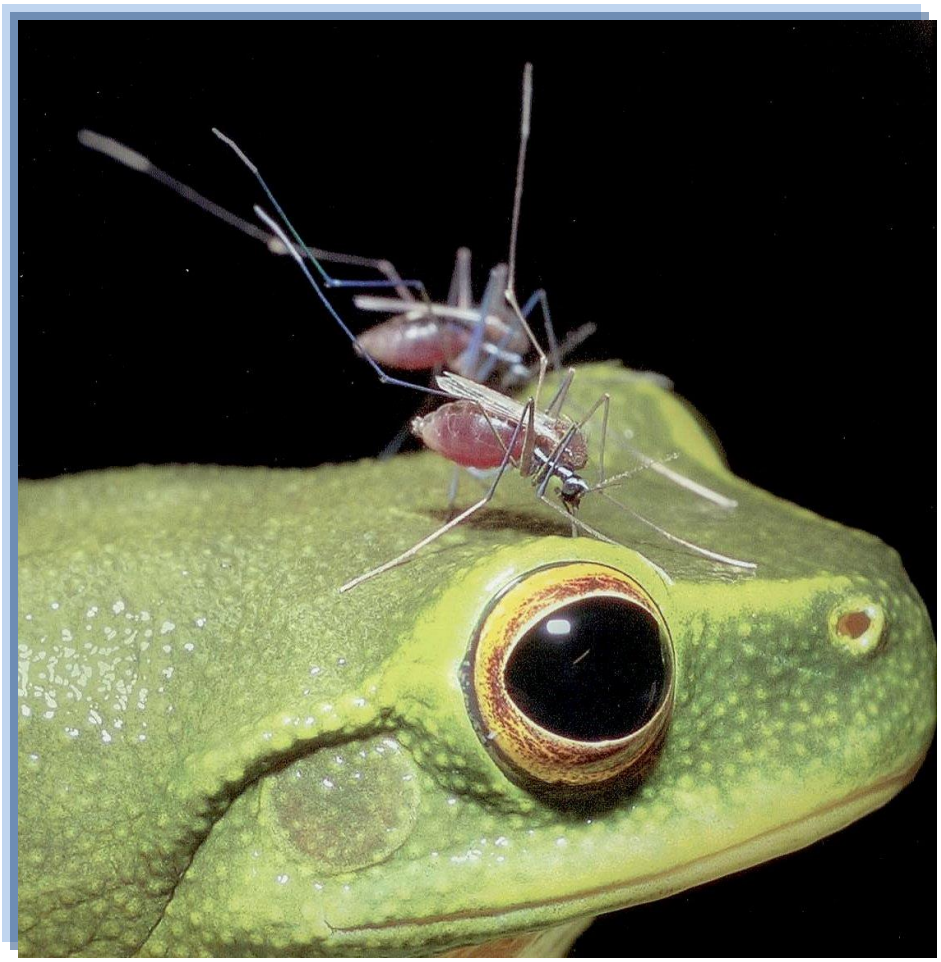
VECTOR MANAGEMENT PLAN



To control vectors of disease using the most cost effective and environmentally sound management methods

Health & Regulatory Services

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PART A
STRATEGIC OVERVIEW

1.1 Executive Summary

Mackay Regional Council has developed a Vector Management Plan to satisfy the Environmental Protection Agency's Code of Practice requirements, as well as, Council's responsibility to effectively manage its control program.

The Vector Management Plan identifies specific objectives and goals, and specific actions, which ensure that Council meet the goals.

- Operations
- Data Collection
- Competencies
- Program Performance Review
- Community Awareness

The Vector Management Program is required to control disease vectors and pests namely mosquitoes and vermin. This Council has significant populations of fresh and salt water mosquitoes, following inundation of breeding sites from rainfall and significant tidal events. The eradication process is centred on ground based larviciding, adulticiding (misting) and supplemented by Aerial larviciding. Vermin concerns are treated working closely with other Programs/Departments.

1.2 Vision

To protect the health, safety and welfare of the residents of Mackay Region.

1.3 Mission Statement

To reduce the incidence of vector borne diseases and reduce nuisances caused by recognised pests.

1.4 Objectives

- To control vectors of disease using the most cost effective and environmentally sound management methods;
- To continually review and improve best practice methods of vector management;
- Review operational methods and procedures;
- To increase public awareness and to promote a community conscience on Council's vector management program; and
- To provide the best information available to the community on vector control options.

1.5 Overview

The Vector Management Program is one of great diversity. Its focus is the management and control of specific vectors of public health significance. These vectors include numerous mosquito species and vermin.

1.6 Goals

Goal 1 To reduce the number of vectors impacting on Mackay Region.

Goal 2 To ensure that Vector Management is undertaken in a cost effective manner and is consistent with the Mosquito Management Code of Practice for Queensland.

Goal 3 To promote, educate and inform the community about Vector Management.

PART B
PRELIMINARY INFORMATION

2.1 INTRODUCTION

The effective control of mosquitoes in the Mackay region is of considerable importance given their impact on public health due to endemic prevalence of Ross River Virus and the influence mosquitoes can have on the regions outdoor tropical lifestyle.

There are more than 25 common species of mosquitoes in North Queensland with many capable of transmitting diseases such as Ross River Virus, Barmah Forest Virus, Encephalitis and Dengue Fever.

The Mackay Regional Council Preventive Program aims to keep mosquito populations at acceptable levels through the effective provision of various forms of treatment and control measures.

In recent years, greater environmental considerations have required improvement in both application technology and chemicals used. The introduction of the *Environmental Protection Act 1994* has placed greater environmental stewardship on the delivery of such programs ensuring that the management of mosquitoes is conducted in such a manner as to have little or no effect on non target species, and the environment in general.

This Vector Management Plan aims to provide general information regarding mosquitoes and other disease vectors, the importance of treatments and the process that treatments should be undertaken to maximise success and minimise environmental harm.

2.2 SCOPE

- Vector Management Plan specifically highlights Mosquito control programs.
- Provide general information regarding mosquitoes including species habitats and life cycle.
- Identify triggers for treatments and types of treatment options currently available.
- Identify of suitable surveillance procedures and treatment efficacy.
- Examine chemical usage options.
- Examine environmental considerations ensuring compliance with the *Environmental Protection Act 1994* and guidance contained in the Mosquito Management Code of Practice 2002.
- Institute a climate of continual research and development for Vector management programs.

2.3 LEGISLATIVE FRAMEWORK

Pursuant to the *Public Health Act 2005*, Queensland Health in conjunction with Local Government has the responsibility for the control of communicable diseases in Queensland. A number of vector-borne diseases come under the classification of a communicable disease including Ross River Virus, Barmah Forest, Dengue Fever and Malaria.

The control of mosquitoes is a responsibility specifically delegated to local government under the *Public Health Act 2005*. The Act places responsibility on owners, occupiers and

local government to perform appropriate works or actions to prevent the breeding of mosquitoes in areas under their control or responsibility.

In cases where the owner or occupier fails to comply with requirements, the Act gives power to Local Government to undertake the necessary works. Where Council is required to undertake works, any cost incurred will become a charge on the land and thus recoverable.

Council's Vector Control Operations within declared fish habitat areas are compliant with the current Department of Primary Industries Fish Habitat Area Code of Practice.

2.4 COUNCIL POLICY

Within Council's plans, the purpose of the program is highlighted as follows:-

To provide a level of control over nuisance species and vectors of medical importance sufficient to reduce vector borne disease in the Mackay region.

Council accepts its delegated role in vector control very seriously and allocated over $765,000 for the financial year (2013/14) to cover both ground and aerial treatments.

In addition to this expenditure, additional funds are provided through health promotion print and television advertisements as well as membership of EHWIM, MCAA and other mosquito control bodies.

2.5 SAFETY AND OPERATIONAL PROCEDURES

Due to the nature of vector control operations through the prerequisite use of 4WD vehicles and bikes and the continual use of chemicals, safety of the operators is imperative.

It should be noted however, it is not the intention of the document to fully address all the issues pertinent to health and safety in the area of vector control and reference should be made to relevant Work Health and Safety legislation and advice from Council's Workplace Health and Safety Advisor.

2.6 VECTOR MANAGEMENT PLAN

The Vector Management Plan covers a number of elements, including:-

- Operations
- Data Collection
- Competencies
- Program Performance Revisions
- Community Awareness

All of the above elements have the underlying principal of ensuring the delivery of an effective and environmental sustainable vector control program.

PART C
VECTOR SPECIES DISEASES CHEMICAL CONTROLS

3.1 MOSQUITO SPECIES

Council's Vector Management Program targets numerous species of mosquitoes based upon vector capability, nuisance value and cohabitation with primary target species. The following sections will group mosquitoes according to:

- Disease Carrying Species (Disease Vectors)
- Nuisance Species
- Domestic Container Breeding Species

3.2 DISEASE CARRYING MOSQUITOES

3.2.1 Aedes vigilax

Ae. vigilax is the primary vector of Ross River Virus (the cause of epidemic polyarthritis) and Barmah Forest Virus in Queensland. Both viruses are notifiable diseases that can have debilitating effects on those infected.

Ae. vigilax's distribution throughout northern Australia is wide spread along the coastline. The major breeding sites of the vigilax include temporary brackish pools and marshes filled as a result of tidal inundation and are commonly associated with salt-water couch grass (Sporobolus). The habits of the adult mosquito include resting amongst dense foliage for shelter throughout the day where possible. They are a voracious biter, will feed off humans and animals day or night and can travel up to 50km from breeding sites. Peak feeding activity is during dawn and dusk.

3.2.2 Culex annulirostris

Culex annulirostris is an efficient vector of a range of arboviruses including Ross River Virus, Barmah Forest, Japanese Encephalitis, E, Kunjin as well as being a vector for myxomatosis and an effective carrier of dog heartworm.

Annulirostris is wide spread throughout Queensland and Australia. Preferred breeding areas include freshwater wetlands and low lying grassy areas that are commonly inundated following rain as well as irrigation areas having heavy organic effluent component.

Peak feeding activity is predominantly at dusk (up to 2 hours following), and to a lesser degree at dawn. They feed off both animals and humans and have the capacity to travel 5 – 10 km from breeding sites.

3.3 NUISANCE SPECIES

3.3.1 Culex sitiens

Cx sitiens can become a major pest during summer months. Current research indicates that this species is also a competent vector of Ross River Virus within the laboratory setting, with further research continuing to determine transmission efficiency as a possible field vector.

As with Ae. vigilax, sitiens is found along most coast lines of Australia and has the ability to travel large distances (up to 35 km) in order to seek a blood meal. The major breeding sites of the sitiens is the same as Ae. vigilax – temporary brackish pools and marshes filled as a result of tidal inundation. Sitiens is often found breeding with Ae. vigilax but also has the ability to successfully adapt to freshwater habits.

3.3.2 Aedes alternans

Alternans can reach reasonably high pest levels following extended periods of rain. They have the ability to breed both in temporary brackish pools and marshes on the coast along with Ae. vigilax and further inland in freshwater areas with Ae. vittiger.

Ae alternans are very aggressive biters, will attack throughout the day and night and have the ability to travel 5-8 km from breeding sites in search of a blood meal. As with vittiger, this species may continue to be a pest from one to three weeks after breeding areas are inundated. Ross River Virus has been isolated form Ae alternans (in the laboratory), however this is yet to be proven in the field.

3.3.3 Verrallina funerea

Verrallina funerea may be a major pest in communities where residential housing is in very close proximity to breeding sites. Ve. funerea has the ability to breed in both fresh and slightly brackish water.

Ve funerea is considered a very aggressive and painful biter. This species travels very little distance from breeding ground and is thus not considered a major pest for areas not adjacent or in close proximity to their coastal breeding areas. There is currently no evidence to suggest that Ve funerea is capable of transmitting disease to humans, however it has been shown to carry a number of arboviruses in the laboratory.

3.3.4 Mansonia uniformis

Mansonia uniformis can prove a major pest problem in Mackay due to the abundance of fresh water lagoon type habitat. It has the unique larval structure of a piercing siphon which allow it to attach to a wide range of aquatic plants such as water hyacinth, as well as aquatic grasses and sedges.

Ma uniformis are more aggressive during the night but willing to feed during the day in protected/shaded areas. The flight range of uniformis is limited to about 3-6 km making this species more of nuisance to those living near fresh water areas. This species has been shown to be a competent vector for Ross River Virus, MVE and Kunjih virus in the laboratory however there is no field evidence incriminating the species as a disease vector in Australia.

3.4 DOMESTIC/CONTAINER BREEDERS

3.4.1 Aedes aegypti

Aedes aegypti is of great importance as it is the major carrier of Dengue Fever and Dengue Haemorrhagic Fever in Queensland (and throughout the world). This mosquito is associated with human habitation.

The Ae aegypti can be found in natural breeding places such as tree holes, fallen palm fronds and plants such as bromeliads. It has however adapted very successfully to human habitation breeding in any available artificial container such as pot plant bases, buckets, tyres, rain water tanks and roof gutters. This mosquito has a limited flight range, up to 1 km (if necessary), in seeking a blood meal. This mosquito is very allusive, tending to bite persons around the feet, ankles, and under tables. The aegypti is an indoor day time biter.

3.4.2 Aedes notoscriptus

Aedes notoscriptus can be a domestic pest species. Its importance relates to the similarity with aegypti and the common breeding area shared.

As with Ae aegypti, Ae notoscriptus is primarily considered a domestic species taking advantage of a range of artificial containers. Laboratory studies have shown this mosquito capable of carrying a number of arboviruses and it is believed to be a suitable vector for Barmah Forest, Ross River and Heartworm in dogs.

The following table provides a summary of the above mosquitoes including their distribution, preferred breeding sites and potential vector ability.

3.5 - Table 1 - Common Mosquito Species in Mackay

MOSQUITO SPECIES	DISTRIBUTION	PREFERRED BREEDING SITES	CONCERN RISK
Ae. vigilax	Most of coastline	Temporary pools in salt marshes flooded during higher tides or by rain.	Major pest species. Vector of RR, BF and heart worm in dogs.
Cx. annulirostris	Widespread	Fresh water wetlands, usually with vegetation. Breeding can be prolific in low-lying areas that hold water for a few weeks after heavy rain.	Most important mosquito in Australia. Vector of BF, JE, Kunjin, MVE, RR and heart worm of dogs.
Cx. sitiens	Coastal saline and brackish.	Commonly found in pools formed when high tides flood the upper limits of marine wetlands. Heavy breeding can occur where natural drainage in tidal wetlands is blocked.	Occasional pest where residential areas are close to breeding sites. RR isolated.
Ae. vittiger	Widespread Coastal and inland	Commonly found in temporary pools filled by rain exposed to sunlight and emerging grass.	Occasional pest where residential areas are close to breeding sites MVE laboratory only.
Ae. alternans	Widespread.	Saline and fresh wetland.	RR isolated. Rarely abundant.
Verrallina funerea	Coastal	Slightly brackish and fresh water pools that are often shaded. Commonly found breeding tea-tree and other wetlands adjoining tidal areas.	RR, BF isolated. Can be a significant pest in residential areas adjacent to breeding sites.
Ae. aegypti	North Queensland.	Prefers containers. Usually associated with human habitation.	Vector of Dengue.
Ae. notoscriptus	Widespread, urban and rural.	Domestic and natural containers.	Can be a Significant domestic pest. Isolated BF, RR and heartworms in dogs.
Mansonia uniformis	Widespread, mainly coastal.	Afresh water lagoon type habitats.	May be a serious pest in the vicinity of freshwater wetlands. RR isolated.

Viruses: BF = Barmah Forest, JE – Japanese Encephalitis, MVE = Murray Valley Encephalitis, RR = Ross Rover.

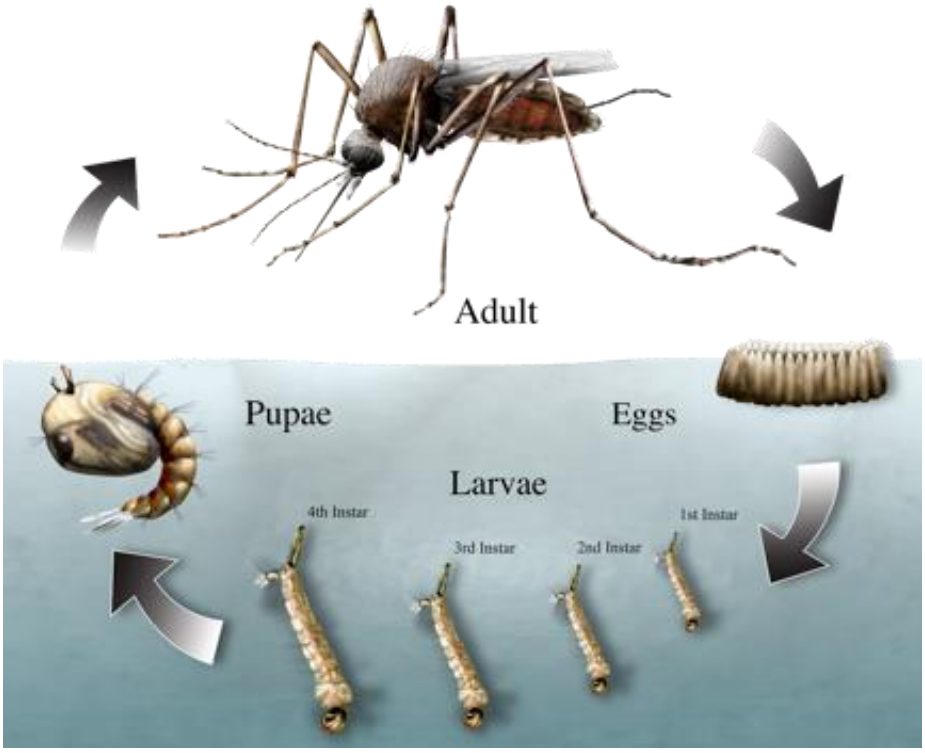
3.6 MOSQUITO LIFECYCLE

Mosquitoes have the ability to breed in a wide range of environments including freshwater wetlands, salt marshes, highly polluted waters and artificial containers.

The life cycle of a mosquito commences with the female laying eggs. The eggs are laid on damp surfaces (generally), just above water level or on free water as a raft as shown in the below diagram. The eggs are often drought resistant and remain viable for many years awaiting rainfall or tidal inundation to allow for hatching.

The eggs hatch into larvae and progress through four (4) developmental larval stages increasing in size reaching the non feeding pupal stage. The adult mosquito develops inside the pupal skin and following emergence feeds, then mates.

This diagram provides a simple representation of the mosquito life cycle.

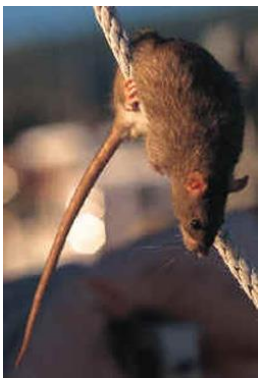


The female mosquito requires a blood meal for egg development, with a single female capable of laying 200 to 400 eggs within a two to four week lifecycle. The male mosquito does not bite and feeds only on nectar from plants.

The length of the breeding cycle is very much dependant of climatic conditions with the characteristic hot and humid days often experienced in Mackay shortening a complete cycle from 14 days down to 5 days.

For further detailed information regarding the mosquito life cycle, reference is recommended to a suitable entomology publication.

3.7 VERMIN CONTROL



Rats and mice have the ability to breed in a range of environments and while there is legal obligation to control vermin, Council can split the control into two (2) facets:-

- Control/prevent breeding and harbourage on Council property and infrastructure; and
- Ensure the community does not provide harbourage and breeding sites for vermin.

Over twenty permanent Rodent bait stations are installed throughout Mackay's city centre.

Local Laws regulate overgrown properties and untidy properties (with potential to provide harbourage).

3.8 CHEMICALS USED

The control program utilises specialised chemicals to maintain effective control of vectors.

Mosquito Chemicals

- Methoprene (ProLink® briquets, pellets, sand and liquid)
- Bacillus Thuringiensis Israelensis (Bti)
- Twilight ULV
- Brigade

Vermin Chemicals

- Generation
- Talon

PART D
OPERATIONAL APPENDICES

Appendix 1 - Control Methods

Ground Based Applications

The Vector Control Unit's land based larviciding program focuses on both fresh and saltwater habitats. All known breeding sites have been plotted with GPS equipment and mapped using the Council's GIS system. These sites are continually monitored throughout the year.

Licensed Pest Management Technicians, of the Vector Control Unit, inspect all sites to determine the presence of mosquito larvae. The timing of the inspections is put in place to intercept the mosquitoes' breeding cycle and is intensified after rainfall and tidal events greater than 5.5 metres.

For example, history has shown that tidal events greater than 5.5 metres will cause inundation of a number of low lying tidal marsh areas.

Breeding sites range from small, water-holding containers, larger areas such as drains and settling ponds and up to vast salt marsh and mangrove swamps (which may well exceed 400 hectares). Identification of the larval mosquitoes is necessary to determine a suitable control method. Samples of larvae are returned to the laboratory to determine the species.

All staff members are required to complete pre and post-treatment surveys.

Pre-treatment Applications

Council undertakes an extensive pre- treatment program. This program is an effective way to control areas that are subject to infrequent or irregular tidal inundations and areas that are difficult to access.

Council utilises (S)-Methoprene Prolink® briquettes for its pre-treatment program. These briquettes have an extended life ensuring that these difficult areas are effectively treated with minimal staff involvement.

The incorporation of this control option into the management plan enables ground staff to redirect their resources to other more suitable sites that require treatment in the event of a major larval emergence, therefore expanding the total area of treatment throughout Mackay Regional Council's known breeding locations.

Aerial Applications

Aerial Larviciding is carried out in accordance with Council's Procedure for Aerial Larviciding, the pilot is supplied with aerial photography maps highlighting the proposed areas for treatment and data from each treatment is stored on file. The need to carry out aerial larviciding is determined by the monitoring of the City's salt marshes, mangroves and Casuarina forests for mosquito breeding.

The main target species in the aerial treatments is Aedes Vigilax, the common salt marsh mosquito, Culex Sitiens and Culex Annulirostris. However, other species of mosquitoes do breed in the same habitat periodically.

Records of each treatment are kept for quality monitoring and to identify any problems such as treatment failure.

Aerial larviciding supplements the main treatment program with difficult areas to be accessed and treated in a short period of time. This allows staff to deal with more accessible breeding sites when required.

Adulticiding

At times, it may be necessary to undertake a program to control adult mosquitoes that have emerged, due to an interrupted larviciding program. Adulticiding involves the application of a fine mist of control agent to areas where adult mosquito numbers are at an unacceptable level. The adult mosquitoes come in contact with the airborne droplets and are controlled as a result.

The equipment used to create and distribute the fine mist is mounted on 4WD vehicles with the program being conducted in the early hours of the day. The timing is critical as thermal activity and stronger wind velocities can affect treatments conducted later in the day.

Mosquito Adulticiding is conducted in accordance with Council's Procedure for ULV Misting Program and data from each treatment is stored on file.

Monitoring and Surveillance

Light Trapping

The Mackay Regional Council's Vector Control Unit utilises adult monitoring as part of its overall mosquito surveillance program.

Standard light traps, baited with carbon dioxide, are set in six locations to provide an accurate indication of adult activity in populated areas of the city.

Captured mosquitoes are then transported to the laboratory and frozen to preserve them. They are then counted, identified to species level and recorded in a computer database. Environmental details such as rainfall, wind speed and direction and night-time temperatures are also recorded.

Pre/Post Dipping

Larvae are collected from their aquatic habitat using a ladle or pipette. As with adult trapping, larvae are identified and counted to determine species composition and population density at a given time.

Pre and post treatment inspections are essential in assessing the need for treatment, the suitability of the product to be used, and also allow for quantitative, visual evidence of a treatments success and will assist in the determination of re-treatment activities.

Data Collection

An integral component of any mosquito surveillance program is the recording of data. Information collected from mosquito surveys can be used to determine the need for a control program and to later evaluate the effectiveness of the program.

The information gathered is documented, filed and integrated into the GIS system.

GIS technology adds significant value to Council's Vector Control Programs data collection analysis by enhancing its function in decision making, especially with regards to service delivery, planning and management.

PART D
OPERATIONAL APPENDICES

Appendix 2 - Mackay Regional Council Protocol for Dengue Outbreaks

1.0 General

Dengue Fever is an acute febrile disease which is transmitted by the bite of an infected Aedes aegypti mosquito. The organism occurs in a number of serotypes and it is now believed the re-infection of a sufferer with a different serotype can lead to development of the potentially fatal Haemorrhagic form of the disease. Control of the mosquito is the only viable form of control of the disease.

2.0 House-to-House Surveys

To detect and eliminate the breeding of Aedes aegypti mosquitoes, house-to-house surveys will be conducted following:-

- The direct import of a Dengue Virus sufferer to an area.
- The presence of a suspected locally acquired case of Dengue.
- The presence of a confirmed locally acquired case of Dengue.
- A general (epidemic) outbreak of Dengue.

It is generally accepted that the Aedes aegypti mosquito will travel up to a maximum of 400m from its breeding site in search of a blood meal. In an attempt to eliminate secondary infections of dengue, the following inspection distances will be adopted.

Inspections will be conducted of every premise in a radius zone of 100m to 200m of the sufferer's home. All breeding found is to be recorded on inspection sheets. Information highlighting control options for the aegypti mosquito will be provided to the effected residences. The Tropical Public Health Unit (TPHU) will provide the necessary Officers to inspect the 0 to 100m zone. In the instance of an outbreak, the TPHU can treat the inside of dwellings to eliminate harbouring adult mosquitoes.

In an epidemic, these distances may be reduced due to human resource shortages when multiple suburbs are affected.

3.0 Notification

Notification of the presence of a case is received from the Tropical Public Health Unit.

Following notification, the Local Government in the area will initiate action to conduct the necessary survey and will:

- Conduct a thorough house-to-house survey within the 100m to 200m zone in accordance with the principles outlined below.
- Note on the maps the location of each premises surveyed, the location of breeding detected and the location of premises treated.
- If necessary, seek the assistance of the TPHU 'DART' team to expedite the conduct of the survey and treatment.

4.0 Survey Equipment

It is recommended the following survey equipment be available for use in house-to-house surveys:

- Suitable identification for the officer.
- Maps, survey forms, information resources and 'Health Warning' door hangers.
- A suitable carrying container holding:-

    - A container of suitable larvicide;
    - A turkey baster to collect large samples;
    - A white bowl to collect larval samples;
    - A pipette to collect individual specimens;
    - Vials for transport of larvae for subsequent identification;
    - Insect repellent;
    - Sun screen; and
    - Water.

5.0 Conduct of House-to-House Surveys

The conduct of house-to-house surveys involves several steps:

Pre survey meetings

- Confirm the case information.
- Hold meeting with all Officers involved.
- Brief staff on all details.
- Assign inspection teams and ensure team communications.
- Ensure all inspection bags are fully stocked with equipment.

Face to Face Communication

- Introduce yourself and explain the purpose of your visit.
- Deliver Information Materials.
- Explain the dangers of Dengue Fever and DHF and the role of the mosquito including its life cycle and flight range.
- Correct any long-held misconceptions (older people especially believe Dengue is annoying but not life threatening).
- Explain the mechanisms of aegypti control (Tip 'em out, Store 'em dry, Throw 'em out).
- Thank the occupier for letting you check the premises and give them contact numbers for further information of required.

Source Reduction

- If it can be emptied, empty it.
- If it can't be emptied or moved, treat it.
- If it is required, have the occupier clean it, dry it and store it in a dry place.
- If it is not required, have the occupier throw it out or do it for them.
- If larvae are located, show them to the occupier, explain their legal liabilities.
- Check inside the house if the occupier advises they have indoor plants or cut flower.
- Ask if there is a disused septic tank or well on the property.
- Check tree holes.
- Check Toilets especially disused ones.

REMEMBER – It only takes one breeding container in twenty houses to sustain an outbreak. Get it right the first time.

If owner or occupier is not home

Under the laws, Council Officers cannot enter premises without the permission of the occupier. In order to gain access at a later time:

- Leave the usual information materials in the letterbox.
- Hang a 'Health Warning' notice on the doorknob, making sure the identifier for the correct contact number is marked or highlighted.
- Reinspect as soon as possible after the occupier makes contact.

Records

Accurate records of the investigation of a Dengue Case are vital.

- Maps should be made as described above.
- Survey forms have been standardised (see sample attached) and must be completed.
- Completion of all those sections highlighted in the sample is mandatory

6.0 Public Relations – Media

Media releases may be required throughout dengue instances. The level of public relations response is dependent on the number and location of these cases. The purpose of the release is threefold.

- Ensures the public is made aware of a potential serious public health issue.
- Provides an opportunity for additional and widespread public education messages
- Facilitates the house-to-house inspection process by making the public aware of Council inspection activities

Note: Irrespective of Council's actions, it is the Tropical Public Health Unit's Policy not to release media/press releases should the case be imported only and no evidence exists of local transmission.

For the purpose of media activities, dengue cases can be grouped under the broad headings – Imported Cases and Local Transmission Cases.

7.0 Imported Cases

Within Individual Council Boundaries

Where imported dengue cases occur solely within the jurisdiction of a Council area, ie. Greater than 1.0km from a common boundary, the following procedures apply:

- The responsible Council to deal with media responses and release according to set policies
- Information and briefing notes will be provided by the investigating Officers to management and public relations section for media dissemination
- Information will be limited to the number of cases, inspections conducted, general health advice and protection measures, and generalised location of cases by suburb only

Border cases

Where an imported dengue case occurs close to the border of adjoining Council areas, inspections are required in both areas.

Council's PR sections will liaise and share all information and jointly prepare proposed media briefs. Council's will present media releases, separately or jointly as deemed appropriate or necessary.

8.0 Local Transmission Cases

Where local transmission of dengue exists, the above protocol (focussing upon cooperation and sharing of information) detailed in section 5.1 for both case scenarios will be followed. In addition to this, Council's PR sections with the Tropical Public Health Unit.

Councils may wish to present additional media releases, separately or jointly as deemed appropriate or necessary.

PART E
ACTION PROGRAMS

Action 1 - Operations

Scope	Inclusions	Present	Actions
Control methods	**Ground based applications**	Currently 85% of the program depending on seasonal demands Larviciding is recognised as the most efficient method of control. Council undertakes a pre-treatment program by distributing Methoprene briquettes and pellets in areas that will be affected by high tides and rainfall. When immediate control is required then BTI is used.	• Continue to review ground based control methods. • Have increased treatment areas. • Identified need to increase the pre-treatment areas and this has been undertaken this year. • Vector Task Calendar has been developed and implemented. • Pre & Post-Dipping is being undertaken and documented. • Introduction of treatment record forms. • The Leading Hand tasks have been reviewed and with the changes in the mosquito teams and areas the Leading Hand role is now much more significant. Continued over page ⇨

Scope	Inclusions	Present	Actions
	Aerial applications	Continue to incorporate this control option as it is an integral part of the overall treatment program.	• Aerial applications have been continued in the early part of the year and will continue. • At this stage no negative impacts have been identified. • Aerial application for mosquito control is an expensive exercise however it is now recognised as an essential part of the treatment program and is producing significant results. • Council's operators continue to work very closely with the helicopter pilot to improve our treatment methods and knowledge of the process and outcome.
	Adulticiding	Adult mosquito control is best achieved through the use of an ultra low volume (ULV) misting machine. Adulticiding is carried out early morning, low winds in densely vegetated known harbourage sites. Usually undertaken during the wet season.	• Continue to identify suitable areas for adulticiding treatments. • Continue to monitor light trap numbers to identify adult mosquito activity. • Trial new products to ensure continued success.
	Vermin baiting	Maintain an integrated approach to vermin control in the City Heart, open drains, refuse and sewerage facilities.	• Continue integrated baited program within City Heart. • Continue to review baiting programs. Continued over page ⇨

Scope	Inclusions	Present	Actions
Monitoring program	**Light trapping**	Approximately 6 hours/week during peak season allows Council to identify mosquito numbers and species found within the city.	• Continue to carry out the weekly light trapping program during the peak season. • Ensure target areas are monitored as required. • Continue to integrate data into the treatment program.
	Ovi trapping	Undertaken to assist Council to establish and identify the presence of Aedes aegypti. Review the benefits of the program as required.	• At this time it has been decided to suspend the ovi trapping program. • Ovi trapping will always remain as an option for dengue response and for the program in general.
	Pre/post dipping	Pre/post dipping is an important part of the treatment program to assist in determining mortality rate/efficacy.	• Continue to incorporate data in the need to determine treatment. • Ensure the pre/post dipping process maintains a mortality rate of 90%. • This is being undertaking to a greater extent and is providing essential information on how the treatment products are working and this data is documented.

PART E
ACTION PROGRAMS

Action 2 - Data Collection

Scope	Inclusions	Present	Actions
Site Identification and characteristics	**Breeding Site Identification and characteristics**	The mosquito breeding areas of the Region have been split into 6 main zones. There are numerous individual sites within these zones.	• Site identification process to be completed (currently 90% complete). • Site identification to be incorporated with the mapping of the breeding sites.
GIS integration	**Mapping Known Breeding Sites**	The majority of the breeding sites and treatment areas has been loaded onto the GIS system.	• Continue to update the treatment sites on the GIS system. • Incorporate treatment data into the GIS system eg. Pre-treatments, aerial treatments.
Treatment Records	**Treatment data**	Continue to operate a simple and accurate treatment recording system. Review light trapping records. Determine necessary data for recording eg. chemical application, Met. Bureau data.	• Continue to improve data recording systems.

PART E
ACTION PROGRAMS

Action 3 - Competencies

Scope	Inclusions	Present	Actions
Staff training	**Mosquito Training**	Presently staff undertake necessary training as determined by program requirements.	• Ensure staff can access ID and mosquito management courses eg. MOZ01 course. • Ensure all staff is provided with in-house training on mosquito management aspects where practicable.
	First Aid	Presently staff undertake necessary training as determined by program requirements.	• Ensure all staff has access to first aid training.
	Vehicle/Driver Safety Courses	Presently staff undertake necessary training as determined by program requirements.	• Ensure staff has access to 4WD quad bike training. • Ensure staff has access to driver safety courses.
	Other Licences and Permits	Staff are required to hold any licence, permit or authority to safely undertake their duties.	• Ensure staff has access to required training eg. chainsaw certificate, pink cards, etc.
Pest Management Technician Licences	**Pest Management Technical Licences**	All staff are required to hold a current Pest Management Technician Licence.	• Ensure all Vector Control Staff have current Pest Management Technicians Licences. Assistance will be provided where required.

PART E
ACTION PROGRAMS

Action 4 - Program Performance Review

Scope	Inclusions	Present	Actions
Legislative compliance	• **EPA Code of Practice** • **Public Health Act – Public Health Risk (Mosquitoes)** • **Pest Management Technician Licences**	Continue to evolve the Vector Management Plan to ensure compliance with relevant legislation.	• Continue to operate under the principles outlined in the Vector Management Plan. • Continue to operate in accordance with Workplace Health and safety requirements and Mosquito Management Procedures. • Continue compliance with relevant statutory legislation.
Budget controls	**Plant and equipment**	Suitable plant is provided within the programs current resources.	• Ensure continued review of plants adequacy. Specific plant and equipment to be replaced regularly. • Ensure laboratory instruments are adequately maintained eg. Microscopes, microscope camera. • Undertake an annual plant review.
	Aerial Larviciding Program	Undertake aerial larviciding treatments as required.	• Continue to ensure aerial larviciding remains an integral part of the mosquito program.
	Pesticides	Pesticides are provided for the treatment program within current resources.	• Identified areas of improvement within the program including operational efficiencies and addition of further treatment sites will demand more pesticides.
	Promotional Brochures	Health & Regulatory Services has developed information brochures on numerous topics including Mosquito Management and dengue awareness.	• Continue to provide information brochures on Council's vector control program. • Provision of ongoing funding, within the Departments Education program.

PART E
ACTION PROGRAMS

Action 5 - Community Awareness

Scope	Inclusions	Present	Actions
Awareness and Education	**Website**	Council's website contains a significant amount of information on Vector Management mainly mosquitoes.	• Health Officers continue to maintain this section of the website.
	Promotional Material	Council provides promotional material in several formats including brochures/handouts, website and awareness prize packs.	• Continue to provide promotional material in all formats. • Increase public awareness of personal responsibilities.
Paid media advertising	**Paid Media advertising**	Major stakeholders in Environmental Health Whitsunday, Isaac, Mackay group (EHWIM). Public education centring on Dengue fever prevention.	• Ensure continued participation in this beneficial committee. • Further develop Mackay Regional Council's proactive dengue fever prevention campaign eg. TV/radio advertising, promotional materials etc.