

An aerial photograph of a park area. A multi-lane road with a median runs horizontally across the middle. To the left of the road is a dark body of water. To the right is a green park with many trees, some of which have yellow autumn foliage. A parking lot with several cars is visible in the lower right. The top of the image features several thick, parallel orange diagonal lines.

City of **Perth**

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# Mosquito Management Plan 2020









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# 1. Introduction

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The City of Perth is the capital city local government of Western Australia. It encompasses the Perth central business district and suburbs of West Perth, Perth, East Perth, Northbridge and Crawley covering an area of just over eight square kilometres. Heirisson Island lying beneath The Causeway in the middle of the river is the main location of the City's mosquito breeding grounds. The southern portion of the island has tidal plains ideal for mosquito breeding. The other location, inherited from the City of Nedlands is Pelican Point. This is a protected bird sanctuary under the control of the Department of Water and Environmental Regulation.

Mosquitoes are common inhabitants of natural wetlands, so their occurrence in constructed wetland systems should be expected. It's also noted that urban development has created more breeding habitats for different species of mosquitoes, such as backyard water tanks, effluent disposal systems, storm water systems, constructed water bodies and engineered wetlands.

Mosquito-borne diseases including Ross River virus and Barmah Forest virus are a growing concern in Australia. Nuisance-biting mosquitoes can have a substantial impact on local residents and tourists. While they may be pests, mosquitoes are also an important component of the local ecosystem. They are a food source for some birds, bats, amphibians, fish and insects; they are pollinators of flowering plants; and play a role in the movement of biomass from wetlands to terrestrial systems. As a consequence, the management strategy to reduce the risk of mosquito-borne diseases requires careful consideration.

This management plan is designed to control the number of mosquitoes and their effects on the population and visitors to the City of Perth. The plan will give guidance to the City on control of seasonal mosquitoes.

Although certain mosquito control methods can pose environmental risks, there are significant benefits including reducing the impacts on public health, and the economy, whilst addressing the nuisance posed by excessive mosquito numbers.

The City liaises closely with key stakeholders to comply with relevant legislation and ensure that there is minimal impact upon the environment.

## 2. Scope of the Management Plan

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This mosquito management plan has been developed to meet the requirements of the Department of Health WA Mosquito Management Program and guidelines to Contiguous Local Authority Groups (CLAGs). The key requirements were to develop a comprehensive plan to gather data on local mosquito populations in a scientific manner with a view to developing maps of “mosquito risk” that may, in turn, form the basis for future site-specific mosquito-borne disease management strategies.

This management plan specifically covers the City of Perth. However, there are large areas of the natural environment that are under the control of other Local Governments. The City is part of Swan & Canning Rivers CLAG as recommended by the Department of Health to manage mosquitoes jointly with the neighbouring Cities of Canning, Melville and South Perth. Mosquitoes dispersing from these habitats can impact the local community. This management plan addresses the risks of mosquitoes dispersing into the community from these habitats, but is not site-specific.

An effective Mosquito Management Plan (MMP) requires the identification and definition of the mosquito problem, determination of practical objectives, the selection of appropriate control measures, procedures for measuring the effectiveness of the mosquito control operations and the establishment of a process for evaluating effectiveness of the management program.

It is not simply possible or environmentally desirable to eradicate mosquitoes as they are an important part of the ecosystem. However, it is possible to achieve a reduction in mosquito populations and the incidence of mosquito borne diseases such as Ross River virus.

The City of Perth MMP has been designed to provide a responsible balance that is acceptable to all stakeholders without being detrimental to people or the environment.

This Management Plan is a continually evolving document which will utilise best practice to achieve the City’s objectives.



## 4. Strategic Implications

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In accordance with The City of Perth Strategic Community Plan (vision 2029+), the MMP aims to satisfy the following goal under the City's Community Plan:

### **"Health and Active in Perth"**

A city with a well-integrated built and green natural environment in which people and families chose a lifestyle that enhances their physical and mental health and take part in arts, cultural and local community events.

## 3. Health Legislation and Other Considerations

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In WA the Health (Miscellaneous Provisions) Act 1911 provides the power to make regulations and by laws in relation to pest or vector management under Part IV (Sanitary Provisions), Part VII (Nuisance and Offensive Trades) and Part IX (infectious Diseases).

Under the Health (Miscellaneous Provisions) Act 1911 and subsidiary legislation, local government has the following responsibilities in relation to mosquito management:

- where required, preparing and implementing management programs for the control of nuisance and disease-carrying insects (e.g mosquitoes) or other arthropods;
- ensuring nuisance or disease-carrying insects breeding on 'non-private' land where such insects impact on residential areas are monitored and managed;



## 5. Management Plan Objectives

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The objectives of this management plan are to:

1. Minimise human vector borne disease and enjoyment of outdoor environments annoyance caused by mosquito outbreaks whilst balancing impacts on the natural environment.
2. Apply best practice mosquito management procedures and regularly review the effectiveness of the MMP in consultation with the Department of Health.
3. Ensure use of multiple treatment agents to protect against mosquito resistance.



## 6. Background and Habitat

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Heirisson Island and Pelican Point have the greatest potential to support significant mosquito breeding within the City's borders. These areas comprise a tidal plain and salt marsh area, both ideal habitats for mosquito breeding.

Within the City of Perth tidal movements and sea conditions are considered to have the single most impact on mosquito breeding. The second most significant factor is considered to be the success of mosquito management within surrounding local government areas. Successful management within surrounding areas minimises the chance of significant outbreaks and the establishment of heavy breeding within the City.

Rainfall events within warmer months, whilst likely to have some impact on mosquito breeding (through stormwater drains, ground pooling etc), is not considered to present a significant risk needing regular monitoring or intervention.

### Specific Mosquitoes

The most prevalent species of concern found at Heirisson Island and Pelican Point are *Aedes vigilax* and *Aedes camptorhynchus*. *Aedes vigilax* is a particularly vicious biting mosquito and has been implicated in the spread of both Ross River virus (RRV) and Barmah Forrest virus (BFV).

Two species of mosquitoes known to breed in man-made environments such as drains, ornamental water bodies, backyards etc are *Culex quinquefasciatus* and *Aedes notoscriptus*.

Both species bite humans, particularly at night and will enter buildings in search of blood meals. *Culex quinquefasciatus* is not known to transmit the common mosquito borne diseases RRV or BFV. *Aedes notoscriptus* on the other hand is known to carry RRV.

Some cases of these are reported in the metropolitan area every year, but in many of these patients have been exposed to infected mosquitoes elsewhere in WA. Over the past 10 years, there have been limited RRV cases reported in City. The average number of mosquito related complaints per annum is 10 cases.



Table – Common mosquito species associated with wetlands, stormwater drains and backyard habitats in City of Perth.

Mosquito Species	Habitat associations	Public Health Risk
<b>SALTWATER</b>		
<i>Aedes vigilax</i>	Tidally influenced saltmarsh.	Vicious biting, important vector of RRV and BFV.
<i>Aedes camptorhynchus</i>	Saltmarsh and brackish wetlands in close proximity to dense urban areas.	Typically greater in cooler months.
<b>FRESHWATER</b>		
<i>Aedes notoscriptus</i>	Small water holding containers around dwellings such as tins.	Regarded as vector of RRV in urban areas.
<i>Culex annulirostris</i>	Fresh water as well as water holding infrastructure and containers.	Proven vector of Murray Valley encephalitis and Kunjin viruses and also implicated in transmission of RRV and BFV.
<i>Culex quinquefascatus</i>	Ground pools, fish ponds or artificial structures containing highly organic water and polluted water.	Vector of West Nile Virus, it is not known as efficient vector of RRV or BFV disease.

## 7. Integrated Mosquito Management

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The traditional concept 'eradication' of mosquitoes by treating habitats with organic insecticides has been replaced by more realistic objective of 'control', where mosquito population numbers are reduced to tolerable or non-threatening level through an integrated mosquito management (IMP) approach.

This method may assist in reducing the reliance on chemicals to minimise mosquito population and the potential of mosquito borne disease. In turn it reduces the environmental impact and is considered more environmentally sustainable and cost effective.

Modern MMPs outline the need for an IMP which at the very least utilises trapping, adulticiding (only in the north of the state),

larvaciding, biological controls and source reduction, as well as incorporating public education/awareness.

It is also paramount that the potential impacts on both the natural environment and humans are understood, to minimise any risks and assist in making more informed decisions.

Mosquito populations will fluctuate from year to year (as well as seasonally) in response to changing environmental conditions. Approaches to mosquito management can be a direct or indirect strategy that includes source reduction, chemical control and biological control. Chemical and biological control strategies are the most appropriate management strategies utilised at Heirisson Island and Pelican Point.





## Mosquito Management in Constructed Wetlands

Mosquito monitoring forms the basis of the MMP in the City. The provision of reliable information on mosquito populations, as well as mosquito-borne disease activity, is crucial in shaping mosquito management strategies. However, it is important to note that monitoring alone does not “control” mosquito populations. Monitoring strategies should be designed to determine the changes in relative mosquito abundance.

To monitor the activity of pest mosquitoes and assess the impact of control strategies, adult mosquito populations will be sampled on a minimum fortnightly basis between September and April. During the winter season sampling is carried out on monthly basis. Increased monitoring will be undertaken during periods of heavy activity.

Adult populations will be sampled using dry-ice baited Encephalitis Surveillance (EVS) traps operated at fixed sites. These traps use carbon dioxide (supplied as either block or pellet dry ice or via gas cylinder) to attract host seeking mosquitoes. Female mosquitoes are attracted to the carbon dioxide, thinking the trap may actually be an animal, a small light serves as a focus and a battery operated fans blows the incoming mosquitoes into a catch bag).

Traps will be set in the late afternoon and collected the following morning. Collections may be influenced by wind and rain but, if appropriate adult trap sites are selected, the influence of these factors can be minimised while optimising mosquito collections. Mosquito monitoring provides important information on the activity of pest species and provide triggers for public health warnings and an assessment of any mosquito control activities.

Mosquito control for constructed land is best achieved by composite methodology, known as integrated control, involving various complementary techniques that are designed to reduce the mosquito habitat or make it unsuitable. This encourages biological regulation of the mosquitoes, and limits or even eliminates the use of toxic pesticides. Features of the design and operational considerations used to mitigate against mosquito production includes:

Manipulating water levels to provide:

- areas of sufficient depth to discourage mosquito breeding;
- constructing bank gradients to discourage development of mosquito habitats;
- preventing development of stagnant pools of water; and
- chemical control.



## 8. Mosquito Management

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### Management Types

#### BIOLOGICAL

The constructed wetland in Queens Gardens and the Freeway interchange are stocked with native Australian fish to increase the natural predation of mosquito larvae.

The natural wetland at Pelican Point and naturally mimicking wetland at Heirisson Island are to be treated with biological control agent BTI Vectobac G.

This agent contains the naturally occurring soil bacterium *Bacillus thuringiensis israelensis* (Bti) and produces a protein crystal which contains a number of microscopic protoxins that when ingested are capable of destroying the gut wall and killing mosquito larvae. This is the most common larvicide used in Australia and despite broad scale use in many estuarine and freshwater habitats with no direct or indirect non-target impacts having been reported. BTI is applied in the City's wetland area if larval activity is observed in a specific area to prevent mosquitoes reaching adulthood.





## PHYSICAL CONTROL

The City will monitor its stormwater drains for water retention and blockages so that breeding in stormwater drains are minimised.

## AQUATIN

Aquatin AMF Liquid Mosquito Film (Physical): is a unique silicone based liquid for mosquito control. It spreads across the surface of standing water even large water bodies and forms a very thin film. As silicones have a very low surface tension, the film prevents pupae and larvae from attaching themselves at the surface while attempting to breathe, thereby causing them to drown. The product has a purely physical action and does not contain any toxic chemicals. Aquatin AFM method of mosquito is applied in the City's storm water drains if larvae activity is observed.

## CHEMICAL CONTROL:

The City uses registered chemicals designed to reduce the breeding cycle of mosquito larvae (larvicides) on the advice from the Department of Health.

In a situation where there is an outbreak of vector born disease or when instructed by the Department of Health, the City may use pesticide fogging (Adulticides). Fogging close to the River will require permission and authorisation from the Swan River Trust. It is the least preferred treatment method due to cost and limited effectiveness.

The City currently uses the following larvicides:

### Prolink XR Briquettes (S-methoprene)

Prolink is a synthetic insect growth regulator that mimics the juvenile hormone produced by insect endocrine systems. When absorbed by the larvae, development is interrupted and immature larva fail to successfully develop to adults, usually dying in the pupal stage. This product is commonly used in Australia, particularly in highly organic rich environments (e.g. waste-water treatment ponds, drains, septic tanks) where B.T.I. may not be as effective. There are commercial sustained release formulations of this product available that may provide residual control of mosquitoes for up to three months.

Chemicals are to be applied in accordance with the manufacturer's specifications and safety data sheets (SDS).

## City of Perth Specific Treatments

### CONSTRUCTED AND NATURAL WETLANDS (HEIRISSON ISLAND AND PELICAN POINT)

The main method of treatment is application of Vectobac at the rate of 300-500g per hectare. This is administered by hand using a calibrated spreading machine.

The use of XR Briquets (S-methoprene) at Heirisson Island is restricted to use when monitoring cannot be done at the required interval due to unplanned staff leave. Briquettes are applied in fixed dispensing

bait stations located in the salt marsh area 3.2 metres apart (on a fixed location float system). When flooding occurs the briquets slowly releases S- methoprene into the water system. The effectiveness of the treatment typically lasts for 2-3 months until they need replacing.

### **STORMWATER DRAINS**

Treatment of artificial water catchments and stormwater drains are done only when larval presence is identified. BTI is the preferred treatment method for large catchments, with Aquatin reserved for small catchments such as stormwater drains and soakwells.

### **POINT FRASER**

Point Fraser is a public recreation reserve of 6.13 hectares located on Swan River foreshore in East Perth (see Figure 2).

The redevelopment of Point Fraser began in 2002 with the objective of significantly enhancing the recreational use of the area, whilst respecting the intrinsic values and sensitivities of the site and the Swan River landscape.

Some of the features include a constructed wetland to treat stormwater from an urban catchment prior to its discharge to the Swan River. Designed to mitigate flooding with vegetated swales to infiltrate and treat stormwater on site. The site has been identified as a negligible risk area for mosquito breeding.

*Figure 2 – Point Fraser*





## Monitoring

This is considered the most critical aspect of the management plan. Effective monitoring enables effective treatment and ensures that over treatment doesn't occur.

An Environmental Health Officer/Assistant from the City of Perth is required to attend breeding habitats as per the following schedule:

1. All year round – within 2-3 days (weekend dependant) of tide and sea height trigger levels being reached (see Appendix 1 for trigger heights) – this ensures that Vectobac BTI treatment can be applied at the right stage of the mosquito lifecycle 1st to early 4th instar (300g per hectare for 1st to 3rd instar and 500g per hectare for 3rd to early 4th instar larval stage).
2. Until water subsides, must attend every 4 days to verify treatment effectiveness (kill rates) and reapply treatment if required.
3. Irrespective of 1, must attend every 2 weeks (14 days) during September to April to:
  - a. observe for larval activity;
  - b. set up mosquito traps late afternoon – see figure 3.
4. Recover mosquito traps early morning every 15 days. Captured mosquitoes are frozen, identified, counted and the data is recorded.

Figure 2 – Point Fraser Figure 3 – mosquito



## Resourcing

### HUMAN RESOURCE

- Environmental Health Officer; and/or Environmental Health Assistant.

### BUDGET

The budget for mosquito management needs to include the following expenditure and is to be adjusted annually dependant on the previous financial year demands (there can be considerable variation on resourcing required from year to year):

- Officers Salary
- Purchase of larvicides and equipment (PPE)
- Purchase of dry ice
- Vehicle maintenance and fuel expenses.
- Mosquito Mgt Course to be repeated by responsible officers every 5 years at minimum.

### EQUIPMENT/RESOURCES

- Vehicle
- Vectobac spreader
- Microscope
- Mosquito Traps
- Ladles
- Stakes, floats and crab bait holders (for Prolink Briquette usage only)

### SAFETY

- Safe work method statements (SWMS) – see Appendix 5 (162705/18)
- St John First Aid Kit
- Working in pairs in remote/isolation locations
- Safety Clothing (high visibility vest, rubber boots, gloves, sun glasses, disposable masks, disposable overalls, trousers, long sleeve shirts, Hats sun screen cream and mosquito repellent, two-way radio, spotter/2nd person)
- Safety Data Sheets (SDS) for all chemicals used

### TRAINING

- Mosquito Management Course (Department of Health)
- Pesticide Management and Safety/Hazmat
- Senior First Aid Course
- C Class drivers' licence
- Internal Health and Safety awareness course

### PUBLIC AWARENESS

The City of Perth, in conjunction with Department of Health WA and CLAG partners, will provide information to residents and developers to mitigate mosquito breeding. Information on mosquitos will be distributed to residents. The current program 'Fight the Bite' is used as a resource to communicate with the public: ([ww2.health.wa.gov.au/Articles/F\\_I/Fight-the-Bite-campaign](http://ww2.health.wa.gov.au/Articles/F_I/Fight-the-Bite-campaign)).



## 9. Contiguous Local Authority Group

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### INFORMATION GATHERING

The City gathers information on mosquito numbers, trapping locations, treatment performed, complaints received, public comments and notifiable diseases to present to CLAG on a bi-monthly basis. The information gathering and record keeping will form justification for funding application as part of the CLAG.

### STAKEHOLDERS

For the City of Perth to achieve its objectives, it is necessary to liaise with the following stakeholders

- Department of Health WA
- Department of Waters and Environmental Regulation
- Swan River Contiguous Local Authority Group

### LEGISLATION

*City of Perth Health Local Law 2000,  
Part 6 Pest Control Sections Division 2*  
*Public Health Act 2016*  
*Health (Miscellaneous Provisions) Act 1911*  
*Environmental Protection Act 1986*

The Swan River Contiguous Local Authority Group (CLAG) has been established under the Mosquito Control Advisory Committee (MCAC) which is coordinated by Department of Health WA.

The CLAG consists of six local authorities City of South Perth, City of Canning, City of Melville, City of Nedlands, City of Belmont and the City of Perth. This enables a regional approach to vector borne disease management.

The WA Department of Health provides mosquito control training, funding of up to 50% of the CLAG's larvicide purchases, as well as compiling data on notifiable diseases and environmental information to assist the CLAG in their treatment programs.

All CLAG members are required to sign a Memorandum of Understanding (MOU) and have a current Mosquito Management Plan (MMP) in place which is endorsed by the Department of Health.

The CLAG collated information from its members to aid in public consultation and measure the effectiveness of mosquito control measures.

# Appendix 1 – Mosquito Management Action Plan:

Monitoring Task	Frequency	Trigger	Action	Duration of treatment	Expected outcome
<b>Review</b> Department of Transport-Marine- Tide Predictions website	<b>Weekly</b>	Tides of >1.2m with seas <2m; or Tides of >0.8m with seas >2m.	<ul style="list-style-type: none"> <li>Visual inspection of site within 2-3 days of tidal/ seas event to assess water pooling</li> <li>Do larval dipping if pooling and larvae present and larvae present.</li> </ul>	Weekly until pooling subsides.	Early detection.
<b>Larval dipping</b>	<b>Fortnightly</b> (Sep-Apr)	Significant increase in average number of larvae per dip	<b>Hierisson Island =</b> Treatment with Vectobac as per label rates.	Weekly until pooling subsides	Reduction in larval numbers.
	<b>Monthly</b> (May-Aug)		<b>Pelican Point =</b> Treatment with Vectobac as per label rates where practicable. Alternatively use S-Methoprene briquettes distributed at 3.2m apart for water depth up to 30cm.		
<b>Adult Trapping</b>	<b>Fortnightly</b> (Sep-Apr) <b>Monthly</b> (May-Aug)	Significant increase in average number of adults per trap (150 biting mosquitos and larval presence is threshold level to commence first treatment of season)	Treatment with Vectobac as per label rates	Reduce current mosquito larvae (from 2nd to 4th instars)	Significant reduction in adult numbers (to less than 150 biting mosquitos at minimum)
		No change or decline in the number of adult mosquitoes	Nil further action	-	-
<b>Vegetation monitoring</b>	<b>Fortnightly</b> (Sep-Apr)	Veg density significant increase, leading to protection of mosquito larvae, predators and reduction in water movement	<b>Heirisson Island</b> Request to City of Perth - Parks team for weed removal/thinning.	Until it grows back.	Reduction in larval numbers.
	<b>Monthly</b> (May-Aug)		<b>Pelican Point</b> Make recommendation to DWER to thin vegetation. City of Perth not to undertake any ground or vegetation works to area.		



## Appendix 2 – Mosquito Sampling Locations



● *Mosquito trapping (sampling) locations*

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