cattle are the main carriers of this disease, flying-foxes may also be infected. Leptospirosis occurs most commonly in people who are exposed to the bacteria during their work, for example farmers, veterinarians and meat workers. The most effective way to avoid getting leptospirosis from bats is to prevent bat urine from coming into contact with broken skin or your eyes, nose or mouth.

Salmonella and other bacteria that cause gastroenteritis may be found in animal faeces. Most cases of salmonella infection in Queensland are caused by eating undercooked or raw food (typically chicken) contaminated with salmonella bacteria. The infection may also be acquired from close physical contact with animals such as dogs, poultry and cattle. It is assumed that some native animals including flying-foxes may also carry the bacteria.

Flying-foxes can defecate whilst flying, splattering objects beneath their flight path with faeces which are typically easily removed with water and do not pose a serious health hazard. Faecal contamination of rainwater tanks may occur from a range of animals including possums, rats, birds, reptiles (geckos) and flying-foxes. It is advisable that a 'first flush' device be installed on all drinking water tanks. It is also a good hygiene practice to keep rainwater tanks covered, and at regular intervals chlorinate the tank and, drain and clean both the tank and the roof area used for rainwater collection. Normal swimming pool maintenance practices (cleaning, filtration and chlorination) should remove any contamination associated with animal faeces. It is important to note that the potential health risks posed by flying-fox faeces are no greater than any other animal, such as possums, rats, birds and reptiles.



THE BEST PROTECTION AGAINST BEING EXPOSED TO AUSTRALIAN BAT LYSSAVIRUS IS FOR MEMBERS OF THE COMMUNITY TO AVOID HANDLING ANY BAT OR FLYING-FOX

4. LEGISLATIVE FRAMEWORK

4.1 FEDERAL AND STATE GOVERNMENT APPROVALS REQUIRED

Depending upon the individual circumstances concerning each roost, various Federal and/or State Government approvals may be required prior to undertaking roost management activities (Table 4).

TABLE 4: POTENTIAL APPROVALS REQUIRED PRIOR TO COMMENCEMENT OF MANAGEMENT ACTIONS AT A FLYING-FOX ROOST.

ACT	COMMENT
Environmental Protection and Biodiversity Act 1999	Presence of grey-headed flying-foxes.
Nature Conservation Act 1992	As of right authority.
Vegetation Management Act 1999	Vegetation mapping for each roost may need to be reviewed prior to any actions.
Environmental Protection Act 1994 - Environmental nuisance (noise)	Some actions may generate high levels of noise in an urban area.

4.2 FEDERAL LEGISLATION

4.2.1 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION (EPBC) ACT 1999

The Department of the Environment has a regulatory responsibility for the protection of federally listed species through administration of the above Act. The grey-headed flying-fox is listed as 'vulnerable' under the EBPC Act 1999, which affords protection to the species and its critical habitat. Grey-headed flying-foxes often roost within the Scenic Rim Region and therefore, guidance from the Commonwealth Government may be required.

Proponents of actions that may have a significant impact on the grey-headed flying-fox must submit a referral to the Department of the Environment. An action includes a project, development, undertaking, activity, or series of activities and would include any proposal to undertake dispersal actions at a subject roost containing grey-headed flying-foxes. If an approval is required, the State and the Commonwealth Governments will liaise to determine what assessment process is appropriate. The most likely outcome of the EPBC Act 1999 referral is that it will be assessed as a controlled action which will require preparation of a detailed species impact statement addressing a number of criteria as set out by the Commonwealth Environment Minister.

Significant impact criteria are:

- Leads to a long-term decrease in the size of an important population of a species
- Reduces the area of occupancy of an important population
- Fragments an existing important population into two or more populations
- Adversely affects habitat critical to the survival of a species
- Disrupts the breeding cycle of an important population
- Modifies, destroys, removes, isolates or decreases the availability or quality of habitat to the extent that the species is likely to decline
- Results in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- Introduces disease that may cause the species to decline, introduces stress upon individuals that affects their immunity to serious disease, thereby increasing the likelihood of transferring the disease to other species
- Interferes substantially with the recovery of the species

4.2.1.1 DRAFT EPBC ACT POLICY STATEMENT DECEMBER 2014

The Department of the Environment recently released a Draft EPBC Act Policy Statement: Camp management guidelines for Grey-headed and Spectacled flying-fox. This policy statement outlines different levels of management actions which may or may not be undertaken at roosts (camps) of these two vulnerably listed flying-fox species. Even though still in draft form and currently open for public comment, Council will ensure any roost management plans are in accordance with this new EPBC Act Policy Statement.

Minor or routine roost management actions which may not require approval under the EPBC Act 1999 include:

- Mowing of grass and similar grounds-keeping actions
- Application of mulch or removal of leaf litter or other material on the ground
- Weed removal, minor trimming of understorey vegetation or the planting of vegetation
- Removal of tree limbs or a small proportion of the whole trees in a roost if they are significantly damaged and pose a health and safety risk, as determined by a qualified and experienced arborist
- Minor habitat augmentation for the benefit of the roosting animals
- Installation of signage or similar-scale infrastructure
- Passive recreation (i.e. low noise recreation)

4.2.2 DRAFT NATIONAL RECOVERY PLAN FOR THE GREY-HEADED FLYING-FOX

The Draft National Recovery Plan for the grey-headed flying-fox (DECCW, 2009) outlines objectives for the recovery of this species. These objectives are to reduce the impact of threatening processes (such as loss of habitat, negative public attitudes and conflict with humans), to arrest decline throughout their range; to conserve their functional roles in seed dispersal and pollination of native plants; and to improve the comprehensiveness and reliability of information available to guide recovery.

The draft recovery plan identifies roosting habitat critical to the survival of the grey-headed flying-fox as satisfying at least one of the following:

- Roost used either continuously or seasonally in more than 50% of years
- Has been used as a roost at least once in 19 years (beginning in 1995) and is known to have contained more than 10,000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months)
- Has been used as a roost at least once in 10 years (beginning in 1995) and is known to have contained more than 2,500 individuals including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (which is September to May)

4.3 STATE LEGISLATION

4.3.1 NATURE CONSERVATION ACT 1992

All three flying-fox species living within the Scenic Rim are protected under the Nature Conservation Act 1992 and any interference or management of a roost is regulated under the associated Nature Conservation (Wildlife) Regulation 2006. Local governments are now authorised 'as of right' under the Nature Conservation Act 1992 to manage, including disperse, flying-fox roosts in defined urban flying-fox management areas (UFFMA; Figure 1). The 'as of right' authority only applies to management activities that are in accordance with the Queensland Government's ecologically sustainable management of flying-fox roost code of practice. Importantly, the exercise of this authority would remain subject to all other relevant legislation such as the EPBC Act 1999 and Vegetation Management Act 1999.

4.3.2 VEGETATION MANAGEMENT ACT 1999

Vegetation mapping for each subject roost will be reviewed prior to any clearing or development works being undertaken. Clearing that requires approval (i.e. a development permit) can only occur for certain 'relevant purposes' such as:

- A project declared to be a significant project under section 26 of the State Development and Public Works Organisation Act 1971
- Necessary to control non-native plants or declared pests
- To ensure public safety

COUNCIL WILL BE RESPONSIVE TO HEALTH CONCERNS AND THE SOCIAL AND ECONOMIC NEEDS OF THE COMMUNITY, WHILE BALANCING ENVIRONMENTAL DUE DILLIGENCE FOR THE PROTECTION OF FLYING-FOXES AND THE ESSENTIAL ECOSYSTEM SERVICES THEY PROVIDE.

- For establishing a necessary fence, firebreak, road or vehicular track, or for constructing necessary built infrastructure, and the clearing for the relevant infrastructure cannot reasonably be avoided or minimised
- A natural and ordinary consequence of other assessable development for which a development approval as defined under the Sustainable Planning Act 2009 was given, or a development application as defined under the Planning Act was made, before 16 May 2003
- For fodder harvesting, thinning, clearing of encroachment or for an extractive industry

4.3.3 ANIMAL CARE AND PROTECTION ACT 2001

The Animal Care and Protection Act 2001 promotes the responsible care and use of animals. It also protects animals from unjustifiable, unnecessary or unreasonable pain.

4.3.4 ENVIRONMENTAL PROTECTION ACT 1994

The Environmental Protection Act 1994 protects Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development). Some flying-fox roost management actions may generate high levels of noise; these are covered by the Act as a potential environmental nuisance (noise).

4.4 LOCAL GOVERNMENT LEGISLATION

4.4.1 LOCAL LAW NO. 3 (COMMUNITY AND ENVIRONMENTAL MANAGEMENT) 2011

All management actions undertaken by Council will be in accordance with Local Law No. 3 (Community and Environmental Management) 2011 and its corresponding Subordinate Local Law. Council's management actions will take into consideration noise standards (Part 6, Section 21). When undertaking such actions Council will do its utmost to minimise the likelihood of community safety hazards (Part 5, Section 17(c) dead animal on premises).

4.4.2 LOCAL LAW NO. 4 (LOCAL GOVERNMENT CONTROLLED AREAS, FACILITIES AND ROADS) 2011

Council will enact Local Law No. 4 (Local Government Controlled Areas, Facilities and Roads) 2011 and its corresponding Subordinate Local Law particularly in relation to Part 2 Section 8 (power of closure of local government controlled areas) when Council deems it appropriate to do so.

Damaging or interfering with vegetation or native fauna is prohibited in all parks and reserves within local government areas as per Schedule 1 of Subordinate Local Law No. 4. Therefore, members of the community wishing to undertake activities which may be considered prohibitive under Local Law No. 4 must ensure all appropriate approvals are obtained prior to undertaking the activity.

5. STATEMENT OF MANAGEMENT INTENT: FLYING-FOXES

Scenic Rim Regional Council recognises flying-foxes are ecologically important and contribute significantly to sustaining the region's unique biodiversity. Council aims to address and manage the concerns of the community whilst conserving and co-existing with flying-foxes by increasing community understanding and appreciation of the essential ecological role of flying-foxes and the need for conservation efforts. Council is authorised under the Nature Conservation Act 1992, to manage flying-fox roosts in the Urban Flying-fox Management Area (Figure 1) and on Council lands.

Individual flying-fox roosts will be assessed by designated Council staff to evaluate whether a Council roost management response is required based on the likelihood of management action success and the risk of transferring the roost impacts to a more problematic site.

Council will be responsive to health concerns and the social and economic needs of the community, while balancing environmental due diligence for the protection of flying-foxes and the essential ecosystem services they provide.

Council acknowledges the high risk of transferring flying-fox roost impacts during management actions and therefore where there is conflict between sensitive receptors and flying-foxes within an UFFMA, Council will undertake a detailed risk assessment prior to any relocation/dispersal. An assessment will consider sensitive receptors including residencies, schools, hospitals and aged care facilities and also potential that relocation will make the problem worse.

Due to the high risk of transferring flying-fox roost impacts to urban areas, Council will not support the relocation/dispersal of flying-fox roosts outside the Urban Flying-fox Management Area and will actively discourage roost relocation/dispersal.

The primary responsibility for the management of roosts on private property both within and outside the Urban Flying-fox Management Area remains that of the landholder. Private landholders may seek appropriate permission from the Queensland Department of Environment and Heritage Protection (EHP) to implement measures to reduce the impact of flying-foxes on their land.

Council may assist landholders with roost relocation/dispersal if an overriding public benefit can be demonstrated.

Council will develop site specific Roost Management Plans prior to the commencement of any management action. These site specific plans will provide the details, technical information and actions on how to manage each individual roost.

Council will only use non-lethal management actions to minimise adverse impacts of flying-fox roosts on residents and the broader community.

All management actions will comply with legislative requirements including Council policy and objectives, and the Queensland Government's Flying-fox Roost Management Guideline and their Code of Practice: Ecologically sustainable management of flying-fox roosts.

6. COUNCIL MANAGEMENT OF FLYING-FOX ROOSTS

Managing flying-foxes and their roosts is challenging and potentially resource intensive. The high roost fidelity of flying-foxes can create difficulties in the management of roost sites and trying to disperse flying-foxes from an established roost may, in some circumstances, result in a worse situation. Past roost dispersals have typically been very expensive and the animals formed new roosts in highly sensitive areas such as schools, hospitals, aged care facilities and local backyards. Council's main objective when undertaking flying-fox roost management is to ensure that roost impacts are not exacerbated and/or transferred to a more problematic location. Therefore, management actions will be restricted during the final trimester of pregnancy and during the crèching period when young pups are incapable of flight.

There are five main types of flying-fox roost management actions Council may choose to undertake:

- Community education and/or consultation
- Management of existing roosts in their current location
- Management of individual roosts with the intention of dispersing or decommissioning the roost
- Management of the roost in response to new and/or temporary roosts
- Management of the roost in response to extreme weather events such as severe thunderstorms and heat waves. Council will develop site specific Roost Management Plans prior to undertaking management actions

6.1 COMMUNITY EDUCATION AND/OR CONSULTATION

Council may conduct community education and/or consultation where community/flying-fox conflicts occur or are likely to occur with the hope of reducing many of the community's concerns about the proximity of flying-foxes. The activities of both humans and flying-foxes can sometimes cause conflict between both groups. Primary concerns include roost noise, odour, flying-fox faeces, flying-foxes feeding in backyard trees and orchards, human health and disease concerns.

Council aims to provide important information to the community about flying-fox ecology and biology. Education will enable members of the community to make informed decisions to limit their own potential sources of flying-fox conflict, such as deciding whether or not to purchase a new property in the proximity of a known roost and which trees to plant in their backyards to restrict flying-fox visitation.

Council may take into consideration the proximity of a flying-fox roost when deciding to approve development applications in order to discourage development that will cause or increase community/flying-fox conflict. Management of flying-fox roosts is most effective when Councils and the community work together to limit areas of potential conflict.

6.1.1 COMMUNITY CONSULTATION

Community attitudes regarding a specific roost may be assessed through a consultative process. This process may run concurrently with an environmental assessment process and may involve public meetings, written submissions on draft proposals and consultation/ notification of the local Aboriginal community. Community consultation may not be necessary if Council decides not to proceed with management actions. Instead, Council may choose to continue with targeted consultation through a working group consisting of representatives from key stakeholder groups. Representatives may include members of Council, affected community members, Department of Environment and Heritage Protection, flying-fox researchers, wildlife rescue groups such as RSPCA Queensland, wildlife welfare representatives, Department of Agriculture, Fisheries and Forestry and Queensland Health. This working group may have input into the management strategy of a specific roost and the development of a project brief for specialist consultants engaged to conduct the environmental assessment, prepare the EPBC Act 1999 referral and if required, prepare a species impact statement and monitoring strategy.

6.2 MANAGEMENT OF EXISTING ROOSTS IN THEIR CURRENT LOCATION

Council's main objective when undertaking flying-fox roost management is to ensure that roost impacts are not exacerbated and/or transferred to a more problematic location such as closer to sensitive receivers. Where there is a high risk of transferring roost impacts to a more problematic site, Council may decide that the best management option is to ensure the flying-fox roost in question remains in its current location. In such cases, Council may undertake management actions to help mitigate roost impacts on neighbouring residents whilst ensuring Council maintains control over the roost site and reduces the risk of impact transference to other parts of the community.

Management actions may include:

- Undertaking minor vegetation removal to create buffer zones between the roost and nearby residences
- Planting and promoting the growth of non-roost tree/shrub species as vegetation buffers
- Re-generating vegetation communities to extend known roost sites away from residential areas
- 'Nudging' flying-foxes into other parts of the roost and away from sensitive receivers
- Periodical monitoring of the roost, its impacts and a review of management options as required
- Providing some financial assistance to affected residents and community groups dealing with the impacts of flying-foxes

6.3 DISPERSAL OF INDIVIDUAL ROOSTS

Where Council considers that there are more appropriate roost locations for the bats within the region, Council will undertake actions to relocate/disperse the roost. Because flying-foxes play a critical role in forest regeneration through pollination and seed dispersal, Council will only use non-lethal methods to disperse flying-foxes in the hope they will relocate to a more suitable location.

Management options may include:

- Community consultation at both the current and potential "new" roost locations
- Locating alternative non-suitable roost locations and undertaking vegetation management to prevent roost formation, as required
- Dispersing the roost and maintaining the current vegetation
- Dispersing the roost and modifying the current vegetation
- Decommissioning the roost through the removal of all roost vegetation
- Post-decommission vegetation management to prevent re-establishment of suitable roost trees
- Where a feasible alternative "new" roost location exists, Council may offer some financial assistance to encourage acceptance of the "new" roost

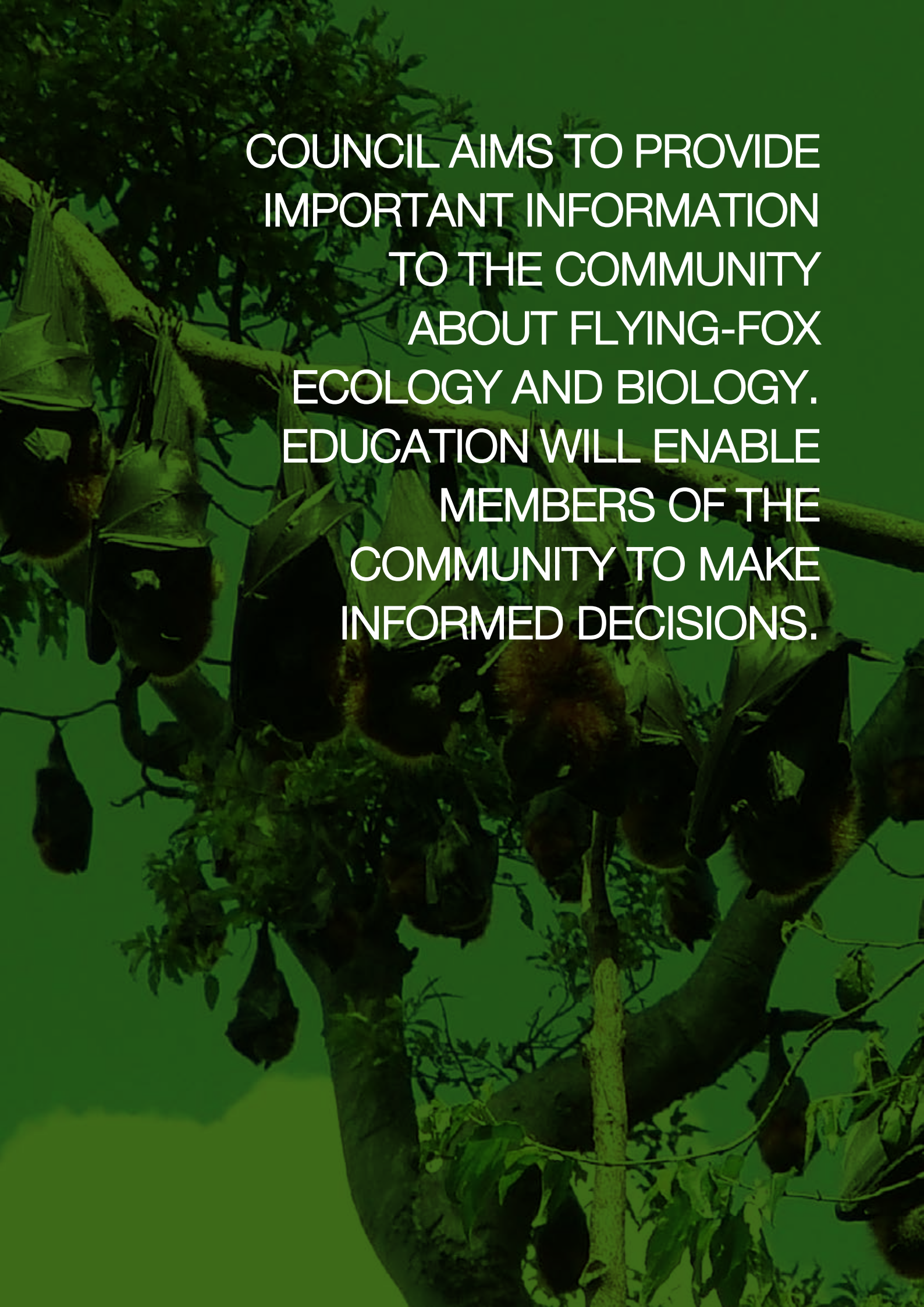
Council will engage experienced contractors, when required, to assist Council staff with flying-fox roost management activities. An independent specialist in flying-fox behaviour (Flying-fox Advocate) will monitor roost management activities to ensure animal welfare standards are maintained.

Dispersal actions will:

- Only commence after advice from a person knowledgeable about flying-fox behaviour and with 48h notice to the Department of Environment and Heritage Protection
- Only occur in the early evening and/or early morning, with dispersals carried out in the early evening to commence immediately prior to dusk 'flyout' at a roost and continue for no longer than 2 hours. And for dispersals carried out in the early morning to commence when flying-foxes start returning to a roost from foraging activities, and continue for no longer than 3 hours
- Disturbance activities conducted at roosts containing grey-headed flying-foxes will be limited to a maximum of 3 hours in any 12 hour period
- Be limited to the non-lethal deterrence methods of smoke, noise, light, foggers, BirdFrite and 'scarecrow' type devices only
- May include some vegetation modification to render the site unattractive for roosting flying-foxes, but this will only be done when the vegetation is free of flying-foxes

6.3.1 FLYING-FOX ROOST PRE- AND POST-DISPERSAL MONITORING

Adaptive management involving monitoring of roosts to determine some measure of species presence, abundance and breeding status correlated with the number of public complaints may be undertaken pre-



COUNCIL AIMS TO PROVIDE IMPORTANT INFORMATION TO THE COMMUNITY ABOUT FLYING-FOX ECOLOGY AND BIOLOGY. EDUCATION WILL ENABLE MEMBERS OF THE COMMUNITY TO MAKE INFORMED DECISIONS.

and post- implementation of management actions, for a minimum of 12 months to allow for potential seasonality changes. Monitoring frequency and intensity may be increased directly pre- and post-dispersal action at both the original roost and other roosts.

When flying-foxes return to a dispersed roost to find it is no longer suitable, displaced flying-foxes may temporarily relocate to nearby trees including those in neighbouring backyards. If this occurs, residents should be urged to leave the animals alone as they require rest to be able to fly off again in the evening. It is anticipated that the flying-foxes will move on to more suitable locations within a day or two. A council officer will assess the situation if the same individual flying-fox remains in a backyard for more than two days post-dispersal activities.

Continual monitoring within 2km of a roost undergoing active dispersal will occur to ensure flying-foxes do not roost in 'unsuitable' areas within the Scenic Rim Urban Flying-fox Management Area. If roosting is identified within the Scenic Rim Urban Flying-fox Management Area and on Council lands and further dispersal activities are deemed appropriate, Council contingency procedures will be implemented.

6.3.2 CONTINGENCIES PROCEDURES

Council has contingency procedures in place should flying-fox roost management actions result in undesirable outcomes (Table 7). These contingency procedures will comply with the Queensland Government's Ecologically Sustainable Management of Flying-fox Roosts Code of Practice.

TABLE 7: CONTINGENCY PROCEDURES FOR UNDESIRABLE OUTCOMES FOLLOWING FLYING-FOX ROOST MANAGEMENT ACTIONS.

SITUATION	CONTINGENCY
Flying-foxes unexpectedly roost outside of current roost boundaries, potentially creating community conflict.	Management action which caused the move will cease immediately and Council consider whether 'nudging' of flying-foxes back into the main roost area is required or whether the animals will return of their own accord once management action has ceased.
Flying-foxes do not leave the roost, regardless of disturbance.	May need to increase duration of action and/or possible full removal of vegetation.
Flying-foxes only abandon the roost temporarily.	May need to increase duration of action and/or possible full removal of vegetation.
Flying-foxes occupy sites other than those identified, creating community conflict.	Council will consider whether community education is appropriate or whether follow up dispersal action is required.
Disturbance adversely impacts on the welfare of the flying-foxes occupying the roost (e.g. exhausted animals dying or coming to ground in neighbouring backyards).	All management activities will cease immediately and Council will reconsider methods utilised, timing and duration of actions.
Unauthorised community actions may be countering Council actions.	Council will endeavour to ensure all unauthorised community actions cease immediately. Police intervention may be requested.

Follow up dispersals will only be undertaken by Council if flying-foxes establish in a more problematic site within the Scenic Rim Urban Flying-fox Management Area. New "follow up" dispersals must be approved by the Project Manager with advice from the Environmental Policy and Services Team, the Flying-Fox Advocate and notice to the Department of Environment and Heritage Protection.

6.4 RESPONSE TO NEW AND/OR TEMPORARY ROOSTS

Newly and/or temporarily established flying-fox roosts (< 1 month old) within the Urban Flying-fox Management Area and on Council lands may be assessed by designated Council staff to evaluate whether a Council roost management response is required. Council's main objective when undertaking flying-fox roost management is to ensure that roost impacts are not exacerbated and/or transferred to a more problematic location. Council is

very conscious that past roost dispersals have typically been very expensive and the animals formed new roosts in highly sensitive areas. All Council management decisions will consider the likelihood of success and the risk of transferring roost impacts to a more problematic site.

Management actions will be based on the classification of the 'new' roost as either:

- A new roost which Council deems to be in a suitable location. In such cases, Council's first course of action will be to protect the roost and actively discourage roost relocation/dispersal. A Roost Management Plan will be developed to ensure the roost remains in its current location and does not move to a more problematic location and/or closer to sensitive receivers
- A new roost which Council deems to be in an unsuitable location and requires immediate relocation/dispersal
- A new roost which is likely to only be a temporary roost and one which the flying-foxes are likely to abandon once local flowering (generally eucalypt trees) has ceased. This type of roost usually only remains for a few weeks to several months and is typically formed by Little Red Flying-foxes. This flying-fox species can literally turn up overnight in the tens of thousands and consequently may impact heavily on nearby residents and/or community groups
- Depending upon the specific location of a temporary roost and its proximity to sensitive receivers, Council may choose to either:
  - Leave the roost in its current location and allow the flying-foxes to naturally disperse when local flowering ceases (Council may offer temporary financial assistance to affected landholders), or
  - Council may decide there is an overriding public benefit to relocating/dispersing the roost and take action to disperse the roost

6.5 RESPONSE TO EXTREME WEATHER EVENTS

Another key component to flying-fox roost management is Council's response measures to potentially fatal extreme weather events. Council will monitor flying-fox roosts and assess whether assistance is required (and at what level) should extreme weather conditions such as severe thunderstorms occur or when the maximum daytime temperature does (or is predicted to) meet or exceed 38oC. Council response measures aim to reduce/prevent mass die-offs of flying-foxes and thereby reduce the likelihood of human/pet exposure to injured and/or dying flying-foxes as well as minimise any subsequent Council expenses relating to the removal and disposal of multiple dead animals in accordance with Local Law No. 3 (Community and Environmental Management) 2011, Community Safety Hazards (Part 5, Section 17(c)).

6.5.1 SEVERE THUNDERSTORMS

Severe thunderstorms, especially those with high winds and hail, can damage trees and injure flying-foxes. When previous severe storm cells have passed over flying-fox roosts many of the animals were injured by hail rendering them incapable of flight. Injured flying-foxes were found in residential properties neighbouring roost sites, thus increasing the potential for human/pet interaction with flying-foxes.

Females incapable of flight are often either unable to return to their young and/or forage for themselves which subsequently causes them to stop lactating; in such cases both the young and the mother die of starvation. Many animals may require euthanasia and orphaned young need to be brought into care as many can suffer pneumonia. This influx of injured and/or orphaned flying-foxes can cause extreme financial and emotional stress for local wildlife carers.

Early monitoring of flying-fox roosts following a severe thunderstorm will alert wildlife care groups to the need for urgent medical intervention and potentially reduce the number of dead animals in the vicinity of the roost and the number of sick and/or orphaned young brought into care. Vegetation removal/maintenance may also be required post-storm depending upon the extent and severity of the storm.

6.5.2 HEAT WAVES

Higher than normal daytime temperatures can expose flying-fox colonies to heat stress, resulting in large numbers of distressed and/or dead/dying animals. A previous heat stress event occurring in January 2014 resulted in tens of thousands of dead flying-foxes across Southeast Queensland including the Scenic Rim Region. Council staff spent many hours removing and disposing of these dead and decaying flying-foxes from parks and other public areas.

The presence and smell of these dead animals caused considerable distress within the local community. Additionally, hundreds of flying-foxes, primarily orphaned young, needed to be taken into care placing enormous financial and emotional stress of local wildlife carers. Early intervention through the application of light water spraying may alleviate symptoms of heat stress and prevent a similar situation.

When maximum daytime temperatures are predicted to meet or exceed 38oC, trained Council staff will monitor roosts for signs of heat stressed flying-foxes such as clustering or clumping of animals along tree trunks and in the understorey. Response measures will be implemented when deemed appropriate.

7. IMPLEMENTATION OF FLYING-FOX ROOST MANAGEMENT

Implementation of Council's flying-fox roost management actions will take one of two forms:

Calculated actions requiring the development of site specific Roost Management Plans to 'manage' or 'disperse' the roost, or

Immediate 'response' actions to newly and/or temporarily established roosts or extreme weather events.

7.1 DEVELOPMENT OF ROOST MANAGEMENT PLANS

Roost Management Plans are detailed plans for the management of specific roosts and only relate to the 'Management of the Roost in its Current Location' and the 'Dispersal of the Roost'. Prior to commencement of any management actions (except those relating to extreme weather events and new or temporary roosts), Roost Management Plans will be developed for individual flying-fox roosts within the Scenic Rim Regional Council Urban Flying-fox Management Area and on Council lands.

The details of these plans may include:

- Site location and history
- Flora/fauna assessment results
- Environmental health assessment results
- Ongoing roost maintenance
- Ongoing mitigation strategies
- Proposed activities and associated timeframes (daytime/night-time works)
- Early intervention dispersal methods and strategies
- Alternative roost sites and sensitive receivers
- Dispersal strategy (if recommended):
  - Activity participants
  - Impacts
  - Animal welfare considerations
  - Human health considerations
- Flying-fox monitoring
- Risk matrix
- Reporting and communications strategy

7.2 RESPONDING TO NEW AND/OR TEMPORARY ROOSTS AND EXTREME WEATHER EVENTS

Council acknowledges that a timely response is very important when responding to the establishment of new and/or temporary flying-fox roosts (< 1 month old) which are in unsuitable locations, and when responding to extreme weather events such as thunderstorms and heat waves. Council recognises the need to expedite response times and has developed procedures which are not site specific and are designed to be readily adapted as the need arises.

7.2.1 NEW AND/OR TEMPORARY ROOSTS

Designated Council staff may evaluate whether a Council roost management response is required for a newly and/or temporarily established flying-fox roost which is within the Urban Flying-fox Management Area and on Council land. Council will determine whether the new and/or temporary roost is either in a 'suitable' or 'unsuitable' location and take the appropriate management action(s).

The 'suitability' of a roost location will be based upon:

- The proximity of the roost to sensitive receivers such as residences, schools, hospitals and aged care facilities. A roost site may be deemed 'suitable' where the minimum separation distance between a new and/or temporary flying-fox roost and sensitive receivers exceeds 300m
- The risk of transferring the negative impacts of the roost closer to higher rated sensitive receivers and/

or closer to more sensitive receivers than those at the current location
- The species of flying-fox utilising the roost. Little red flying-foxes typically only form temporary roosts and will naturally disperse during cooler months and/or once local flowering ceases. Black and grey-headed flying-foxes are more likely to form roost fidelity if they reproduce at the site

When Council deems a new and/or temporary roost to be 'suitably' located, a site specific Roost Management Plan may be developed and Council may actively protect the roost, discouraging relocation/dispersal. Council may also decide to undertake immediate management actions such as vegetation modification to provide buffer areas and 'nudge' the flying-foxes into other parts of the roost away from sensitive receivers. In the case of temporary roosts, the roost may be regularly monitored and reassessed should the animals fail to move-on of their own accord within acceptable timeframes.

Council does acknowledge that urgent action may be required to prevent the flying-foxes from establishing roost fidelity at a new 'unsuitable' location as this may impede any future relocation/dispersal attempts. Where relocation/dispersal is deemed appropriate, Council will undertake immediate action following the completion of the appropriate risk management assessments.

Relocation/dispersal actions will:

- Only commence after advice from a person knowledgeable about flying-fox behaviour and with 48h notice to the Department of Environment and Heritage Protection
- Only occur in the early evening and/or early morning, with dispersals carried out in the early evening to commence immediately prior to dusk 'flyout' at a roost and continue for no longer than 2 hours. And for dispersals carried out in the early morning to commence when flying-foxes start returning to a roost from foraging activities, and continue for no longer than 3 hours
- Disturbance activities conducted at roosts containing grey-headed flying-foxes will be limited to a maximum of 3 hours in any 12 hour period
- Be limited to the non-lethal deterrence methods of smoke, noise, light, foggers, BirdFrite and 'scarecrow' type devices only
- May include some vegetation modification to render the site unattractive for roosting flying-foxes, but this will only be done when the vegetation is free of flying-foxes

Council will endeavour to support the community in the appropriate management of new and/or temporary flying-fox roosts where they adversely impact on nearby residents and community groups. However, Council will not support the relocation/dispersal of flying-fox roosts outside of the Urban Flying-fox Management Area, as Council is very conscious of not transferring roost impacts to urban areas and closer to sensitive receivers. The primary responsibility for the management of roosts on private property both within and outside the Urban Flying-fox Management Area remains that of the landholder. Council may choose to assist the landholder regardless of the above if an overriding public benefit can be demonstrated.

7.2.2 EXTREME WEATHER EVENTS

Flying-fox roosts can be severely impacted by extreme weather events. Animals may require urgent medical intervention to potentially reduce the number of dead animals in the vicinity of the roost and the number of sick and/or orphaned young needing to be brought into care. Early monitoring of flying-fox roosts following severe thunderstorms and when maximum daytime temperatures are predicted to meet or exceed 38oC will alert government agencies and wildlife care groups to the need to provide immediate assistance to injured and/or debilitated animals in order to prevent mass fatalities.

Trained Council staff will monitor flying-fox roosts, in response to extreme weather events, for signs of injured and/or heat stressed flying-foxes such as clustering or clumping of animals along tree trunks and in the understorey. When deemed appropriate, Council will immediately implement response measures including:

- Contacting the Department of Environment and Heritage Protection (EHP)
- Contacting the RSPCA
- Contacting local wildlife care groups
- Arranging for the local Fire Brigade or Rural Fire Service to send a water truck to the roost (where accessible) and spray the roost as per guidelines (see Appendix B)
- Trained Council staff may assist EHP, the RSPCA and/or local wildlife carers with the recovery of animals requiring more intense re-hydration and/or with the removal of carcasses

7.3 ROLES AND RESPONSIBILITIES

Prior to the commencement of any flying-fox roost management action, the roles and responsibilities of personnel involved will be known by all involved (Table 8). Roost management actions will be coordinated by a Project Manager with support from the Environmental Policy and Services Section. Site supervisors will be appointed as required and dependent upon the activity, these may include staff members from the Pest and Animal Management section. A Flying-fox Advocate will be appointed as an observer to ensure the ethical treatment of flying-foxes.

TABLE 8: THE ROLES AND RESPONSIBILITIES OF PERSONNEL INVOLVED IN FLYING-FOX ROOST MANAGEMENT ACTIONS.

POSITION/SECTION	RESPONSIBILITY
CEO	Ensure Council resolution is carried out.
Director Regional Services	Delegated by the CEO to ensure Council resolution is achieved.
Project Manager	Coordinate, plan and oversee on-ground activities including engaging contractors for vegetation modification and dispersals. Develop roost management plans as necessary and coordinate applications and approvals necessary to undertake actions.
Environmental Policy and Services Section	Develop specific roost management plans. Support on-ground activities and assist in obtaining relevant permits and approvals. The provision of ecological advice about flying-foxes and their roosts. Undergo rabies vaccinations and training to increase capability in flying-fox management.
Pest and Animal Management Section	(If required) provide on-ground support and leadership for dispersals and flying-fox rescues. Senior staff to coordinate staff and equipment and supervise operations for on-ground dispersals as applicable. Undergo rabies vaccinations and training to increase capability in flying-fox management.
Site Supervisor	The staff member supervising the work site, may change depending on the activity.
Flying-Fox Advocate	Ensure the humane and ethical treatment of flying-foxes. Stop or delay management activities regarding flying-fox welfare. Provide technical advice on the ecology and behaviour of flying-foxes. Assist in any rescue activities.
Vegetation Contractors	Contractor will be utilised for the removal of the vegetation.
Ground Maintenance Staff	May be required to provide some on-ground assistance.
Additional Staff	Additional contracting staff may be recruited if necessary. Staff to be appropriately trained in flying-fox management actions.

8. UNDERSTANDING THE IMPACTS OF ROOST MANAGEMENT ACTIONS

Managing flying-foxes and their roosts is challenging. Some management actions utilised by Council when managing a flying-fox roost may adversely impact residents, the broader community, Council and flying-foxes. Management actions will consider flying-fox ecology and biology to ensure actions are conducted at appropriate times of the year, otherwise these impacts could be exacerbated and/or transfer to more problematic locations and potentially cause flying-fox fatalities.

8.1 IMPACTS OF COMMUNITY EDUCATION AND/OR CONSULTATION

Impacts of Council's community education and/or consultation actions include:

- Acceptance of flying-foxes and willingness to co-exist, resulting in a decrease in complaints to Council
- Community takes positive, proactive steps to reduce their own potential for conflict with flying-foxes such as choosing to plant non-flying-fox attracting trees
- Council will incur costs during on the development of and implementation of education and/or consultation programmes depending upon the roost location and the number of residents and/or community groups affected
- Additional Council staff time and resources may be required for evaluating documents, preparing media releases and conducting community education/ consultations
- Affected residents and/or community groups continue to suffer from the negative impacts of living, working or undertaking recreational activities within close proximity to a flying-fox roost

8.2 IMPACTS OF MANAGING EXISTING ROOSTS IN THEIR CURRENT LOCATION

Impacts of Council's management of the roost in its current location include:

- Buffer zones between roost and sensitive receivers are established, providing welcomed relief for neighbouring residents and/or community groups
- Flying-foxes successfully 'nudged' away from sensitive receivers, providing welcomed relief for neighbouring residents and/or community groups
- Council incurs expenses to undertake vegetation modifications such as vegetation/re-generation of the roost and minor tree removal to establish buffer zones
- Additional Council staff time and resources may be required to 'nudge' flying-foxes away from sensitive receivers and report on actions
- Buffer zones between roost and sensitive receivers are established, but the roost continues to impact on neighbouring residents and/or community groups
- Flying-foxes are 'nudged' away from sensitive receivers, but the roost continues to impact on neighbouring residents and/or community groups
- Affected residents and/or community groups may feel that problems are exacerbated whilst there are still flying-foxes using the roost and the creation of buffer zones and/or 'nudging' activities are being carried out
- Certain management actions may lead to the roost dispersing and Council losing all ability to mitigate the impacts

8.3 IMPACTS OF DISPERSING INDIVIDUAL ROOSTS

Impacts of Council's roost dispersal actions include:

Dispersal action itself:

- Both flying-foxes and residents in the vicinity of the roost would be affected by dispersal actions

for the duration of dispersal attempts (e.g. several hours per day prior to dawn and/or on dusk) and potentially for an extended or ongoing period depending upon the success or failure of these actions
- Flying-foxes and nearby residents will be subject to a series of uncomfortable and distressing situations during dispersal actions which may have implications upon the health and wellbeing of individuals
- Flying-foxes may have to spend additional time searching for new roost locations and expend more energy than they would otherwise have done
- A reduction in energy available to an individual flying-fox as a result of dispersal actions may inhibit an individual's ability to find food, mate and reproduce during the period of exposure to dispersal actions
- Exhausted and/or tired flying-foxes may seek refuge in undesirable locations such as schools and backyards, thus increasing the likelihood of residents and/or their pets interacting with flying-foxes
- Female flying-foxes may abort their pregnancy, mothers may drop their young or dependant young unable to fly could get separated from their mothers and die of starvation
- Aborted foetuses and dropped young may occur within the vicinity of the roost (i.e. not within the roost itself) such as in residential backyards, along footpaths and in school grounds increasing the risk of human/pet interaction with flying-foxes

Financial impact to Council:

- Dispersal actions can be extremely expensive and potentially resource intensive
- Additional Council staff time and resources may be required for evaluating documents, preparing media releases, conducting community consultations, assisting with implementing the dispersal, and reporting on actions

Roost successfully relocated:

- Affected residents and/or community groups gain welcomed relief from the impacts of the flying-foxes
- Council may face a suite of new requests from other residents and/or community groups to disperse other flying-fox roosts
- Alternative roost sites may afford less shelter than the dispersed roost site, increasing the exposure of flying-foxes to extreme weather events which could result in increased mortality

Roost moves to unsuitable location:

- Previously unaffected residents and/or community groups may now face ongoing disturbance from a new or expanded roost established in an unsuitable location
- Council may receive an increase in the number of flying-foxes complaints
- Council may face legal action from previously unaffected residents and/or community groups which may be impacted upon by the new roost
- Council may loose all ability to mitigate roost impacts
- Additional Council staff time and resources may be required for conducting community education/ consultations at the new location and/or assisting with implementing follow-up dispersals, and reporting on actions
- Flying-foxes relocated to a more problematic location could now be subjected to additional disturbance and stress
- Unsuitable roost sites may afford less shelter for the flying-foxes than their preferred sites, increasing the exposure of flying-foxes to predation and extreme weather events which could result in increased mortality

Roost remains despite dispersal action:

- Affected residents and/or community groups will continue to suffer from the negative impacts of living, working or undertaking recreational activities within close proximity to a flying-fox roost, along with the added disruption caused by dispersal activities
- Council may receive an increase in the number of flying-fox complaints
- Affected parties may attempt their own potentially harmful and illegal solutions (of roost disturbance), unless other management actions are taken to alleviate their concerns

8.4 IMPACTS OF RESPONDING TO NEW AND/OR TEMPORARY ROOSTS

Impacts of Council's response actions to new or

temporary roosts include:

- Both flying-foxes and residents in the vicinity of the roost would be affected by dispersal actions for the duration of dispersal attempts (e.g. several hours per day prior to dawn and/or on dusk) and potentially for an extended or ongoing period depending upon the success or failure of these actions
- Dispersal actions can be extremely expensive and potentially resource intensive
- Additional Council staff time and resources may be required for evaluating documents, preparing media releases, conducting community consultations, assisting with implementing the dispersal, and reporting on actions
- Flying-foxes and nearby residents will be subject to a series of uncomfortable and distressing situations during dispersal actions which may have implications upon the health and wellbeing of individuals
- Exhausted and/or tired flying-foxes may seek refuge in undesirable locations such as schools and backyards, thus increasing the likelihood of residents and/or their pets interacting with flying-foxes
- If the roost is successfully relocated/dispersed, the affected residents and/or community groups will gain welcomed relief from the impacts of the flying-foxes
- Unsuccessful relocation/dispersal of the roost may fail to alleviate the negative impacts of the roost on the current residents and/or may result in previously unaffected residents and/or community groups now being subjected to ongoing disturbance from a new or expanded roost and the previously affected
- Council may receive an increase in the number of flying-foxes complaints and a suite of new requests from other residents and/or community groups to disperse other flying-fox roosts
- Council may face legal action from previously unaffected residents and/or community groups which may be impacted upon by the new roost
- Flying-foxes may remain within the vicinity of the roost whilst local flowering continues, relocating to a more problematic location and may now be subjected to additional disturbance and stress

8.5 IMPACTS OF RESPONDING TO EXTREME WEATHER EVENTS

Impacts of Council's response actions to extreme weather events include:

- Reduction in the number of flying-foxes dying from extreme weather events
- Reduction in the likelihood of human/pet interactions with flying-foxes following extreme weather events
- Reduced costs incurred by Council to remove and dispose of dead/decaying flying-fox bodies
- Decrease in the number of complaints to Council about the smell of dead flying-foxes
- Council incurs costs to undertake vegetation clean-up post-thunderstorm or to deploy a water truck to spray a heat stressed flying-fox roost

FAILURE TO CONSIDER FLYING-FOX ECOLOGY AND BIOLOGY COULD RESULT IN INCREASED RISK OF EXPOSURE TO NEIGHBOURING RESIDENTS AND THE BROADER COMMUNITY.

9. UNDERSTANDING THE RISKS OF ROOST MANAGEMENT ACTIONS

Managing flying-foxes and their roosts is never simple. Undertaking certain management actions, such as 'nudging', 'buffering' and/or dispersing of flying-fox roosts, presents several challenges for managing operational risks as well as ongoing risks to the public (Table 9). In addition, activities need to be sympathetic to flying-fox ecology and biology to ensure minimal disturbance and stress to animals. Failure to consider flying-fox ecology and biology could result in increased exposure risks to neighbouring residents and/or the broader community. Council will do its utmost to ensure that management actions do not place staff at undue risk, cause the transfer of risks associated with flying-fox roosts to additional residences and/or community groups.

9.1 WORKPLACE HEALTH AND SAFETY RISKS

When undertaking roost management actions it is imperative that all personnel adhere to good workplace health and safety practices and understand the risks associated with working closely with flying-foxes and their roosts. As such, all staff involved in roost management activities will have access to this plan, specific roost management plans and risk assessments before and during any activity. All contractors and Council staff will undergo an induction before undertaking any activity related to this plan or specific roost management plans.

Only staff, contractors and volunteers trained and rabies vaccinated may handle live flying-foxes. All other personnel must not handle a live flying-fox or place themself in a position that is likely to result in a bite or scratch from a flying-fox. All bites and scratches from a flying-fox must be reported to the Project Manager or Site Supervisor immediately. All potential exposures to Australian bat lyssavirus require immediate first-aid measures and medical advice must be sought as soon as possible, even for vaccinated personnel (refer section 3.1 Human Health and Flying-foxes).

Personnel conducting vegetation modifications associated with flying-fox roosts, where the vegetation is potentially covered in dried faeces, should wear appropriate personal protective equipment (such as a face mask) to prevent inhalation of aerosolised dried faeces resulting from the vegetation modification process.

TABLE 9: RISKS ASSOCIATED WITH VARIOUS FLYING-FOX ROOST MANAGEMENT ACTIONS.

RISK	COMMENT	MANAGEMENT
Health Risks	Operational staff may be required to work in close proximity to flying-foxes when undertaking management actions.	All operational staff working in close proximity to flying-foxes are to be rabies vaccinated and trained in roost management.
	The general public and their pets could be at risk of flying-fox exposure. Stressed and/or exhausted flying-foxes may come to ground and/or females may abort or drop young, thus increasing the potential for human/pet exposure to flying-foxes.	Adjacent areas will be closed to the public during operations, where possible and signage erected. Vegetation modification will primarily occur at night after flyout thus greatly reducing any human/flying-fox interactions. Suitably qualified flying-fox carers will be appointed for any roost dispersal actions.
Managing Outcomes	There is a significant risk that the outcomes of any dispersal or vegetation modification could result in increased impacts upon the wider community.	Prior to roost dispersal, it may be necessary to undertake vegetation modifications at alternate locations to reduce vegetation attractiveness to the flying-foxes currently being dispersed. Follow up dispersals may need to be undertaken.
Liability	Actions undertaken by Council in dealing with a flying-fox roost may expose Council to an increased risk of litigation.	All required State and Federal Government approvals will be obtained prior to undertaking any management actions.
Increased Impacts	Rushed or poor management responses could exacerbate flying-fox problems and cause increased levels of conflict between flying-foxes and residents/community groups.	Dispersal actions will be planned including staff training, equipment and rabies vaccinations. Vegetation modification will be staged to ensure no operations are rushed.
Transference of Impacts	Rarely have flying-foxes relocated more than 2km from the original decommissioned roost. There is a real risk of transferring the problem to another area which may be more problematic than the original roost.	Ongoing monitoring of roost and surround high risk “new roost” locations will be undertaken. Vegetation modification of the likely “new roost” sites may need to occur prior to the commencement of dispersal actions. Follow up dispersals may also be necessary.
Loss of Control	The current location may enable control over the impacts of the flying-foxes. Certain management actions may lead to the roost dispersing and Council losing all ability to mitigate the impacts.	Follow up dispersal actions may be necessary.
Risk of Mortality	Flying-fox mortality may potentially occur when undertaking roost decommission. Other animals may also be affected, such as possums, gliders, birds and reptiles.	Vegetation modification will occur outside of key flying-fox breeding events and at night (after flyout) and only in trees where no animals are present. Personnel capable of rescuing flying-foxes will be on site during activities. If mortality is observed, operations will cease immediately and EHP will be notified.

10. ASSESSING ROOST MANAGEMENT OPTIONS: LIKELIHOOD OF SUCCESS

When considering whether or not to undertake flying-fox roost management actions Council will take into consideration previous management actions which have been unsuccessful. It is also worth remembering that many flying-foxes will spend time roosting and foraging within urban environments where the loud noises, bright lights and pungent smells (such as vehicle exhaust) of human habitation are frequently present. They readily adapt to their surrounding environment and easily become habituated especially when food resources are limited. This can provide challenges for the management of flying-foxes.

Cost-effective, reliable techniques for relocating flying-fox roosts have not yet been developed. The result of relocation attempts such as the use of loud noises, lights or hosing with water have generally been that the animals have not deserted the roost, or, if forced to desert the roost, have not relocated to the pre-selected "new" location(s). Instead, they have relocated to less desirable locations, for example, they have scattered throughout a town or joined nearby roosts in other towns, compounding problems at those sites. The stress caused to the animals has sometimes resulted in fatalities, with pregnant females and dependent young being particularly vulnerable.

10.1 INEFFECTIVE MEANS OF MANAGING FLYING-FOX ROOSTS

Unauthorised attempts to disturb flying-fox colonies are not only illegal but also ineffective. Queensland's native wildlife, including flying-foxes, are protected by the Nature Conservation Act 1992. Examples of ineffective means of controlling flying-foxes include the use of shooting, noise deterrents, bright or flashing lights and pungent odours.

Past reductions of local flying-fox numbers by means of shooting or poisoning (illegal) have historically been used across Australia. While a small number of flying-foxes can be removed by shooting, this does not deter other bats from returning later. Orchards are most affected by bats when native food-resources are extremely scarce and cultivated fruit provides the only alternative to starvation. Furthermore, findings of the Animal Welfare Advisory Committee concluded that shooting flying-foxes was inhumane.

The installation of high-frequency emitting bat-repellents has repeatedly been trialled with high hopes of success. Flying-foxes do not use echolocation or ultrasound. Their hearing range is similar to that of humans, making high-frequency sound inaudible to them. Therefore, sounds that can potentially detract flying-foxes have an equally offensive effect on humans and meet with very limited popularity in the community.

Strobe, bright or flashing light sources installed in trees are unsuccessful as deterrents. While flying-foxes may be disturbed initially, hunger and desensitisation to the light causes the effect to be short lived and may eventually serve to attract the bats. Driven by desperation, flying-foxes will become accustomed to most novel stimuli in a matter of days or weeks.

Due to flying-foxes' highly developed sense of smell, strong and unpleasant odours would seem the most likely detractor of flying-foxes. Pungent kerosene, fish paste and snake faeces have been placed in fruit trees with limited success. Wild animals are accustomed to the smell of predator faeces (such as python faeces) and are able to quickly determine the freshness and therefore the likely proximity of the predator. This means that to deter flying-foxes from roosting or foraging in specific trees the predator faeces (such as

python faeces) must be re-applied on an almost daily basis. While odour detraction may warrant further investigation, hungry bats are likely to habituate to it if no food/roost alternatives exist.

10.2 PREVIOUS DISPERSAL ATTEMPTS

While dispersal attempts at the Boonah flying-fox roost resulted in a successful outcome, previous dispersal attempts at a range of flying-fox roosts across eastern and southern Australia have shown that the success rate is very low. Success is measured in terms of both a satisfactory resolution of the original conflict and uptake of suitable alternative roosting locations.

New roosts are often formed which are problematic for other residents, businesses and/or community groups (e.g. Maclean NSW, Charters Towers QLD). In most cases flying-foxes often roosted within 500 metres of the original roost at which dispersal actions were undertaken. Nor did the bats roost within the 'pre-determined' alternative roost sites, join pre-existing roosts or move to locations acceptable to the broader community.

10.3 ALTERNATIVE ROOSTING LOCATIONS

Council may investigate potential alternate roost sites prior to determining the course of management actions to be undertaken. It is impossible to predict where dispersed flying-foxes will relocate to, but it is hoped the flying-foxes will join existing colonies in more suitable locations. Understanding where dispersed flying-foxes may end up will greatly impact on management options as displaced animals may choose to roost in less suitable locations such as the grounds of nearby schools, hospitals or aged care facilities. Council may choose to manage the roost in its current location instead of risking flying-foxes roosting in a more problematic location.

Key criteria for assessing possible alternative roost locations include:

- Vegetation type, height and patch size
- Canopy cover of a similar density to current roost
- Proximity to water, food resources and < 2km from original site
- Ideally the site would be located away from sensitive receivers such as schools, hospitals and aged care facilities
- Extent to which vegetation may impede views or visual amenity
- Willingness for landholder to sell/allow vegetation rehabilitation
- Opportunities for multiple uses for the site such as recreation/education

DEFINITIONS /GLOSSARY

COUNCIL LANDS - are lands that Council has a responsibility to manage such as parks reserves, roads reserves and trustee lands. It does not include public lands subject to the operations of the State, such as National Parks, Main Roads, and SEQ Water lands.

FLYING-FOX ADVOCATE - means a person able to demonstrate experience of, or a methodology for:

- Classifying flying-fox species
- Assessing flying-fox population numbers in particular roosts
- Identifying flying-fox breeding cycles including evidence of breeding and rearing activity in particular roosts
- Recognising signs of distress in, or harm to, flying-foxes
- Management Actions - are non-lethal actions utilised by Council to manage flying-fox roosts and may include preventing flying-foxes from making use of a site or part of a site by destroying and/or modify vegetation at that site

ROOST OR FLYING-FOX ROOST - means a tree or other place where flying-foxes congregate during the daytime to rest and to breeding or rear their young.

CONTINUOUSLY OCCUPIED ROOST - a roost that has been utilised by flying-foxes for continuously for at least 12 months.

IRREGULARLY OCCUPIED ROOST - a roost that has been utilised by flying-foxes intermittently (e.g. at times of local flowering).

NEW ROOST - a roost that has been recently established (< 1 month).

SEASONALLY OCCUPIED ROOST - a roost that has been utilised by flying-foxes on a seasonal basis (e.g. winter or summer roost).

TEMPORARILY OCCUPIED ROOST - a roost which is deemed to only be occupied on a temporary basis, such as a little red flying-fox roost where the animals are expected to move on once local flowering ceases.

SENSITIVE RECEIVERS - are areas within the Urban Flying-fox Management Area which Council deems to be sensitive to flying-fox activity such as schools, hospitals, playgrounds, aged care facilities and urban residential areas.

URBAN FLYING-FOX MANAGEMENT AREA (UFFMA) - the Queensland State Government defines the UFFMA as areas designated within Council's planning scheme as having a residential or commercial purpose including a 1 km buffer.

ATTACHMENT A: MEDICAL HELP AND ASSISTANCE

A.1 HUMAN HEALTH

For further information, contact a local doctor or nearest public health unit (Table A1) or the 13HEALTH information line (13 432584).

TABLE A1: QUEENSLAND HEALTH NEARBY PUBLIC HEALTH UNITS.

NEARBY PUBLIC HEALTH UNITS	TELEPHONE	FACSIMILE
Metro South Public Health Unit (Brisbane South Office) Level 1, 39 Kessels Road, Coopers Plains (PO Box 333, Archerfield Qld 4108)	(07) 3176 4000	(07) 3176 4045
Gold Coast Level 1, 14 Edgewater Court, Robina (PO Box 4256, Robina Town Centre Qld 4230)	(07) 5668 3700	(07) 5562 2703
West Moreton (Goodna) 81 Queens Street, Goodna (PO Box 188, Goodna Qld 4300)	(07) 3818 4700	(07) 3818 4701

A.2 ANIMAL HEALTH

If a flying-fox has come into contact with a domestic pet (i.e. dog or cat) then Biosecurity Queensland (daff.qld.gov.au or 13 25 23) or a local veterinarian should be contacted. Where flying-foxes are found to be injured or killed, Department of Environment and Heritage Protection (ehp.qld.gov.au or 1300 130 372) and RSPCA Qld (1300 ANIMAL (1300 264 625)) should be notified immediately.

Local volunteer wildlife care organisations should be contacted if sick, injured or orphaned flying-foxes (or other bats) are found. It is very important that all bats, including flying-foxes, are only handled by trained personnel.

Local volunteer wildlife care organisations:

- Australian Bat Clinic and Wildlife Trauma Centre: 07 5563 0333
- Bat Conservation and Rescue Queensland: Rescue Hotline 0488 228 134
- Bats Qld: Gold Coast Rescue Hotline 0447 222 889

ATTACHMENT B: FLYING-FOX ROOST HEAT STRESS GUIDELINES

Previous heat stress events have typically occurred during December and January but unpredictable temperatures can occur at any time.

Factors contributing to the severity of heat stress events include:

- High daytime temperatures of 40oC or above
- Number of animals occupying the roost
- Number of lactating females
- Number and age of juveniles
- Animals' access to adequate understorey vegetation, where it is often cooler
- Condition of animals prior to event (i.e. access to adequate food sources, temperatures in the month proceeding)
- Accessibility of the roost (to humans and water trucks) and what resources are available to assist animals
- Guidelines for water spraying heat stressed flying-fox roosts include:
- The use of tepid water since cool water can cause shock
- Only use water pressure hoses to hose vegetation and never the animals directly
- 25mm canvas hoses of the end of live reels with three-way directors with approximately 800kpa pressure are recommended
- In the absence of wind to drift the mist, water can be shot over the top of the canopy and allowed to drip down (similar technique to attacking a pole fire)
- When prevailing winds can push the water some distance, short lengths of 38mm canvas and fog nozzles at 230/L with three-way directors have the greatest impact
- No need to saturate an area as it is more effective to wet a larger area a little than to just wet one area well

FLYING-FOX MANAGEMENT STRATEGY

Scenic Rim Regional Council