City of Kwinana

Mosquito Management *Plan* 2024-2027

This document is available in alternative formats upon request.

City of Kwinana kaditj kalyakool moondang-ak kaaradj midi boodjar-ak ngala nyininy, yakka wer waabiny, Noongar moort. Ngala kaditj baalap kalyakoorl nidja boodjar wer kep kaaradjiny, baalap moorditj nidja yaakiny-ak wer moorditj moort wer kaditj Birdiya wer yeyi.

City of Kwinana acknowledges the traditional custodians of the land on which we live, work and play, the Nyoongar people. We recognise their connection to the land and local waterways, their resilience and commitment to community and pay our respect to Elders past and present.

Contents

Background

The City of Kwinana (the City) is situated in Perth's outer southern suburbs between 25 km and 37 km south of the Perth CBD and covers an area of approximately 120 km².

The City has a population of 47,658 (REMPLAN 2023). A chain of freshwater wetlands and drains located on a north to south axis throughout the City are considered to be a primary source of mosquito breeding.

Ross River Virus (RRV) and Barmah Forest Virus (BFV) are the most common mosquito-borne viruses causing human disease in Western Australia. The City has identified several species of mosquitoes known to carry the RRV and BFV, which occur in fresh and brackish water habitats. The key vector-borne disease species in Kwinana include *Aedes camptorhynchus* (southern saltmarsh mosquito), *Aedes notoscriptus* (container mosquito) (RRV) and *Culex annulirostris* (common banded mosquito). The capacity of certain mosquito species to carry diseases is influenced by environmental and seasonal factors. Subsequently the risk of contracting mosquito-borne disease varies with the season, rainfall events, location, type of mosquito species, presence of vertebrate hosts near breeding areas, and duration of exposure people have to mosquitoes.

Urban expansion within the City has predominantly been located within close proximity to wetlands. The population is projected to increase by 2.29% each year until 2046 when the population is forecast to reach 84,028 (REMPLAN 2024). Residents living closer to wetlands are at an increased risk of being affected by mosquito-borne disease and reduced quality of life.

The City has maintained its commitment to controlling mosquito populations through an integrated management approach since the introduction of the preceding Mosquito and Midge Management Plan in 2018.

Purpose

This Mosquito Management Plan is intended to provide strategic direction to the management of public health risk from mosquitoes within the City.

The objectives of this Plan are to:

- Minimise the transmission of potential vector-borne diseases, primarily Ross River virus within the City.
- Coordinate an effective monitoring program and management controls which includes identification and evaluation of known or potential mosquito breeding sites.
- Educate the community and other stakeholders on preventative measures to reduce the risk of contact with mosquitoes through the implementation of mosquito education actions within the City's Environmental Health Education Plan.
- Research and develop skills to apply the most appropriate methods of monitoring and controlling mosquito populations within The Spectacles Wetland Reserve.
- Coordinate with other Local Governments in the Continuous Local Authorities Group (CLAG) in mosquito management activities under the guidance of WA Health Department.

Strategic Context

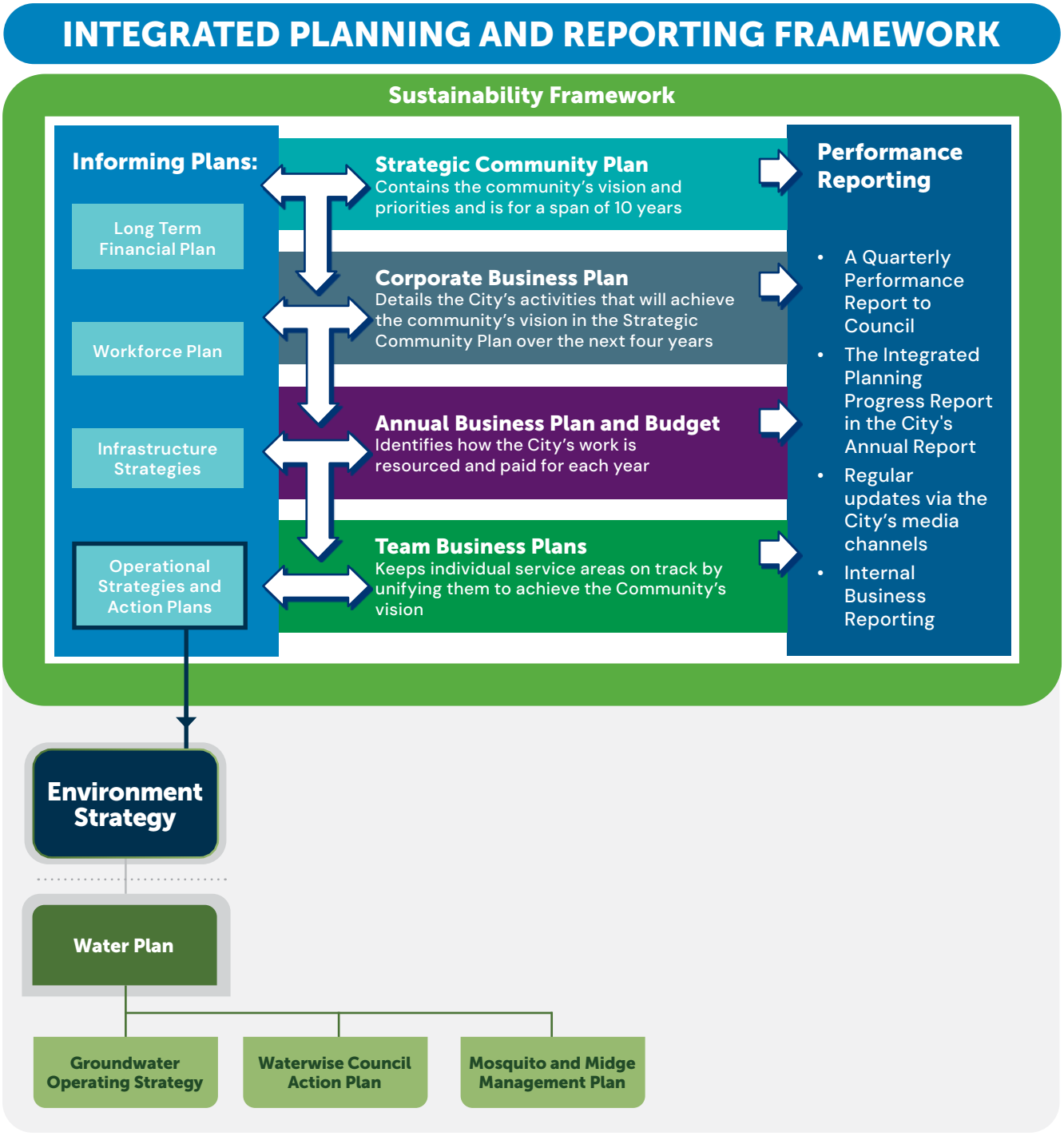
The Mosquito Management Plan has been identified as an important document under the City's Strategic Community Plan 2021-2031, the Corporate Business Plan 2021-2025, the Public Health Plan, the Water Plan and the Environmental Health Team Business Plan.

The City will deliver mosquito management within the following statutory framework:

- *Public Health Act 2016* and subsidiary legislation
- *Local Government Act 1995*
- *Animal, Environment and Amenity Local Law 2024*
- *Planning and Development Act 2005*

The context of the Mosquito Management Plan within the City's Integrated Planning Framework is outlined below, with its interdependency with key strategies and plans detailed thereafter.

Figure 1: City of Kwinana Integrated Planning and Reporting Framework



City of Kwinana Sustainability Framework

The City's Sustainability Framework provides guiding principles and priority focus areas to aid the City's realisation of the United Nations Sustainability Development Goals outlined in the City's Strategic Community Plan. The following key principle and priority areas are applicable to the Mosquito Management Plan.

Figure 2: City of Kwinana Sustainability Framework Guiding Principle and Priority Areas

Sustainability Guiding Principles	
	**Community Wellbeing** Creation of liveable neighbourhoods with healthy communities and environments
United Nations Sustainability Development Goals	
	
Priority Areas	
Priority Area 2: Environment and biodiversity	Environment is one of the pillars of sustainability: it provides ecosystem services and underpins all life. Biodiversity is a key feature of our local environment: its protection is an essential part of maintaining these ecological services and functions
Priority Area 3: Liveability	Liveability is a fundamental part of the City's role as a local government, to create and maintain a safe, connected, comfortable environment so that we have a thriving and happy community.

City of Kwinana Strategic Community Plan

The City of Kwinana's Strategic Community Plan 2021-2031 (SCP) was developed in consultation with the community and is the overarching document that guides the City's priorities. The SCP prescribes a number of objectives aimed at achieving the City's vision of "*A unique and liveable City, celebrated for and connected by its diverse community, natural beauty and economic opportunities*".

There are several outcomes and objectives (Table 1) that are applicable to the Mosquito Management Plan.

Table 1: SCP outcomes and objectives applicable to the Mosquito Management Plan

Outcome 1 **A naturally beautiful environment that is enhanced and protected**
1.2 Maintain and enhance our beautiful, natural environment through sustainable protection and conservation
Outcome 3 **Infrastructure and services that are sustainable and contribute to health and wellbeing**
3.1 Develop quality, financially-sustainable infrastructure and services designed to improve the health and wellbeing of the community
3.3 Maintain infrastructure, playgrounds, parks and reserves to a high standard through sustainable asset maintenance and renewal
Outcome 4 **A unique, vibrant and healthy City that is safe, connected and socially diverse**
4.1 Create, activate and manage places and local centres that are inviting, unique and accessible
Outcome 5 **Visionary leadership dedicated to acting for its community**
5.3 Provide a high standard of customer service with the community as priority

City of Kwinana Water Plan 2024-2028

The City aspires to be a Water Sensitive City, as defined by the Cooperative Research Centre for Water Sensitive Cities. The journey towards becoming a Water Sensitive City involves making improvements through the implementation of the City's Water Plan 2024-2028.

The Mosquito Management Plan will contribute towards the Water Plan 24-28, through one of the overarching goals - to improve ecological health.

Table 2: Water Plan 2024-2028 actions applicable to the Mosquito Management Plan

Action Number	Water Sensitive City goal area	Action
Strategy		
6	Improve ecological health	Maintain surface water quality monitoring at aquatic sites at risk of vector-capable mosquitoes

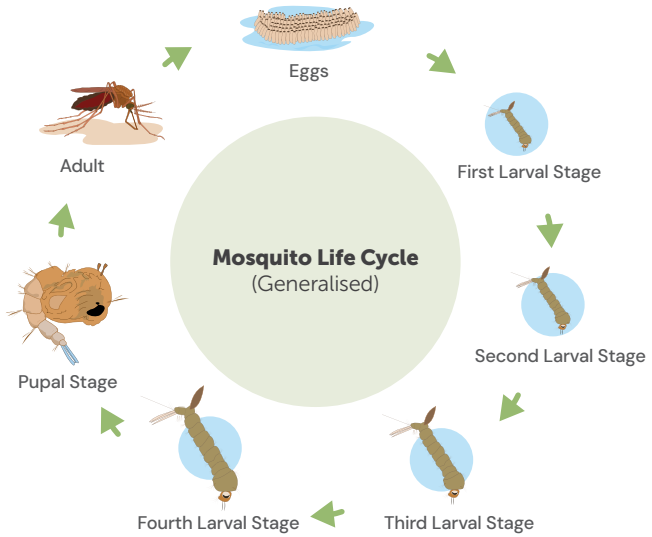
Mosquito Biology and Ecology

Adult female mosquitoes require a blood meal in order to obtain the necessary protein required to produce a large number of eggs. The rate of larval growth or development through the larval stages is dependent upon different environmental factors including temperature, rainfall, wind condition, larval density within the breeding site and the availability of food. During summer when environmental conditions are most favourable, Anopheles and Culex species may complete larval development within 7-10 days, while Aedes species may take only 4-5 days. The majority of mosquito species are active for only part of the year, and this is often determined by the seasonal availability of breeding sites suitable to the particular species. Local weather patterns and conditions play an important role in the ability for mosquitoes to sustain their breeding cycles. Significant weather events such as summer storms have the potential to produce spikes in mosquito abundance.

Mosquitoes capable of transmitting mosquito-borne disease are referred to as vector species and have the potential to infect humans with the following viruses:

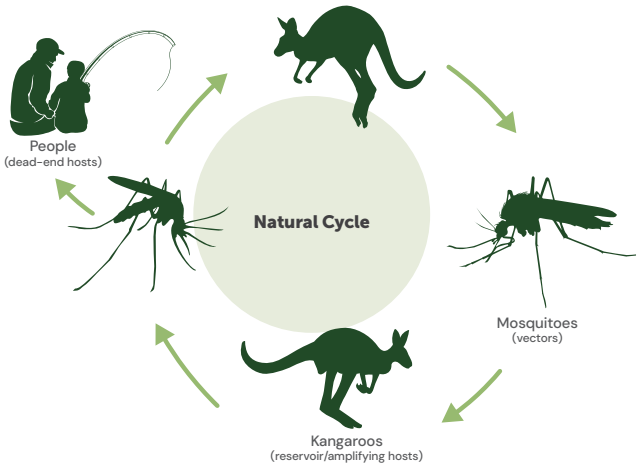
- Ross River virus (RRV) - this is the most common virus transmitted by mosquitoes in WA. Symptoms of RRV disease include joint pain and swelling, sore muscles, rash, fever and fatigue. Symptoms may persist for several weeks to months.
- Barmah Forest virus (BFV) – similar symptoms to RRV disease but is not as common.
- Murray Valley encephalitis (MVE) virus – a rare but potentially fatal disease that occurs mainly in the northern two thirds of WA. Symptoms include fever, drowsiness, confusion, headaches and stiff neck, nausea and vomiting, muscle tremors and dizziness. In severe cases brain damage, paralysis or death may result.
- Japanese encephalitis virus (JEV) - Japanese encephalitis (JE) is a rare but serious disease of the brain that is caused by JEV. Water birds and pigs are important in the JEV transmission cycle as the virus multiplies within these animals and infects further biting mosquitoes. A recent arrival into south eastern Australia (2022), in WA it has only been detected in the Kimberley and Pilbara regions so far.

Figure 3: Mosquito Life Cycle



Source: Purdue University 2024.

Figure 4: RRV disease transmission cycle.



Source: WA Department of Health 2024

Common Mosquito Species Found in Kwinana

Table 3. Common Mosquito Species Found in Kwinana

Mosquito Species	Breeding Habitat	Dispersal Capabilities (from breeding site)	Active Season	Disease Carrier
Culex annulirostris	Permanent and semi-permanent. Freshwater, mildly brackish, man-made lakes, containers. Prefers heavily vegetated sites.	10km	November to March	RRV, BFV, MVEV*, KUNV* JEV*
Aedes camptorhynchus	Temporary water. Freshwater, brackish, tidal saltmarsh.	3-5km	Winter, Spring and Early Summer	RRV, BFV
Aedes notoscriptus	Clean, domestic, environment, artificial containers (e.g. gutters, discarded containers, pot plant bases, rainwater tanks).	0.4km	Year round	RRV, BFV
Culex globocoxitus	Open swamps, brackish water, artificial containers.	1-3km	Year round.	Non-human biter. No known link to RRV.

*MVEV, KUNV and JEV have not yet been detected in the south west of Western Australia

Source: Department of Health 2017.

Nuisance and Disease Risk

Nuisance mosquitoes

The City aims to reduce pest or vector mosquitoes to a level where the impact on adjacent human populations within residential areas is kept to an acceptable level. The City generally receives a low number of complaints, and will undertake monitoring in response to any local nuisance complaints. Mosquitoes are considered a 'nuisance' when the number of adult mosquitoes caught at a single location in an EVS/CO_2 trap exceeds 50 individuals.

Mosquito-borne disease risk

Known vectors of RRV are collected through extensive trapping undertaken by the City. When mosquito-borne disease notifications are received, follow-up interviews with affected individuals are also undertaken in attempt to locate the likely exposure site to mosquitoes.

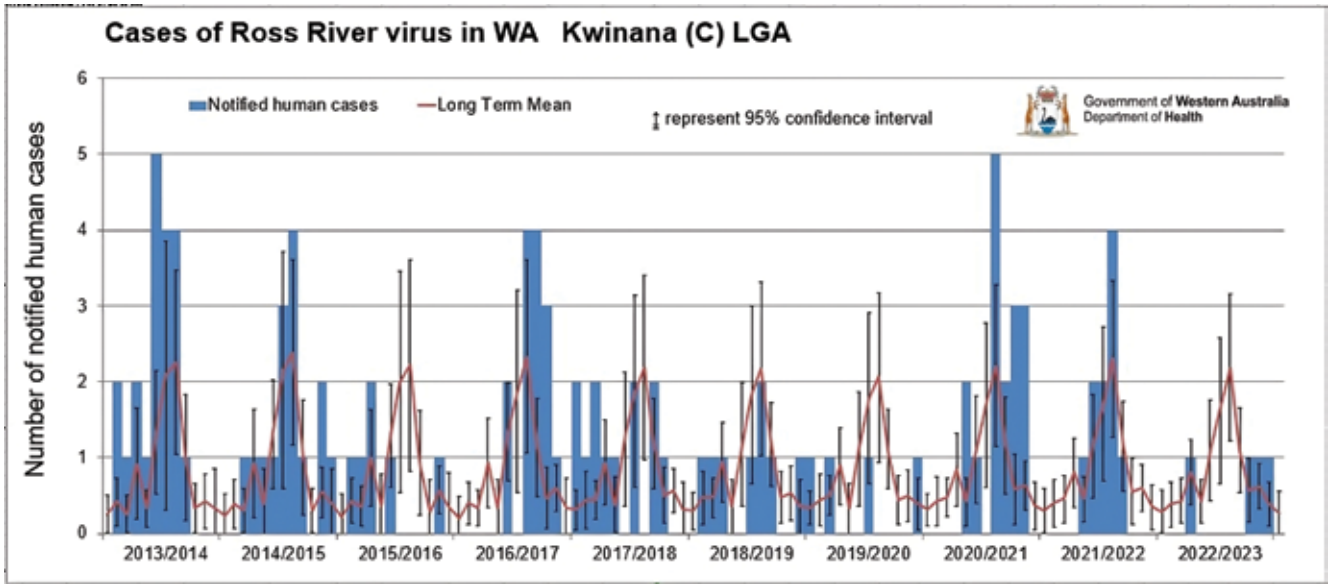
Ross River virus isolates have been detected in mosquitoes at The Spectacles reserve in 2021 and 2024, and the overall long-term mean for Kwinana is nine RRV cases per year, between 2013-2024. The public health risk is expected to increase in the future due to the close proximity of new residential developments to wetlands over time.

The disease thresholds are identified when specific mosquito species exceed the numbers shown:

- 20 adult *Aedes vigilax* represents a significant mosquito problem;
- counts of > 30 *Aedes camptorhynchus* indicates that there is a mosquito problem;
- counts of > 30 *Aedes notoscriptus* indicates that there is a mosquito problem; and
- 100+ Culex *annulirostris* indicates a mosquito problem.

For City managed sites, control strategies will be undertaken at the source of breeding if found to exceed these threshold levels.

Figure 5: Notified human cases of RRV in City of Kwinana between 2013-2024 and the long-term mean.



Source: Department of Health 2024.

Ongoing Monitoring Program

Climate and Environmental Conditions

To manage mosquito populations, the collation of climatic and environmental data including rainfall, prevailing winds and temperature outlooks are monitored through the Bureau of Meteorology, the Department of Health and discussed at CLAG quarterly meetings.

Climate drivers in Western Australia including El Niño and La Niña (El Niño and the Southern Oscillation Pacific Ocean), Indian Ocean Dipole and Southern Annular Mode play a major role in determining how severe a mosquito season will be. For example, the presence of La Niña may increases the chance of rainfall, cooler days and warmer nights, and typically establishes conditions that are more conducive to mosquito breeding.

Adult Trapping

Mosquito monitoring has been undertaken across the City since 2006. Monitoring of adult mosquito populations using EVS/CO_2 traps is carried out on a fortnightly basis between September and April, and once per month for the remainder of the year (May to August). Regular surveys provide an indication of the current mosquito populations and changes in habitats which may give rise to mosquito population fluctuations. Traps are deployed in the early afternoon and picked up the following morning. An EVS/CO_2 trap combines the use of dry ice and light as attractants to adult mosquitoes. Mosquitoes are counted and identified to species which are then used to identify potential breeding sites.

Trapping also indicates which mosquito species are affecting certain areas. This can be important to know, as there are many species which breed in other habitats such as freshwater wetlands, roadside gullies, rainwater tanks, septic tanks and pot plants. With this information, corrective action can be taken such as treating roadside gullies or educating the public to reduce mosquitoes breeding in domestic backyards.

Larval Monitoring

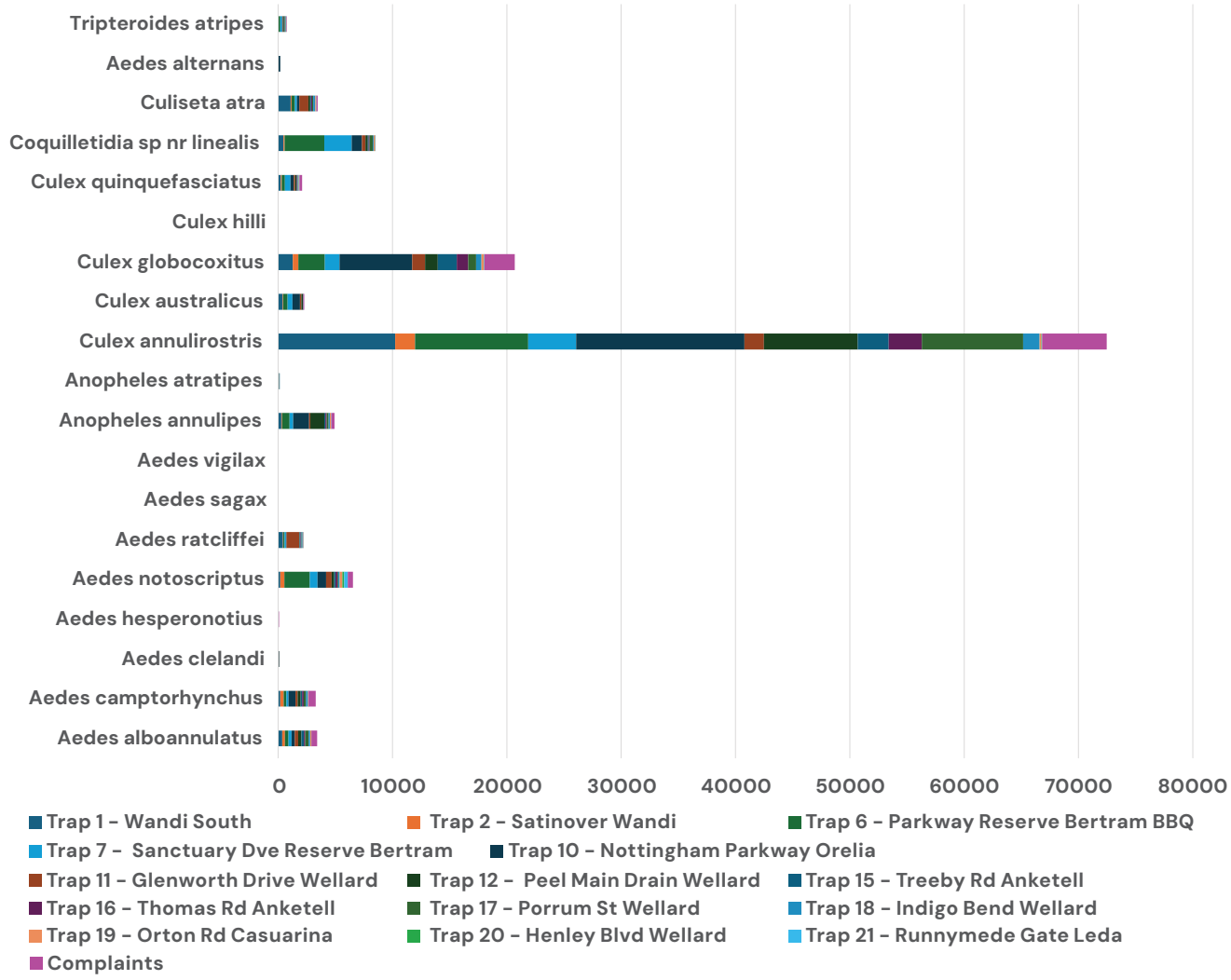
Larval monitoring is carried out at the same frequency as the adult monitoring program when surface water is present. Each sample is examined for mosquito larvae and if present the growth stages are recorded. Other observations including water quality or any event that it is thought to be impacting on either the wetland or the mosquito larvae will be made and recorded. Several dips are usually undertaken at the same site and the number of mosquito larvae within each dip estimated. An average is calculated, based on the number of dips taken and then converted to obtain an overall estimate of the number of mosquito larvae at each site (larvae per m^2). Larvae may be identified under a microscope or reared in emergence cages and identified as adults when significant levels are detected.

Upon the completion of treatment, a post-treatment survey is undertaken to determine the effectiveness of the treatment. This involves a simple check for the presence of live larvae or determining emergence rates to gauge control levels, depending upon the chemical used. Further treatment can also be identified and then carried out.

Existing Data

The most common type of mosquito found within the City is Culex annulirostris, followed by *Culex globocoxitus* and *Aedes notoscriptus*. *Cx. annulirostris* are predominantly trapped at or near The Spectacles wetland and areas near the Peel Main Drain.

Figure 6: City of Kwinana Mosquito Trap Identification 2020-2024



Note: Traps 3, 4, 5 8, 9 13 and 14 were historical sampling sites.

Figure 7: The Spectacles Mosquito Trap Identification 2020-2024

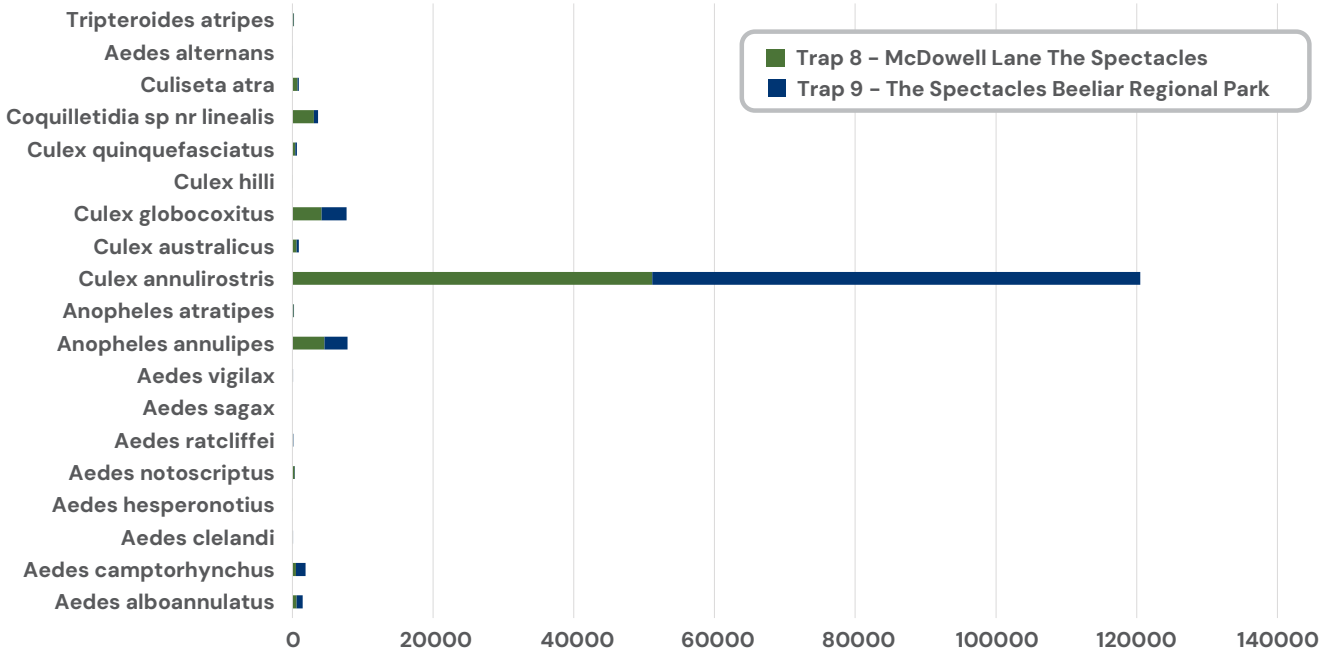


Figure 8: City of Kwinana Adult Mosquitoes Trapped % Disease Threshold Exceedances 2020-2024

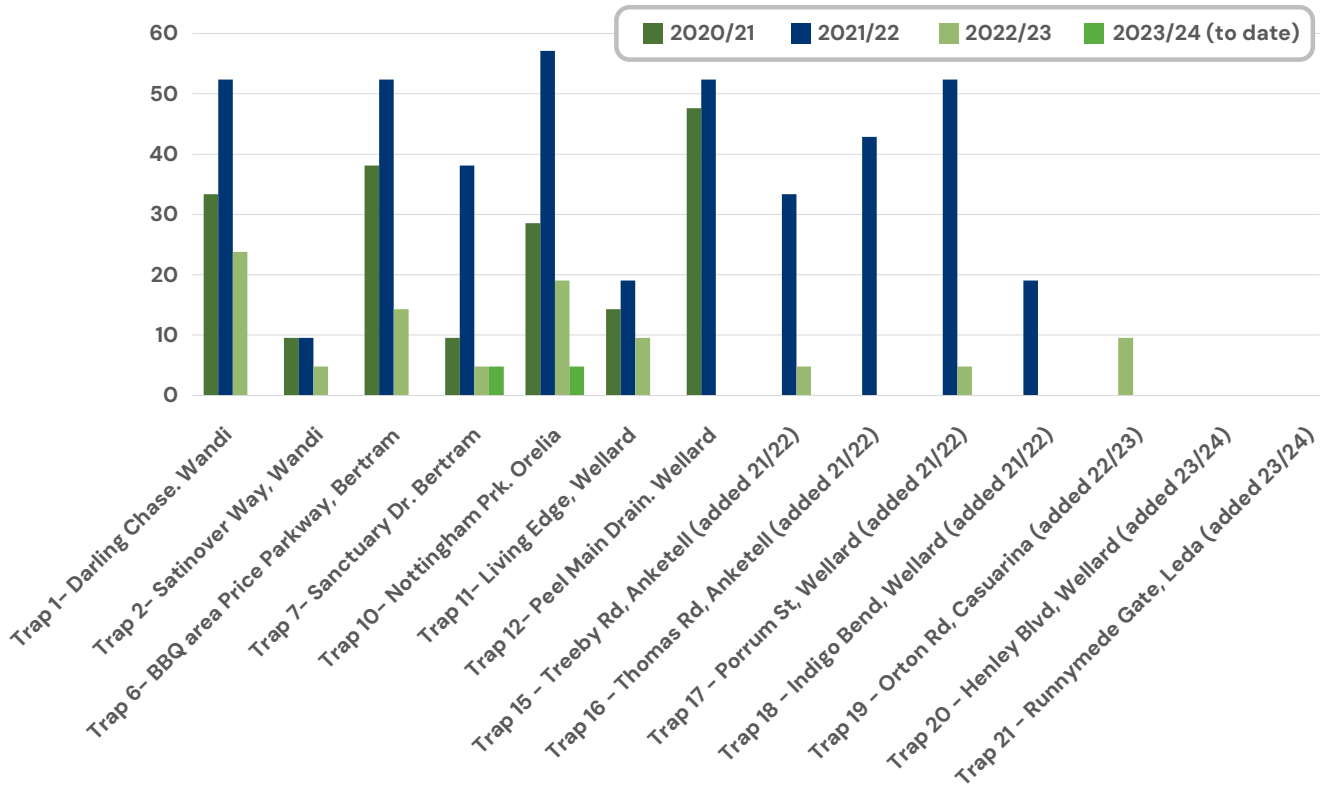
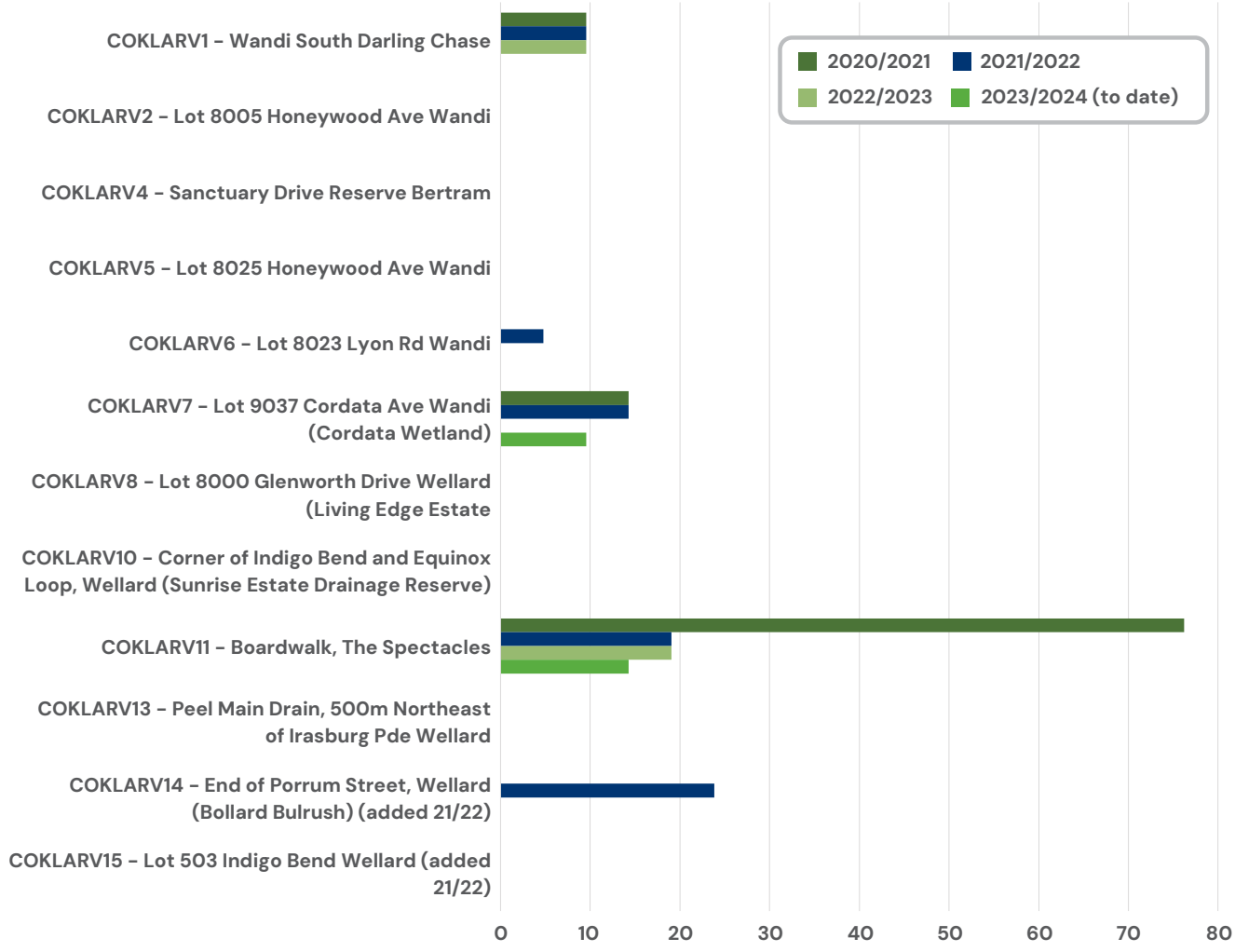


Figure 9: City of Kwinana Larval Sampling % Disease Threshold Exceedances 2020-2024



Note: COKLARV 3, 9 and 12 were historical sampling sites.

Complaints

The following actions may be undertaken depending on the nature of the complaint:

- An assessment of the location of potential mosquito or midge breeding habitat through a site inspection and larval sampling where possible.
- Provision of educational brochures to private properties including residences.
- Setting up a mosquito trap at the complainant's property to determine whether there is a nuisance or disease risk. Mosquito species are identified to determine the breeding habitat of the mosquitoes. Mosquito numbers are counted to determine whether the nuisance or disease threshold is exceeded.

Surface Water Quality Monitoring

Specific water quality parameters, such as pH, temperature, dissolved oxygen, and nutrient levels, can influence mosquito breeding. High organic content or nutrient-rich waters can support greater mosquito larvae populations for some types of mosquitoes.

The City has undertaken surface water quality monitoring at The Spectacles Wetlands, Bollard Bulrush Wetlands and Bollard Bulrush Peel Main Drain and Cordata Wetland since 2022. Concentrations of nitrogen and phosphorous in surface water were generally above the ANZECC/ ARMCANZ (2000) trigger values for fresh water at The Spectacles and Peel Main Drain. Long-term water quality monitoring results will be used to advocate for improvements to water quality at these sites managed by State Agencies.

Department of Health Surveillance

The Department of Health Medical Entomology monitors mosquito-borne virus activity throughout WA. The Spectacles has been a high-risk area and forms part of the Southwest Mosquito and Arbovirus Surveillance program where mosquitoes are identified to species level and sent to be tested for the presence of RRV and BFV. Upon detection of an arbovirus, the Department of Health (or the City) will issue a media statement advising the general public to take personal protection measures to prevent mosquito bites.

The Department of Health provides ongoing and regular updates on the mosquito borne diseases through the WA Notifiable Infectious Diseases Database and Enhanced Surveillance Data, virus detection data and seasonal outlook to help Local Governments undertake future planning activities.

Mosquito Breeding Sites

Trapping and larval sampling sites have been chosen to provide a representation on the risk of mosquito breeding and harbourage. These sites have been chosen based on the evaluation of the following factors:

- historical monitoring and treatment data
- permanent water bodies including the Peel Main Drain and The Spectacles
- public complaints and RRV notifications in the past five years
- areas with standing water during the summer season and sites in the prevailing wind direction of potential sources

Current trapping and larval sampling are listed in Appendix 1. Gullies, sumps and drains known to hold water are checked throughout the season and treatments applied when necessary.

The Spectacles

The Spectacles is 360 hectares of natural bush and wetland and is a part of the chain of wetlands that make up the Beeliar Regional Park, managed by the Department of Biodiversity, Conservation and Attractions (DBCA). It is a designated Bush Forever Site and is the largest fresh-water lake in the City of Kwinana. The site is situated between the Ramsar wetland areas of Thompsons Lake and the broader Peel-Yalgorup system and is bordered by Anketell Rd to the north, Mclaughlan Rd to the west; Thomas Road to the south and the Kwinana Freeway to the east.

The Peel Main Drain, which is managed by the Water Corporation, runs through the Northern and Southern Spectacle Wetlands. The Peel Main Drain traverses from Banjup to Karnup, predominately located in the Cities of Kwinana and Rockingham, and discharges into the Serpentine River. Parts of the Peel Main Drain are overgrown with weeds, providing mosquito harbourage and breeding habitat. According to the Department of Water (2009), the Peel Main Drain contributes approximately 48 per cent of the water entering The Spectacles, while the remainder is from groundwater. The wetland responds to rainfall, evaporation and modified land uses within catchment areas (e.g. land development, ground water extraction and recharge) and perched water levels. The southern wetland generally dries out during February to May.

The Spectacles has been found to be significantly contributing to mosquito breeding within the City of Kwinana. Ross River virus has been detected by the Department of Health in 2021 and 2024. Very high numbers of adult mosquitoes were also trapped at The Spectacles between 2020-2024 (Figure 5 and 6) with *Culex annulirostris* being the dominant species trapped. As part of an intensive larval survey undertaken, it is estimated that 45 hectares of The Spectacles wetland require larvicide treatment when there is a detection of high concentrations of mosquito larvae predominantly in shallow pools under large mature paperbark trees. No larvae have been observed in open water areas, while the highest larval concentrations were observed in semi-permanent deep pools and contiguous water to 0.5m depth under the canopy. Representative accessible sites for larval sampling have been selected to provide an indication for mosquito breeding as well as pre and post larvicide treatment surveys. Ongoing monitoring has proven to be difficult with changing water levels and accessibility. Further investigation and collaboration with the Department of Health, DBCA and Water Corporation are required to undertake effective and successful mosquito management at The Spectacles.

New Developments

The management of mosquitoes on new development is the responsibility of the respective developer. Some of these developments are located within the catchment and floodplain or within close proximity to the Peel Main Drain, The Spectacles and other wetlands. Drainage infrastructure constructed as part of the new developments may inadvertently become a breeding habitat.

The WA Planning Commission has the power to impose a memorial on land titles that are newly created through the process of subdivision and are potentially affected by a relatively permanent hazard notifying prospective purchasers of the potential hazard. The WAPC also has the power to impose conditions of approval on any subdivision proposal considered to be located in a high-risk area. The City requires land owners of new developments to provide a Mosquito Management Strategy to demonstrate adequate management of mosquito and midge breeding until common infrastructure is transferred to the ownership of the City as part of the planning process. A mosquito management levy set within the Council's annual budget fees and charges is charged to the developer for mosquito management.

Management Strategies

There are four mosquito management strategies considered in the development of an integrated mosquito management plan: physical, chemical, cultural and biological. Avoiding the reliance on a single strategy helps prevent many of the problems inherent with long-term chemical control, such as the development of chemical resistance.

The following mosquito management strategies are currently employed in the City's management program:

Physical Control

Physical control methods are used to reduce the potential for mosquito breeding and harbourage by modifying the natural or built environment. Breeding sites are reduced by decreasing the amount of vegetation within drains, marsh or other known breeding sites or by filling in low lying land to reduce the impact of flooding/tides. Other physical mosquito control measures include:

- Ensuring that septic tanks are sealed and fitted with mosquito proof screens.
- Ensuring rainwater tanks are sealed or openings covered with mosquito proof screens.
- Reducing emergent vegetation in known breeding sites.
- Regular maintenance program by Natural Areas Management Team.
- Maintenance of stormwater drains and ensuring that water is not held for more than 96 hours in accordance with Urban Water Management Plan.
- Constructed wetlands will be assessed using the Department of Health Chironomid Midge and Mosquito Risk Assessment Guide.

Chemical Control

It is most efficient to treat mosquitoes as larvae, while they are contained within an aquatic environment, rather than as flying adults. Larvicides kill mosquito larvae and/or prevent the larvae developing into adult mosquitoes. They are also target-specific when applied at the label rate, reducing the impact on the environment.

The following larvicides are currently used as part of the City's mosquito management program –

- *S-methoprene* is an insect growth regulator that is absorbed by the larvae and prevents the larvae from emerging from the pupal stage. The City applies this product in accordance with the required application rates throughout the mosquito season. This product is available in several different formulations, including slow-release briquets and pellets, which can provide ongoing control for up to 150 days under certain environmental conditions.
- *Bacillus thuringensis israelensis* (Bti) contains spores and endotoxins of naturally occurring bacterium. These spores and endotoxins are ingested by mosquito larvae, resulting in death within 24 hours. Bti is toxic only to the larvae of certain dipteral (true flies). It does not harm other aquatic, marine or terrestrial fauna.
- *Bacillus sphaericus* can also be used in breeding sites where the water is polluted or has high nutrient levels (road gullies, Water Corporation drains etc). Its mode of action is similar to Bti.

In 2022, a trial aerial treatment was conducted with the Department of Health and confirmed that Vectoprime granules (which contains Bti and S-methoprene) is an appropriate biological larvicide that can be used to treat mosquito larval at The Spectacles as it is able to penetrate the dense canopy.

Larvicides will only be applied in accordance with the standard operating procedures and manufacturer's instructions regarding recommended application rates using calibrated equipment by operators who are trained in mosquito and midge management. All larvicide used by the City are target specific and have negligible impact on other aquatic and terrestrial species when used at label rates. The larvicides are endorsed for use by the Department of Health and approved for use by Australian Pesticides and Veterinary Medicines Authority.

Aerial treatment may be required to be undertaken at The Spectacles due to significantly high numbers of mosquitoes exceeding disease thresholds. Any aerial larvicide treatment will be undertaken in collaboration with the Department of Health and Heliwest.

Cultural Control (Public Education)

The public are a vital stakeholder in the City's Mosquito Management Program and have a responsibility in any integrated program to manage mosquitoes on their own properties. It is important that educational programs are ongoing to ensure information is received by all residents and visitors.

During the mosquito season, the following public education activities are undertaken:

- Social media is used to promote the campaign and inform the community about local government mosquito management activities including promotional mosquito video.
- Media following detections of arboviruses such as RRV and BFV.
- Active engagement with community at various events throughout the mosquito breeding season to promote Fight the Bite and awareness of health risks associated with mosquitoes.
- Mosquito education program at local primary schools.
- Fight the Bite signage in reserves and parks.

The City actively implements a range of promotional and education activities, including those listed above, in its delivery of the City of Kwinana Environmental Health Education Plan.

Stakeholders

Effective mosquito management requires consultation and collaboration with a range of internal and external stakeholders. The Environmental Health Team is primarily responsible for the implementation of the Mosquito Management Plan, however, the following stakeholders contribute to the planning and implementation of the Plan:

- Internal Stakeholders: Environmental Management Unit, Marketing, Planning and Engineer Team.
- External Stakeholders: Residents, landowners, visitors, businesses, developers, schools, Department of Health, Department of Biodiversity, Conservation and Attractions, Department of Planning, Lands and Heritage, Water Corporation, CLAG members and Heliwest

The City partners with surrounding Local Government stakeholder through the Southern Metropolitan Contiguous Local Authorities Group (CLAG) with City of Cockburn, City of Armadale and Shire of Serpentine Jarrahdale, formalised through a Memorandum of Understanding.

Financial Implications

The budget for mosquito management varies each year depending on the level of mosquito control required. Factors affecting mosquito control include the number of anticipated sites requiring monitoring, weather predictions, chemicals, replenishment of existing equipment, PPE and training.

The annual budget provides funds for the education program, ongoing monitoring program and chemicals for treatment. The ongoing monitoring and management program is anticipated to cost approximately $65,000 per year over the next three years. The budget for the education program and treatment chemicals are reviewed annually.

Additional funding has been included in the Long-Term Financial Plan to factor in increases for chemical treatment of water bodies due to cyclical weather changes. It is forecast that the mosquito management costs will continue to increase due to climate change conditions and new developments situated in close proximity to mosquito breeding sites.

The CLAG funding scheme allows the City to apply for annual funding to cover Mosquito Control Advisory Committee (MCAC) approved items including treatment chemicals, educational merchandise, training course costs and helicopter services. The City will continue to prepare a funding submission application to CLAG each year. The City also has access to an existing CLAG Trust Account and developer mosquito levy contributions reserve to manage mosquito disease risk greater than normal.

Monitoring and Review

The actions will be monitored and reviewed annually. Emerging trends and risks will be identified and new technology for mosquito management may become available. Ongoing refinements will be made throughout the implementation of the plan and evaluation to be completed before the next plan is developed.

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Implementation Plan

Action	Responsible Officer	Frequency/Timeframe	Responsible
Monitoring Program			
1	Continue to implement the ongoing monitoring program through adult trapping and larval sampling.	Coordinator Environmental Health, Senior Environmental Health Officer	Ongoing. Fortnightly from September to April, Monthly from May to August. Frequency may increase during Summer season due to environmental conditions.
2	Review information from the Department of Health Surveillance Program.	Coordinator Environmental Health	Ongoing. Fortnightly from September to April, Monthly from May to August.
3	Investigate all complaints and mosquito-borne disease notifications through a follow up interview with the patient.	Environmental Health Officers and Assistant	As required.
4	Monitor the climatic conditions that may affect mosquito breeding including rainfall and temperature outlooks. Weather forecasts should be analysed and considered for timing of interventions.	Coordinator Environmental Health, Senior Environmental Health Officer	Monthly through Bureau of Meteorology and quarterly through Contiguous Local Authorities Group (CLAG) meetings.
5	Conduct surface water monitoring at selected mosquito breeding sites of concern, including The Spectacles Wetland.	Coordinator Environmental Health, Senior Environmental Health Officer	Annually, after the first rainfall.
6	Review mosquito monitoring sites on an annual basis.	Environmental Health Coordinator, Senior Environmental Health Officer	Annually, during July.
7	Monitor for standing water across POS sites, bubble-up pits and soak-wells.	Coordinator Environmental Health, Senior Environmental Health Officer	Annually, during July.
Physical and Chemical Control Program			
8	Conduct larviciding through ground-based application and apply treatment in areas with nuisance/ disease risks.	Coordinator Environmental Health, Senior Environmental Health Officer	When larval surveys and adult mosquitoes trapped exceed defined thresholds.
9	Coordinate aerial application of larvicides at The Spectacles.	Coordinator Environmental Health	As required and when advised by the Department of Health.
10	Continue to minimise nutrient levels in the environment and debris input into drainage infrastructure through a range of physical control measures including: Parks and Natural Areas • Removal of excessive grass clippings from mowing all turf within POS space and adjoining drains, waterways or wetlands. • Minimisation of fertiliser use via appropriate application rate and treatment intervals. • Control of weeds in drains and wetland areas through the Natural Areas Management Plan. Infrastructure • Regular street sweeping. • Removal of organic build-up within drainage infrastructure as part of the annual gully education program with interim inspection round. • Annual drainage inspection program to ensure that all drainage assets have appropriate maintenance requirements.	Coordinator Parks and Natural Areas, Coordinator Infrastructure	Ongoing and frequency varies across the City.

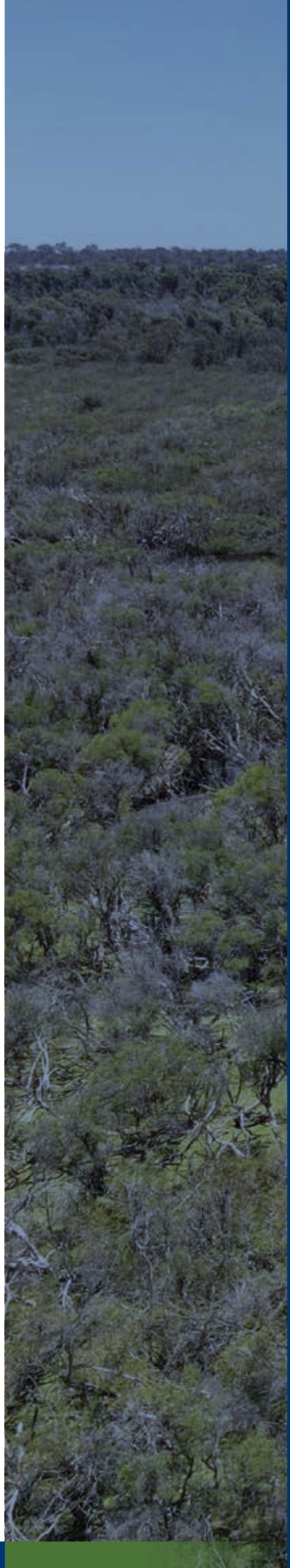
Action	Responsible Officer	Frequency/Timeframe	Responsible
Education Program			
11	Implement the Environmental Health Education Plan which includes but not limited to: • Deliver mosquito education to the community and local schools • Maintain up to date information on websites. • Implement the Mosquito Management Marketing and Communications Plan e.g. promote Fight the Bite campaign via various media channels.	Coordinator Environmental Health, Senior Environmental Health Officer, Environmental Health Assistant and Senior Marketing and Communications Officer	Ongoing and frequency varies across the City.
12	Ensure all Environmental Health staff who participate in mosquito management are adequately trained and participate in the annual helicopter induction.	Coordinator Environmental Health	Aligned to the timing of the Department of Health mosquito management course. Every year for helicopter induction, during June/ July.
Planning Considerations			
13	Impose planning conditions for developers to produce, submit for approval and carry out their own Mosquito and Midge Management Plan.	Senior Environmental Health Officers and Planning Officers	Ongoing and as required.
14	Refer Local Structure Plans and subdivision planning applications to the Environmental Health Directorate for consideration and for assessment of developer's Mosquito and Midge Management Strategy. Impose fee contribution to mosquito reserve fund for each new residential lot created .	Senior Environmental Health and Planning Officers	Ongoing and as required.
15	Assess the design of the City's drainage and water management systems, including those proposed by developers, to ensure consistency with Water Sensitive Urban Design (WSUD) practices.	Coordinator Engineering Developments	Ongoing and as required.
16	Assess constructed water bodies against the Chironomid Midge and Mosquito Risk Assessment Guide for Constructed Water Bodies.	Coordinator Environmental Health and Senior Environmental Health Officer	Ongoing and as required.
Investigation and Collaboration			
17	Investigate opportunities and control strategies to assist with effective mosquito management of The Spectacles (e.g. further collaboration with stakeholders).	Coordinator Environmental Health	Ongoing, by 2025
18	Continue to work with CLAG to control mosquito-borne diseases in the South Metropolitan Region.	Coordinator Environmental Health, Senior Environmental Health Officer	Ongoing, through quarterly meetings.
Monitoring and Review			
19	Prepare an annual report and submit to the Department of Health Medical Entomology Unit and CLAG for their review and comment prior to finalising.	Coordinator Environmental Health	Annually, during July.
20	Prepare an annual budget and seek annual CLAG funding	Coordinator Environmental Health	Annually, during March and June.
21	Publish annual report on the City website.	Coordinator Environmental Health	Annually, by September each year.
22	Undertake an evaluation of the plan.	Coordinator Environmental Health	October 2027

Appendix 1

Figure 11: Mosquito Trapping Sites 2024/25

Figure 12: Mosquito Larval Sampling Sites 2024/25

City of Kwinana



Administration

Cnr Gilmore Ave and Sulphur Rd,
Kwinana WA 6167
PO Box 21, Kwinana WA 6966

Telephone 08 9439 0200

customer@kwinana.wa.gov.au

www.kwinana.wa.gov.au