Health Protection Programs
Public Health Division
Department for Health and Wellbeing

South Australian Arbovirus and Mosquito Monitoring and Control Plan

Government of South Australia
SA Health

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Acronyms and Abbreviations

APY	Anangu Pitjantjatjara Yankunytjatjara lands
ARPH	Aboriginal and Regional Public Health, Department for Health and Wellbeing
ARCAG	Arbovirus Response Cross Agency Group
BOM	Bureau of Meteorology
BFV	Barmah Forest virus
CAP	Arbovirus communication action plan
CDCB	Communicable Disease Control Branch, Department for Health and Wellbeing
CPHO	Chief Public Health Officer, Department for Health and Wellbeing
DEW	Department for Environment and Water
DHW	Department for Health and Wellbeing
DMB	Disaster Management Branch, Department for Health and Wellbeing
ENSO	El Niño–Southern Oscillation
EPA	Environment Protection Authority SA
EVS	Encephalitis Vector Survey
HoR	Hierarchy of Response
HPP	Health Protection Programs, Department for Health and Wellbeing
HPR	Health Protection and Regulation, Department for Health and Wellbeing
JE	Japanese encephalitis
JEV	Japanese encephalitis virus
LGA	Local government association
MCU	Media and Communications Unit, Department for Health and Wellbeing
MMP	Mosquito management plan
MVEV	Murray Valley encephalitis virus
NGO	Non government organisation
NHC	Nganampa Health Council
OCA	Outback Communities Authority
PHD	Public Health Division, Department for Health and Wellbeing
PHPA	Public Health Partner Authority
PHPR	Public Health Response Planning, Department for Health and Wellbeing
PHEMP	Public Health Emergency Management Plan
PIRSA	Department of Primary Industries and Regions

RASAC	Regional Anangu Services Aboriginal Corporation
RPHP	Regional Public Health Plan
RRV	Ross River virus
SMP	Strategic management plan
SPHP	State Public Health Plan
WNV/KUN	West Nile Virus – Kunjin strain

Definitions

The Act	*South Australian Public Health Act 2011*
Alphavirus	Single stranded RNA viruses transmitted by arthropods, especially mosquitoes.
Arbovirus	Arthropod borne viruses affecting humans.
Encephalitis	Inflammation of the substance of the brain.
Flavivirus	Enveloped, spherical positive stranded RNA viruses, the genus contains many arthropod-borne viruses that are distributed worldwide.
The LG Act	the *Local Government Act 1999*
LGA report	Communicable Disease Control Branch, Local Government Area (LGA) monthly report.
Reservoir	The reservoir of an infectious agent is the habitat in which the agent normally lives, grows, and multiplies. Reservoirs include humans, animals, and the environment
The Annual Report	The South Australian Arbovirus and Mosquito Monitoring and Control Annual report.
The Plan	The South Australian Arbovirus and Mosquito Monitoring and Control Plan.
The Monthly Report	The South Australian arbovirus and mosquito monitoring report.
Sentinel	An indicator for the presence of disease.
The Strategy	The South Australian Arbovirus Management Strategy.
Vector	Organism capable of transmitting viruses or parasites to humans.

Background

Mosquitoes are vectors of several arthropod-borne viruses (arboviruses) affecting humans and are the leading cause of morbidity and mortality in many parts of the world. There are approximately 30 species of mosquitoes in South Australia, several which are serious pests and/or disease vectors. South Australia has historically experienced a low incidence of serious mosquito-borne diseases. However, climate change-related threats, including rising global temperatures and extreme rainfall events, coupled with global trade and travel, are contributing to the increased risk of mosquito-borne arboviruses. New developments in mosquito-prone areas and efforts to address climate change, like water storage and urban greening, can create unintended consequences by creating mosquito breeding grounds.

Endemic and epidemic mosquito-borne arboviruses pose a significant threat to the health and well-being of South Australians. Understanding the distinctions between these is crucial for developing effective prevention and control strategies. Endemic arboviruses are continuously present in a particular region, with relatively predictable transmission patterns. Epidemic mosquito-borne diseases are characterised by sudden and rapid surges in transmission, potentially leading to outbreaks.

Mosquito-borne arboviruses are classified as either flaviviruses or alphaviruses. In South Australia, endemic flaviviruses, including Murray Valley encephalitis virus (MVEV), West Nile virus Kunjin strain (WNV/KUN), and Japanese encephalitis virus (JEV), are of particular concern due to their potential to cause permanent neurological damage or death in humans. Alphaviruses, including Ross River virus (RRV) and Barmah Forest virus (BFV), are also a cause for concern in South Australia as they can cause chronic illness, with symptoms sometimes persisting for over a year or more. RRV infection is the most commonly notifiable mosquito-borne disease notified in South Australia.

South Australia's last major outbreak of RRV and BFV occurred in the summer of 2010/11, along with two reported cases of locally acquired MVEV, one of which was fatal. Many detections of RRV and BFV in trapped mosquitoes were reported in South Australia during the 2022/23 season. JEV was detected in South Australia for the first time during the summer of 2021/22 and nine locally acquired human cases were subsequently notified. There was one confirmed human case of MVEV reported in South Australia in May 2023.

There is currently no vaccine and no cure for RRV, BFV, MVEV or WNV/KUN. Personal and household protection against mosquito bites are the only evidence-based measures known to prevent individuals from being infected. In addition, nuisance biting can significantly affect community morale and reduce engagement in outdoor activities. Nuisance biting and arboviruses have significant health, economic and social implications. Detailed information on mosquito-borne arboviruses and mosquito ecology can be found in the South Australian integrated mosquito management resource pack (the resource pack).

Prevention and control strategies for endemic and epidemic arboviruses primarily focus on vector control, including larvicide treatment, environmental management, and public education on mosquito bite avoidance. While disease control is the primary focus, reduction in social and economic impacts of mosquitoes improves community wellbeing. It is acknowledged that eradication of mosquitoes or mosquito-borne disease is unrealistic.

Introduction

The South Australian Arbovirus and Mosquito Monitoring and Control plan (the Plan) has been developed to support the goals and strategic priorities detailed in the South Australian Arbovirus Management Strategy (the Strategy). The aim of the Plan is to inform mosquito surveillance and control activities commensurate to the local arbovirus risk. The Plan guides collaboration between relevant state and local government agencies in South Australia in the areas of mosquito surveillance, management, and control, and provides the framework for the implementation of coordinated mosquito management programs. It establishes procedures for Department for Health and Wellbeing (DHW) officers to implement coordinated mosquito management programs and outlines the responsibilities, authorities, and mechanisms to minimise, manage and recover from an outbreak of mosquito-borne arboviral disease in South Australia.

DHW collects data from a broad range of partners and sources to determine the state arbovirus risk threat level. The Code of Ethics for the South Australian public sector is the Code of Conduct (the Code) for the purposes of the Public Sector Act 2009, and all public sector employees are bound by it. All data provided to support response to arbovirus incidents, outbreaks or emergencies is subject to the professional conduct standards within the Code, which include handling official information and confidentiality.

The Hierarchy of Responses (HoR), as detailed in this Plan, is dependent upon on-going data and trends identified by surveillance activities, weather forecasting, and human and animal disease notifications. The HoR was developed to guide decision making on an appropriate level of response that is proportionate to the risk or incidence of serious human arboviral diseases. The HoR specifies trigger conditions for each level of response and measures that should be considered for implementation at that level.

The Plan provides a risk-based approach to determine required mosquito surveillance and control activities, and clearly identified roles and responsibilities in relation to these activities in accordance with the HoR. The HoR guides decision making to support appropriate responses to the risk or incidence of serious human arboviral disease.

Scope

The Plan is intended for use by DHW. It does not replace existing local mosquito management plans (MMPs) developed by local councils or other key stakeholders. Actions detailed in the Plan may be used to inform local council MMPs, guide actions by key stakeholders, and to support resource allocation during periods of increased arbovirus risk.

The plan does not describe mosquito ecology or specific arboviruses. That information can be found in the resource pack.

Exotic mosquito-borne diseases pose a severe threat to public health due to their potential for rapid spread and severe illness in immunologically naïve populations. The Plan does not contemplate responses to exotic incursions. They will be detailed in the South Australian exotic incursion response plan.

The legal and administrative framework

In Australia, communicable disease control is a shared responsibility between the Commonwealth, state, territory, and local governments. Each level of government has its own role to play, and they are all supported by relevant governance and legislative frameworks. These frameworks provide the legal basis for the collection of data, the investigation of outbreaks, and the implementation of control measures.

National Arbovirus and Malaria Advisory Committee

In Australia, national recommendations are provided by the National Arbovirus and Malaria Advisory Committee (NAMAC). NAMAC is a technical advisory group to the Communicable Diseases Network Australia (CDNA). NAMAC is responsible for making recommendations to the CDNA on arbovirus and malaria surveillance, strategic arbovirus and malaria disease management, and vector control. NAMAC also provides expert technical advice on arboviruses and malaria to assist in the detection, management, and control of real or potential outbreaks of arboviral and malarial disease. DHW has representatives on both NAMAC and CDNA.

South Australia

The comprehensive legal and administrative framework in South Australia ensures that public health, including the management of endemic and epidemic arboviruses, is effectively coordinated, and managed at both the state and local levels, with clear roles and responsibilities defined for various authorities and stakeholders.

The South Australian Public Health Act 2011

DHW is the lead control agency in South Australia for human disease epidemics including outbreaks of serious human arboviruses. The *South Australian Public Health Act 2011* (the Act) is the primary legislation that promotes and provides for the protection of the public in South Australia and the reduction of preventable illness, injury, and disability. All arbovirus infections detected in humans in South Australia are notifiable under the Act and the South Australian Public Health (Notifiable and Controlled Notifiable Conditions) Regulations 2012. As the relevant public health authority for their area under the Act, local councils are responsible for ensuring appropriate mosquito management on public land, including Crown Land, within their jurisdictions.

The *Emergency Management Act 2004*

The *Emergency Management Act* 2004 establishes strategies and systems for managing emergencies within the State. The Public Health Emergency Management Plan (PHEMP), written in accordance with the Act, outlines the legislative obligations of DHW to prepare for and respond to public health incidents and emergencies. The PHEMP also guides incident management across the prevention, preparedness, response, and recovery phases of an emergency.

The PHEMP outlines and informs public health emergency management arrangements at a strategic/state level. It will be the main reference document used if HPP determines it no longer has the resources to manage a state coordinated response to an outbreak of serious arboviral disease in humans.

Public Health Partner Authorities

Section 51(18) of the Act allows for the establishment of Public Health Partner Authorities (PHPA). PHPA agreements provide a basis for parties to work in partnership to protect the health and wellbeing of the community and the environment by contributing to the intended outcomes of the Act.

State Public Health Plan

The State Public Health Plan (SPHP) meets the requirements of Section 50 of the Act. The SPHP is developed in consultation with public health partners with the objects and principles of the Act at its core. It provides a framework to work together to take early action to protect health, prevent illness, and promote physical and mental health and wellbeing for all South Australians.

Regional Public Health Plans

Pursuant to the Act, local councils in South Australia prepare, maintain, and report on a Regional Public Health Plan (RPHP) that is consistent with the SPHP and responds to public health challenges within their local area or region. The planning process can be used to formalise local partnerships and facilitate commitment to public health strategies across other relevant organisations working in the region.

Strategic Management Plans under the *Local Government Act 1999*

Section 122 of the *Local Government Act 1999* (the LG Act) requires councils to prepare strategic management plans (SMPs). These plans must address, amongst other things, the economic, social, physical, and environmental development and management of its area; partnerships with other councils, state, and national governments; and the role of local government in coordinating the planning and delivery of services with other partners.

Partnership working

The partnership principle, as described in the Act, promotes collaboration, partnership, and joint action across all levels of government, non-government organisations (NGOs), wider stakeholders, and communities. DHW works with a range of internal and external partners through both formal and informal networks to plan for and manage the risk of mosquito-borne disease in South Australia.

Responsibility for public health falls within the Public Health Division (PHD), which is a service delivery arm of the DHW. The PHD, led by the Chief Public Health Officer (CPHO) comprises of three directorates:

> Health Protection and Regulation (HPR): Dedicated to undertaking a range of health protection functions including the development of policy, legislation and high-level technical advice, delivery of health protection programs and the management of compliance with public health legislation.

> Communicable Disease Control Branch (CDCB): Dedicated to undertaking a range of functions to reduce the incidence of communicable and infectious diseases in South Australia.

> Public Health Planning and Response (PHRP): Dedicated to undertaking a range of enabling functions to support the CPHO, the broader PHD division, Local Health Networks and partners to address emergencies and other public health challenges.

Health Protection Branch

The Health Protection Branch (HPB) sits within HPR and focuses on the identification, monitoring, investigation, and management of environmental factors that impact on the health of the South Australian community. It does this through the development and direct delivery of health protection legislation, policy, advice, and services. HPB provides authoritative high-level advice on public health issues and works in partnership with local councils, other government agencies, businesses, NGOs, and the community.

Arbovirus management, surveillance and control operations are coordinated by the Health Protection Programs team (HPP) within the HPB, supported by other branches within the PHD and other key partners.

Communicable Disease Control Branch

CDCB aims to reduce incidence of communicable and infectious diseases in South Australia. They do this through provision of specialist services, including medical and epidemiological advice, liaison with laboratories, government agencies and professional groups, coordination of state responses to notifiable conditions, disease surveillance and investigation, immunisation programs and infection control services.

All arbovirus infections detected in humans in South Australia are notifiable under the Act. CDCB receives laboratory notifications for all positive arbovirus tests and medical notifications from doctors with place of exposure when known. CDCB monitors and analyses arbovirus notifications locally and nationally and routinely provides data, information, and advice to HPP to support a risk-based approach to mosquito management.

Disaster Management Branch (DMB)

The Disaster Management Branch (DMB) sits within PHPR and provides strategic leadership and direction for SA Health in preparing for, responding to, and recovering from major incidents, emergencies and disasters that occur in South Australia as well as nationally or internationally. DMB implements education, training, and exercise programs, and engages with the Commonwealth Government and jurisdictional partners to maintain and develop the national health emergency management arrangements and associated capabilities within SA Health.

If the CPHO determines that an arboviral outbreak constitutes a public health incident or emergency, DMB will facilitate transition to the PHEMP.

Aboriginal and Regional Public Health

DHWs aboriginal and regional public health team (ARPH) sits within PHPR and delivers regulatory services to unincorporated areas of South Australia (areas outside of local government jurisdiction). Any reference in the plan to the roles and responsibilities of local councils are taken to be the roles and responsibilities of ARPH. When required, ARPH will undertake mosquito surveillance and control operations in unincorporated areas of South Australia.

Media and Communications Unit

DHW's media and communications unit (MCU) sits within DHWs corporate communications branch which provides advice and support to develop and implement communications and media across SA Health. MCU is responsible for wide scale communication and community engagement across South Australia. They plan, prepare, and deliver the annual 'Fight the Bite' community education campaign. The campaign targets mosquito bite prevention and ways the community can stop mosquitos from breeding.

One Health South Australia Working Group

DHW is a member of the One Health South Australia Working Group (OHSAWG) which operates under a formal PHPA agreement between DHW, the Department of Primary Industries and Regions, South Australia (PIRSA) and the Department for Environment and Water (DEW). OHSAWG is a government cross-agency information sharing and advisory group established in 2009 with the following membership:

DHW

> Health Protection Branch (HBR)
> Food Safety and Regulation Branch
> Specialist Services Unit (medical team)
> Disease Surveillance and Investigation Services
> ARPH
> DMB

PIRSA

> Animal Biosecurity
> Food Standards Program

DEW

> Conservation and Wildlife Management Branch

OHSAWG is committed to working collaboratively to ensure effective sharing of data and information to understand disease risks.

Members provide and share relevant environmental, human, and animal health information relating to arbovirus risk and surveillance to ensure appropriate targeting of mosquito control programs (in conjunction with local councils), education of animal owners, and community education initiatives. OHSAWG contributes to national research and programs and provides data to support the national One Health approach.

Arbovirus Response Cross Agency Group

The Arbovirus Response Cross Agency Group (ARCAG) is a key partner group which aims to help facilitate communication through the various agencies involved in mosquito management and control. The purpose of ARCAG is to provide a mechanism for effective communication amongst key stakeholder agencies and organisations on all aspects of the planning and implementation of integrated mosquito management programs.

ARCAG considers the preparedness of representative agencies, other organisations, and the state to support a state coordinated response, should it be necessary. ARCAG assists DHW by:

- providing advice (technical, operational, and strategic).
- facilitating access to intelligence, information, and resources.
- facilitating communication and decision making within the representative agencies, where required, to ensure an effective and timely response.
- providing appropriate recommendations to support effective and timely responses.

ARCAG membership and terms of reference can be found in appendix 1. Arbovirus management roles and responsibilities of ARCAG members can be found in appendix 2.

The Local Government Association

The Local Government Association (LGA) of South Australia is a membership organisation which provides advocacy services, training, and support to local councils. The LGA deliver services and leadership relevant to the needs of member councils.

Local government / councils

As local public health authorities for their areas under the Act, local councils are responsible for ensuring appropriate mosquito management on public land, including Crown Land, within their jurisdictions. To achieve the best possible public health outcomes, councils are encouraged to implement integrated mosquito management programs incorporating a considered balance of surveillance, mosquito control, and health promotion activities. At a local level, councils perform risk assessments to identify, analyse and evaluate the level of risk posed by mosquitoes to the community during any given season. Where mosquito control activities are deemed necessary, these are targeted in locations which most directly impact on residents and visitors.

Remote and regional areas

Implementing adult mosquito surveillance and control programs in remote and regional areas is particularly challenging. The logistics of arranging human and physical resources to undertake adult mosquito surveillance can be difficult and delays in transportation can result in degraded samples being unsuitable for viral analysis. Similarly, timely mosquito control can be subject to significant logistical challenges arising from weather conditions, access and availability of suitable chemicals and human resources.

The Outback Communities Authority

The Outback Communities Authority (OCA) is responsible for facilitating a hybrid governance model incorporating aspects of local government and community self-management for the approximately 4500 people that occupy the 625,000 km^2 of unincorporated South Australia, also known as the unincorporated areas. Traditional local council models would be impractical for this area.

OCA community development officers work across outback South Australia and maintain up to date contact details for community groups and progress associations in the unincorporated areas. Such groups may be able to assist by undertaking health related activities in communities and are best placed to assist with reporting or response relating to incidents.

Anangu Pitjantjatjara Yankunytjatjara

Anangu Pitjantjatjara Yankunytjatjara (APY) is incorporated by the *Anangu Pitjantjatjara Yankunytjatjara Land Rights Act 1981.* APY oversees the activities of the various constituent groups serving the needs of the people on the Lands. It also helps shape policies regarding economic and social development. Permits to enter the APY lands are required.

APY lands present specific logistical challenges for conducting mosquito surveillance during the cultural season. There are periods of time when roads to the lands are closed due to flooding or where access is not granted for cultural reasons. These periods often cannot be predicted. Therefore, communication with key, locally based stakeholders is critical.

Nganampa Health Council

Nganampa Health Council (NHC) is an Aboriginal community-controlled health organisation operating on the APY Lands in the far northwest of South Australia. The APY lands cover over 105,000 square kilometres in the northwest corner of South Australia and is home to almost 3,000 residents. Across this area, NHC operates seven clinics and assorted health related programs including environmental health, health worker training and immunisation.

Regional Anangu Services Aboriginal Corporation

Regional Anangu Services Aboriginal Corporation (RASAC) is a not-for-profit Aboriginal Corporation with over 30 years of experience in remote service delivery on the APY lands. RASAC is owned and governed by the Anangu people of the APY Lands.

Effective risk management

In South Australia coastal saltmarsh areas, tidal inundation patterns significantly impact mosquito abundance. The broad areas of flood plain associated with the River Murray provide breeding opportunities for *Culex annulirostris*, the main vector mosquito associated with MVEV and JEV. This is particularly significant after a period of high and prolonged river flow, when floodwaters recede and during times of high spring and summer rainfall.

Effective mosquito management can help to minimise the public health risk and improve amenity associated with mosquitoes. Mosquito management is only necessary if people and mosquitoes come into contact in residential or recreational areas that are within the dispersal range of mosquito breeding habitats. The overall aim of mosquito management is to reduce pest or vector mosquitoes to a level where the impact on the adjacent human population is kept to an acceptable level.

Public health risks, such as those associated with mosquitoes, can be difficult to prevent given that there are many associated factors beyond immediate control such as weather patterns, animal migrations and human behaviour. Risk assessments identify, analyse, and evaluate new and emerging hazards and, where possible identify ways to mitigate health risks to humans, animals, and the environment. The location and frequency of, and responsibility for, surveillance activities vary depending on identified spatial or temporal risk or legislated responsibilities.

Risk assessment in the context of arboviral disease risk involves monitoring a broad range of data and anticipating the risk of disease based on known or potential trigger conditions. Risk assessments inform actions at state and local level levels, guiding informed decision-making, public health interventions, and resource allocation, whilst enabling targeted control measures to be implemented at agreed threshold levels.

Effective control measures are guided by information and data received from local intelligence sources and partners. Applying any mosquito control measure on a pre-determined schedule without a documented need is not acceptable practice. The main objective of mosquito control is to decrease the risk of a human outbreak of serious mosquito-borne disease through the reduction of mosquito breeding, and provision of public health information and personal protective measures, especially for those with significant outdoor exposure.

Routine surveillance activities

Surveillance methods for endemic mosquito species and subsequent control programs can vary by region due to their ecology and habitat preferences. Coordinated programs and on-going monitoring for endemic mosquitoes are necessary for effective risk management in the long term.

DHW and local councils conduct a range of routine arbovirus surveillance activities in South Australia to reduce the risk of human arboviral disease. The collective aim of these activities is to:

- monitor human mosquito-borne disease risk status.
- provide an early warning of the presence of the viruses known to cause mosquito-borne disease.
- inform activities to reduce mosquito breeding opportunities in high-risk locations.
- advise the public and visitors to South Australia of the risks and how to protect themselves from mosquito-borne disease.
- promote interagency cooperation on matters relating to the monitoring, prevention, and control of human mosquito-borne disease.

These routine activities include surveillance of:

- meteorological data.
- adult mosquito abundance, species, and viral screening.
- mosquito larvae.
- sentinel chicken flocks.
- human disease notification data.

Meteorological data

Meteorological data is important for assessing the risk for human cases of arbovirus infection by signalling conditions conducive to increased mosquito abundance. Mosquito numbers in inland parts of South Australia are influenced by rainfall and temperature during the peak period for mosquito breeding, which usually spans the months of September through to April. In coastal saltmarsh areas, tidal inundation patterns significantly impact mosquito abundance, particularly during the months of January through to April.

Periods of high and prolonged river flow along the broad areas of flood plain associated with the River Murray provide breeding opportunities for the main vector of concern for MVEV and JEV, *Culex annulirostris*, particularly when floodwaters recede and during times of high spring and summer rainfall.

Meteorological data, specifically rainfall and flooding data, assists in predicting the distribution of waterbirds, the primary reservoirs for both MVEV, WNV/KUN and JEV. Rainfall and flooding data also assists in predicting an increase in mosquito breeding locations near to feral pig populations, important reservoir and amplification hosts for JEV.

The El Nino Southern Oscillation (ENSO) forecaster is used to predict weather conditions that would create the perfect conditions for both amplification of JEV, WNV/KUN and MVEV in reservoir populations and increased abundance of vector species. The La Niña phase of the ENSO climate cycle influences climatic conditions that are favourable for increased mosquito abundance over the season with increased rainfall, cooler day time temperatures and warmer night-time temperatures. Weather conditions and the ENSO forecaster are continually monitored via the Bureau of Meteorology.

Adult mosquito surveillance

The South Australian mosquito surveillance program has historically consisted of two main elements, the northern Adelaide mosquito surveillance program, which is delivered by HPP, and the subsidy program which is delivered by local councils. Adult mosquito surveillance is undertaken in high-risk areas by local councils in South Australia with enumeration, species identification and viral screening providing data to support risk-based responses. DHW funds the laboratory costs for identification, enumeration and viral screening of all mosquitoes trapped by local councils.

Adult mosquito trapping in South Australia is undertaken using 3D printed encephalitis vector survey (EVS) mosquito surveillance traps baited with CO^2 and a light source which are produced and provided to councils free of charge by HPP. Adult mosquito trap abundance, species data and viral analysis is provided to HPP via a contracted laboratory. Each batch of mosquitoes from local council traps are routinely processed according to trap location, counted, and identified to species level. Samples are then screened for arboviruses.

Northern Adelaide Program

DHW has a longstanding involvement in mosquito surveillance and management in the highly mosquito prone areas of Torrens Island and Globe Derby Park. Formal mosquito management activities date back to the 1960s following industrial action in relation to Torrens Island power station workers experiencing severe mosquito biting, and HPP continues to undertake routine adult mosquito surveillance and control in this area.

Larval surveillance

Several local councils routinely undertake routine mosquito larvae surveillance and control activities. Larval sampling is often undertaken as a component of a mosquito surveillance and control program. It enables both permanent and temporary aquatic breeding grounds to be identified and can show seasonal fluctuations in breeding. Larval sampling enables the identification of mosquito species prior to adult emergence and survey findings can be used to determine the need for larval control activities. Information obtained from larval sampling can be used to identify the optimal times for larvicide application and can potentially detect insecticide resistance.

When used in conjunction with adult mosquito trapping, larval sampling can provide a useful means of assessing the effectiveness of a larval control program. If larval sampling indicates that larvicide control has been effective yet adult numbers are not declining, unidentified breeding grounds can be suspected, indicating that the area requires further surveying. Larval sampling can also assist in the investigation of complaints. Residents may think that mosquitoes are coming from a neighbouring area or property, when in fact breeding sites are located at their own property.

Sentinel chicken surveillance

Environmental surveillance includes the South Australian sentinel chicken program which consists of backyard chicken flocks established in strategically selected locations in South Australia. Blood sampling frequency varies depending on identified spatial or temporal risk. Chickens are a good indicator of flavivirus risk to the community, as they readily produce antibodies to these viruses if infected, without developing symptoms. The program is funded by DHW and delivered by HPP. DHW funds the laboratory costs for serological testing of sentinel chicken blood samples for specified flaviviruses including MVEV, WNV/KUN and JEV.

The South Australian Mosquito Management Subsidy Program

Local council mosquito management programs receive funding from DHW under the South Australian mosquito management subsidy program (the subsidy program). To achieve the best possible public health outcomes, councils are encouraged to implement integrated programs incorporating a considered balance of surveillance, mosquito control, and health promotion activities. Where mosquito control activities are deemed necessary, these are targeted in locations which most directly impact on residents and visitors.

DHW supports local councils to implement mosquito control programs and community education programs to prevent or reduce human cases of infection through the subsidy program. Many regional areas have limited human and/or financial resources to enable effective responses to the increased threat of serious cases of human arboviral disease. The subsidy program provides financial assistance to local councils in specific high-risk mosquito breeding areas of South Australia, where the cost of effective mosquito management exceeds available local council resources. The subsidy program is administered by HPP. Seasonal subsidy funding to councils will vary depending on risk factors including geographical location,

Mosquito management plans

Councils play an important role in supporting the state government in managing public health risks through mosquito management activities. Mosquito managements plans (MMPs) provide a risk profile for local council areas and provide a framework to support local councils in meeting their obligations under the Act to protect the health of their communities through mosquito and arbovirus management, prevention, and control programs and community engagement. MMPs provide a mechanism to assist local councils in identifying, planning for, and achieving strategic priorities as identified in a RPHP whilst supporting business planning and resource allocation. MMPs also enable councils to consider the types of surveillance, management, and intervention strategies available and appropriately cost the appropriate measures.

Local councils are required to undertake local risk assessments to access funding from DHW under the Subsidy Program. These risk assessments are included in local council mosquito management plans (MMPs). Local MMPs provide a framework for local councils to support them in meeting their obligations under the Act to protect the health of their communities through mosquito and arbovirus management, prevention and control programs and community engagement. MMPs provide a risk profile for local council areas and identify key strategies and actions to reduce the local incidence of mosquito borne disease in the community in line with the varying levels of risk for each season. A MMP will also ensure that local environmentally sensitive areas, such as wetlands, are identified and considered when contemplating surveillance and control activities.

Whilst MPPs should be reviewed routinely each season, they should also be reviewed where new or emerging risks are identified. A local MMP should include:

- high risk locations for mosquito breeding found in the council area.
- existing/baseline mosquito management activities.
- existing/baseline information about the mosquitoes and breeding sites in the area.
- any investigations used to prepare the plan.
- mosquito management strategies proposed for the upcoming season.
- surveillance proposed for the upcoming season.
- risk assessment of new developments.
- reporting.
- budget.
- training and procedures.
- monitoring and review of plan.

A MMP template can be found in the resource pack.

Private landowners

Private landowners and occupiers are responsible for mosquito management on a range of land, including domestic, commercial, and agricultural. In urban settings, mosquito management can often include a range of simple strategies that effectively reduce mosquito activity, such as removing and preventing breeding sites, and maintaining and cleaning the property to prevent adult mosquitoes from seeking refuge.

In agricultural settings, mosquito management can often be more difficult due to the size and geography of a property, presence of dams and troughs and intentional widespread water use. Agricultural landowners/occupiers are responsible for mosquito management and ensuring that measures are taken e.g., installation of efficient watering systems, that prevent increased mosquito-borne disease risk to the wider community.

Local councils may provide education and guidance to support effective mosquito management on private land. Where necessary they may use enforcement powers under the Act to achieve positive public health outcomes.

Public sector landowners

All public sector landowners and occupiers are responsible for their own mosquito management and ensuring mosquito disease risk originating on their land is not impacting the community or members of the public accessing these public places.

Communication

Communication is an integral part of managing mosquito-borne disease risks. The information delivered must be useful, timely, accurate, consistent, and accessible. Having a framework for effective information sharing to support appropriate public health responses reduces the burden of mosquito-borne diseases by:

- empowering communities: When people understand the risks, they can take preventive measures like using mosquito repellents, wearing protective clothing, and eliminating mosquito breeding sites around their homes. This can lead to a reduction in individual exposure and minimise local mosquito breeding.
- enhancing control efforts: Clear communication about mosquito surveillance and control programs, promotes transparency, builds trust, and can address community concerns regarding the need for chemical control in high-risk locations.
- providing early warning: Effective, targeted communication can help inform communities of areas with high mosquito populations or outbreaks of mosquito-borne diseases. This allows for targeted public health messaging to reduce risks to local communities.

Fight the Bite

As part of its responsibility, DHW uses the Fight the Bite campaign to advise and inform all South Australians about the health risks associated with mosquito bites and how individuals can reduce their risk of acquiring an arbovirus. Fight the Bite was first launched in 2004 and runs annually.

The campaign highlights the adverse effects of mosquito bites on human health and encourages individuals to adopt protective measures to reduce the likelihood of being bitten by mosquitoes and acquiring a mosquito-borne disease. In addition to raising awareness about health issues associated with mosquito bites, the campaign also aims to raise awareness about the importance of eliminating environments where mosquitoes live and breed. Campaign resources are distributed to relevant stakeholders and radio advertising is broadcast on local radio stations in affected areas.

South Australian arbovirus communications action plan

DHW's South Australian arbovirus communications action plan (CAP) guides the delivery of the Fight the Bite campaign. The CAP is supported by a standby CAP which is enacted when the risk of local arbovirus transmission is heightened. The CAP and standby CAP promote preparedness by ensuring swift and coordinated responses to any arbovirus incident, outbreak, or emergency. The CAP ensures consistent, accurate information commensurate to the level of risk is disseminated to relevant stakeholders in a timely manner. The CAP and standby CAP outline communication strategies for different audiences and for different locations according to risk.

Reporting

DHW, OHSAWG and ARCAG prepare and disseminate risk-based information to internal and external stakeholders through a range of mediums, including:

- the South Australian arbovirus and mosquito monthly report (the monthly report).
- the South Australian arbovirus and mosquito monitoring and control annual report (the annual report).
- the SA Health website.
- the CDCB Local Government report (the LG report).
- the OHSAWG biennial report.
- ad-hoc internal reporting.

Hierarchy of Responses

The HoR guides decision making to support appropriate responses to the risk or incidence of serious human arboviral disease. It provides risk-based guidance and outlines the responsibilities, authorities, and mechanisms to scale up, manage, and scale down responses to arbovirus incidents, outbreaks, or emergencies in South Australia. The level of HoR is dependent on specific triggers for escalation/de-escalation based on ongoing data and trends identified by surveillance and control activities, environmental conditions, and human and animal disease notifications. Communication between state and local government agencies and other key stakeholders is necessary for accurate decision making and ensuring correct response levels are implemented.

DHW declares a response level as low, medium, or high depending on the intelligence received. Level 1 (low risk) represents normal surveillance and control activities during mosquito season. Levels 2 (medium risk) and 3 (high risk) are heightened response levels which may require additional resources and coordination. At Level 2, DHWs primary role is to support local council run mosquito surveillance and control programs. At Level 3, DHW coordinates and supports local council mosquito control programs in targeted high-risk locations.

Response level indicators specified in the HoR will not always happen sequentially meaning that conditions specified at one level may not necessarily precede those at the next level. Although certain triggers are noted for the implementation of each level of the HoR, DHW determines when the implementation of each HoR level is appropriate.

When cases of arboviral infection or the risk of cases is elevated, coordinated state government mosquito control programs are required to protect public health. Coordinated state government mosquito control programmes require considerable resources beyond the capacity of local councils and require significant planning and preparedness to ensure appropriate response to trigger conditions are met. Table 1 provides a summary of trigger conditions for each response level and an overview of core responsibilities and resourcing requirements.

Table 1: HoR Summary of response level trigger conditions, responsibilities, and resourcing.

Level 1	Level 2	Level 3
Overview: Environmental conditions and surveillance data indicate low to average arbovirus risk levels. Local councils make decisions on surveillance and control priorities with minimal guidance from DHW. Resourcing requirements are manageable within local council's existing resources with DHW subsidy funding.	**Overview:** Environmental conditions and surveillance data indicate medium arbovirus risk. Local councils make decisions on control needs and priorities based on local risk with a high level of guidance and assistance from DHW. Additional resources may be provided to support local council responses in targeted high-risk locations.	**Overview**: Environmental conditions and surveillance data indicate high flavivirus risk. DHW coordinate outbreak response and supplement local council mosquito surveillance control programs in targeted high-risk locations.

Level 1 response

Level 1 of the HoR is a low ‘business as usual’ response which represents routine surveillance and control activities during the mosquito season. A level 1 response occurs when HPP determines there is no indication of a high-risk season, and no additional surveillance or control measures are necessary to reduce the risk of human cases of flavivirus infection. Trigger examples for a level 1 response include:

> low/average rainfall during previous spring/summer.
> low/average RRV/BFV human case notifications.
> no human cases of flavivirus infection.
> forecast spring/summer rain at average/low levels.
> low/average numbers of vector mosquitoes.
> low/ average alphavirus detections from trapped mosquitoes during the previous season.
> no flavivirus detections from trapped mosquitoes during the previous season.
> no flavivirus detections from sentinel chickens during the previous season.
> no confirmed cases of flavivirus infection in animals notified by PIRSA.

Roles and responsibilities

ARCAG

During a level 1 response ARCAG meets twice during the mosquito season including at the start of the season and mid-way through the season. The focus of ARCAG’s role is to maintain open lines of communication between all members and their represented agencies and organisations. ARCAG will ensure any information regarding activities that have the potential to impact on mosquito control in the state is shared as required throughout the season.

HPP

HPP provide centralised data management. Routine environmental arbovirus surveillance and control activities undertaken are reported monthly throughout the season and summarised in the South Australian Arbovirus and Mosquito Monitoring and Control Annual Report (the Annual report). Table 2 details routine actions to be undertaken by HPP during a level 1 response.

Table 2: Level 1 Routine actions - HPP

Action	Frequency
Monitor and respond to response level indicators.	Ongoing
Prepare and secure laboratory contracts for trapped adult mosquito analysis.	July
Prepare and secure laboratory contracts for sentinel chicken sample analysis.	July
Convene pre-season meeting with councils.	August
Release mosquito management subsidy guidelines and reporting requirements to local councils prior to the season.	August
Provide subsidy funding pre-approvals to local councils.	August
Provide mosquito traps to local councils.	August
Prepare sentinel chicken program.	August
Assess and provide feedback on local council MMPs.	Sept
Coordinate and deliver the northern Adelaide surveillance program.	Weekly (Sept-Apr)
Produce monthly South Australian arbovirus and mosquito monitoring report.	Monthly (Sept-Apr)
Coordinate and manage the subsidy program.	Ongoing (Sept-Apr)
Provide centralised data management.	Ongoing (Sept-Apr)
Approve the annual Fight the Bite campaign.	Nov
Coordinate and deliver the sentinel chicken bleed program.	Monthly (Nov-Apr)
Coordinate and deliver the Globe Derby aerial treatment program.	Fortnightly (Dec-Apr)
Share annual Fight the Bite partner pack through ARCAG.	Dec
Convene ARCAG as required.	As required
Provide technical advice and equipment to key stakeholders as required.	As required
Convene end of season meeting with councils.	May
Process local council subsidy claims.	May-Jun
Produce South Australian arbovirus and mosquito monitoring annual report.	July
Collaborate with OHSAWG.	Quarterly

CDCB

CDCB provides centralised data management of notified cases of human arboviral disease. Case numbers by suburb are routinely reported to local councils in the via local government area monthly report (LG report) and to HPP as part of the monthly arbovirus reporting process. Table 3 details routine actions undertaken by CDCB during a level 1 response.

Table 3: Level 2 Routine actions – CDCB

Action	Frequency
Monitor human arboviral disease notification data.	Ongoing
Provide confirmed and probable human case data to HPP as appropriate.	Ongoing
Prepare and distribute the LG report.	Monthly
Provide human arboviral disease data to HPP.	Monthly (Sept-Apr)
Collaborate with OHSAWG.	Quarterly
Present at ARCAG meetings.	As required
Provide human arboviral disease data to HPP for the South Australian arbovirus and mosquito monitoring annual report.	July

MCU

MCU delivers the CAP and develops digital resources throughout the mosquito season to support the delivery of the Fight the Bite campaign. Table 4 details routine actions undertaken by MCU during a level 1 response.

Table 4: Level 1 Routine actions – MCU

Action	Frequency
Plan and prepare the annual Fight the Bite campaign.	Oct
Prepare Fight the Bite campaign partner pack.	Nov
Launch Fight the Bite campaign in the media.	Dec
Manage paid Fight the Bite media campaign.	Dec-Jan
Manage organic communications.	Dec-Mar
Assist HPP in preparation South Australian arbovirus and mosquito monitoring annual report.	July

ARPH

During a level 1 response, ARPH do not routinely undertake mosquito surveillance and control activities. However, they will support public health messaging in remote and regional communities and participate in stakeholder meetings. Table 5 details routine actions undertaken by ARPH during a level 1 response.

Table 5: Level 1 Routine actions – ARPH

Action	Frequency
Undertake ad hoc, risk-based mosquito surveillance and control activities.	As required
Promote Fight the Bite messaging within remote and regional communities.	As required
Attend OHSAWG meetings.	Quarterly
Attend ARCAG meetings.	As required

Local councils

As summarised in table 1, during a level 1 response, local councils make decisions on control needs and priorities with minimal guidance from SA Health. Assistance from DHW is limited to the provision of the mosquito management subsidy, mosquito traps, technical advice, central data management and reporting.

Local councils are responsible for the planning and execution of MMPs within their council area. MMPs developed and implemented by individual local councils are the primary means of achieving effective control of mosquitoes in high-risk areas during a level 1 response.

Actions contained within an MMP include surveillance of mosquito prone areas, obtaining mosquito control resources, making decisions on priority areas to be treated and ensuring appropriate control measures are implemented. Local councils will determine where to implement mosquito surveillance and control activities on public lands in their area.

Control measures used in routine local government mosquito control programs are usually limited to ground-based application of larvicides and implementing engineering controls as appropriate. Table 6 details routine actions to be undertaken by local councils during a level 1 response.

Table 6: Level 1 Routine actions– Local councils

Action	Frequency
Review local risk factors to prepare/update local MMP.	Preseason
Develop or update local MMP implementation plan.	Preseason
Submit local MMP to HPP in accordance with the subsidy guideline.	Preseason
Attend and contribute to pre-season meeting convened by HPP.	Preseason
Purchase consumable items as required.	As required
Purchase larval control chemicals.	As required
Confirm all personal protective equipment (PPE) is in good condition.	As required
Distribute Fight the Bite resources to local stakeholders.	As required
Display Fight the Bite resources in local areas where residents and visitors spend significant amounts of time outdoors, e.g., campgrounds, sporting grounds, parks.	As required
Conduct larval surveillance.	Ongoing
Undertake larval control as required.	Ongoing
Review efficacy of larval control programs as required.	Ongoing
Undertake adult mosquito trapping.	Monthly (Sept-Apr)
Prepare local council monthly reports.	Monthly (Sept-Apr)
Submit local monthly reports to HPP.	Monthly (Sept-Apr)
Prepare end of season subsidy claim form.	May
Submit end of season subsidy claim form.	May
Attend and contribute to end of season meeting convened by HPP.	May
Attend and contribute to ARCAG meetings.	As required

Level 2 response

Level 2 is a heightened response requiring enhanced surveillance and control in addition to that undertaken during a level 1 response. A level 2 response will be declared when DHW determines indicators suggest there is/will be a moderate flavivirus risk and additional mosquito surveillance and/or control measures are necessary to reduce the risk of human flavivirus cases. Specific example triggers are listed below; however, these are to be used as a guide only. A level 2 response may require additional coordination by DHW and ARGAG representatives.

Trigger examples for a level 2 response include:

- above average rainfall during previous spring/summer, particularly if in association with a strong La Niña event.
- above average RRV/BFV human case notifications in high risk flavivirus locations.
- forecast spring/summer rain at above average levels, particularly if in association with a strong La Niña event.
- high levels of rainfall during spring and/or summer, particularly if in association with a strong La Niña event.
- above average numbers of vector mosquitoes.
- confirmed cases of flavivirus infection in animals notified by PIRSA.
- environmental flavivirus detections in southeastern Australia, particularly in South Australia or in Victoria close to the South Australian border, during the current or previous season.
- 1 or more human cases of flavivirus infection in southeastern Australia, particularly in South Australia or in Victoria close to the South Australian border in the previous season.

Roles and responsibilities

ARCAG

If DHW determines a heightened level of response is required HPP will notify the ARCAG members. The primary role for ARCAG at this level is to facilitate and provide advice and assistance to SA Health in preparation for a possible state coordinated response. The ARCAG should be convened at more frequent intervals during a HoR level 2.

At this level, ARCAG members should also consider their own agency's preparedness to support a state coordinated response, either because of specific responsibilities or a general ability to assist. Communication between state and local government agencies and organisations will be primarily via the ARCAG. Members are encouraged to develop their own internal communications plan for implementation during a heightened response.

HPP

During a level 2 response, enhanced surveillance and control operations will include actions in addition to those undertaken during a level 1 one response. HPP work collaboratively with internal and external partners deliver key actions to protect public health.

Additional resources may be provided to support local council responses in targeted high-risk locations. Local councils may receive additional resources from DHW through the subsidy program to support them in delivering and managing local mosquito management programs. Enhanced surveillance and control activities may be required. Monthly and annual reporting will be continued throughout the mosquito season and may be supplemented by public health alerts and targeted public health messaging. Table 7 details actions taken by HPP during a level 2 response.

Table 7: Level 2 Enhanced response actions – HPP

Action
Brief CPHO on heightened risk and contingency planning.
Secure additional funding to support level 2 response.
Brief ARCAG on heightened risk and contingency planning.
Provide or facilitate access to additional resources to individual councils on a prioritised basis.
Brief OHWGSA on heightened risk and contingency planning.
Consider increased bleed frequency of sentinel chickens.
Consult with laboratory to determine capacity for increased viral screening of sentinel chicken blood samples.
If required, confirm laboratory contract agreements for viral screening of sentinel chicken blood samples.
Consider increased frequency of local council trapping programs.
Consider targeted trapping programs in high-risk locations.
Convene meetings with CDCB, MCU and ARPH as required.
Convene additional meetings with ARCAG, and local councils as required.
Report viral detections from environmental surveillance to ARCAG via email.
Where possible, engage local council to enable them to prepare/ update messaging prior to MCU media releases.
Distribute additional Fight the Bite resources as required to ARCAG members.
Engage with non ARCAG government organisations (e.g., Department for Education, Tourism SA) to recommend review/ implementation of MMP/ preventative pest control programs (PPCP).
Contact non ARCAG councils to recommend review of risk in local areas.
If required, deliver mosquito management training to additional local councils in high-risk locations.
Consider purchase of Fight the Bite resources and merchandise for distribution to key stakeholders.
Distribute additional Fight the Bite resources and merchandise to key stakeholders.
Confirm the ability of potential chemical suppliers to procure chemical at short notice.
Seek formal quotes for the supply of chemicals from suitable suppliers, in line with DHWs procurement procedures.

CDCB

During a level 2 response, enhanced disease surveillance may be required. CDCB work collaboratively with internal and external partners deliver actions to protect public health. Table 8 details actions taken by CDCB during a level 2 response.

Table 8: Level 2 Enhanced response actions – CDCB

Action
Prepare and release Public Health Alerts as required.
Interview flavivirus cases to ascertain exposures during incubation period and determine most likely place of acquisition.
Share place of acquisition, onset dates and other relevant details with HPP, ARCAG and OHSAWG.
If applicable, source and procure vaccines.
If applicable, manage vaccination programs.
If applicable, contact pharmacies and GPs.

MCU

During a Level 2 response clear and consistent messages concerning the elevated risk should be communicated to the public and relevant stakeholders. Good communication during such an event is crucial to reduce public anxiety, inform relevant actions, and improve the effectiveness of local responses. The standby CAP will be activated to outline communication activities during a level 2 response. Table 9 details actions taken by MCU during a level 2 response.

Table 9: Level 2 Enhanced response actions – MCU

Action
Activate the level 2 standby CAP.
Increase Fight the Bite campaign media coverage in targeted high-risk locations.
Prepare and release additional media as required.
Develop additional resources for targeted stakeholders as required e.g., schools, caravan, and camping groups.

ARPH

During a level 2 response, ARPH may be required by HPP to undertake targeted mosquito surveillance and control activities. They will engage with key stakeholders in remote and regional areas to support preparedness. ARPH will support public health messaging in remote and regional communities and participate in stakeholder meetings where required. Risk management plans will be reviewed and implemented as required. Table 10 details actions taken by ARPH during a level 2 response.

Table 10: Level 2 Enhanced response actions – ARPH

Action
Brief OCA to support preparedness.
Brief NCH to support preparedness.
Brief RASAC to support preparedness.
Review risk management plans – remote and regional high-risk locations.
Consider implementation of planned preventative pest control programs e.g., residual spraying of residential and community housing and facilities.
Consider adult mosquito trapping in targeted locations in remote and regional high-risk locations.
Liaise with MCU to deliver targeted public health messaging in remote regional high-risk locations.

Local councils

At a level 2 response, local councils make decisions on control needs and priorities with a high level of coordination, guidance, and assistance form DHW. Priority will be to identify and treat mosquito breeding locations in areas where the risk of serious human arboviruses is high. Control efforts will focus on the highest priority areas and may include state government coordinated larviciding. Neighbouring councils should seek to coordinate their mosquito surveillance and control activities. DHW will provide additional resources to local councils through the subsidy program. Table 11 details actions taken by local councils during a level 2 response.

Table 11: Level 2 Enhanced response actions – Local councils

Action
Initiate local communications plan as detailed in MMP.
Engage with local businesses to increase of awareness of mosquito borne disease risk and inform them of their responsibilities as private landowners/ business operators (e.g., sporting groups, campgrounds, golf clubs, equestrian centres).
Distribute Fight the Bite resources and merchandise to local businesses.
Increase Fight the Bite messaging in local areas where residents and visitors spend time outdoor, e.g., ferry’s, boat ramps, wineries, equestrian centres .
Implement enhanced surveillance and control activities in targeted areas.
Purchase additional larvicide as required.

Level 3 response

Level 3 is the highest level of response and will usually only be declared by HPP following the notification of one or more human case of flavivirus infection. At a level 3 response DHW will coordinate and support local council mosquito control programs in targeted high-risk locations with assistance from ARCAG member agencies. The purpose of a state coordinated response is to provide additional support and coordination of local government mosquito control programs to ensure the problem is tackled on a regional basis.

Additional human, physical, chemical, and financial resources will be required to support a level 3 response. HPP will prepare a detailed risk assessment based on all available information to ensure that resources are targeted appropriately. Where appropriate, DHW recruitment and procurement procedures will be followed.

Additional staffing requirements at the state and local levels will be assessed and, where required, contractors may be sourced, engaged, trained, and briefed. The provision of training and briefings to council staff and contractors may be necessary, the timing and content of which will vary depending on the extent of the state coordinated response and local council preparedness and may include:

> current situation and future projections regarding mosquito populations and arbovirus.
> mosquito surveillance and control activities.
> record keeping and data handling.
> field communication.
> work health and safety.
> environmental policies.

Staffing costs for both local councils and DHW may result in significant financial impacts. Response planning should take into consideration wages, overtime, and accommodation and meals for staff working away from home. Additional physical resources including: vehicles, IT equipment, chemical application equipment and surveillance equipment may also be required and will require significant financial planning and resourcing.

Increased adult mosquito surveillance activities will also incur increased laboratory costs. HPP will source and engage suitable laboratory services accordance with DHW procurement processes. Additional larval treatment chemicals will be required by local councils and HPP. HPP will engage with chemical suppliers nationwide to secure and procure adequate volumes of suitable treatment chemicals.

If DHW deems it necessary, the state coordinated response may also include the implementation of ground-based applications of adulticides in targeted areas, if approved. Adulticide treatment should be undertaken by licenced pest controllers due to the risk of off target impacts. Further considerations for the use of adulticides are discussed in the resource pack.

Roles and responsibilities

ARCAG

If level 3 of the HoR is to be implemented, the ARCAG members will support SA Health in the implementation of a state coordinated response, and if necessary, contingency planning for transition to the state PHEMP. ARCAG will support SA Health through the provision of advice and practical assistance to the represented agencies wherever possible.

HPP

During a level 3 response, heightened surveillance and control operations will include actions in addition to those undertaken during a level 2 response. DHW will coordinate the state response deliver key actions to protect public health.

Additional resources will be provided to support local council responses in targeted high-risk locations. Local councils will receive additional resources from DHW through the subsidy program to support them in delivering and managing local mosquito management programs. Heightened surveillance and control activities will be required. Routine reporting will be supplemented by public health alerts and targeted public health messaging. Table 12 details actions taken by HPP during a level 3 response.

Table 12: Level 3 Heightened response actions – HPP

Action
Consider implementation of state coordinated application of adulticides in targeted areas.
Seek quotes from licensed pest control contractors. Potential providers should be asked about their likely availability during the potential period for control activities, their availability at short notice, and their flexibility in terms of hours worked and locations they are prepared to work in.
Ensure that pre-approval is sought from the CPHO for the aerial application of mosquito control chemicals, if necessary.
Consider intensification of state coordinated targeted larviciding.
Increase and expand enhanced environmental surveillance.
Increase sentinel chicken surveillance.
Ensure that appropriate mechanisms are provided for councils to share intelligence, coordinate their control activities, and where appropriate, share resources.
Engage with industry to develop risk management plans in identified high risk locations (e.g., abattoirs, agriculture, viticulture).
Assist industry to develop and implement risk management plans.
Prepare regular, routine briefings for DHW.
Prepare regular, routine briefings for ARCAG.
Consider purchase of insect repellents for distribution to communities.
Consider attendance at large public events in high-risk locations.
Distribute Fight the bite resources to GPs and pharmacies in high-risk locations.
Coordinate DHW situation reports as required.

CDCB

During a level 3 response, heightened disease surveillance may be required. CDCB work collaboratively with internal and external partners deliver actions to protect public health. Table 13 details actions taken by CDCB during a level 3 response.

Table 13: Level 3 Heightened response actions – CDCB

Action
Liaise and/or communicate with local health networks, emergency departments, general practitioners, and infectious disease consultants to ensure cases of encephalitis are investigated and reported.
Review previously reported encephalitis cases in a look back to ensure all cases are reported.
Where appropriate, collaborate with existing vaccine distribution centre providers in the identified geographical areas at highest risk to identify willingness and capacity to support this program, and provide support to those participating.
Develop resources for providers such as consent forms, after vaccination leaflets, checklists, and webpages
Where appropriate, collaborate with the MCU to develop messaging for the public to advise of vaccination program
Engage with ARPH to facilitate vaccine distribution and administration in remote and regional areas as required
Contribute to DHW situation reports as required.

MCU

During level 3 response, clear and consistent messages concerning the elevated risk should be communicated to the public and relevant stakeholders. Good communication during such an event is crucial to reduce public anxiety, inform relevant actions and improve the effectiveness of the heightened response. Table 14 details actions taken by MCU during a level 3 response.

Table 14: Level 3 Heightened response actions – MCU

Action
Activate the level 3 standby CAP.
Contribute to DHW situation reports as required.

ARPH

ARPH will deliver adult mosquito and larval surveillance in unincorporated areas including the APY lands if required. Additional partner organisations may also be able to assist, dependent upon the location of required surveillance and/or control. The remote and regional mosquito surveillance and control plan has been developed to guide mosquito surveillance and control in these areas. Table 15 details actions taken by ARPH during a level 3 response.

Table 15: Level 3 Heightened response actions – ARPH

Action
Engage with OCA to facilitate distribution of resources and public health messaging as required.
Engage with NHC to facilitate distribution of resources and public health messaging as required.
Engage with CDCB to facilitate vaccine distribution and administration as required.
Engage with RASAC to facilitate distribution of resources and public health messaging as required.
Implement risk managements plans in remote and regional areas as required.
Undertake targeted mosquito surveillance and control activities in high-risk locations as required.
Implement planned preventative pest control programs as required.
Contribute to DHW situation reports are required.

Local councils

During a level 3 response, local council actions will be guided by DHW according to local risk factors. DHW will provide additional resources to local councils through the subsidy program. Table 13 details actions taken by local councils during a level 3 response.

Table 16: Level 3 Heightened response actions – Local councils

Action
Seek quotes from licensed pest control contractors if adulticide treatment is required in targeted areas (e.g., council owned facilities - BBQ areas, campgrounds, toilets, sports grounds etc.)
Undertake enhanced adult mosquito surveillance at a frequency advised by HPP
Liaise with neighbouring councils to coordinate mosquito surveillance and control activities
Consider implementation of locally delivered application of adulticides in targeted areas as directed by DHW.
Contact private landowners/ business operators to recommend development and implementation MMP/ planned preventative pest control programs (e.g., Camping and caravan parks, sporting clubs, vineyards, wineries, equestrian centres etc.).

Transition to Public Health Emergency Management Plan

If the number of locally acquired arbovirus cases reach levels that are beyond the capacity of HPP and ARCAG to effectively manage, then the transition to Public Health Emergency Management Plan (PHEMP) may be activated by the CPHO. ARCAG will help with the transition to the PHEMP if/when a public health incident or emergency is declared under the provisions of the Act. Classification of a public health incident and emergency can be found in the PHEMP.

The purpose of the transition to the PHEMP is for the state government to assume direct responsibility for the resourcing and implementation of all mosquito control programs, and to ensure control resources can be applied to the highest priority areas within the shortest possible timeframe. There may be an increased emphasis on the use of adulticides at this stage.

Scaling down a response

As with scaling up, scaling down the HoR level involves review of multiple sources of data to assess whether the risk of transmission has declined sufficiently for a reduction in the threat level to be declared. Data from all surveillance systems will be analysed and key stakeholder will be consulted to determine the presence or absence of response level indicators. Data sources may include:

- human notification data.
- sentinel chicken surveillance.
- mosquito surveillance and viral analysis.
- environmental data, particularly climatic conditions.
- opportune data (e.g., wild, or domestic animal MVEV, WNV/KUN, or JEV data etc.)

If it is determined that the scaling down procedure can begin, the Manager of HPP will brief the Director Health Protection, ARCAG and the CPHO and make appropriate recommendations to transition to the appropriate lower level of response.

Transitioning from a high-risk mosquito season to a lower risk one requires a staged approach with a gradual decrease in surveillance and control.

Continued surveillance

- **Maintain mosquito trapping:** Although the frequency of trapping can be reduced compared to the high-risk period, continue monitoring mosquito populations and virus presence.
- **Reduced sentinel chicken testing:** Decrease the frequency of testing sentinel chicken blood for mosquito-borne viruses (e.g., monthly testing instead of bi-weekly).
  Data surveillance: Maintain mosquito laboratory screening and mosquito-borne illness notifications to ensure early detection of any resurgence in risk.

Shift from targeted control to maintenance

- **Larviciding:** Transition from targeted larviciding to a maintenance program, focusing on known breeding grounds and areas with historical high mosquito activity.
- **Public awareness campaigns**: Maintain public awareness campaigns but shift the message to emphasise ongoing prevention efforts. Encourage residents to continue eliminating potential breeding sites around their homes and properties and personal protection.

Public health communication

- **Risk communication:** Issue public health advisories that acknowledge the reduced risk level while still encouraging continued preventive measures.
- **Maintain reporting platforms**: Continue to maintain SA Health website and update monthly throughout the season.
- **Multilingual communication**: Maintain communication efforts in diverse languages to ensure information reaches all communities.

Gradual demobilisation

- **Resource allocation**: As the risk subsides, reallocate resources as appropriate.
- **Personnel:** Reduce the manpower dedicated solely to the mosquito response but maintain ongoing surveillance and control activities.

Monitoring and Adaptation

- **Data analysis:** Continuously analyse surveillance data to identify any potential increases in mosquito populations or virus activity, including interstate reporting.
- **Maintain flexibility**: Be prepared to re-escalate control measures and public awareness campaigns if data indicates a potential rise in risk.

Key points for scaling down:

- **Gradual decrease:** The transition from high risk to lower risk should be gradual to avoid creating conditions for a resurgence in mosquito populations.
- **Maintain vigilance:** Even with a reduced risk level, continued surveillance and control efforts are required to support preparedness for future outbreaks.
- **Public Education:** Ongoing public education is essential to maintain awareness and encourage continued preventive behaviours.

Transition from Public Health Emergency Management Plan

Scaling down from the PHEMP will include DMB, HPP and ARCAG and managed in accordance with the recovery processes detailed in the PHEMP and the SA Health Major Incident Community Recovery Arrangements.

Recovery is the recognised term for the phase that relates to the support/effort provided by organisations and services to return those affected by an event, disaster, or incident to a state of “normality”. Recovery operations may commence during the response phase of an incident. However, recovery may last weeks, months or even years after an incident or event response.

Debriefs and Reporting

The purpose of debriefing is to analyse all information from the response and identify what worked well and what could be improved in preparation for future seasons or events and consider and evaluate the effectiveness of community education and awareness campaigns. Debriefs assist in the implementation of future responses and should include relevant key stakeholders involved in the response.

HPP, with input from all agencies and organisations involved in the response, will prepare a report for the CPHO detailing information on the conduct of the response and its achievements, lessons learned and recommendations for future responses.

Appendix 1 ARCAG membership and terms of reference

ARCAG member agencies and organisations.

Table 17: ARCAG membership

Agencies & Organisations	
DHW	Coordinator - HPP
	ARPH
	CDCB
	DMB
	MCU
DEW	National Parks and Wildlife Management
EPA	Environmental Services Branch
Landscape SA	Murraylands and Riverland Landscape Board
Local councils	Local councils in receipt of subsidy funding
PIRSA	Epidemiology and Risk
SA Water	Need to confirm dept.

Terms of Reference

(1) To provide a mechanism for effective communication amongst key stakeholder agencies and organisations on all aspects of the planning and implementation of coordinated mosquito control programs.

(2) To assist SA Health to plan and if necessary, implement a state coordinated response through:

   a. providing advice (technical, operational, and strategic).
   b. facilitating access to intelligence, information, and resources.
   c. facilitating communication and decision making within the representative agencies where required to ensure an effective and timely response.

(3) To consider the preparedness of representative agencies, other organisations and the state to support a state coordinated response should it be necessary and make appropriate recommendations to government.

Appendix 2 Arbovirus management roles and responsibilities of the ARCAG members

DHW

> Responsible for the administration of the Act.
> Protecting and improving the health of all South Australian's by providing leadership in health reform, policy development and planning and direct public health service delivery
> Providing a central coordinating/initiating role in matters related to integrated mosquito management.
> Provision of the Mosquito Management Subsidy Funding to local councils
> Provide strategic direction for the control and prevention of disease, and investigation and monitoring of arbovirus activity throughout SA.
> Surveillance of mosquito-borne infections in humans.
> Conduct public awareness campaigns through the Fight the Bite Arbovirus Prevention Program.
> Provide comment on local and state government development plans and planning amendment reports.

HPP

> Proactive and reactive mosquito and arbovirus surveillance and control
> Procuring laboratory services for the identification, enumeration, and viral screening of trapped mosquitoes
> Supporting relevant local councils to undertake, mosquito trapping, larval surveillance, and larval control through provision of equipment and training, provision of subsidy funding to undertake surveillance and control activities and assistance in preparing council mosquito surveillance and control plan development.
> Planning, delivery and reporting on the South Australian sentinel chicken program.
> Procuring laboratory services for the serological testing of sentinel chicken blood samples
> Collaboration with PIRSA Animal Health to ensure effective sharing of data and information to understand disease risks.
> Notifying PIRSA Animal Health of cases of human arboviral disease
> Data management and analysis including animal, environmental, human disease, river flow and height and meteorological data.
> Sharing data with PIRSA Animal Health, relevant local public health authorities, DHW CDCB and DHW Communications
> Representing DHW on working groups and committees as required
> Investigating the viability of and where appropriate establishing novel surveillance programs
> Updating, developing, and implementing policy and legislative frameworks to guide appropriate public health responses based on risk assessments.

CDCB Disease Surveillance and Investigation Section (DSIS), Specialist services and Immunisation Section

- Undertake routine surveillance activities.
- Report and classify cases of human arboviral disease notified to CDCB.
- Interview cases to ascertain exposures during incubation period and determine most likely place of acquisition.
- Share place of acquisition, onset dates and other relevant details with HPP, PIRSA and CDCB.
- Contribute data to national reporting body for collation with other states. Represent DSIS on working groups and committees as required.
- Liaise with emergency departments and infectious diseases consultants in public hospital to ensure cases of encephalitis are investigated and reported.
- Implement immunisation programs as required.
- Prioritise vaccine distribution where required.
- Collaborate with existing Vaccine Distribution Centre (VDC) providers in the identified geographical areas at highest risk to identify willingness and capacity to support this program and provide support to those participating.
- Plan for the delivery of vaccinations in conjunction with the relevant Local Health Networks, general practitioners, and pharmacists.
- Develop resources for providers such as consent forms, after vaccination leaflets, checklists, and webpages.
- Collaborate with MCU to develop messaging for the public to advise of the program, and where to find more information regarding eligibility and accessing a vaccine.
- Provide specialist services (medical team) to support and advice to DSIS and Immunisation Section on human health aspects of cases of serious human arboviral disease.

DEW

- Wetland inventories to document the conservation value of wetlands, e.g., Ramsar Convention (to assess environmental significance of the site and hence to treat or not treat).
- Various aspects of coastal and marine matters including coastal management, vegetation, marine, estuary and wildlife conservation and environmental reporting.
- Responsible for the allocation, management and tenure administration of Crown Lands.
- Collection of census data on the Rufous Night-Heron.
- Advisor on ecological issues related to mosquito control.
- Management of parks, including areas of recreation, conservation and wilderness protection.
- Indigenous heritage issues and Land Use Agreements.

EPA

- Investigations of incidents that cause actual or potential serious or material environmental harm and environmental nuisance including harm from the application of pesticides.
- Research and monitoring studies related to environmental impacts from the application of pesticides, mosquito habitats in urban wetlands and ambient water quality monitoring using aquatic macro invertebrates as biological indicators of stream health.

Local councils

- Local health authority under the *South Australian Public Health Act 2011*.
- Manage council land for community benefit including mosquito surveillance and control where necessary.
- Forming mosquito management regions where appropriate, e.g., Riverland and Southeast areas.
- Maintain knowledge of local mosquito-prone areas and species present.
- Public education and promotion of personal/household protection measures.
- Consideration of mosquito related as part of Development Plan Amendments.
- Instruct contractors (e.g., pest controllers) to undertake site-specific monitoring and control to guide and define integrated mosquito management (IMM) across the local area.

PIRSA

- Primary pesticide use regulator for the non-commercial sector of SA.
- Biosecurity and standards for rural chemicals including appropriate use of pesticides, e.g., spray drift.
- Agrivet Chemical Information Service for all registered agricultural and veterinary chemicals in Australia which may define the site-specific use of pesticides.
- Assistance and advisory role specific to the use of native fish as mosquito predators, e.g., appropriate species, mechanisms to move fish stocks.
- Flavivirus detection in domestic and native animals.
- Opportunistic bleeding of wild and domestic birds.
- Licensing and education/training of pest control companies and pest management technicians.

SA Water

- Provide water and wastewater services to SA.
- Assist in the expansion and development of the SA water industry.
- Provide technical advice and support in areas such as:
  - water utility operations.
  - water resource management.
  - engineering services.
  - research and laboratory services, including the Australian Water Quality Centre (AWQC).
- Ensure SA Water facilities are not breeding grounds for levels of mosquito populations that are likely to create a nuisance or risk to health and:
  - conduct mosquito risk assessments for SA Water land holdings.
  - implement IMM programs as appropriate.
  - share information with relevant organisations and councils.
  - provide contact details to SA Health for SA Water Operations staff and facilitate access to SA Water sites (if required).

For more information

Health Protection Programs
Public Health Division
www.sahealth.sa.gov.au

Interpreter

www.ausgoal.gov.au/creative-commons

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