



PORT PIRIE REGIONAL COUNCIL

MOSQUITO CONTROL PLAN

2023 - 2028



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1. INTRODUCTION

Purpose of the Mosquito Control Plan (MCP)

The purpose of this MCP is to;

- Highlight the significant threat mosquitoes represent to Public Health & Wellbeing,
- Identify the species and characteristics of mosquitoes relevant to the area, and
- Highlight the measures Council employs to protect the Community from these pests.

Background

Based on studies conducted by the University of South Australia beginning in 2001 until April 2004, a MCP has been operated by the Council, usually between September and April of each year. The program provides both short and long term benefits to the community by;

- Identifying mosquito breeding sites to enable control measures to be taken either immediately or, recommendations made for engineering works to prevent further breeding,
- Measuring mosquito species and numbers to allow assessment of public health risk,
- Raising community awareness about mosquito and disease transmission,
- Providing long term data to enable joint initiatives between the Council and relevant key stakeholders to implement common strategies to reduce the incidence of mosquito borne diseases.

This MCP has been guided by, and aligned with the South Australian Arbovirus and Mosquito Monitoring and Control Plan, which provides the framework for the state-wide strategic management and control of mosquitoes and mosquito borne diseases, and provides the basis for this MCP.

Key Stakeholders

Given that mosquito management is coordinated through Local Government by the South Australian State Government, the key stakeholders relevant to this plan are;

- Government of South Australia – SA Health
- Council Development & Regulation Department – Environmental Health Officer
- The Community
- Preferred Pest Control Contractor

2. LEGISLATION, PLANS & GUIDELINES

Relevant Legislation

- The South Australia Public Health Act 2011 & Regulations
- The Local Government Act 1999
- The Port Pirie Regional Council, Environmental Health, Regional Public Health Plan
- Agricultural and Veterinary Products (Control of Use) Act 2002 & Regulations 2004
- The Environment Protection Act 1993 - Section 25
- The EPA Guidelines for Responsible Pesticide Use

Work Health & Safety (WHS) – Safe Work Procedures

Given that most methods of mosquito control involve insecticides or potentially hazardous chemicals, WHS is vital in protecting contractors and the workforce from potential adverse health risks.

3. MOSQUITO ECOLOGY

Mosquito Life Cycle

The mosquito life cycle is composed of four distinct stages of growth: egg, larva, pupa and adult (Figure 1). The initial stage of the life cycle begins when the adult female lays eggs. The eggs develop into an immature aquatic larval stage which requires four moults to reach the pupal stage. Once development is complete, the adult mosquito emerges from the pupa and the life cycle can replicate again.

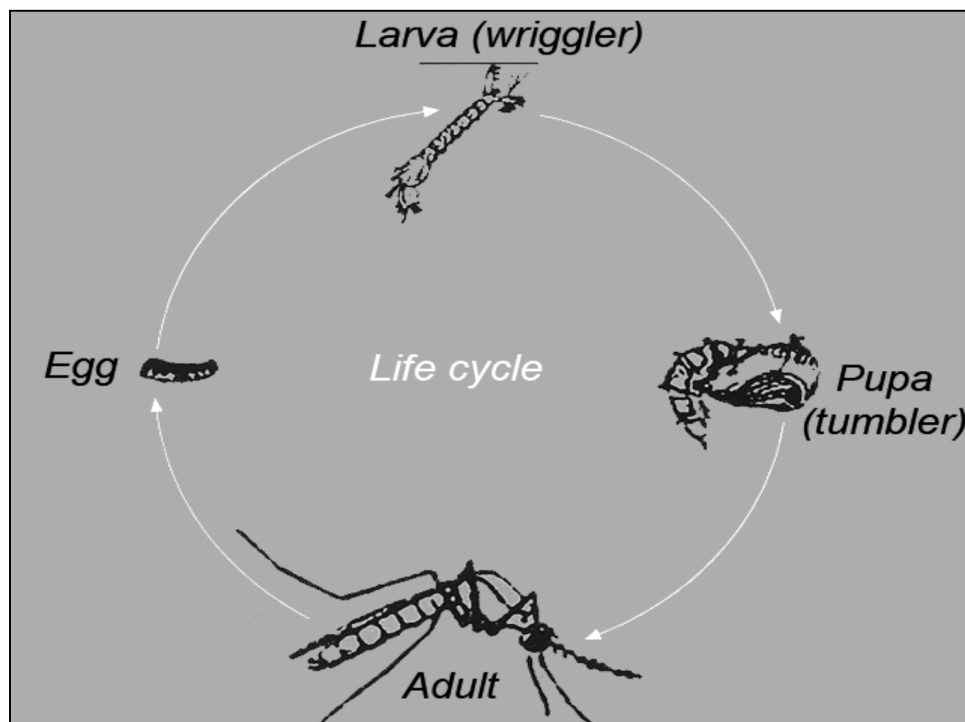
Eggs - Mosquito eggs vary in characteristic and location depending on the species type. *Ochlerotatus* species lay their eggs on a moist substrate (e.g., earth, rocks, vegetation base) whereas *Culex*, *Anopheles* and *Coquillettidia* species deposit their eggs on the water surface. Generally eggs will hatch around 2-4 days after laying although this period can vary depending on the species type and environmental conditions.

Larvae - The mosquito larval stage is dependant on an aquatic habitat to progress in development to the pupal stage. The larval habitat is selected by the female mosquito depending on physical and chemical parameters of the site including the water type before the eggs are deposited. Fresh, salt, brackish and polluted water sources are all utilised by differing mosquito species. Once hatched from the eggs, larvae progress through four instars where the outer skin is shed in between each stage to increase in size. Larval stage development varies with environmental conditions, specifically temperature, but commonly takes 5-10 days to complete.

Pupae - The pupal stage begins after the moulting of the fourth instar when the immature tissues begin to break down and form adult tissue within the pupa casing. This mobile stage generally takes 2-3 days but can take longer depending on temperature. Before the pupa emerges from its casing, it rises to the surface of the water and becomes immobile. The adult mosquito emerges to stretch and dry out body parts that have been folded in the casing before flying off.

Adults - Both male and female adult mosquitoes will seek out a meal of nectar or plant juices following emergence. Mating occurs quickly and the female now requires a blood meal (protein source) to produce eggs. The blood source varies with the species type and availability but commonly involves a variety of mammals including humans and bird species. Males are short lived and will continue to feed on plant nectar and juices without seeking a blood meal while females continue the cycle of blood feeding, egg laying and development.

Figure 1 – Mosquito Life Cycle



4. MOSQUITO SPECIES FOUND IN THE PORT PIRIE REGIONAL COUNCIL AREA

Based on research undertaken by scientists from the Mosquito Research Laboratory, of the University of South Australia, the following table summarises the species of mosquito commonly found in the region, their preferred breeding sites and their potential to spread disease

SPECIES	DISTRIBUTION	BREEDING SITES	PERIOD OF ACTIVITY	POTENTIAL DISEASE TRANSMISSION
<i>Ochlerotatus camptorhynchus</i>	Typically a coastal species but also known to occur in inland riverine areas with a brackish influence such as the lower Murray Valley; regional distribution in the South East.	Brackish to fresh ground pools associated with coastal swamps and bushland but also salinity affected areas.	Vicious biters day and night.	Known laboratory vector of Ross River Virus (RRV), Murray Valley Encephalitis (MVE), and dog heartworm.
<i>Ochlerotatus notoscriptus</i>	Domestic distribution but also in forested areas with tree-holes and/or rock pools; regional distribution in the Murray Valley and South East.	Tree-holes and rock pools in creek line environments, artificial containers in domestic environments.	Readily attack by day in shaded areas but will also bite during early morning, evening and night.	Major domestic pest species, known laboratory vector of MVE and RRV and important vector of dog heartworm.
<i>Ochlerotatus vigilax</i>	Gulf coastal and saline river areas; regional distribution in the Murray Valley and South East.	Temporary brackish ground pools left in mudflat/marshland depressions, occasionally in deeper pools and within mangroves and often behind mangrove areas.	Attack mainly during the day in sheltered areas but will also bite during the evening and at night. Readily attack at all times in full sunlight near larval habitats	Major coastal pest species, laboratory vector of MVE, RRV and dog heartworm.
<i>Culex molestus</i>	Widespread; regional distribution in the Murray Valley.	Typically suburban sewage ponds, septic tanks, foul ground and container water and drainage pits.	Attack readily at night.	Can be a serious domestic pest, laboratory vector of MVE.
<i>Culex quinquefasciatus</i>	Widespread in urban areas; regional distribution in the Murray Valley and South East	Near human habitation in man-made containers such as septic tanks, water tanks, wells, tyres, gutters and discarded containers.	Tend to bite more towards the middle of the night.	Can be a significant domestic pest, laboratory vector of MVE although appears to be a poor vector of arboviruses and heartworm in general.

5. MOSQUITO HABITATS

Mosquitoes breed in standing water whether it is fresh, salty or stagnant. Therefore any water body can act as a mosquito breeding ground. Mosquitoes often breed in puddles and water-holding containers such as old tyres, bathtubs, drums, fish ponds and pools. The identification and removal of such potential breeding sites is an important part of ensuring that mosquito populations do not grow to undesirable numbers. Although some natural water courses such as rivers and wetlands may provide habitat and breeding grounds for mosquitoes, most are dominated by predators such as fish, amphibians and various adult and larval insects that limit the growth of large numbers of mosquitoes.

Mosquitoes and Wetlands

Wetlands (natural and man-made) are often perceived to be mosquito breeding grounds however well designed and maintained wetland systems are generally not associated with an increase of mosquitoes. Healthy wetlands support a balanced ecosystem and encourage predators to keep mosquito numbers in check as part of natural food chain processes.

Man-made or artificial wetland systems are commonly constructed to control and treat stormwater and wastewater. During the initial planning and development stages, it is possible to design the wetland system in a way that makes it less attractive to mosquitoes. It is therefore

important for Engineers, Planners and other professionals involved in the design/construction process to be aware of and address mosquito-related issues.

Mosquitoes and Surface Irrigation Waters

Irrigation water used for agricultural production has the potential to result in mosquito breeding grounds through the following mechanisms; water storage systems, water delivery/drainage systems, or the area of land receiving the water. The extent to which irrigation will impact on mosquito presence may vary according to the specific method applied to an area, e.g.

Flood irrigation – occurs when large amounts of water inundate an area of land. This method has the potential to create mosquito habitat but situations where the water evaporates, drains or is moved elsewhere within a five day period will prevent significant breeding.

Drip Irrigation – small amounts of water are delivered via a dripper system to the base of individual plants where the water is quickly absorbed into the soil. This method, if operating correctly, is unlikely to contribute to mosquito breeding.

6. HEALTH IMPACTS OF MOSQUITOES

Mosquito-borne Disease

During blood-feeding, the female mosquito is able to become infected with pathogens circulating in the bloodstream of the meal source or pass on pathogens carried from a previous blood-feed. These pathogens require a period of time to multiply and develop within the mosquito before they can be transmitted to a new vertebrate host through the salivary glands during feeding. Mosquitoes are therefore known as vectors of disease.

Mosquito-borne organisms capable of causing disease in humans can be grouped into three categories: protozoan blood parasites, filariasis and arboviruses.

Category 1: Protozoan Blood Parasites – Malarial disease in humans is the result of infection by a protozoan blood parasite (*Plasmodium*) that is transmitted by *Anopheles* mosquitoes. There are four species of the genus *Plasmodium* and human infection results most commonly from the species *P. falciparum* or *P. vivax* and the blood parasites are transferred from an infected mosquito during blood feeding. These sporozoites initially invade the liver cells, progressively moving into the red blood cells and other organs such as the brain and kidneys.

Category 2: Filariasis – There are three filarial nematodes that are transmitted to humans by mosquitoes although only one, *Wuchereria bancrofti*, has been detected in Australia. The parasite circulates in the bloodstream of an infected human where it is transmitted to a mosquito during blood-feeding. The immature parasitic worm develops in the mosquito for approximately two weeks before moving into the mouthparts in an infective state. Subsequent blood-feeding by the infected mosquito enables the parasite to invade a new human host where it further matures and infests the lymphatic system, resulting in a variety of symptoms including swollen limbs. Filarial worms also infect a variety of native and domestic animals. Dog heartworm is caused by *Dirofilaria immitis* and infection is now considered to be endemic in mainland Australia.

Category 3: Arbovirus – An arthropod-borne virus transmitted from an infected to susceptible vertebrate host via arthropods such as mosquitoes, ticks and flies. Arboviruses associated with human disease in Australia are classified within the family *Togaviridae*, genus *alphavirus* (Group A), Ross River Virus and Barmah Forest Virus, or *flavivirus* (Group B), Murray Valley Encephalitis.

Group A:

Ross River Virus (RRV) is an infection caused by an alphavirus and is the most commonly transmitted arbovirus in South Australia. The virus was first isolated from the mosquito species *Oc. vigilax* near Ross River in Townsville in 1959.

The primary vectors of RRV in South Australia are *Cu. annulirostris* (inland regions), *Oc. vigilax* and *Oc. camptorhynchus* (coastal mangrove/saltmarsh regions).

Common symptoms of RRV infection include a rash, joint and muscle pain, swelling or stiffness and flu-like symptoms including fever, chills, headache and tiredness or weakness. RRV is not fatal and infection is thought to result in immunity thereafter. Symptoms become evident 3-11 days after infection and diagnosis is made through a series of blood tests. Most people recover completely from the disease within a few weeks but sometimes symptoms such as joint pain and tiredness persist for several months. Currently there is no vaccine available to protect against RRV infection nor is there specific treatment for the disease.

Barmah Forest Virus (BFV) is an infection caused by an alphavirus and was first isolated from the species *Cu. annulirostris* collected from Barmah Forest (near the Murray River) in northern Victoria in 1974. Mosquitoes of the same species collected from south-west Queensland were also found to be carrying the virus at this time. BFV has been isolated from other species including the saltmarsh mosquitoes *Oc. vigilax* and *Oc. Camptorhynchus*.

BFV has been recorded in all states of Australia and the incidence of infection appears to have increased in recent years.

The symptoms of BFV are very similar to those associated with RRV, ranging from subclinical infection to arthritis, fever and rash following an incubation period of 7-10 days. Recent studies have indicated that a rash is more commonly associated with BFV while arthritic symptoms are greater in RRV infections.

BFV is detected through a significant rise in antibody titre to the virus in blood samples. BFV is not fatal and most infected people will recover within a few weeks, although symptoms such as tiredness and joint pain can persist for several months. There is no vaccine currently available to protect against the disease.

Group B:

Murray Valley Encephalitis: (MVEV) is a flavivirus that has the potential to cause severe human disease. MVEV was first isolated from fatal encephalitis cases in 1951 in Victoria and South Australia.

Since 1974, nearly all cases of the disease have been reported from the Northern Territory and Western Australia. The most recent case of MVE in South Australia was recorded in 2000 in the far north of the State.

Water birds are recognised as the primary hosts of MVEV, with the night heron being a major vertebrate host of the virus. The freshwater breeding mosquito *Cu. annulirostris* is the major vector of the virus and is known to be widely distributed in South Australia, particularly the Murray Valley.

MVE commonly infects humans without producing disease (subclinical infection). However, in some cases symptoms include headache, nausea, fever and vomiting. Severe cases can result in coma or fatality due to the involvement of the central nervous system and the progression of encephalitis. Symptoms such as confusion, drowsiness and convulsions usually indicate the onset of encephalitis.

In cases of disease, the onset of MVE is usually evident within 7-28 days of infection with the virus and detection requires a series of blood tests. Infection with the virus produces life-long immunity. No vaccine is currently available for protection against the disease.

7. CLIMATE CHANGE AND MOSQUITOES

Global climate change is expected to have wide-ranging consequences on the quality of human health although its effects will vary in complexity, scale, directness and timing.

Higher global temperatures may lead to an increase in the transmission rates of certain mosquito-borne diseases, an extension of geographic ranges and seasonal numbers of certain mosquito species and perhaps the acceleration of pathogens developing in certain species. These factors may be particularly relevant with regard to the following diseases;

Ross River Virus

Unlike other mosquito-borne diseases, RRV can potentially be transmitted by a variety of species across a wide area of Australia. Therefore the effects of climate change are likely to vary by geographical region. Rising temperatures alone are unlikely to have a significant impact on the transmission rate of RRV but coupled with a predicted change in rainfall patterns, the rate of spread of the disease is likely to increase throughout Australia.

Dengue

It is possible that the distribution of the species *Ae. aegypti* will increase within Australia with the progression of global warming. At present this mosquito is restricted to Queensland, however climate change modelling has predicted that based on climate factors alone, dengue transmission will increase due to the increased dispersion of this mosquito to previously colder climates.

Malaria

Climatic modelling has indicated that there is a possible risk of the Australian malaria receptive zone spreading southwards from far north Northern Territory and Queensland with an increase in average temperatures. However, with continued effective public health practices to promote protection, prompt treatment of identified cases and vigilance in preventing re-establishment, malaria is not viewed as a direct threat to Australia in the foreseeable future.

8. MOSQUITO SURVEILLANCE

Mosquito surveillance plays an integral role in mosquito management and is undertaken to monitor mosquito populations in a given area. Surveillance allows pest and vector mosquito species to be identified and also provides a means to monitor abundance and fluctuations in populations over time.

Larval Sampling

Larval sampling is often undertaken as a component of a mosquito surveillance and control program. Larval surveillance enables aquatic breeding grounds to be identified and seasonal fluctuations in breeding determined. Larvae are collected from their aquatic habitat using a ladle, tube or pipette.

The information obtained from larval sampling can be used to determine the optimal times for larvicide application. When used in conjunction with adult trapping, larval sampling can provide an effective means of determining the efficiency of a control program. If larval sampling indicates that larvicide control has been effective yet adult numbers are not declining, unidentified breeding grounds are implied and need to be located.

9. PROTECTION PRACTICES TO AVOID HEALTH AND NUISANCE IMPACTS

The first line of defence in protection against mosquito-borne disease is to avoid mosquito prone areas. As this is not always possible or practicable, personal and household protection measures are the next best line of defence in the avoidance of mosquito bites and mosquito-borne disease. Practices currently promoted include:

Personal Protection

- Wearing loose-fitting, light-coloured clothing covering as much as the body as possible
- Using an insect repellent containing DEET (diethyl toluamide) or picaridin on uncovered skin
- Protecting rest and sleep areas with mosquito nets
- Avoiding times of peak mosquito activity – some mosquito species will bite during the day but many are particularly active for two to three hours around sunrise and sunset

Household Protection

- Ensuring pot plant drip trays are emptied at least once a week or are filled with sand

- Ensuring all windows and openings of houses, boats, caravans and tents are fitted with fine (1mm) insect screens
- Ensuring rainwater and septic tank openings, wells or other large water containers are covered with wire mesh no coarser than 1mm
- Appropriate disposal of rubbish: emptying, then covering or puncturing containers that may hold water
- Stocking ornamental ponds and other man-made water bodies with small Australian native fish to eat any wrigglers

Nuisance Impacts

While nuisance mosquito biting represents a much lower risk to human health than the transmission of arbovirus, pest mosquitoes present risk to the general well-being of an individual, and often the wider community. Particularly if it is perceived that the threat of disease is increased.

Nuisance biting can cause discomfort and result in secondary bacterial infections due to continued or prolonged itching of the bite site. Allergic reactions to the saliva injected during mosquito blood feeding can result in raised, red welts that persist for some time.

Appropriately disinfecting swimming pools and ensuring unused swimming pools are emptied or stocked with small Australian native fish

- Ensuring roof gutters are kept in good repair and that leaves and debris are removed regularly so that pools of water do not form
- Ensuring bird baths, stock troughs and pets' drinking water are emptied and refilled at least once a week

Community Protection

- Mosquito population and disease surveillance programs
- Mosquito control programs where necessary
- Promote community awareness of personal and household protection measures against mosquito bites
- Appropriate planning and development processes that identify and address mosquito related issues

Planning Controls for Integrated Mosquito Management Principles

Strive to balance both health and environmental interests through incorporating consideration of the potential impacts of mosquitoes throughout the planning and risk management process.

Eliminating / Reducing / Avoiding Risk using:

Planning Controls

- Preventing the creation of potential 'new' breeding sites during construction and infrastructure development, through the appropriate design of permanent or temporary retention/detention basins.
- Consideration given to the appropriate location of 'people-intensive' development and activities such as residential areas, schools, hospitals, child and aged care facilities, light industry, tourism, and recreational.
- Consideration given to the location of animal intensive areas and development or activities, such as feed lots, or stock farms.
- Zoning to help protect the community against inappropriate development and activities, such as avoiding people-intensive development in close proximity to mangrove/salt marsh regions.

Administrative Controls (legislation, policy & guidelines.)

- Planning/activity approval in high-risk areas dependent on developer/tourism operator undertaking a risk management/IMM plan, including provisions for long-term funding where

necessary, e.g. compulsory insect screens to be installed and developer to identify means of funding on-going mosquito management/control measures if development/activity is to go ahead in an identified high-risk/mosquito-prone area.

- Penalties for existing breeding sites or the creation of potential new breeding sites, e.g. through the “General Duty” provisions of the Public Health Act.

Engineering and Design Controls

- Source mitigation through appropriate and adequate design and maintenance of stormwater management systems and consideration of surface water implications such as irrigation and tidal inundation.
- Forward design consideration to avoid negative mosquito impacts such as the inclusion of appropriate lighting and vegetation screens.

10. DETERMINING THE NEED FOR MOSQUITO CONTROL

The decision to undertake mosquito control should only be made following careful consideration of all the factors involved. Mosquito management is primarily undertaken to protect the health of the community through reducing the risk of arbovirus transmission. However there are several other factors which contribute to the principles of mosquito management including;

- Nuisance
- Community Perception of Risk
- Amenity
- Economic Loss
- Environmental Impact

An integrated mosquito management program aims to assess these factors to ensure that the most suitable approach is adopted on a case-by-case basis.

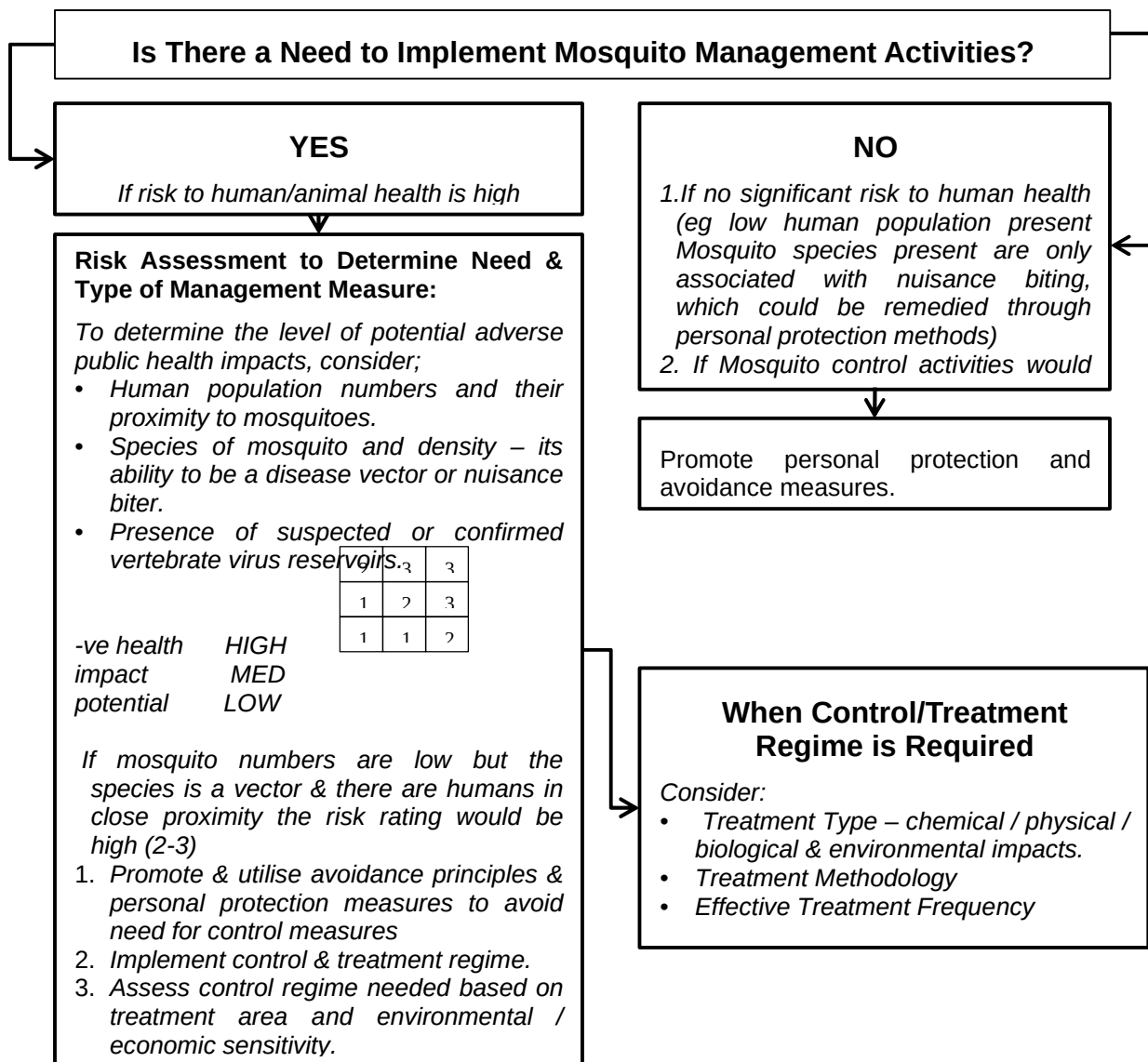
During the larval stage of their life, mosquitoes live in water habitats, many of which may represent an area of environmental significance. The aquatic habitats and breeding grounds of mosquitoes can vary greatly, although many are natural or artificial wetland regions. These ecosystems can be varied and quite complex, therefore it is important to consider the implications of mosquito management across the entire ecosystem.

Certain aspects of the supporting environment may be unknown in relation to mosquito management, for instance effects of chemical control on off-target species, the effects of runnelling or other means of physical modification. Where the implications involved in the proposed mosquito management are unidentified, due care must be taken to ensure that environmental safeguards are applied and that the best practice control method for that particular region is selected.

While it is not feasible or environmentally responsible to attempt to eliminate all mosquitoes it is sometimes necessary to reduce numbers in an effort to decrease the risk of arbovirus transmission. The following model can be utilised in determining the benefit of mosquito control in specific situations and localities.

Integrated Mosquito Control & Management Model Principles:

- Avoid human and domestic animal presence in mosquito-prone areas, where possible, to minimise exposure.
- Utilise personal/household protection measures to reduce the risk of mosquito bites and mosquito-borne disease, including promotion of the concept of ‘living with mosquitoes’.
- Only control / treat when avoidance and protective measures do not effectively protect human / animal health or wellbeing.
- Minimise impact to the environment and the economy of any control/treatment measures implemented.



11. BEST PRACTICE MOSQUITO CONTROL METHODS

All chemicals have the potential to create adverse human and environmental effects and it is important to recognise the need for careful consideration of the anticipated benefits versus the negative impacts as shown in the aforementioned model. If chemical control is deemed necessary, chemicals must be used in accordance with the *Agricultural and Veterinary Products (Control of Use) Act 2002* and its associated *Regulations 2004*, which aims to provide a clear framework for the use of chemicals in a responsible manner based on knowledge, skill and responsibility.

A general duty of care is mandated in Part 2 of the Act in which a person who uses or disposes of agricultural and certain veterinary chemical products must exercise all reasonable care to prevent or minimise harm to the health and safety of humans and the environment. This duty of care is extended to the prevention/minimisation of land, plant and animal contamination outside of the intended treatment area in the case of agricultural chemical products.

The fate of the pesticide on the receiving environment must also be considered. The EPA *Guidelines for Responsible Pesticide Use* are a guide for users to be aware of the key principles for environmentally sound pesticide use and pesticide regulation in South Australia. In addition, Section 25 of the *Environment Protection Act 1993* dictates a 'general environmental duty' in

which everyone has a responsibility to take all reasonable and practicable measures to avoid causing environmental harm.

What could be considered to be “best practise” chemical mosquito control methods is constantly changing, both in terms of which chemical agents are available for application to a particular circumstance as well as environmental safety and work place safety. To ensure that best practice methods are always in place, that take these factors into consideration, the Port Pirie Regional Council contracts the implementation of its mosquito control program to a reputable and certified pest controller. The Environmental Health Officer conducts seasonal meetings with the Pest Controller to ensure that relevant areas are being treated, new treatment areas are clearly identified and that any special events can be accommodated if they occur outside of normally treated areas.

Physical Control - Land Modification Solutions

Physical control of mosquitoes is achieved through environmental modification to decrease or eliminate the habitat of mosquito larvae. Several methods of physical mosquito control are possible including;

- Environmental Modification – an alteration of habitat characteristics such as pH or vegetation load to render it unsuitable for mosquito breeding,
- Water Management - making water bodies unsuitable for mosquito habitation through methods such as runnelling (trenching), ditching or adjustment of depth,
- Filling - larval habitats are filled in or covered with sand, earth or other material to eliminate the topographical depression that, once filled with water, can act as a breeding ground for mosquitoes
- Draining - drainage of the habitat so it no longer supports mosquito larvae including open ditching, gravity drainage and installation of tidal gates.

Mosquito Repelling Plants

There are many garden plants that have been identified as exhibiting potential mosquito repelling properties. Plant species containing essential oils that reportedly have some form of repellent activity include; citronella, cedar, verbena, pennyroyal, geranium, chrysanthemum, lavender, pine, cinnamon, rosemary, thyme, garlic and peppermint. Most of these essential oils, extracted by crushing the plants leaves, give short-term protection of up to two hours when applied as a personal insect repellent.

In addition, there is a grass *Cymbopogon* spp. (native Lemongrass) in South Australia is also thought to have repellent properties due to the high citronella content of its leaves.

12. IMPLEMENTATION PROCEDURES

The Environmental Health Officer coordinates the Mosquito Control Program, which includes;

- Periodically (4 yearly) reviews and updates the Mosquito Management Plan,
- Processing & logging of Customer Requests and complaints,
- Compiling & annually updating the Mosquito Treatment Site Register & Maps,
- Facilitating appropriate budgeting for the Program,
- General Contractor Management associated with the Program Service Provider,
- The submission of Annual Reports and Subsidy Applications to all relevant internal and external parties.

13. MOSQUITO INTERNET RESOURCES

Further information related to Mosquitoes and Mosquito Management can be found at the following websites;

The National Arbovirus and Malaria Advisory Committee (NAMAC - a sub committee of the Communicable Diseases Network Australia)

- Provides information on mosquito borne disease statistics
- National overview of mosquito, human and virus surveillance
<http://www.health.gov.au/internet/main/publishing.nsf/content/cda-arboanrep.htm>

Mosquito Control Association of Australia

- Information on mosquito biology
- Links to other mosquito related sites
- Information on mosquito related training courses
<https://mcaa.org.au/>

SA Health, Communicable Disease Control Branch

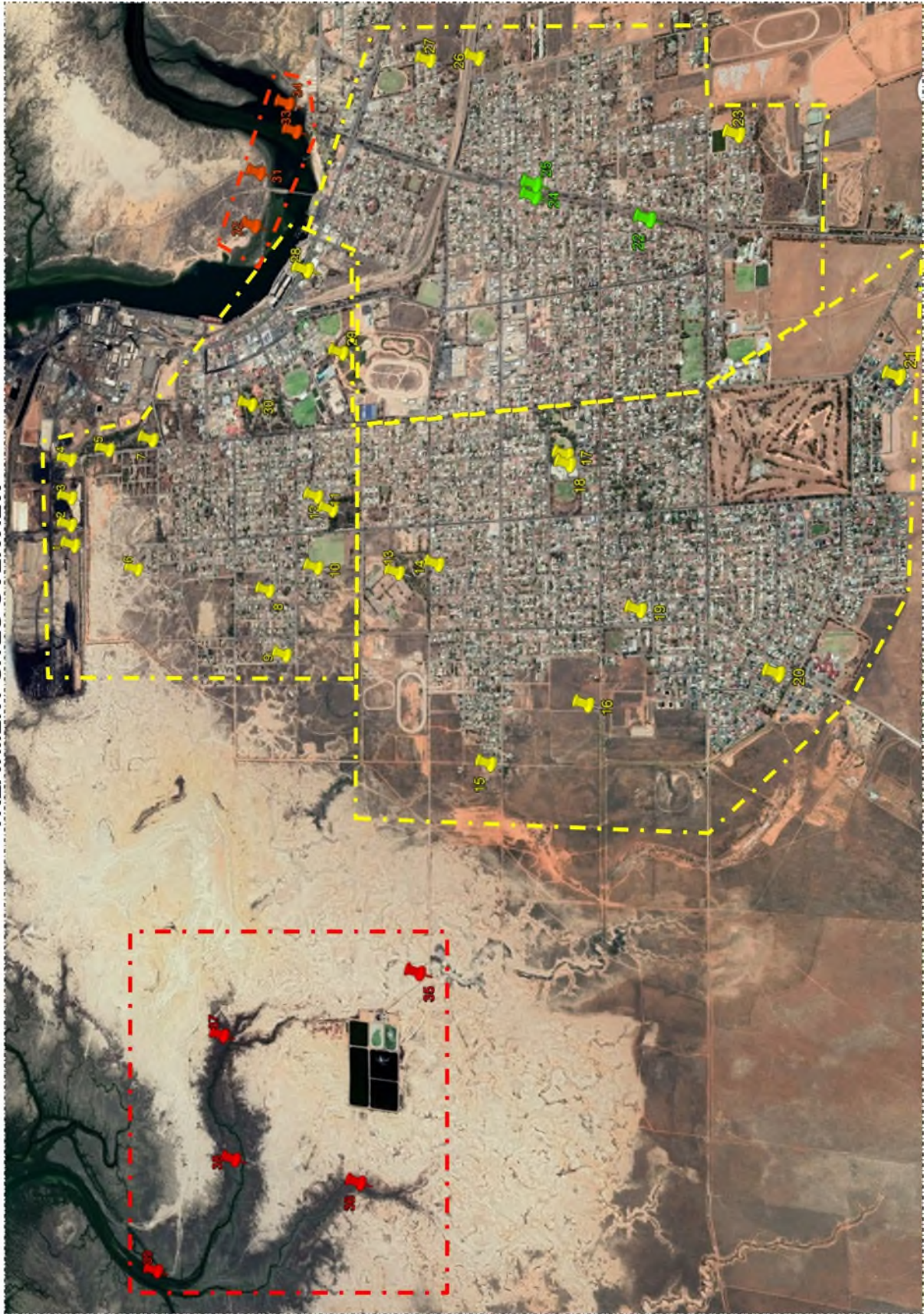
- [South+Australian+Arbovirus+Management+Plan+2024.pdf](#)
- [Mozzies Suck | SA Health](#)
- [Ross River virus infection - including symptoms, treatment and prevention | SA Health](#)
- [Barmah Forest virus infection - including symptoms, treatment and prevention | SA Health](#)
- [Japanese encephalitis - including symptoms, treatment and prevention | SA Health](#)
- [Mosquito-borne diseases in South Australia | SA Health](#)

Australian Pesticides and Veterinary Medicines Authority

- Information on chemicals registered for use in Australia
- Links to product labels and MSDS's
- <http://www.apvma.gov.au/>
- [Emerging technology - mosquito control | Australian Pesticides and Veterinary Medicines Authority](#)

APPENDIX A – PPRC Mosquito Treatment Sites 2023-28

PORT PIRIE REGIONAL COUNCIL – MOSQUITO CONTROL PROGRAM
TREATMENT SITES OVERVIEW



PPRC: MOSQUITO CONTROL PROGRAM
TREATMENT SITES - AREA 1



PPRC: MOSQUITO CONTROL PROGRAM
TREATMENT SITES - AREA 2



PPRC: MOSQUITO CONTROL PROGRAM
TREATMENT SITES - AREA 3



PPRC: MOSQUITO CONTROL PROGRAM
TREATMENT SITES - AREA 4



PPRC: MOSQUITO CONTROL PROGRAM
TREATMENT SITES - AREA 5



Appendix B – PPRC Mosquito Treatment Sites 2023-2028 (GPS)

	Site Name	Description	Latitude	Longitude
1	Coombe Rd a		33°10'0.63"S 137°59'51.16"E	
2	Coombe Rd b		33° 9'59.70"S 137°59'56.16"E	
3	Coombe Rd c		33° 9'59.79"S 138° 0'2.78"E	
4	Coombe Rd d		33° 9'59.74"S 138° 0'12.07"E	
5	Francis St & The Terrace Drain		33°10'9.89"S 138° 0'13.51"E	
6	Sifton Rd Pond		33°10'16.97"S 137°59'44.57"E	
7	Leahey Rd & The Terrace Wetlands		33°10'21.09"S 138° 0'14.75"E	
8	Tummel St & Tay St		33°10'49.20"S 137°59'38.04"E	
9	Paralla St Drain		33°10'53.11"S 137°59'23.46"E	
10	Pearce St Drain		33°11'0.25"S 137°59'42.64"E	
11	Falconer St Swale		33°11'0.29"S 137°59'58.38"E	
12	Moppett Rd Wetlands		33°11'3.60"S 137°59'55.23"E	
13	Cemetery Depression		33°11'17.98"S 137°59'40.63"E	
14	Vivian & McBride Courts Depression		33°11'26.25"S 137°59'41.97"E	
15	Esmond Rd Pond		33°11'36.70"S 137°58'59.86"E	
16	Balmoral Rd Drain		33°11'55.46"S 137°59'12.12"E	
17	Regent & Heywood Swale		33°11'51.69"S 138° 0'2.76"E	
18	Regent & Oxford Swale		33°11'52.12"S 138° 0'0.82"E	
19	Jervis St Drain		33°12'5.08"S 137°59'30.81"E	
20	Pt Davis Rd & Ferme St Drain		33°12'28.78"S 137°59'17.87"E	
21	Wilsdon Way Drainage Ditch		33°12'47.86"S 138° 0'11.87"E	
22	Lacey & Three Chain Rd	Sth S.E.P	33°12'6.70"S 138° 0'47.89"E	
23	Beaumont Ave Shallow Pond		33°12'22.17"S 138° 1'1.42"E	
24	Smith St & Three Chain Rd	Nth S.E.P	33°11'45.47"S 138° 0'56.35"E	
25	Osbourne & Three Chain Rd	Sth S.E.P	33°11'45.65"S 138° 0'58.81"E	
26	Harris Rd Lagoon		33°11'34.32"S 138° 1'27.45"E	
27	Geddes St Pond		33°11'24.48"S 138° 1'29.24"E	
28	Main Rd Wetlands		33°10'58.18"S 138° 0'48.82"E	
29	Phoenix Park Wetlands		33°11'5.77"S 138° 0'29.52"E	
30	Memorial Park & Playground		33°10'45.18"S 138° 0'20.44"E	
31	Mangroves A		33°10'46.93"S 138° 1'12.72"E	
32	Mangroves B		33°10'45.79"S 138° 1'0.92"E	
33	Mangroves C		33°10'55.28"S 138° 1'20.35"E	
34	Mangroves D		33°10'53.57"S 138° 1'26.87"E	
35	Kitchener Tce Pond		33°11'22.21"S 137°58'14.90"E	
36	Tidal Flats a		33°11'9.55"S 137°57'27.93"E	
37	Tidal Flats b		33°10'38.28"S 137°57'56.50"E	
38	Tidal Flats c		33°10'41.08"S 137°57'28.48"E	
39	Tidal Flats d		33°10'21.92"S 137°56'59.19"E	