



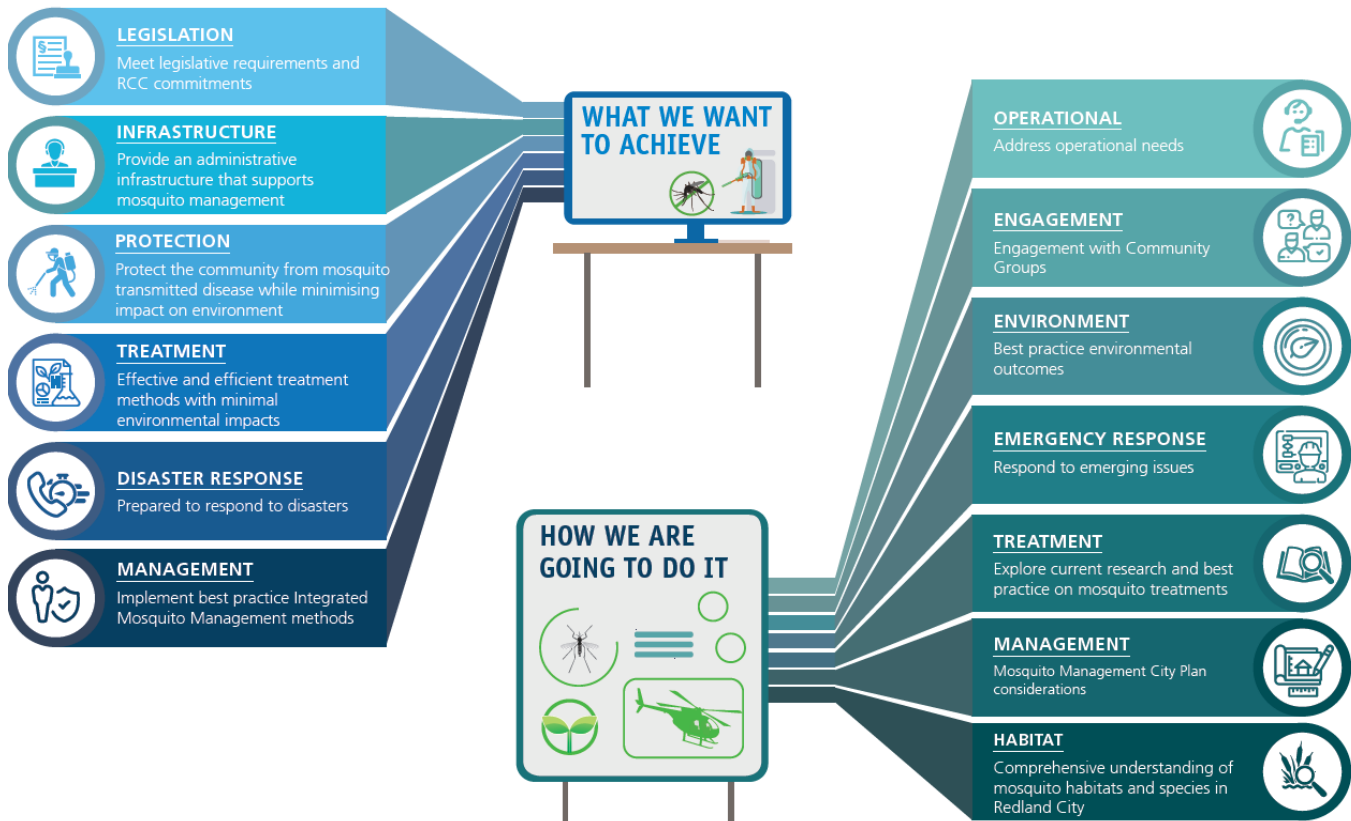
# Mosquito Management Action Plan

2019 – 2024



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## Acronyms

### Indicative Costs

High*	Over \$100,000
Medium*	\$10,000 – \$100,000
Low*	Below \$10,000
BAU	Business as Usual - Absorbed in existing operational budget

\*Subject to budget considerations and business cases presented to Council.

### Time Frames

Short	The actions will commence in the next 12 months
Intermediate	The actions will be undertaken in the next 2 years
Long	The actions will be undertaken in the next 5 years



## 1.0 Introduction

Located along the Moreton Bay Marine Park, Redland City has unique coastal and freshwater environments that provide various species of flora and fauna the ability to grow and thrive. These unique environments found within the Redlands, particularly along the bayside, provide ideal breeding grounds for the saltmarsh mosquito, *Aedes vigilax*. In freshwater wetlands, the *Culex annulirostris* mosquito can be found breeding in low-lying areas among vegetation after heavy rain events. These species of mosquito pose a significant public health risk to the Redlands community as they are able to transmit diseases such as Ross River virus, Barmah Forest virus and Kunjin.

Council acknowledges the risk mosquitoes present to the community and is committed to the delivery of year round mosquito management services that are cost effective and environmentally responsible. The Mosquito Management Policy (POL-2710) outlines Council legislative obligations under the *Public Health Act 2005*, *Environmental Protection Act 1994*, *Fisheries Act 1994* and *Marine Parks Act 2004*. Supporting documents to this policy, such as the Mosquito Management Plan, Mosquito Management Operational Plan and Communication Strategy, provide clear performance indicators and strategies to effectively deliver the Mosquito Management Program.

While Council currently provides resources for the Mosquito Management Program, it is expected that factors such as climate change, urban development and expanding population growth will identify a greater need for future mosquito management services in the Redlands. This Mosquito Management Action Plan consists of a review of the current Mosquito Management Program. It provides a snapshot of the current status of the Mosquito Management Program and identifies gaps that impact on the effectiveness of the current program, as well as strategies to overcome these gaps and potential opportunities for future planning.

## 2.0 Overview of the Mosquito Management Program

Redland City is impacted by both freshwater and saltmarsh mosquito species. Breeding areas are found across Redland City, including the Southern Moreton Bay Islands and smaller uninhabited islands. Council currently monitors and treats mosquitoes in saltmarsh environments along the Redlands Coast and some freshwater locations. To treat along the Redland Coast which is located in the Moreton Bay Marine Park, Council must ensure all appropriate permits, such as the Marine Park Permit, are in place and compliance with any site specific conditions.

On average, 9500 hectares of land is treated in Redland City via ground and aerial applications each year. The treatments target mosquitoes in their larval form using chemicals registered for use by the *Australian Pesticides and Veterinary Medicines Authority* and Council's Marine Park Permit. In combination with these treatments, regular surveillance is also undertaken across the city to monitor the species of mosquitoes and their activity levels. Council's Pest Management Team, consisting of four operational staff and a Team Coordinator, are

responsible for delivering Council's Mosquito Management Program. While treatments form a significant aspect of the Mosquito Management Program, other aspects also include community engagement, exotic incursion and disaster management preparation and regional consultation through groups such as the Mosquito and Arbovirus Research Committee (MARC), Regional Mosquito Management Group (RMMG) and North East Moreton Mosquito Organisation (NEMMO).

## 2.1 Legislative Obligations

Under Chapter 2 of the *Public Health Act 2005*, Council is legally obliged to undertake mosquito management activities as mosquitoes are a designated pest and capable of transmitting disease to humans. The Mosquito Management Program is defined by an overarching Council Policy – *POL-2710 Mosquito Management* that outlines these legislative obligations and aligns with Council's *Corporate Plan 2018 - 2023* under two key outcome areas; *Healthy Natural Environment* and *Strong and Connected Communities*. The program commitments, strategies and performance indicators are detailed in the Mosquito Management Plan. The Mosquito Management Plan and Policy were endorsed by Council Resolution on 28 November 2012, with minor administrative changes approved on 20 September 2017. It is noted that the Mosquito Management Plan is a publicly available document on Council's webpage.

Under section 319 of the *Environmental Protection Act 1994*, it states that “*a person must not carry out any activity that causes or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to minimise the harm.*” In acknowledgement of these environmental risks associated with mosquito management, the *Mosquito Management Code of Practice 2014* (the “Code of Practice”) was prepared by the Local Government Association of Queensland (LGAQ) and the Queensland Government Department of Environment and Science (DES) to assist councils in demonstrating that all reasonable and practicable steps are taken to prevent environmental harm. The Code of Practice advocates for Integrated Mosquito Management that incorporates both reactive and proactive methodologies such as public education and awareness. Integrated Mosquito Management (Appendix 1) is the implementation of a number of mosquito management techniques to collectively contribute to the management of mosquitoes in a way that may reduce reliance on chemicals to decrease mosquito numbers and disease risk, taking into account environmental impact, sustainability and cost effectiveness (LGAQ, 2014).



Redland City Council's *Mosquito Management Plan 2017 - 2024* has been drafted in accordance with the *Mosquito Management Code of Practice* which includes specific strategies that need to be delivered in order to align with these Integrated Mosquito Management methodologies.

The *Mosquito Management Plan 2017 - 2024* identifies seven outcome areas which are supported by objectives, key strategies and performance indicators. These outcomes and objectives are:

Outcome Area	Objective
<b>Governance</b>	To meet legislative requirements and Redland City Council commitments
<b>Administration</b>	To provide an administrative infrastructure that supports mosquito management
<b>Community Engagement and Education</b>	The Redlands Coast community is educated about how they as individuals can reduce their contact with mosquitoes
<b>Environment</b>	To protect the community from mosquito transmitted disease and nuisance while limiting the impact on environment
<b>Treatment</b>	To apply effective and efficient treatment methods with minimal impacts on the environment
<b>Emergency Response</b>	To be prepared to respond to disasters
<b>Research</b>	To implement best practice Integrated Mosquito Management methods

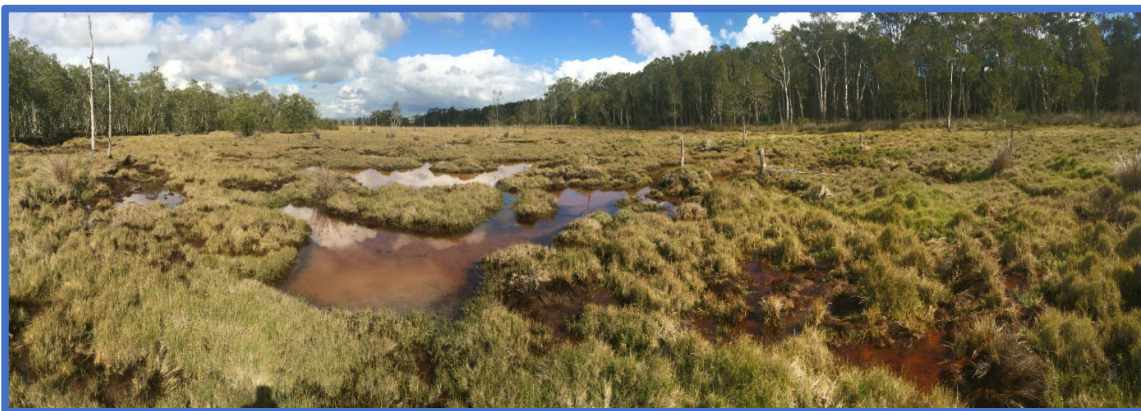
### 3.0 Mosquito Management – Five year review snapshot

Over the past five years, Council has run an effective program in managing mosquito breeding in various locations across Redland City. A crucial part of the Mosquito Management Program is surveillance of areas subject to tidal inundation and the capacity to hold water following rain events. Regular surveying of these identified mosquito breeding sites is undertaken across the city. Data is collected from each site, such as mosquito species, number of larvae and the stage of growth to which the mosquito has progressed. Where sites are positive for mosquito breeding, treatments are undertaken to reduce numbers.

The data collected through surveys assist in the coordination of treatments, as mosquito larvae will go through four growth periods known as instars. Treatments ideally are targeted during 2<sup>nd</sup> and 3<sup>rd</sup> instar, as this allows sufficient time for post-surveying to be conducted which checks for mortality and overall effectiveness of the treatments.

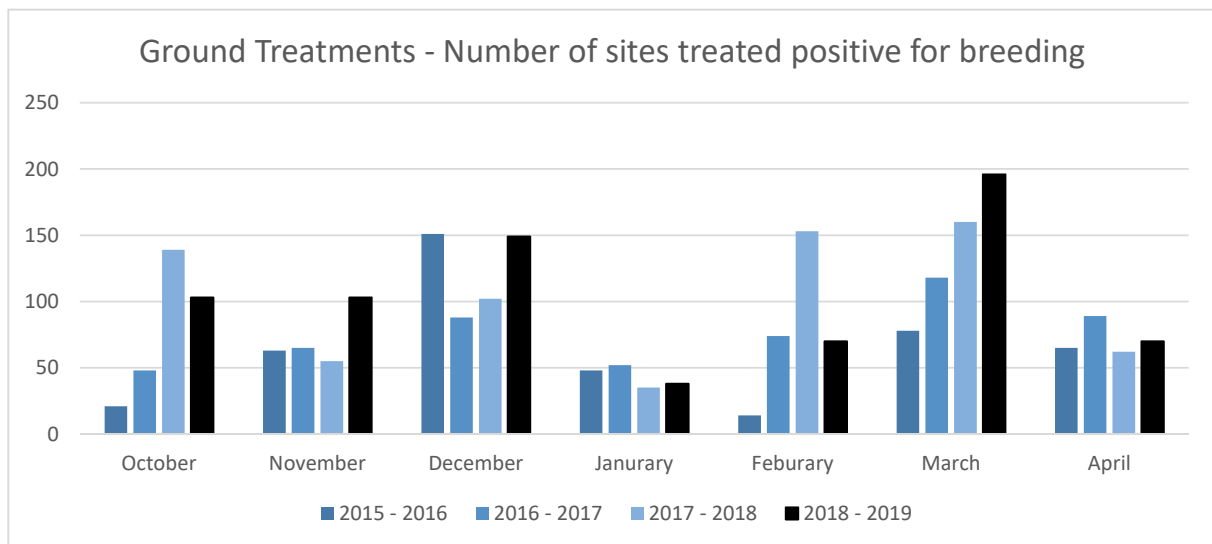
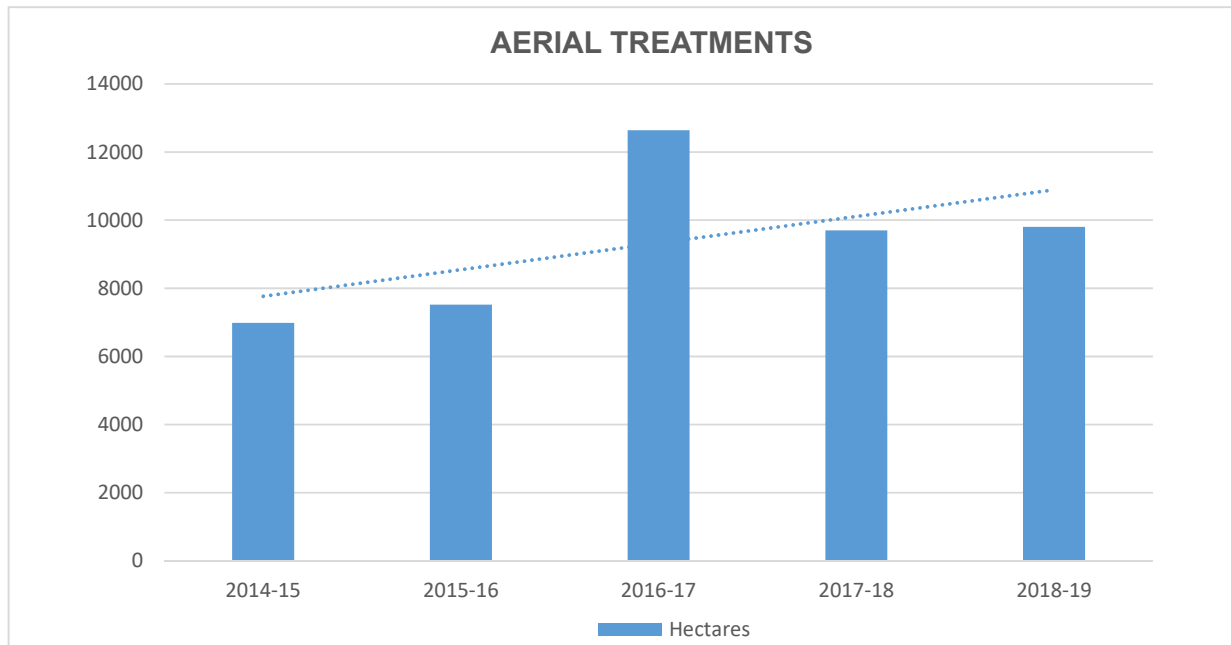
Post aerial treatment surveillance is undertaken of all treated sites to determine the effectiveness of the treatments. Where surveillance identifies the treatment has not achieved the desired mortality rate, the area is re-treated. When conducting treatments, the bacteria *Bacillus huringiensis israelensis* (referred to as Bti) is the most preferred product as it is cost effective and has little resistance. *S – Methoprene* is also used when surveillance indicates that a treatment has not achieved the desired mortality rate and where mosquito larvae are more developed. While effective, *S – Methoprene* is not as cost effective and can be labour intensive when conducting post treatment surveys.

While aerial and ground treatments are an effective means of managing mosquito numbers, Council also provides education to residents on personal protective measures. This advice is available on Council's website, on pamphlets in Council facilities and advertised on the Bay Island Ferries.



### 3.1 Ground and Aerial Treatments

Over the past five years, aerial and ground treatments have increased in both frequency and land coverage. During the 2016 - 17 financial year, above average tidal inundations and significant weather events resulted in 24 aerial treatments covering more than 12,000 hectares of land. Of these 24 aerial treatments, 18 were due to tidal inundation and six due to rain events. Data trends also indicate that above average treatments occurred during the 2017-18 period with 21 aerial treatments conducted covering 9,702 hectares and 17 aerial treatments covering 9800 hectares during the 2018-19 period.



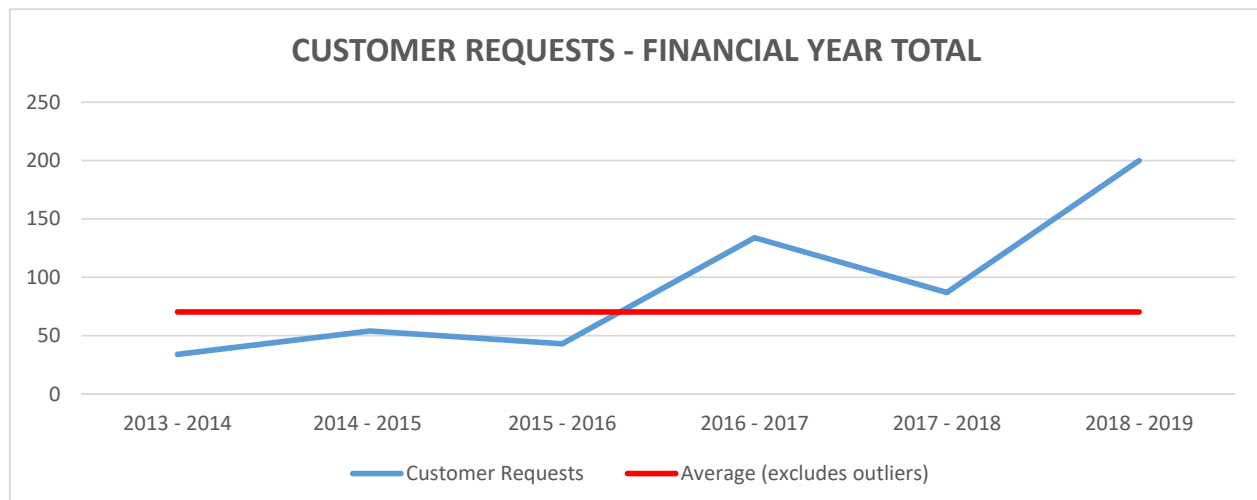
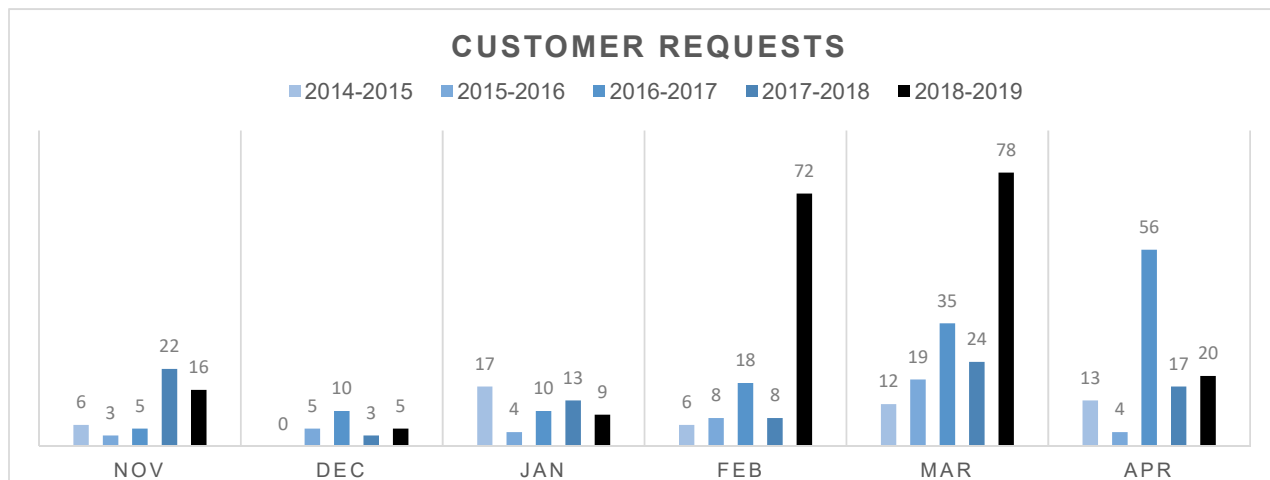


### 3.2 Customer Request Figures

As part of Council's Mosquito Management Program, data is collected in relation to customer request figures. During peak mosquito breeding season, Council will experience a higher number of requests, as mosquito numbers are elevated which creates a nuisance for many residents. During the 2018 – 19 reporting period, Council received 129 additional mosquito customer requests above the average number received annually. While this coincides with the significant tidal events, warm temperatures and rain events experienced during February and early March, the past three years have shown above average customer requests received annually.

While some requests may be in relation to mosquitoes on private property, the Mosquito Management Program is limited to Council and Crown Land. Advice is provided to customers on ways to minimise mosquito breeding on their properties with this information also being available through other media outlets such as social media, pamphlets and Council's website.

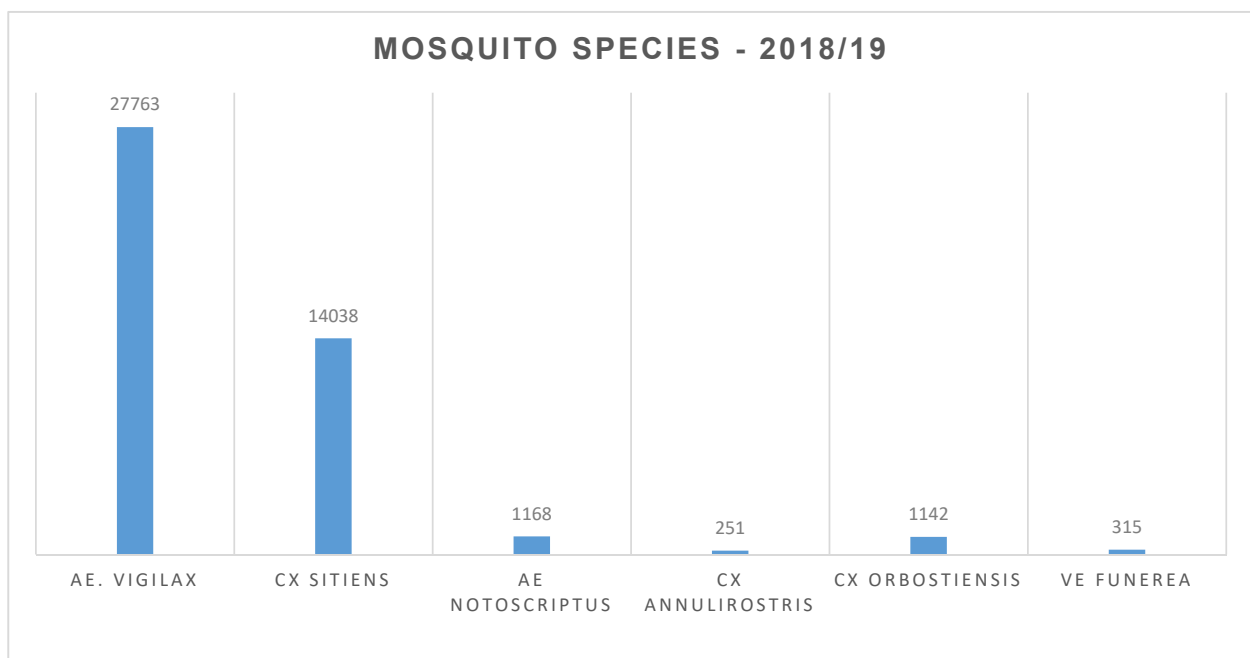
There is a clear trend that customer requests are increasing and this is expected to continue based on factors such as increased population and changes to climate.



### 3.3 Surveillance

Surveillance of mosquitoes is a key function of the Mosquito Management Program. Light traps are used across various locations in Redland City to monitor the number of mosquitoes and the species found within each of these areas.

Redland City is impacted by various mosquito species however monitoring during the 2018-19 period showed the *Aedes Vigilax* and *Culex Sitiens*, both estuarine breeding species, were the most common mosquito species collected. Surveillance helps inform where treatments are needed the most, particularly when mosquito activity is elevated during peak mosquito breeding season.



## 4.0 Program Pressures

### 4.1 Disaster Events

Redland City has been impacted by significant disaster events over the past five years, ranging from floods to fires. These disasters not only impact the community but also place strain on Council resources, particularly in relation to mosquito management services. Depending on the disaster event, mosquito management services must adapt to respond to the emergency situation. For instance, where there are severe rain events or exotic incursions, aerial treatments and ground treatments may be required at very short notice across large areas in order to protect public health. This would therefore necessitate extensive resources for staffing, chemicals and available equipment. In situations where there is a declared emergency, fogging or other alternative treatments may also be necessary to protect public health which would need to consider community perception and concerns, as well as potential environmental impacts.

In 2017, Queensland experienced above average temperatures and rainfall, including a disaster event; Cyclone Debbie in late March. Records were set for maximum temperatures in Queensland, with Brisbane experiencing the hottest February day on record, 3.5°C above average (*Australian Government, Bureau of Meteorology, 2017*). These extreme temperatures and rain events resulted in 74 sites in February testing positive to mosquito breeding and 118 sites testing positive in March as compared to the previous year of 14 sites in February 2016 and 78 sites in March 2016. As a result of these increased temperatures and rain events, Council increased the number of aerial treatments in order to protect the community, with 24 aerial treatments being conducted for mosquito management during the 2016-17 financial year.

To ensure Council's Pest Management Team are prepared and capable of responding to disaster events, regular training and appropriate resources including vehicles and staff are an important aspect.

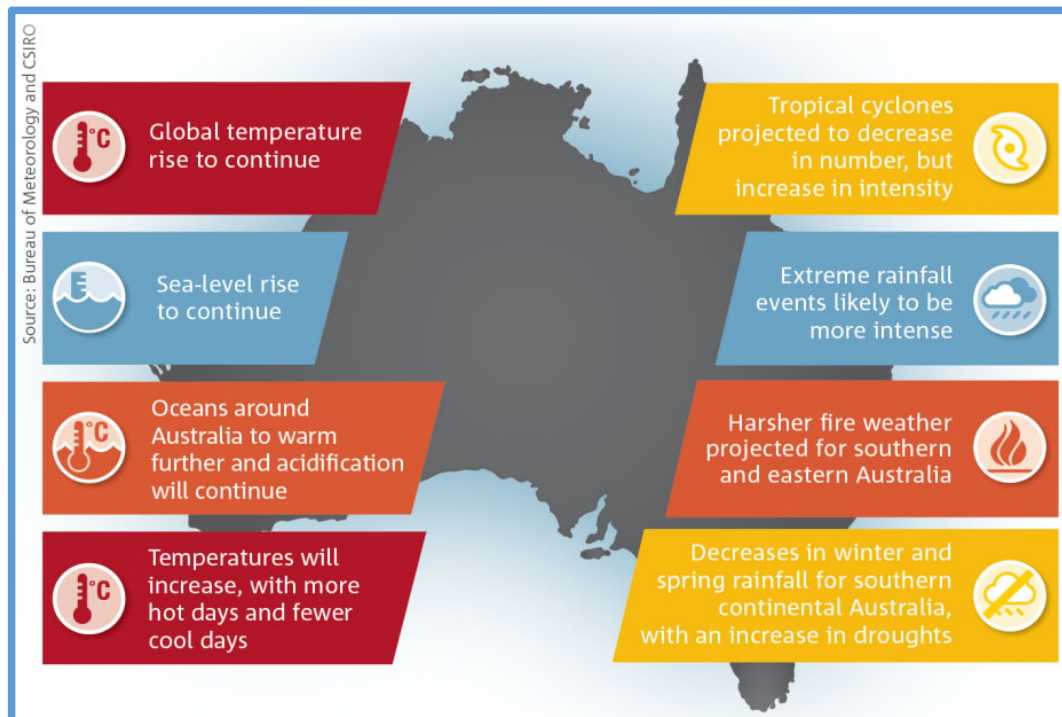


## 4.2 Climate Pressures

Climate variance plays an important role in the future planning of mosquito management. Mosquito management services are entirely weather dependant, with the city impacted by both rain and tidal events. Increased rain events and rise in sea level attributed to climate variance will provide greater opportunity for mosquito breeding in fresh water wetlands, mangrove and saltmarsh areas. Combined with higher temperatures, this will encourage optimal breeding conditions for mosquitoes and increase the potential risk of mosquito transmitted diseases to the community.

The Bureau of Meteorology and CSIRO monitor climate change in Australia and have released the *State of the Climate 2018* report which explains the changes and variability of Australia's current and future climate. The report outlines key points for future climate change; of particular note for Redland City is the rise in sea level, increase in intense rain events and increase in global temperature resulting in shorter winter seasons where generally mosquito breeding is reduced.

These changes have the potential to impact on the Program effectiveness, particularly when considering operational expenses, staff resources and fatigue management. Currently peak mosquito breeding season generally occurs between October to April with current budget allocation to cover contractor, employee and chemical costs for this period. Should the peak mosquito breeding season expand past these months, it would be expected that the number of mosquito treatments and employee resources would also need to increase and therefore require consideration in future planning of the Mosquito Management Program.



Source: *Climate change impacts for Australia 2016*, Bureau of Meteorology and CSIRO



### 4.3 Urban Development

Urban development plays a vital role in economic growth and community development in Redland City. Recent years have shown an increase in urban and infill development along the bayside suburbs, such as Redland Bay and Victoria Point, where there are some of the largest known mosquito breeding sites across the city. There is also significant capacity for the population of the Southern Moreton Bay Islands to increase substantially given the current number of undeveloped building lots.

The development of residential properties near saltmarsh and intertidal mudflats are of particular concern, given the close proximity to the breeding areas of the saltmarsh mosquito, *Aedes vigilax*. This mosquito is capable of flying up to 10km in search of a blood meal and is a persistent biter (QIMR Berghofer, 2019). While mosquito aerial and ground treatments are an effective way to minimise mosquito breeding, better planning during the development application stage will provide an opportunity for additional mosquito management measures to be incorporated into developments, such as buffer areas/ breezeways, dwelling construction requirements (such as midge-proof screened windows and doors) and engineering designs for stormwater management.

Further consideration needs to be given to urban development encroaching on identified mosquito breeding sites. Residents living closer to mosquito breeding sites may be at greater risk of contracting mosquito borne diseases, with Council also likely to be impacted through increased customer requests. Over the past three years, Council has received 550 mosquito customer requests, with a sample in February 2019 showing 59 customer requests received over just three days following a tidal event.

Figure 2: Redland Bay urban development aerial imagery comparison



Red E Map 1998 Historical Image



Red E Map Nearmap Latest Imagery 2019

## 5.0 Mosquito Management Program Review Analysis

For Council to be able to demonstrate compliance with the *Mosquito Management Code of Practice 2014* each strategy listed under the *Mosquito Management Plan 2017 - 2024* must be implemented. An analysis has been undertaken of the current Mosquito Management Program, including the strategies under the Mosquito Management Plan.

There are seven key outcome areas listed in the Mosquito Management Plan, each outcome area is supported by objectives, key strategies and performance indicators. Each Outcome Area has 2-5 Key Strategies to be implemented over the lifecycle of the Plan to ensure an effective mosquito control program within the city. As part of the review of the current program a summary outlining which strategies have yet to be implemented or are only partially implemented is displayed in the table below, utilising a traffic light rating system.

Outcome Area	Objective	Outcome Area Key Strategy Implementation
<b>Governance</b>	To meet legislative requirements and Redland City Council commitments	
<b>Administration</b>	To provide an administrative infrastructure that supports mosquito management	
<b>Community Engagement and Education</b>	The Redlands Coast community is educated about how they as individuals can reduce their contact with mosquitoes	
<b>Environment</b>	To protect the community from mosquito transmitted disease and nuisance while limiting the impact on environment	
<b>Treatment</b>	To apply effective and efficient treatment methods with minimal impacts on the environment	
<b>Emergency Response</b>	To be prepared to respond to disasters	
<b>Research</b>	To implement best practice Integrated Mosquito Management methods	
<b>Traffic light colour system:</b> <b>Green:</b> All Strategies in the Outcome Area have been achieved <b>Orange:</b> 1-2 Strategies in the Outcome Area have yet to be achieved <b>Red:</b> 3 or more of the Strategies in the Outcome Area have yet to be achieved		

Following the review of the Mosquito Management Program an action plan was developed to address the gaps identified under each Outcome Area with an orange or red traffic light rating.

Each of the identified actions in the action plan corresponds to a strategy under the *Mosquito Management Plan 2017 – 2024*, with performance indicators, timeframes and indicative costs. While internal stakeholder engagement has been undertaken with relevant groups, the responsibility to implement each action remains with Council's Health and Environment Unit.

The Mosquito Management Program Review (gap analysis) and action plan has been divided into short, intermediate and long term strategies, to acknowledge the issues currently restricting the Program. Once these resources are addressed, the intermediate and long term strategies that have been identified will also require consideration to enable the Program to be fully resourced and sustainable for the future.

Future planning is important for the continuation of the Mosquito Management Program. While effective now, the Program will need to adapt to proactively address future pressures like urban development, and identify potential opportunities for growth, including the adoption of new technologies.

## 6.0 Gap analysis – Identified short term strategies

### 6.1 Appropriate resourcing

*Strategy 4 – Resource the mosquito management program with appropriate facilities, equipment, budget, and staff to successfully implement the Redland City Council Mosquito Management Plan 2017-2024.*

Mosquito treatments are entirely weather dependant and triggered by tidal inundation or rain, combined with high temperatures. Aerial treatments in particular need a full coordinated response by Council to ensure that officers are available at helicopter landing sites, conducting ground treatments in access restricted areas and surveying treated sites to determine treatment effectiveness.

During peak mosquito breeding season, both aerial and ground treatments can consume long hours, with the sole focus on targeting areas that are breeding mosquitoes to protect the community. To manage fatigue, resources are concentrated on conducting these treatments with limited time remaining to address other aspects of the Program. It is acknowledged that in order for the Mosquito Management Program to be fully implemented and future growth proactively addressed, additional resourcing may need to be accounted for in consideration of the strategies identified in the Mosquito Management Action Plan.

## 7.0 Gap analysis – Identified intermediate strategies

### 7.1 Engagement with community groups

*Strategy 7 – Participate in community engagement activities and provide the community with education and information to increase awareness of protection against mosquitoes and reduction in mosquito breeding sites.*

*Strategy 8 – Integration of mosquito control information with other Council educational information.*

*Strategy 9 – Deliver educational activities that target at risk groups e.g. outdoor workers, communities living near mosquito breeding areas.*

While ground and aerial treatments play an integral role in managing mosquito numbers in Redland City, residents are also encouraged to protect themselves and their properties against mosquitoes. This advice is communicated to the community through various media avenues such as Facebook posts, Twitter, media releases, flyers and posters. Council also has a dedicated web page for mosquito management that provides advice on personal protection measures and ways to reduce mosquito breeding around the home.

In recent years, online communication has gained momentum in the community, particularly with Facebook, Twitter and other social media platforms. These platforms provide an opportunity for Council to communicate to a broader audience faster than using traditional methods such as newspaper. While effective, our current online communication can be enhanced to be more interactive, enabling better accessibility to up to date information for the community. These opportunities could include live data of mosquito surveillance, numbers and prevalence across the City, along with live streaming avenues for treatment updates and educational materials.

Online communication while effective, cannot be relied upon exclusively to reach all demographics across Redland City. During the 2018-19 peak mosquito breeding season, Council experienced the highest rate of customer requests and enquiries about mosquitoes in the past five years. In light of this, other communication avenues and meaningful community engagement needs to be explored to better inform the community about mosquitoes and Council's Mosquito Management Program.

Through community engagement activities, such as attending Redland based events like Indigi Day Out and Wonderful Wildlife Day, residents will have the opportunity to engage with Council to seek information on mosquitoes, how to better protect themselves against mosquitoes and provide feedback on the effectiveness of Council's communication about mosquitoes.

Other avenues for consideration will also involve the possibility of partnering with other Council initiatives, library and school programs and continuing to build on the information provided to residents on Council's mosquito webpage. This recommendation and anticipated resources to facilitate this opportunity has been included as an action item under section 9.



## 7.2 Best Practice Environmental Outcomes

*Strategy 16 – Give consideration to areas of sensitive environmental value when determining treatment methods.*

Redlands Coast has an abundance of natural coastline that is protected under the Moreton Bay Marine Park. Council plays an important role in maintaining these protected areas so they can be preserved for future generations. As mosquitoes breed in these areas, mosquito treatments need to reflect best practice environmental practices to minimise environmental disturbance.

Under the *Mosquito Management Code of Practice 2014*, an important component of a Mosquito Management Program is developing strategies to minimise the risk of environmental harm from mosquito management activities. These could include liaising with stakeholders to identify specific access ways in less sensitive areas, maintenance and reinforcement of existing access routes to minimise any environmental disturbance, and the possibility of alternative treatment methods through the use of advanced technology should also be explored

An important aspect in reinforcing this strategy is the strengthening of internal communications between key stakeholders within Council, such as the City Operations Group. Similar to other areas in Council, the formation of a streamlined stakeholder engagement group with internal referral will enable teams to work together better to minimise the environmental footprint caused by mosquito treatments in sensitive environments. This process will provide the Pest Management Team an opportunity to notify other areas across Council of upcoming treatments and where needed engage with the City Operations Group. It is anticipated that this stakeholder engagement group would also include other Council departments that are involved in projects that may have an impact on mosquito breeding locations or affect what type of treatments are undertaken.

## 7.3 Pro-active surveillance

*Strategy 9 - Deliver educational activities that target at risk groups e.g. outdoor workers, communities living near mosquito breeding areas.*

*Strategy 22 – Prepared to respond to emerging issues.*

Surveillance remains a critical element of the Mosquito Management Program. Two types of traps are used for monitoring, however one targets exotic mosquitoes such as *Aedes albopictus* and the other local mosquitoes such as *Aedes notoscriptus* already found within the City.

*Aedes notoscriptus*, a container breeding mosquito commonly found breeding in backyards, presents a year round nuisance and potential public health risk to the Redland's community, as they transmit Ross River virus. While known as a common backyard mosquito breeder, *Aedes notoscriptus* are also found in commercial areas conducive to their natural breeding environment such as old vehicle tyres and containers.

Exotic container breeding mosquitoes such as the *Aedes aegypti* and *Aedes albopictus* can also be found breeding in commercial areas. Recent exotic incursions in nearby Local Government Areas in South-East Queensland have been linked to commercial businesses.

Within the city, there are many commercial businesses that conduct activities that could have the potential to breed mosquitoes. These include, motor vehicle workshops storing tyres and boat repair businesses where water can be found pooling in boat hulls.

Across Redlands Coast there are a number of sites that are routinely monitored for mosquitoes using traps. These sites are located on Council land such as public open space and generally do not extend into commercial businesses or privately owned land. It is important to protect the community from these emerging issues and to educate businesses on how to effectively implement mosquito management controls. To expand the monitoring of both local and exotic mosquito species that can be found breeding within these types of premises, pro-active inspections can be an effective form of surveillance and education for high risk businesses.

#### 7.4 Data collection & Extraction (software)

*Strategy 21 – Keep up to date with best practice and current research, including international, national and local mosquito treatment methods and cost-effectiveness.*

A key component of running a targeted Mosquito Management Program is the collection and extraction of data. Data can identify the trends being experienced by the community in real time which enables Council to respond appropriately. Effective data collection also provides an opportunity for Council to collect information and statistics on mosquito activity across the city so that treatments can be better targeted to where they are needed the most. Other benefits also include increasing the capabilities and ease of data sharing between stakeholders and providing accurate and up to date data to the community.

While trending data is important for the Mosquito Management Program, Council is also legislatively obligated to keep certain records about the types of mosquitoes found within Redland City and the chemicals used for mosquito treatments, including where the product has been applied and at what rate. This reporting is provided to the State Government on an annual basis.

Council currently utilises mapping software which stores locational data only. A project is proposed to increase efficiencies and streamline the reporting platforms for mosquito management, including the use of remote technology. The project will include asset capture, collection of data and creating reports that links to Council's Business Intelligence (BI) program. It is acknowledged that additional software will be required, to enable the capacity of capturing live data in the field. This recommendation and anticipated resources to facilitate this opportunity has been included as an action item under section 9.

#### 7.5 Data collection & Extraction (technology)

*Strategy 21 – Keep up to date with best practice and current research, including international, national and local mosquito treatment methods and cost-effectiveness.*

Recent advances in remote technology are emerging in the mosquito management industry due to their extensive benefits for local councils. Remote technology enables officers to collect and enter data in the field, saving on both officer time and reducing inefficiencies. Remote sensors and BioGents Traps are innovative technology that can be set up in known mosquito breeding areas to assist with monitoring of tidal inundations and mosquito numbers within the

area. The remote sensor software allows a trigger alarm to be set for a certain tide height, helping identify the extent of inundation and potential treatment areas. While the BioGents Traps automatically identify the number of mosquitoes present in a specific area to target treatments where they are needed most. This technology, allows officers access to live data streaming, that if utilised, could allow officers to better plan their daily work, reduce overtime expenditure and avoid unnecessary travel to areas that potentially have not yet been inundated or are unaffected by mosquitoes. This has been considered under section 9 of the Mosquito Management Action Plan.

## 7.6 Alternative Treatments

*Strategy 15 – Review the available treatment methods and best practice procedures to best inform mosquito control methods.*

*Strategy 17 – Review treatment options effectiveness on annual basis and adjust preferred methods to reflect findings.*

Across Redlands Coast, tourism and events are promoted and encouraged in the community. With the increase in visitors and residents participating in events across the city, further research into the viability of alternative mosquito management services that are of benefit to the community should be explored.

Community events in the city generally start during the early morning hours (such as triathlons, sporting events etc.) or late afternoon periods, which coincides with when mosquitoes are most active. This increases the risk of exposure to mosquitoes that affects not only the amenity of an event, but can also pose a health risk if personal protective measures are not taken.

While research is still underway to determine long term effectiveness, some councils are conducting barrier treatments around venues where events are held to help manage adult mosquito numbers. Barrier treatments may also play a role during disaster events, in particular at evacuation centres. Following a disaster event, such as flooding, barrier treatments may be an effective way to manage adult mosquito numbers around evacuation centres where there may not be appropriate personal protective measures in place.

For a barrier treatment to be effective, there needs to be enough contact surface for the product to adhere too. The treated surface also needs to be located in such a way that harm to other important species of insect are managed. To determine whether alternative treatments such as barrier treatments are a viable option for Council, further research has been identified under section 9 in the Mosquito Management Action Plan.



## 8.0 Gap analysis – Identified long term strategies

### 8.1 Mosquito management planning considerations

*Strategy 13 – Redland City Council provides a liveable environment where mosquito nuisance is managed.*

*Strategy 11 – Council is committed to Integrated Mosquito Management – the implementation of a number of mosquito control techniques with the intent to reduce its reliance on chemicals, to reduce mosquito numbers and disease risk, taking into account environmental impact, sustainability and cost effectiveness.*

Across Redland City, urban and infill development is occurring closer to mosquito breeding sites. Under the previous Redlands Planning Scheme Version 7.2 and current City Plan, mosquito management provisions are not able to be considered as part of a standard Development Application. Consequently properties may not fully be designed to prevent mosquitoes breeding or harbouring in areas that experience elevated mosquito activity.

A rare opportunity for Council to address mosquito and biting midge through a development process occurred in 2015 with the Shoreline development. The Shoreline development proposed to construct dwellings along the bayside, where one of the largest saltmarsh mosquito breeding areas is located in Redland City. The development application type was to vary the Redlands Planning Scheme which allowed Council and the Developer to incorporate mosquito and biting midge management into the design of the development.

The *Biting Insect Management Plan* was drafted which outlined a management framework, monitoring and building design in response to biting insects, such as mosquitoes and biting midge. This management plan will continue to be used throughout each stage of the Shoreline development for dwelling houses, open space concepts, landscaping and engineering designs. While effective to an extent, urban encroachment on mosquito breeding sites still remains a concern as it increases the potential risk of exposure to mosquito transmitted diseases.

Across the border in New South Wales, Ballina Shire Council has incorporated mosquito management provisions under *Chapter 2 – General and Environmental Considerations* of their *Development Control Plan*. This section applies to all zones and development which aims to; *minimise nuisance and health risks associated with mosquitoes; and minimise human contact with mosquitoes*. 'Development Controls' are listed that specify building requirements such as insect screening for dwellings and rainwater tanks. Depending on the location and scale of development, additional requirements are also in place for buffers, stormwater management, and entomological assessments.

This proactive approach to mosquito management ensures developers are made aware of the potential health risks posed by mosquitoes and that appropriate steps are taken to minimise this risk to the future property owners and occupiers. With the recent introduction of the new Redland City Plan, mosquito management advice was not able to be incorporated as part of the assessable criteria for developments; however options for a Planning Scheme Policy, similar to Ballina Shire Council, should be explored.

It is acknowledged that while there are limitations to inclusions in the City Plan for mosquito management, other avenues can also be explored strategically across various departments



in Council. These may include integrating mosquito management advice within existing Council strategies or plans where there is the potential to influence the design of a proposed development site, to minimise mosquito breeding areas and the impacts on residential amenity.

Within Council, there are various project proposals that require consideration for the management of mosquitoes. Where Council may promote an area for public use that is in close proximity to known mosquito breeding sites, measures should be taken to inform residents and visitors of the potential risks to public health. This may include signage displayed in a prominent position advising residents and visitors to take precautions in protecting themselves from mosquitoes by wearing insect repellent and wearing light-coloured, long loose-fitting clothing. To facilitate these opportunities for mosquito management planning considerations and integration into existing project proposals, resourcing for the implementation has been provided under section 9 in the Mosquito Management Action Plan.

## 8.2 Scoping Study – Freshwater mosquito surveillance

*Strategy 23 – Develop an ongoing comprehensive understanding of the mosquito habitats and species in Redland City.*

Given the number of environmental, social and financial constraints, the Mosquito Management Program currently does not expand to the treatment of mosquitoes in all freshwater sites. Surveillance through the current Mosquito Management Program has indicated that fresh water mosquito species, such as *Culex annulirostris*, are found within the city however there is limited data to identify freshwater mosquito breeding locations or if treatment in these areas is warranted. For this reason, a scoping study through an external agency is recommended to conduct research and investigations into the possibility of treating mosquitoes in freshwater locations across the Redlands.

As part of this scoping study, additional surveying of freshwater locations such as parkland and conservation areas would need to be conducted to effectively identify mosquito species, density and freshwater mosquito breeding sites. This data would then provide a baseline to determine whether there is a need to expand the current Mosquito Management Program to target freshwater mosquitoes to manage the potential transmission of diseases, such as Ross River Virus, in the community.

Treating in freshwater locations, such as conservation and parkland while possible, requires extensive consideration of the environmental and social impacts. These impacts include but are not limited to, vegetation disturbance from vehicle and equipment, track marks and the public perception of chemical use, as generally freshwater sites are found in closer proximity to residential areas. While community perception does not negate the need for treating mosquitoes this will need to be addressed in the scoping study and when considering new technology and treatment locations.

To facilitate this scoping study a Business Case and proposal will be put forward for consideration in the 2021/22 financial year. The Business Case will outline the key aspects of the scoping study including the background, benefits, and potential cost implications for Council.

### 8.3 Data collection & extraction (Drone Technology)

*Strategy 21 – Keep up to date with best practice and current research, including international, national and local mosquito treatment methods and cost-effectiveness.*

Recent advances in remote technology have provided an opportunity for Council to explore better ways to undertake mosquito surveillance and treatments.

In partnership with MARC, the Queensland Institute of Medical Research Berghofer and other industry bodies, Council will continue to explore new technology such as drones to assist with mosquito treatments, including the collection of data such as vegetation density and topography of a treatment site. Advanced technology may also play a role in assisting during disaster management or exotic incursions for increased surveillance and monitoring of sites.

The benefits of using this technology are particularly favourable towards better environmental outcomes, such as minimising vegetation disturbance through the access and treatments of mosquito breeding sites in sensitive environments. Currently, treatments are delivered through aerial and ground application, which often involves some element of vegetation disturbance due to the use of quad bikes.

From an operational perspective, remote technology such as drones are able to increase response times and efficiencies through the capture of real time data when undertaking surveillance and the treatment of access restricted sites. This in turn reduces the risk placed on officers when entering sites with unstable ground/mud, encountering trip hazards and in summer heat stress and fatigue.

While there are some hurdles to overcome with remote technology, Council aim to explore treatment options and data collection opportunities with drones. To ensure the continuation of these projects, resources such as equipment, chemicals, officer time and active participation in MARC research have been considered and included under section 9 of the Mosquito Management Action Plan.



## 9.0 Action Plan: Summary of Gap Analysis & Performance Indicators for the Mosquito Management Program

Following the identification of the gaps in the current Mosquito Management Program, outlined in sections 6 to 8 of this action plan, a summary has been provided below to indicate which of the strategies under the *Mosquito Management Plan 2017 – 2024* will be addressed over the next five years. These strategies are categorised under each of the seven Outcome Areas of the *Mosquito Management Plan 2017 – 2024*, using the “traffic light rating system” as explained in section 5. Any costs associated with the Action Plan will be subject to formal Council consideration through the annual budget development and planning process.

### Mosquito Management Outcome Area: Administration

Objective: To provide an administrative infrastructure that supports mosquito management.

Action Item #	Strategy	Performance Indicator	Timeframe	Indicative Cost
1	Resource the mosquito management program with necessary facilities, equipment, budget, and staff to successfully implement the Redland City Council Mosquito Management Plan	<b>Appropriate resourcing</b> Review existing resources and identify any additional resources needed for the Pest Management Team to ensure that Program commitments can be met under Council’s Mosquito Management Plan.	Short Term	Medium

### Mosquito Management Outcome Area: Community Engagement and Education

Objective: The Redlands community is educated about how they, as individuals, can reduce their contact with mosquitoes.

Action Item #	Strategy	Performance Indicator	Timeframe	Indicative Cost
2	Delivery of educational information and activities to communities, in particular high risk groups e.g. outdoor workers, communities located near mosquito breeding areas.	<b>Community engagement activities and enhanced online communication</b> Engage in local temporary entertainment events such as Indigi Day Out and explore other engagement opportunities through Council initiatives, libraries or school programs. Explore opportunities for enhanced online communication to be more interactive, enabling better accessibility to live information for the community.	Intermediate	Medium

### Mosquito Management Outcome Area: Environment

Objective: To protect the community from mosquito transmitted disease and nuisance while limiting the impact on the environment.

Action Item #	Strategy	Performance Indicator	Timeframe	Indicative Cost
3	Council provides a liveable environment where mosquito nuisance is managed.	<b>Mosquito management planning considerations</b> Undertake consultation with Council's Planning Assessment Team and Strategic Planning Unit to explore opportunities for mosquito management to be incorporated through the planning/development process.	Long Term	BAU
4	Council provides a liveable environment where mosquito nuisance is managed.	<b>Mosquito management signage</b> Signage (similar to neighbouring councils) to be installed in public spaces located in close proximity to mosquito breeding sites.	Long Term	Low
5	Council provides a liveable environment where mosquito nuisance is managed.	<b>Alternative treatments</b> Explore options and viability of alternative treatments such as barrier treatments for Council sites, evacuation centres and community events.	Intermediate	Med

### Mosquito Management Outcome Area: Treatment

Objective: To apply effective and efficient treatment methods with minimal impacts on the environment.

Action Item #	Strategy	Performance Indicator	Timeframe	Indicative Cost
6	Give consideration to areas of sensitive environmental value when determining treatment methods.	<b>Habitat modification and maintenance for treatment access</b> Working with stakeholders such as Conservation Services Unit to identify key conservation areas to preserve and establish access points for treatments and habitat modification for mosquito management.	Intermediate	Low
7	Give consideration to areas of sensitive environmental value when determining treatment methods.	<b>Internal networking for best practice environmental outcomes</b> Explore opportunities between the City Operations Group, Pest Management and other relevant areas of Council, to establish a stakeholder engagement process for officers to ensure best practice environmental outcomes for mosquito management both strategically and operationally.	Intermediate	BAU



## Mosquito Management Outcome Area: Research

Objective: To apply effective and efficient treatment methods with minimal impacts on the environment.

Action Item #	Strategy	Performance Indicator	Timeframe	Indicative Cost
8	Prepared to respond to emerging issues.	<b>Proactive surveillance</b> Proactive surveillance and education involving commercial businesses such as motor vehicle workshops and boat repair, for imported and container breeding mosquitoes.	Intermediate	BAU
9	Remain up to date with current research including international and national mosquito treatment methods and cost effectiveness.	<b>Data collection and extraction</b> Mapping Software implementation to capture and report on data in relation to the surveying and treatment of mosquitoes.	Intermediate	Medium
10	Remain up to date with current research including international and national mosquito treatment methods and cost effectiveness.	<b>Data collection and extraction</b> Use of latest technology and equipment (such as remote sensors and BG Traps) to increase surveillance of tidal inundations and mosquito populations and locations.	Intermediate	Medium
11	Develop an ongoing comprehensive understanding of the mosquito habitats and species in Redland City.	<b>Scoping study</b> Undertake a scoping study of potential freshwater breeding sites to determine possible viability including access for treatments.	Long Term	Medium
12	Remain up to date with current research including international and national mosquito treatment methods and cost effectiveness.	<b>Data collection and extraction</b> Use of latest technology such as drones to increase surveillance and minimise environmental disturbance.	Long Term	Medium/High

## 9.0 Summary

While there are pressures such as disaster events, urban development and climate change that will impact on the Mosquito Management Program, future planning will enable Council to continue to improve upon the current Program with strategies that support the principles of Integrated Mosquito Management.

The Mosquito Management Program Review has identified a number of gaps in the current Mosquito Management Program, as summarised in section 9, which will require additional resources in order to be achieved, both in the short and long term. It is recognised that the short term gaps will need to be addressed before the Program can explore potential opportunities for growth.

Given the unique environments in the Redlands, the long term strategy to conduct a scoping study will be crucial in collecting data on mosquito species to better inform the future direction of the Program. It is anticipated that the *Mosquito Management Action Plan 2019-2024* will be an initial phase; however the recommendations of the scoping study will indicate possible opportunities to expand the Program that continues to meet the strategic and legislative commitments of Council.

## 10.0 References

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## 11.0 Appendix

### Appendix 1 – Integrated Mosquito Management (LGAQ, 2014)

