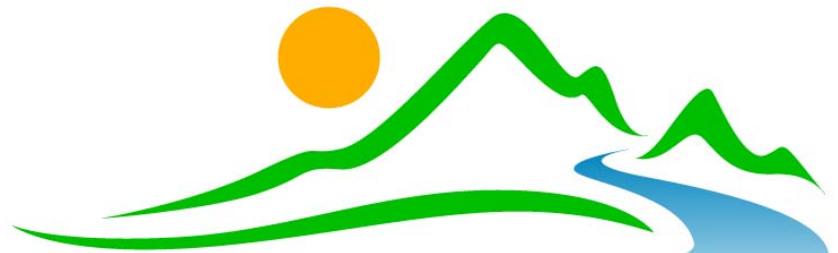


2014

Standing Committee Meetings –
Policy and Planning



NORTH BURNETT
REGIONAL COUNCIL

MONTO

North Burnett Regional Council

November 05, 2014

Attendees	Agenda Item 1	Attendees	
Welcome	Agenda Item 2	Welcome / Housekeeping	
Apologies	Agenda Item 3	Apologies	
	3.1	Mayor, Cr DG Waugh	
Declaration	Agenda Item 4	Declaration of Interest	
Deputations	Agenda Item 5	Deputations	
	5.1	Economic Development – Peta Jamieson and Neil McPhillips	
	5.2	Monto and District Show Society – David Schulz	
Governance	Agenda Item 6	Governance Report	
	6.1	Depreciation Workshop	003-005
Social	Agenda Item 7	Social Report	
Economic	Agenda Item 8	Economic Report	
	8.1	North Burnett Region Futures Program Progress Report	006-015
Environmental	Agenda Item 9	Environment Report	
	9.1	Vector Management Plan	016-129
Confidential	Agenda Item 10	Confidential Reports	
General Business	Agenda Item 10	General Business	
Closure of Meeting	Agenda Item 11	Closure of Meeting	

DEPRECIATION EXPENSE - A WAY FORWARD

Responsible Officer: David Wiskar – General Manger Corporate&Community Services
Report by: David Wiskar – General Manger Corporate&Community Services

1 PURPOSE OF REPORT

The purpose of this report is to advise Council of a plan that has been developed to assist Council to deal with the pressure that depreciation expense is placing on NBRC's financial sustainability.

2 INTRODUCTION/BACKGROUND

As part of the 2014-2015 budget development and the 1st quarter budget review, Council identified that depreciation expense placed significant pressure on the financial position of Council and ultimately an upward pressure on rates.

Some key NBRC depreciation facts are;

- In the 2014-2015 financial year, depreciation represented a budgeted expense to the business of \$12.216M or 22.56% of the Council's total budgeted expenditure.
- As a percentage of rates income, depreciation represents 87.71% of all rates collected from North Burnett ratepayers.
- The recent asset revaluation process completed in the first quarter saw depreciation grew by 21% and \$2.178M per annum.

To address the affect of depreciation on NBRC's financial position, meetings have been held with senior QTC staff.

QTC has been working over recent months with a number of local governments to develop appropriate strategies for the calculation of depreciation which meet the relevant accounting standards but at the same time helps to relieve pressure on sustainability indicators.

In developing these work programs, QTC has been working closely with the Queensland Audit Office at a senior level to ensure that the approaches meet all the necessary statutory and audit office requirements.

This work program has used a number of different approaches (for different asset classes) to reduce the burden of depreciation on financial sustainability - for example;

- Appropriate classification and cost arrangements for rural roads.
- New approaches to funding and replacement of donated assets.
- Use of acceptable service levels to frame-up depreciation values.
- Treatment of legacy building assets and the use of categorisation of these assets to diminish financial burden.

To help NBRC to move forward with this issue, QTC has agreed to the creation of a partnership.

This partnership will see QTC act in a mentoring role with North Burnett Regional Council staff to help us to progress with some of the strategies that they have implemented in other Council's and to develop solutions appropriate for our asset mix.

To begin this project, a workshop with Senior Staff from QTC (and some guests from other local governments) has been set for December 1st in Brisbane (after Lisa returns from annual leave).

It is proposed that the workshop will be attended by; the General Managers, Lisa Benahm, accounting staff, Tyrone, Trevor.

QTC and other Local Governments would bring a number of their specialists to the workshop.

The format for the day will be as follows;

- **Session 1** - At the start of the workshop QTC and other Local Government's will share some of the case studies of depreciation work that they have completed.
- **Session 2** - In the second half of the workshop; NBRC and QTC would develop 2-3 priority areas that we can target with the aim of seeing the best benefit.

The intention is that at the end of the workshop NBRC would leave with briefs for the 2-3 priority projects to be targeted.

Following the workshop, NBRC will implement projects to target the areas identified via the workshop.

Following the workshop QTC would provide on going project mentoring to support our finance team with the implementation of the depreciation review projects.

The QTC Mentoring is a free service that QTC will provide to North Burnett on the proviso that we will freely share the results of our activities with other Local Governments.

3 CORPORATE/OPERATIONAL PLAN

In accordance with Outcome 5 – Governance, 5.5 – Transparency and Performance, 5.5.1 – Review and implement levels of transparency and accountability.

In accordance with Operational Plan - Outcome 3 – Organisational Capability, Section 3.7 Sourcing External Funds.

4 POLICY IMPLICATIONS

Council adopted an Asset Management Policy on 5/3/2013. This policy along with the underlying Asset Management Plans will need to be reviewed dependent on the outcomes of these meetings.

5 STATUTORY REQUIREMENTS

NIL

6 FINANCIAL IMPLICATIONS

The implementation of appropriate approaches for depreciation which meet statutory requirements whilst diminishing the burden on ratepayers is a priority financial sustainability project for Council.

7 RISK MANAGEMENT

NIL

8 CONSULTATION

NIL

9 OPTIONS FOR COUNCIL TO CONSIDER

NIL

10 OFFICER'S COMMENTS/CONCLUSION

That Council note the strong partnership with QTC that has been established.

Regular reports on this work will be brought to Council as part of the quarterly budget review process.

11 ATTACHMENTS

Nil

RECOMMENDATIONS

That Council endorse the partnership with QTC and this project to address Council's depreciation expense matters.



North Burnett Region
Futures Program

NORTH BURNETT REGION FUTURES PROGRAM CONSULTANCY PROGRESS REPORT

Report by:	Neil McPhillips, Peta Jamieson
Report to:	North Burnett Region Futures Program Advisory Committee
Reporting Period:	August 2014-August 2015
Meeting Date:	5 November 2014



November 2014

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1. Introduction

The purpose of this report is to provide a summary of activity of the North Burnett Region Futures Program. Further information can be found in the attached North Burnett Region Futures 2014-2015 Operational Plan.



NBRF Program
2014-2015 Operation

The Key Responsibilities of the North Burnett Region Futures Program are to:

- Provide overall strategic economic development direction and management in accordance with Council's draft Economic Development Plan 2014-2020 recommendations and priority actions.
- Provide strategic advice and mentorship to Council and the region generally in areas of economic development.
- Develop, facilitate and administer specific economic development projects and initiatives as directed by the North Burnett Region Futures Program Advisory Committee or other governance structures as per the approved Operational Plan.
- Support the North Burnett Regional Council's active participation on the Wide Bay Burnett Regional Organisation of Councils (WBBROC) Regional Economic Development Advisory Committee (REDAC).

The abovementioned responsibilities are delivered by the Consultants in line with the Council-adopted 2009-2014 *The North Burnett Region: A Centre for Rural Innovation* Economic Development Plan and draft 2014-2020 *The North Burnett Region – Where Opportunity & Lifestyle Align* Economic Development Plan. The plans contain three (3) high-level Strategies:

- Council, Business and Industry Leadership
- New and Emerging Opportunities
- Resourcing and Implementing Economic Development.

Work undertaken by the NBRF Program team aligns with the projects and associated initiatives listed in the 2014-2015 Operational Plan.

2. Actions from Previous Meeting (28 April 2014)

Item	Progress Report
That the North Burnett Region Futures Program Advisory Committee forward the draft North Burnett Region Economic Development Plan 2014 – 2020 to Council and request the Program Team Members to present the Draft Plan to Council for consideration and discussion concerning a future agreed consultation process.	Complete with draft Plan to be circulated to broader community by NBRC.
That the North Burnett Region Futures Program Advisory Committee forward the North Burnett Regional Economic Profile 2014 and the Economic Profile Summary Report to Council for information and use in future communications and promotions.	Complete
The Advisory Committee agreed that the potential to reschedule Business Expo/Festival should be discussed by members of the Advisory Committee established to support the Business Expo /Festival.	Complete

3. Strategic Economic Development and Management

Managing the implementation of the North Burnett Region Futures Program

Initiatives include:

- Chair of Wide Bay Burnett Region Economic Development Advisory Committee (WBBREDAC)
- Strategic Advisor(s) to North Burnett Regional Council
- Advocate and lobby for key strategic rail infrastructure and services to Queensland Government
- Involvement in strategic economic development issues and initiatives.

Most activity has included projects/issues such as:

- Redrafting the North Burnett Region *Economic Development Plan 2014–2020* and subsequent community consultation website survey
- Engagement with members of the Citrus Industry to ensure the industry is supported as much as possible from a Council perspective
- Working with the Burnett Boyne Rail Line Preservation Group Inc to assist in development of the Monto Rail project
- Regional visits across the North Burnett region including to Mundubbera and Gayndah
- NBRC Economic Development & Planning Collaboration (between NBRF Program consultants and Insite Strategies)
- Representation at presentations and forums including RegionsQ forums held in Bundaberg, Gympie and Kingaroy.

Following is some additional information about a number of the abovementioned strategic initiatives:

Review of Economic Development Plan 2009-2014

- In late 2013, at the direction of the former NBRF Program Advisory Committee, work commenced to review the current Plan and commence drafting the new Economic Development Plan 2014-2020.
- Since this time a draft was developed and considered by Council in April 2014.
- Council is in the process of making the draft available for business/community consultation via the website. To assist this process a questionnaire was developed and will be included on the website.

Citrus Industry Facilitation

- As an outcome of a one-on-one discussion with Judy Shepherd as part of the Mentoring for Innovation, Sustainability & Succession (MISS) Program in September 2014, Council representatives and the NBRF Program consultants has a one-on-one session with Judy to discuss current and future challenges being experienced by the citrus industry.
- A 2nd session was then held with members of Citrus Australia and other growers in the North Burnett in late September 2014 at which time it became clear there is two views being expressed by representatives from the citrus industry.
- The view presented by Judi (with support in some aspects from other growers) indicated that, the industry needed further assistance and some concerns amongst smaller growers about viability and the future direction of the industry. In contrast, the view presented by other growers reinforced that Citrus Australia as the industry body was working pretty well on most issues and the area that needed further assistance was in overseas marketing.
- Following the meeting David Wiskar met with representatives from Department of Agriculture, Forestry and Fisheries (DAFF) who reinforced their commitment to supporting the local North Burnett Citrus Industry. However, understandably, DAFF are wary of what to do and want to ensure that they don't get caught in the middle of industry politics.
- As a result, following is the agreed actions that it was agreed would occur:
 1. For the next two months – DAFF will allocate two officers to conduct an industry survey through a series of on-farm one on one consultations. (NBRC will be given an opportunity to review the survey instrument prior to the survey taking place), and
 2. In December/January once the Survey has been completed NBRC and DAFF will host an event where DAFF will present (to the citrus industry) the results of the survey and then how they will work with the industry to further develop the Citrus Industry in our region.

Monto Rail Project

- The NBRF consultants have been assisting Jack Muller and other members of the Burnett Boyne Rail Line Preservation Group Inc. to develop the Monto Rail light rail project which includes preservation of a section of rural railway and development of a light rail based tourism business which it is anticipated may provide substantial economic benefit to the Monto/ Gladstone region. The main benefits of this venture would be the flow on effect it would have to local businesses by attracting grey nomads, families and

overseas tourists to this area.

- This venture will hold the lease, obtain railway accreditation for the line, and develop commercial tourist products based on a similar venture established by New Zealand Rail Riders Ltd.
- To date, NBRF Program consultants have met with Jack and other members of the Preservation Group to develop various forms of communication and have offered to review their draft business case once ready.

NBRC Economic Development & Planning Collaboration

- At the initiation of NBRF Program consultants and with the agreement of David Wiskar, a meeting was held with David Newby and Nathan Freeman, Insite SJC to collaborate and identify opportunities for stronger links between planning and economic development within the North Burnett region.
- Following a meeting in September 2014 it was agreed the following initial joint activities would be progressed:
 - o updating of the WBBROC Regional Incentive fact sheet from a North Burnett perspective,
 - o development of a NBRC "Ready to do Business" fact sheet
 - o potential combined launch of Council's "Ready to do Business" program and Council's new Planning Scheme at the end of Oct at which time existing businesses would be invited to partner/attend the launch with Council to attract media.
- David and Nathan will attend the next NBRF Program presentation to Council on 5 November at which time this collaboration will be discussed in more detail.

WBBREDAC linkages to the North Burnett Region:

The Wide Bay Burnett Regional Organisation of Councils (WBBROC) previously established the Regional Economic Development Advisory Committee (REDAC). The North Burnett Region Futures Program Consultant has been nominated and approved as Chair of that Committee.

The key objectives of REDAC are to:

- Provide advice to WBBROC and to recommend actions that facilitate economic development in the Wide Bay Burnett Region.
- Provide advice and recommend actions on matters of a short, medium and long--term nature that will affect the future development of the Region (especially for implementation of prioritized regionally significant economic development projects).
- Where necessary, consult with industry, private sector companies and all levels of Government to facilitate the participation of the private sector and the Government in the sustainable economic growth of the Region.
- Where necessary, act as an ambassador for the whole of the Region and assist in the promotion of a positive image and the future development of the Region.

REDAC) manages the implementation of five Regional Priority Projects focusing on the following concepts:
Regional Priority Projects:

1. The 'Liveable Cities - Liveable Towns' project focuses on developing themes and linkages across the six Council areas and their regional cities and towns and build a distinctive Wide Bay Burnett Brand for residential and business and industry attraction.

Achievements to date include:

- WBBROC endorsed regional brand The Perfect Place At Your Perfect Pace
- Promotion of region at Regional Lifestyle Expo, Regional Flavors and other opportunities
- Regional Facility Audit Proposal and links to draft Regionalisation Plan
- Regional Incentives flyer developed
- Regional website, facebook developed/promoted
- Digital stories of people/businesses moving to region developed/promoted.
- Regional Economic Impact Modelling contract (APPROX SAVING - \$3,000-\$10,000)

2. The 'Digital Economy Support' project focuses on improving the capability and capacity of the region's small to medium sized enterprises to compete and thrive in the rapidly evolving digital economy, and position the WBB as a "connected region" making it attractive to technology-reliant businesses, service providers and infrastructure providers.

Achievements to date include:

- Development of the *Independent Broadband Testing Report (February 2014)*
- 5 out of 6 Councils received stage 1 request from Cth Gov't via the Blackspot Funding Program

(worth \$100M)

- Bundaberg Regional Council Digital Enterprise Program (regional leadership role but focused on delivering locally)
- 18 Grow Your Business Online workshops held late 2012 in Fraser Coast, South Burnett, North Burnett, Gympie, Bundaberg and Childers with on average approx. 25 participants attending each session.

3. The 'Regional Innovation Centre' project will ultimately provide project facilitation, brokerage services, advice and advocacy, and coordination assistance to agricultural landholders and businesses throughout the region in taking advantage of opportunities derived through innovation in all its forms.

Achievements to date include:

- Colin Graham, Causeway Innovation engaged as Project Manager in July 2013 to June 2014
- 44 potential businesses/clients assessed by Colin with Council officers (resulted in 6 businesses receiving direct support, including Sno-VAC, from the North Burnett)
- Business Case endorsed by WBBROC for 2014/2015 – commitment to \$100K provided matching funds secured
- Proposal provided to number of organisations to match part/full funding.

4. The 'Experiential/Outdoor/Eco-Tourism' project will package and market the region's competitive outdoor attractions, including agritourism, the region's biospheres, competitive natural attractions and events, and the associated support infrastructure such as accommodation and food service.

Achievements to date include:

- Commonwealth Games Investigation Report 2012 developed in collaboration with DSDIP
- Awaiting final Destination Tourism Plans to be released to identify where Councils can play role – *BNBT Destination Tourism Plan 2020* reviewed to date.

5. The 'Economic Scenario Planning' project will explore the 25 year outlook and potential for the region and, in doing so, via the use of scenarios, present an understanding of the range of regional and industry environments which could impact on the Wide Bay Burnett's future.

REDAC was also tasked with two Strategic Responsibilities including:

1. Development of the 'Wide Bay Burnett Regional Economic Development Strategy' which is a non-statutory framework that supports regional economic development.

Achievements to date include:

- WBBROC finalized the *Regional Economic Development Strategy 2014-2019* in February 2014.
- Successful 2014 Regional Economic Development Growth Forum at which time there were approximately 12 representatives from business/industry/Council at the forum and a stall hosted by North Burnett Regional Council.

2. Strategic regional involvement in monitoring and planning for integrated transport networks (road, rail, air and sea) for the Wide Bay Burnett Region. Every local government area in the Wide Bay Burnett region is affected by either lack of transport infrastructure development and/or a lack of understanding the impact of poor transport networks have on the region's (and, in some instances, the State's) economy. Transport networks and integrated transport facilities will be one of the most important strategic planning requirements for the region, particularly considering the impact of future population growth, as well as resource sector initiatives and the role that transport networks and facilities play in enabling businesses to more effectively supply markets and, thereby, enhance their competitiveness.

Achievements to date include:

- Submission to Great Barrier Reef Ports Strategy (December 2012)
- Submission to Moving Freight Paper (August 2013), including regular contact with David Edwards, DG, DSDIP
- Submission to Draft Ports Strategy (Nov 2013)
- Assisted RDA to review the State of the Regions document
- WBBROC response to RegionsQ Framework (July 2014) and participation at forums.

4. Measuring the Performance of North Burnett Region Economic Development

So that we can monitor the performance of economic development in the North Burnett Region, it has previously been agreed that the following Performance Indicators be used for future reference and reporting:

- Gross Regional Product
 - Employment
 - Annual Employment Growth
 - Unemployment Rate
 - Participation Rate
 - Housing & Development
 - Number of Dwelling Approvals
 - Value of non-residential Building Approvals
 - Business Activity & Engagement
 - Businesses by Industry & Turnover
 - Industry Productivity (measures the efficiency of production in a region by dividing the GRP/ employee hours worked)
 - Number of Businesses engaged through Business Engagement Activities
 - Number of Functions and Training Workshops
 - Number of Businesses registered on North Burnett Region Business Database
 - Growth in post school qualifications (e.g. Vocational Skill Sets, Cert III, Diploma, University)
 - Increase in key demographic indicators
 - Average individual income
 - Average household income
 - Average family income
 - Population Growth
- Over the last couple of years the *North Burnett Regional Economic Profile 2013* and *North Burnett Regional Economic Profile 2014* have been developed by Lawrence Consulting which detail the economic performance of the region and is relevant to the agreed Performance Indicators for the North Burnett Region Futures Program.
- Attached, as provided previously, is the *North Burnett Regional Economic Profile 2014* and a Summary of the Performance of the Region.



North Burnett
Regional Economic Profile 2014



2014 North Burnett
Economic Profile Report

- In late 2014 the *North Burnett Region Economic Profile 2015* will be developed and provided to Council for consideration.
- David Wiskar, Neil and Peta will meet with Reuben Lawrence, Lawrence Consulting in early December to discuss the 2015 economic profile.

5. Business Engagement & Support

- On Wednesday 10 September 2014 the North Burnett Region Futures team held Round 2 of the Mentoring for Innovation, Sustainability & Succession (MISS) Program.
- Mentors travelled from Bundaberg, Cracow, Mt Perry and Mundubbera to assist business owners with new ideas or challenges they may be facing. 3 Businesses attended individual sessions. These businesses were from the retail and tourism sectors and were provided with a wealth of information and advice on topics such as diversifying, new technology, business startup, succession planning and marketing.
- This is the fourth Mentoring program organised by the North Burnett Region Futures program beginning with two Mentoring for Recovery sessions held in Mundubbera and Gayndah in August 2013. The mentoring program has since been customised for North Burnett businesses and the last two MISS sessions have been held in Eidsvold with

www.southburnettimes.com.au

News

Ask a mentor

MENTORING might just be what some of the business community needs in the North Burnett.

Wide Bay Burnett Regional Organisation of Councils (WBBROC) Regional Economic Development Advisory Committee (REDAC) chairman Neil McPhillips said new and expanding businesses needed guidance.

"We are holding one-on-one mentoring sessions across the North Burnett to critique businesses that are starting up, expanding, selling or on the edge and need advice on how to repair or the get out," Mr McPhillips said.

The regional council's economic development consultant Lisa Wain has assisted many businesses since becoming involved with the North Burnett Council and would like other business people in the region to book in for a consultation.

"The sessions are 100% free and are private," Mrs Wain said.

"Notes of the meeting are taken and all aspects of the advice given are noted and emailed to the client so nothing is overlooked after the meeting," she said.

The next round of mentoring will be in three months.

If you would like further details contact the North Burnett Regional Council.

» HERE TO HELP: Michelle Croner, Leeanne Rudd, Lisa Wain, Neil McPhillips, Hellen Hughes and Peter Rowe.

PHOTO: NOEL THOMPSON

businesses travelling from Monto and Mundubbera to attend.

- Over this period 14 businesses have accessed valuable consultation and advise valued at approximately \$2,500 per individual session. The next round of mentoring sessions will be held on 11 December 2014 in Biggenden.

6. Regional Economic Development

- On behalf of the North Burnett Regional Council David Wiskar assumes responsibility for ensuring Council implements activities in accordance with the 5 regional priority projects and 2 strategic responsibilities, however, the NBRF Program is responsible for supporting development of the Wide Bay Burnett *Regional Economic Development Strategy 2014-2019* as the foundation strategy for achieving enhanced economic development across the Wide Bay Burnett region.
- Now that the Strategy and development of the complementary Regional Priorities document have been finalized, the final Implementation Plan will be considered by WBBROC at its November 2014 meeting.
- In addition to the Implementation Plan work has commenced to develop the Wide Bay Burnett Regional Investment Strategy which will seek to define the framework within which projects need to be “investment ready” and ultimately support realisation of private investment in the Wide Bay Burnett region. The strategy will also be a key advocacy tool for WBBROC when meeting with the State and Federal Governments regarding what are the key regional infrastructure needs.

7. Attraction & Retention

- As detailed in the NBRF Program 2014-2015 Operational Plan to main initiative that will be progressed from an attraction and retention perspective includes implementation of initiatives that deliver on the regional Attraction & Retention Strategy, including marketing of *The Perfect Place at Your Perfect Pace* regional identity and brand.
- In line with the abovementioned focus the NBRF Program consultants provided comment and assistance to David Wiskar on development of the R4R “Digital Infrastructure to drive local Economic Growth along the Australian Country Way” application which linked to the North Burnett Regional Council signage initiative will promote *The Perfect Place At Your Perfect Pace* tagline.
- The North Burnett region was also showcased at the recent Regional Economic Development Forum and will be promoted as part of the Wide Bay Burnett presence at the RegionsQ Showcase on 13-14 February 2015.
- The NBRF Program consultants have also been requested to potentially be involved in the following game changer initiatives:
 - Analyse opportunities for the relocation of State Government Agencies to the Region
 - Drive the North Burnett region business development component of the Centre for Regional Innovation.

8. Digital Business Engagement & Support

- The North Burnett Region Futures program consultants are available to assist and work closely with David Wiskar who is working in partnership with Bundaberg Regional Council in the delivery of the Digital Enterprise Program.

9. Digital Communication Strategy

As part of priority action 16 of the Economic Development Report – **Communicate the Economic Vision to Stakeholders** – a **digital communication strategy** has been operational since April 2012. The main activities include:

E-newsletters/Mailchimp

- Subscription numbers have remained relatively the same with 11 new subscribers and 5 unsubscribes since April 2014 leaving us with a total of 660 subscribers as at 15/10/2014.
- 3 e-newsletters have been sent since April 2014.
- Our open rate has slightly increased from an average of 26.1% in April 2014 to 26.2% in September 2014 and is still significantly higher than the Business and Finance industry average of 18.9%. The last e-newsletter sent out in September showed an open rate of 30.4% showing a significant increase in engagement.
- Our click rate average is currently at 3.2% which is also higher than the industry average of 2.8%. The

last e-newsletter sent out in September showed a massive increase in the click rate to 7.6%. This dramatic increase in subscriber engagement can be attributed to the change in e-newsletter format sending readers to the North Burnett Futures website to read more about each story. The "Reopening of Goondicum Mine" article overwhelmingly received the most clicks with 30 unique clicks. The second most popular article to be clicked was about the upcoming Mentoring sessions with 9 unique clicks, showing the vast difference in the high level of interest our subscribers have in the mining activity in our region. It is worth noting here that the most popular e-newsletter ever sent to our subscribers was back in April 2012 in relation to the Australian Bauxite Business Breakfast with a 43.9% open rate and 16.8% click rate.

- 70.3% of our subscribers are accessing their e-newsletters via a desktop computer with 29.7% of subscribers accessing via a mobile device. Interestingly Windows Outlook is overwhelmingly the most popular email client used by those accessing e-newsletters via desktop computer at 33.8% of users.

NBRF Facebook page

- The North Burnett Futures facebook page currently has a total of 209 likes, an increase of 33 since April 2014.
- A recent post featuring the launch of the WBB North Burnett Digital Stories has outperformed all other posts with an organic reach of 3190 people and attracting 280 post clicks and 123 likes, comments and shares. This is a fantastic result considering all of our activity is organic (i.e. no paid posts or advertising). Reports show that post reach and engagement has shown a significant increase since August 2014.
- 73% of our followers are female (an increase of 1% since April 2014) with the largest segment being between 25-34 (21% of total followers). Of the 25% of males following our page the largest segment is between the ages of 35-44 (8% of total followers). 52% of all our followers are between the ages of 25-44. The largest numbers of followers come from Mundubbera with 52 fans and Brisbane being the 2nd largest with 23 fans.
- The Majority of our followers come from Mundubbera with 55 fans, Brisbane 26, Gayndah 23, Bundaberg 10, Eidsvold 10, Kingaroy 8 with Biggenden and Monto with 6. It is worth noting here that some people do not list their town of residence and it is known that some people list Brisbane due to privacy reasons. The same can be noted about followers ages with some people entering an incorrect date of birth for privacy concerns.

Eventbrite account and website

- The eventbrite website is predominantly being used for promoting and registration for our Mentoring for Innovation, Sustainability and Succession Program of which we have completed two and have one scheduled for 11 December 2014.

10. Recommendations

1. That the North Burnett Region Futures Program Consultancy Progress Report dated 5 November 2014 be received and the contents noted.

11. Summary

Whilst the focus of the North Burnett Region Futures Program has significantly shifted from being directed towards the economic recovery of the region, the Program consultants are still involved in discussions regarding sectors such as the citrus industry who were drastically affected by the disasters. With Strategic issues continuing to need to be addressed, our focus has, in part shifted to the need to provide continued engagement with business and industry.

On another note, as mentioned previously I believe we are starting to really see the benefit of the North Burnett Region being involved in the wider Wide Bay Burnett Region through WBBROC and REDAC. I believe the last few months have seen some outstanding results through the development of the *Regional Economic Development Strategy 2014-2019*, Regional Economic Development Growth Forum and development of digital stories, just to name a couple. There are many initiatives currently underway in the WBBROC arena, and some of these would not be available or possible for the North Burnett Region, if we weren't capitalising on the regional economies of scale and importantly, the support of some of the other larger Councils.

On behalf of Peta and myself as the NBRF Program consultants I would like to thank David Wiskar and the North Burnett Regional Council members for their guidance and support and trust we see future economic development growth in the North Burnett Region.



Neil McPhillips
North Burnett Region Futures Program Consultant

ENVIR 01 MOSQUITO, BLACK FLY & BITING MIDGE MANAGEMENT PLAN

Responsible Officer: Brendan Pearce – General Manager Engineering & Environmental Services

Report prepared by: Sue Paul – Manager Environmental Services

1 PURPOSE OF REPORT

The purpose of this report is to present the North Burnett Regional Council's Mosquito, Black Fly & Biting Midge Management Plan for adoption

2 INTRODUCTION/BACKGROUND

The effective management of mosquitoes in the North Burnett Regional Council (NBRC) area is of considerable importance given the impact on public health due to diseases such as Ross River, Barmah Forest and potentially Dengue fever, kunjin and chikungunya; and to the impact on outdoor activities of residents due to nuisance biting of mosquitoes, black flies and biting midge.

The North Burnett Regional Council's Mosquito Program aims to gather and provide current information regarding the distribution and abundance of important mosquito species to better understand risk posed by mosquitoes and other vectors to the community. Further, the program aims to keep mosquito populations at acceptable levels through the effective provision of various forms of treatment and control measures. It also aims to reduce the nuisance factor from black flies and biting midge in accordance with guidelines set by Queensland Health.

This Mosquito, Black Fly & Biting Midge Management Plan provides general information regarding mosquitoes, black flies and biting midge, the importance of treatment and the process in which treatments should be undertaken to maximise success and minimise environmental harm. The Plan also outlines a commitment to increasing knowledge of vectors in the NBRC to manage risks associated with mosquitoes.

3 CORPORATE/OPERATIONAL PLAN

4.4.1 Review and provide environmental health services to ensure a suitable and equitable standard of service to address infectious, vermin, vector and other pest and compliance issues;

4.4.2 Develop and implement a vector management plan;

and can be linked to the following outcomes:

2.8 Maintain and enhance community sport & recreational facilities and reserves;

3.5.6 Develop and implement an Amenity and Aesthetics Policy to minimize adverse social and visual impacts on the regions natural and built environments.

4 POLICY IMPLICATIONS

Workplace Health and Safety - 226

5 STATUTORY REQUIREMENTS

Council has a legal requirement under the Public Health Act 2005 and the associated Regulation to prevent and control the public health risks associated with mosquitoes.

6 FINANCIAL IMPLICATIONS

Implementation of the North Burnett Regional Council Mosquito, Black Fly & Biting Midge Management Plan will need to be considered as part of future operational budgets – 2014/18

7 RISK MANAGEMENT

Implementation of the appropriate vector management activities will mitigate the risk to the community of contracting vector-transmitted diseases as well as reduce the nuisance value of the pests. The Plan also focuses on proactive management activities, with the aim of reducing reactive management activities.

8 CONSULTATION

Mary Burnett Vector Management Group, Consultant – Wide Bay Burnett Food Safety Auditing (Prue Brinkley), Queensland Health together with NBRC - Environmental Health and Natural Resource Management teams.

9 OPTIONS FOR COUNCIL TO CONSIDER

To adopt the plan in accordance with the Act.

10 OFFICER'S COMMENTS/CONCLUSION

Implementation of plan and vector management activities will provide the opportunity to utilise current staff and equipment.
The plan is now presented for adoption. It can be reviewed annually.

11 ATTACHMENTS

Draft - North Burnett Regional Council Mosquito, Black Fly & Biting Midge Management Plan.

RECOMMENDATION

That Council adopts the *North Burnett Regional Council Mosquito, Black Fly & Biting Midge Management Plan 2014-2018*



MOSQUITO, BLACK FLY & BITING MIDGE MANAGEMENT PLAN

2014 - 2018

Amendment Page

Document Adopted by Council		Date:	
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PART A - STRATEGIC OVERVIEW

1.1 Executive Summary

North Burnett Regional Council has developed a Mosquito, Black Fly & Biting Midge Management Plan in accordance with the Mosquito Management Code of Practice developed by the Local Government Association of QLD. This plan was also put together to satisfy Council's legislative responsibilities to effectively manage a practical control program.

The Mosquito, Black Fly & Biting Midge Management Plan identifies specific objectives and goals: aligned with some are specific actions which will enable Council to meet their goals. The core principals underlying these goals include:

- *Reduce Pest and Disease Impact on the region*
- *Appropriate Surveillance and Resources*
- *Competencies*
- *Program Performance Review*
- *Community Awareness*

The main focus of the Mosquito, Black Fly & Biting Midge Management Plan is to characterise the distribution and ecology of key mosquito species throughout the region to better understand the risk posed and, accordingly, identify appropriate vector management activities to be implemented, where necessary. These activities will mitigate the risk to the community of contracting vector-transmitted diseases as well as reduce the nuisance value of the pests. The Plan also focuses on proactive management activities, with the aim of reducing reactive management activities.

North Burnett Regional Council (NBRC) is committed to the implementation of the Plan which has been developed with consideration for relevant best practice methods, legislation and the environmental amenity of the region.

1.2 Vision

To protect the health, lifestyle and welfare of residents within the North Burnett Regional Council area.

1.3 Mission Statement

Gather appropriate information and data to determine the level of risk associated with mosquito breeding in the North Burnett Region; and reduce the incidence of vector borne diseases and the nuisance value created by recognised mosquito pests, black flies and biting midge within the North Burnett Regional Council area.

1.4 Objectives

- *To identify and control vectors of disease using the most cost effective and environmentally sound management methods;*
- *To identify triggers for implementing management measures to control vectors and nuisance pests (mosquitoes, black fly, and biting midge) emergence and identify appropriate actions;*
- *Implement surveillance and monitoring programs to understand mosquito breeding and populations within our region;*
- *To increase preparedness in relation to vector borne disease and nuisance complaints;*
- *To continually review and adopt best practice methods of vector surveillance and management;*
- *Provide an effective and equitable mosquito, black fly and biting midge management service to the communities of North Burnett Regional Council;*

- *To increase community and stakeholders awareness of Council's Mosquito, Black Fly & Biting Midge Management Plan;*
- *Undertake mosquito management in a manner consistent with the Mosquito Management Code of Practice and the Australian Mosquito Control Manual;*
- *To have sufficient resources and knowledge, within Council, to react to mosquito and black fly complaints and inundations;*
- *Utilise an integrated management approach which minimizes chemical use, is sustainable and considers the environmental assets of the region; and*
- *Commit to an adaptive management framework to develop and implement proactive and effective operational procedures.*

1.5 Goals

- **Goal 1** - *Reduce the pest and disease impact of vectors on the North Burnett Region.*
- **Goal 2** - *Ensure that mosquito surveillance and management is conducted in a cost effective manner and is consistent with the Mosquito Management Code of Practice for Queensland and The Australian Mosquito Control Manual.*
- **Goal 3** – *Increase knowledge of key vector species and promote, educate and inform Council (Management and Staff) and the community about Vector, Black Fly & Biting Midge Management.*

1.6 Aims

Specifically, the NBRC aims to achieve the following through the implementation of the Mosquito Management Plan:

- *Identify priorities for surveillance of mosquitoes based on the associated risk;*
- *A risk-based approach will be used to identify locations where and times when surveillance activities should be conducted. Further, best practice tools will be adopted to enhance surveillance efforts.*
- *Gather information to enable informed decisions regarding mosquitoes, black flies and biting midge;*
- *Surveillance activities will assist the acquisition of knowledge regarding local species which, over time, may identify triggers for emergence. Local observations can also include - collate weather data to determine prime breeding conditions.*
- *Increase capacity to respond to identified risks;*
- *The NBRC aims to increase its capacity to respond to perceived mosquito risk including (but not limited to) nuisance complaints, vector borne disease cases and, disaster situations. Response actions will be enhanced through the establishment with stakeholders and increased knowledge and skills amongst the workforce.*
- *Increase preparedness: and*
- *By increasing knowledge and capacity to respond to risk, the NBRC will be better placed to deal with local transmission of vector borne diseases and incursions of exotic mosquitoes, by having response methods and resources identified;*
- *Identify resources required to achieve a sustainable program.*
- *As a part of The Plan, NBRC will project a forward view of mosquito management by implementing sustainable procedures and recognising future, training and, community education.*

PART B - PRELIMINARY INFORMATION

2.1 Introduction

The effective management of mosquitoes in the North Burnett Regional Council (NBRC) area is of considerable importance given the impact on public health due to diseases such as Ross River, Barmah Forest and potentially Dengue fever, kunjin and chikungunya; and to the impact on outdoor activities of residents due to nuisance biting of mosquitoes, black flies and biting midge.

Further surveillance is required to identify the various mosquito species present within the NBRC area. Once this information is gathered the risk of disease transmission and the extent of the nuisance can be better appreciated. Importantly, key vector species including *Aedes aegypti* 'primary vector of Dengue viruses' and *Culex annulirostris* vector of 'Ross River virus' are both found within the NBRC region.

The North Burnett Regional Council's Mosquito Program aims to gather and provide current information regarding the distribution and abundance of important mosquito species to better understand risk posed by mosquitoes and other vectors to the community. Further, the program aims to keep mosquito populations at acceptable levels through the effective provision of various forms of treatment and control measures. It also aims to reduce the nuisance factor from black flies and biting midge in accordance with guidelines set by Queensland Health.

This Mosquito, Black Fly & Biting Midge Management Plan provides general information regarding mosquitoes, black flies and biting midge, the importance of treatment and the process in which treatments should be undertaken to maximise success and minimise environmental harm. The Plan also outlines a commitment to increasing knowledge of vectors in the NBRC to manage risks associated with mosquitoes.

2.2 Scope

- *Mosquito, Black Fly & Biting Midge Management Plan specifically highlights Mosquito surveillance and control programs.*
- *Identify suitable surveillance methodologies and locations which should be monitored with priority, based on local risk from mosquitoes.*
- *Identify species of mosquitoes within the region and determine the Public Health Risk.*
- *Identify potential and actual mosquito breeding sites within the region.*
- *Determine the relative densities of mosquitoes and the seasonal fluctuations.*
- *Identify resting sites for mosquitoes that impact on the community.*
- *Identify training needs to implement the Plan.*
- *Provide the community with general information regarding mosquitoes including species habitats and life cycle.*
- *Provide the community with general information regarding black flies and biting midge including species habitats and life cycle.*
- *Follow guidelines provided by Queensland Health when dealing with Black Fly and mosquitoes during disasters. (Queensland Health Guidelines for Controlling Public Health Risks relating to Mosquitoes, Flies and Black Flies in a Flood Event)*
- *Identify triggers for interventions and consider treatment options currently available.*
- *Examine chemical usage options and measurement of treatment efficacy.*
- *Examine environmental considerations ensuring compliance with the Environmental Protection Act 1994 and guidance contained in the Mosquito Management Code of Practice 2002.*
- *Institute a climate of continual research and development for Mosquito Management programs.*

2.3 Legislative Framework

Pursuant to the *Public Health Act 2005*, Queensland Health in conjunction with Local Government has the responsibility for the control of communicable diseases in Queensland. A number of vector-borne diseases come under the classification of a communicable disease including Ross River, Barmah Forest, Dengue Fever and Malaria.

The control of mosquitoes is a responsibility specifically delegated to Local Government under the *Public Health Act 2005*. The Act places responsibility on owners, occupiers and local government to perform appropriate works or actions to prevent the breeding of mosquitoes in areas under their control or responsibility.

In cases where the owner or occupier fails to comply with requirements, the Act gives power to Local Government to issue Penalty Infringements Notices and/or undertake the necessary works. Where Council is required to undertake works, any cost incurred will become a charge on the land and thus recoverable.

There is currently no legislative requirement for Local Government to have a Vector Management Plan.

Other legislation relevant to Vector management activities include:

- *The Agricultural Chemical Distribution Control Act 1966*
- *Chemical Usage (Agricultural and Veterinary) Control Act 1988*
- *Fisheries Act 1994 and associated regulation;*
- *Nature Conservation Act 1992 and associated regulation;*
- *Environmental Protection Act 1994*
- *Pest Management Act 2001 and associated regulation*
- *Public Health Regulation 2005*

2.4 Council Policy

The implementation of the North Burnett Regional Council Mosquito, Black Fly & Biting Midge Management Plan is closely associated with two outcomes of Council's Corporate Plan. These include:

2.4.1 Corporate Plan Outcomes:

- *4.4.1 Review and provide environmental health services to ensure a suitable and equitable standard of service to address infectious, vermin, vector and other pest and compliance issues;*
- *4.4.2 Develop and implement a vector management plan;*

and can be linked to the following outcomes:

- *2.8 Maintain and enhance community sport & recreational facilities and reserves;*
- *3.5.6 Develop and implement an Amenity and Aesthetics Policy to minimize adverse social and visual impacts on the regions natural and built environments.*

Council will require a sufficient budget to cover initial surveillance, equipment purchase, contract work, treatments, monitoring, health promotion media and television advertising. Funding also needs to incorporate costs of staff undertaking surveillance specifically for the urban breeding *Aedes aegypti*.

2.5 Environmental and Safety Considerations

The inherent nature of mosquito, black fly and biting midge management activities has the potential to adversely affect the environment. The *Environmental Protection Act 1994* makes clear

statements of intention in relation to a person's responsibility and the environment, known as General Environmental Duty, Section 319 of the Act defines this duty as:

- *'A person must not carry out any activity that causes, or is likely to cause environmental harm unless the person takes all reasonable to practicable measures to minimize the harm'.*

The Act stipulates that all activities, including mosquito management activities, should take environmental issues into consideration. The Mosquito Management Code of Practice for Queensland and the Australian Mosquito Control Manual provide further guidance.

Due to the nature of mosquito, black fly and biting midge control operations through the use of 4WD vehicles, all terrain vehicles and the continual use of chemicals, safety of the operator is imperative. All activities associated with the implementation of the Plan will be consistent with Council WH&S Policy and Plans.

PART C – BACKGROUND

3.1 Mosquito Borne Disease Significance

Mosquitoes are blood sucking insects that are responsible for the transmission of many pathogens throughout the human and animal populations of the world. Within Australia there are more than 300 different species of mosquito but only a small number are of major concern to public health. Clinical symptoms associated with vector borne disease range from mild fevers, to a severe and potentially life threatening haemorrhagic disease. Several important human diseases are transmitted in Australia by these insects including Dengue fever, Australian encephalitis, Ross River virus disease and Barmah Forest virus disease; malaria has been transmitted locally in Australia only rarely in recent decades. Chikungunya is also emerging as a possible threat. The disease is evident in South East Asia and has been found more recently in Papua & New Guinea. This is an extremely debilitating disease and mosquitoes that are known to be able to transmit the disease are found in Australia. In addition to being disease vectors, mosquitoes can cause major disruptions, through their persistent biting, to occupational, recreational and social activities.

3.1.1 Notifications - Barmah Forest and Ross River Virus in the North Burnett Regional Council area

There have been notifications of Barmah Forest virus and Ross River virus in most communities within the North Burnett in 2013.

Despite an absence of dengue notifications in the NBRC area in recent years the presence of the dengue vector, *Aedes aegypti*, in many of the major towns throughout the NBRC highlights the vulnerability of the region. Indeed, dengue cases imported in to the region could present a public health risk with each providing an opportunity for local transmission if sufficient mosquito vectors are present. Thus, ongoing monitoring of *Aedes aegypti* populations is necessary to accurately assess risk across the NBRC region. If dengue cases are notified to the Public Health Unit, contact will be made with local government to assess risk and consider possible mosquito control measures.

Calculation of notification rates allows comparison of the prevalence of infections with larger populations such as the Wide Bay Health and Hospital Service area and Queensland. Importantly, the annual notification rate for Ross River and Barmah Forest viruses (number of notified cases per 1,000 population per year) of the NBRC area has been markedly and consistently above the state rate for the past six years. Similarly, in almost all years since 2008, the rate of Barmah Forest virus notification in the NBRC area has been above the Queensland average (Table 1).

Table 1: Barmah Forest and Ross River Virus notifications (counts and rates per 1,000 population) 2008-2013* in the North Burnett Regional Council, Wide Bay Health and Hospital Service and Queensland.

Geographical area (2011 Estimated Residential Population count)	Barmah Forest Virus					
	2008	2009	2010	2011	2012	2013**
North Burnett Regional Council (10,342)	3 (0.29)	4 (0.39)	4 (0.39)	2 (0.19)	1 (0.10)	7 (0.68)
Wide Bay Health and Hospital Service (205,178)	68 (0.28)	62 (0.30)	53 (0.26)	52 (0.25)	53 (0.26)	146 (0.71)
Queensland (4,474,098)	1,232 (0.28)	808 (0.18)	897 (0.20)	875 (0.20)	978 (0.22)	2,182 (0.49)

Geographical area (2011 Estimated Residential Population count)	Ross River Virus					
	2008	2009	2010	2011	2012	2013**
North Burnett Regional Council (10,342)	7 (0.68)	11 (1.06)	6 (0.58)	3 (0.29)	4 (0.39)	7 (0.68)
Wide Bay Health and Hospital Service (205,178)	126 (0.52)	134 (0.65)	136 (0.66)	54 (0.26)	76 (0.37)	89 (0.43)
Queensland (4,474,098)	2,841 (0.63)	2,159 (0.48)	2,380 (0.53)	1,225 (0.27)	1,962 (0.44)	1,721 (0.38)

*2011 Estimated Residential Population used to calculate the rates

**Year to date 13 December

Notes:

The Wide Bay Health and Hospital Service (HHS) comprises of the North Burnett, Bundaberg and Fraser Coast Regional Councils and the Miriam Vale Shire part of the Gladstone Regional Council (Figure 1).



Figure 1: Statistical Local Areas (SLAs) in the Wide Bay Health and Hospital Service (HHS)

3.2 Mosquito Overview

Mosquitoes belong to the family of flies called Culicidae and are small fragile insects that have two wings covered in scales and a head equipped with a forward projecting proboscis which conceals and protects the long piercing and sucking mouthparts. These biting insects have a complex life cycle; the immature stage is totally aquatic while the adult is terrestrial. The adult female returns to a water habitat for a brief period to lay each batch of eggs. Importantly, mosquito species vary in their breeding habits, biting behaviour, host preferences and flight range. Most mosquitoes disperse less than two kilometres; some move only a few metres away from their original breeding place, others can fly some 5 to 10 kilometres, and a few species will disperse up to 50 kilometres downwind from the larval habitats.

On average, a female mosquito will live 2-3 weeks, but the male's lifespan is shorter. Within their lifetime both adult male and female will feed on nectar and plant fluids, but it is only the female that will seek a blood meal. The majority of species require this blood meal as a protein source for egg development. Female mosquitoes are attracted to a potential host through a combination of different stimuli that emanate from the host including carbon dioxide, body odours, air movement or heat. Upon locating a suitable host, the female will probe the skin for a blood capillary then inject a small amount of saliva, presenting a potential pathway for the transmission of pathogens such as viruses to enter a host. After engorging on the host's blood the female will find a resting place to digest the meal and develop eggs before dispersing to deposit them in a suitable aquatic habitat.

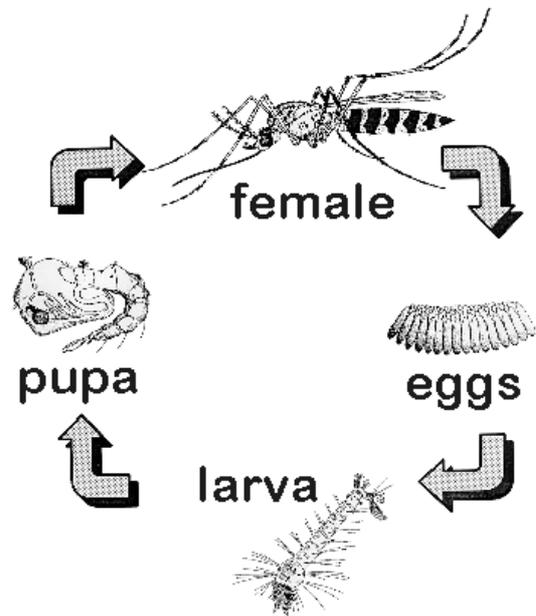
As stated earlier mosquitoes have the ability to breed in a wide range of environments including; freshwater wetlands, salt marshes, highly polluted waters and artificial containers.

Within the North Burnett Region there are two distinct habitats:

1. *Groundwater/freshwater/polluted water breeding, and*
2. *Urban or Container breeding.*

3.2.1 Lifecycle

Mosquito eggs are laid either on damp surfaces, just above water level or on the surface of water as a raft as shown in the diagram. The eggs of some species may survive drying and can remain viable for many years awaiting rainfall or tidal inundation to facilitate hatching. The eggs hatch into larvae (wigglers) that need to feed continuously to progress through the four (4) developmental larval stages (increasing in size with each stage). This development is dependent on the availability of food and the prevailing conditions, particularly temperature, but generally takes at least one to two weeks. The final larval instar develops into a non-feeding pupae stage. The adult mosquito emerges from the pupal skin, generally within two days and feeds, then mates and develops eggs for the next generation.



With the exception of a few species, female mosquitoes require a blood meal for egg development, with a single female capable of laying between 200 and 400 eggs within a two to four week lifecycle. Male mosquitoes do not bite but feed only on plant sugars.

The length of the breeding cycle is very much dependent of climatic conditions with the characteristic hot days often experienced in the North Burnett region potentially shortening a complete cycle and accelerating development.

Mosquitoes differ in their biology and required larval habitat between species. Further, different species vary in their host feeding preferences and ability to transmit various pathogens. Accordingly, surveillance and control methodologies must be tailored to the biology and ecology of target species to maximize the impact of interventions. For the purposes of description of surveillance and control methodologies, two general classes of mosquitoes can be described: those that inhabit groundwater including flooded pools and saltmarshes and those that inhabit small containers in urban environments.

Not all mosquitoes bite humans. Currently the number of competent vectors within the North Burnett region are unknown, but this Plan aims to ensure the required information is gathered so that informed decisions on appropriate responses/actions can be made.

3.2.2 Prevention

A variety of active mosquito control measures are available. Large scale activities that can be undertaken by government bodies include:

- *habitat modification in order to reduce water availability for breeding of the larval stage, and*
- *use of appropriate insecticides for controlling the larval or adult stage.*

Activities that can be undertaken by the community include:

- *taking precautions against being bitten by mosquitos;*
- *avoiding being outside during times of heavy infestation of mosquitoes;*
- *using insect repellents (containing DEET or picardin) and wear protective, light coloured long sleeve shirts and pants;*
- *screening living and sleeping areas; and*
- *checking your home regularly for potential mosquito breeding areas e.g. any uncovered water containers should be emptied regularly.*

The link below provides information and recommendations regarding personal protection prepared by “Cameron Webb, Westmead Hospital/ University of Sydney”

<http://medent.usyd.edu.au/RepellentGuidelines.pdf>

Other preventative measures include government based programs that undertake mosquito monitoring and virus surveillance from mosquitoes. These programs aim to act as an early warning system for virus activity by monitoring mosquito populations, viruses such as Ross River or Barmah Forest and weather patterns.

Note: The biology of black fly and biting midge are described in Part D, appendices 7 and 8, respectively

3.3 Mosquito Habitats

Council's Mosquito, Black Fly and Biting Midge Management Program targets species based on their ability transmit pathogens (vectorial capacity), nuisance value and cohabitation with humans. Mosquitoes breed in a variety of environments. Generally the different habitats can be classified as follows:

3.3.1 Fresh Water

Ground water

1. Natural habitats
 - a. *Lakes and swamps – vegetated margins and floating vegetation*
 - b. *Streams – vegetated margins, isolated quiet reaches, backwaters, billabongs*
 - c. *Temporary and semi-permanent ground pools, rain filled depressions, animal wallows, hoofprints*
 - d. *Rock pools – sides of or in stream bed, rain filled*
 - e. *Flooded animal borrows and crayfish tunnels*
2. Man-made habitats
 - a. *Irrigation ditches and runoff, overflow and tail drains*
 - b. *Dams – usually more important after stabilization and when vegetated*
 - c. *Excavations – borrow pits, road works, wells mining operations*
 - d. *Wheel ruts*

Container water

1. Natural habitats
 - a. *Tree-holes*
 - b. *Leaf axils*
 - c. *Fruits, bromeliads and husks*
2. Man-made habitats
 - a. *Domestic functionals – water tanks/barrels, roof guttering, animal drinking troughs, pot plant saucers*
 - b. *Discarded/hoarded rubbish – tins, tyres, plastic containers, tarps, derelict car bodies*

3.3.2 Polluted water

Septic tanks

Drains, sullage pits

Ground water at garbage dumps

3.3.3 Brackish water

Estuarine marshes/swamps

Tidal reaches of river margins

Rain pools/irrigation run-off in inland areas with saline soil

3.3.4 Salt Water

Pools on coastal rock platforms

The techniques used for surveillance and response vary depending on the breeding/larval habitat. In NBRC the type of breeding/larval habitats can be grouped into two general classes for surveillance and response purposes:

1. *Groundwater/freshwater/polluted water species, and*
2. Container/Urban species.

3.3.5 Groundwater/freshwater/polluted water

There is a wide range of mosquito habitats that fall into this category. The diversity of mosquitoes present and the productivity of the individual sites are predominately dependent on characteristics including water depth, water quality, vegetation composition, vegetation density and predator (fish and macroinvertebrate) populations. Important pest mosquitoes associated with these habitats are *Culex annulirostris*, *Culex linealis* and *Culex quinquefasciatus*.

3.3.6 Container/Urban

Generally, these habitats are divided into two categories: those high in organic content and small water holding containers found around residential areas. The most important pest mosquitoes associated with these habitats are: *Aedes aegypti*, *Aedes/Ochlerotatus notoscriptus* in containers and *Culex quinquefasciatus* in areas with a high organic content.

There is limited information available regarding the species found within NBRC. Importantly, container/Urban surveillance has been conducted in the major towns.

The following mosquitoes capable of transmitting disease were identified:

- *Aedes aegypti*
- *Culex annulirostris*
- *Aedes notoscriptus*

The following mosquitoes that are known to bite humans were also identified:

- *Culex quinquefasciatus*

3.4 Surveillance

Surveillance is essential for the planning, operation, and evaluation of any effective mosquito control program. All control decisions should be based on as much science as possible. Surveillance will ensure the timing and choice of response methodologies will have a scientific basis. An initial survey will determine the nature and extent of the problem and indicate an appropriate response. The initial survey can be used to determine:

- *The species of mosquito present,*
- *source/s (breeding sites),*
- *relative densities and*
- *dispersal or flight range.*

If baseline data is not collected prior to the commencement of a control program, any evaluation at a later stage may not be accurate.

Routine surveillance yields the location of breeding habitat and identification of problem sites where control should be concentrated. Survey data will provide vital information, such as: an increase in adult numbers within an area suggesting a need for or increased control; a dominance of one species may indicate missed or novel breeding habitat that can be investigated; or timing treatment to catch the most number of larvae and adults within a given breeding habitat or location. Surveillance will also detect disease activity, allowing for control measures prior to an epidemic.

3.4.1 Routine Mosquito Surveillance provides:

- *A list of mosquito species within a local area.*
- *An estimate of adult and larval mosquito populations.*
- *Insight into mosquito breeding habitat.*
- *Locations where control efforts are needed.*
- *Source of female mosquitoes for disease surveillance.*

The surveillance methods used will depend on the type of environment the mosquito inhabits.

Note: A list of surveillance and monitoring methods for groundwater mosquitoes are presented in Part E, Appendix 1. Similarly, surveillance and monitoring requirements for urban/container mosquitoes are presented in Appendix 3.

3.5 Response

In most cases it will not be possible to eradicate mosquitoes or even eliminate a particular species from an area. If there is a significant risk or nuisance then an appropriate response should be determined. Methods used to control mosquitoes vary according to the species concerned and the local situation and circumstances. Economic and environmental considerations also influence response methodology. Therefore, the accurate identification of the target species and its habitats is important to ensure controls are efficient and pose no/limited risk to the environment.

When determining which response methodology to utilize, consideration should be given to using the most appropriate control rather than the most expedient method. Long term benefits usually outweigh short term gains. An 'integrated control' method should be used and this essentially means the use of a combination of methods that are complimentary, and will limit the sources and reduce the abundance of the mosquito populations, and protect the health and well-being of the human community, and exert minimal detrimental effects on non-target species and the environment. Integrated control programs will usually include a blending of informed methods of environmental management, application of chemical insecticides, consideration of the use of biological control agents and public awareness campaign.

Note: A list of response methods for groundwater mosquitoes are presented in Part E, Appendix 2. Similarly, response methods for urban/container mosquitoes are presented in Appendix 4"

3.5.1 Environmental Management

Advances in habitat modification techniques have shown that the suppression of mosquito populations is possible without reliance on chemical control or endangering the flora, fauna or ecological function of the wetland itself. However, it is important to note that any modification to the environment to reduce the production of mosquitoes may have the potential to impact other components of the local ecosystem and should be fully investigated before any strategies are implemented.

Strategies to reduce the productivity of mosquito habitats without the use of control agents are generally achieved by the manipulation of water flows and/or vegetation to reduce the suitability of the habitat for mosquito production. In urban environments, source reduction is generally directed towards habitats such as sullage pits, drains, guttering, backyard containers and other areas where water is retained for long periods of time.

3.5.2 Chemical Control

Chemical control is often seen as the initial method of choice to reduce vector populations and interrupt transmission and disease. This is short term control, but it will continue to be the pivotal component of 'epidemic-control' for many years to come. However, product contamination or environmental pollution can lead to community concerns and legal problems. Chemical control programs should use the most species specific chemicals available, but this is often difficult due to the broad toxicity of many of the available insecticides.

The *Pest Management Act 2001* and the Australian Pesticides and Veterinary Medicines Authority restrict the types of chemicals that can be used for mosquito control.

Chemical attack on pest or vector mosquito populations will be aimed at either the point of source with the larval stages (larviciding), or at the point of nuisance with the adult stages (adulticiding), or both.

The most effective, and generally environmentally friendly, strategy to control mosquito populations, and minimize nuisance and public health risks, is to target larval populations and their habitats. However, the effectiveness of larval control is very dependent on the timing of the applications.

Adulticiding may be considered when quick reductions in adult pest or vector numbers are required. However, the effectiveness can be unreliable and this method may have a greater negative impact on non-target species. As with larviciding the correct timing of application is essential. During an epidemic of mosquito-borne disease or during a disaster situation, adulticiding can be considered essential. Refer to the Queensland Health – Guidelines for Controlling Public Health Risks relating to Mosquitoes, Flies and Black Flies in a flood event for recommended actions.

Repellents are chemicals that tend to produce avoidance reactions in mosquitoes approaching a host, block the host-detection senses or at least 'cover' the attractiveness of the host. Repellents are often the most practical agent for personal protection against mosquitoes. The most common commercial anti-mosquito repellents contain ingredients such as diethyl toluamide (DEET) or piciradin.

As stated earlier the types of breeding habitats in the NBRC can be grouped into two classes and treatment responses vary accordingly.

Note: Part E contains specific response methodologies and risk assessment guide (located in appendix 8).

3.6 Community Engagement/Awareness

One of the most important aspects of mosquito management is the engaging of the community in the program. It is important for local authorities to assist in the dissemination of accurate information on the public health risks associated with mosquitoes and strategies to reduce those risks, to the community. It is also crucial that the community is educated on the place of mosquitoes in the local environment and the reasons why specific management strategies have been employed in the region.

There is often a lot of misinformation in the community regarding mosquitoes. A lack of understanding of the diversity of mosquito species, their life cycle and habitat associations is common. Concise, accurate information regarding the local mosquito populations can not only provide important public health messages but garner a greater interest in the ecology of local wetlands and the importance of environmentally sensitive mosquito management.

Generally public health messages, detailing disease potential and personal protection, relating to mosquitoes dominate most community awareness programs. However, benefits could be gained by the inclusion of biological and/or ecological facts and figures associated with the local mosquito.

Public education campaigns often involve the production of posters, fact sheets, stickers, radio bites and videos, usually undertaken by local government or health authorities. The content, formatting and distribution of this material will be determined by the intended target audience of the campaign. It is important for NBRC to have educational resources prepared and available for distribution when the need arises. Educational Materials should consist of a combination of fact sheets and online advice presented on websites. Consideration of social media may be useful, particularly in outbreak or disaster situations.

Artificial containers found in the yard setting account for a significant portion of the summer mosquito population in many urban areas; improving property owners awareness about this habitat and the importance of its removal may be just as effective as trying to treat all that habitat. This communication also offers the opportunity to increase awareness about mosquito avoidance, with respect to peak mosquito activity, and effective repellents like those containing DEET or Picaridin.

When mosquitoes are abundant, local authorities may receive complaints regarding nuisance biting in the residential or recreational areas. These complaints may provide information on areas where mosquito impacts are greatest. However, the tolerance of individuals to mosquitoes varies greatly and the number of complaints within and between seasons may not be directly related to actual mosquito populations. There are a number of factors that will influence an individual's sensitivity to mosquitoes and also their likelihood of making a complaint to local authorities. Ongoing surveillance and monitoring data should be used to augment the number of complaints received by local authorities to measure mosquito activity. The quantity and frequency of complaints may, at times, be due to factors such as increased publicity regarding mosquitoes and arboviruses in the media or within local action groups, and not an actual substantial increase in mosquito abundance. However, if some significant linkage can be established, then a public complaint 'threshold' can be a useful trigger for further investigation or intervention.

When a complaint is made, it is important that it is directed to a person supplied with information on the local mosquito surveillance and management program, and able to provide appropriate information on reducing nuisance-biting impacts. A database of complaints should be kept and, if time and resources allow, an adult trap could be operated overnight in the local area to determine the mosquitoes likely to be causing the nuisance impacts. These short investigations also provide an excellent opportunity to connect the local community with the mosquito management program.

Dealing with the media is an important component of community education because it provides an opportunity for the dissemination of accurate information on mosquitoes and personal protection strategies, as well as opportunities to publicise the local mosquito management program.

It is crucial that representatives of local authorities dealing with media have appropriate training and/or resources to answer questions regarding general mosquito biology, locally important pest

mosquitoes, personal protection strategies and background on the local mosquito surveillance and any mosquito management programs.

PART D – GENERAL APPENDICES

Appendix 1 Dengue Fever

Aedes aegypti, is the principal mosquito vector of the dengue viruses and the insect is closely associated with humans and their dwellings. People not only provide the mosquitoes with blood meals, but also water-holding containers in and around their homes that the mosquito needs for breeding. The mosquito lays her eggs on the sides of containers holding water and eggs hatch into larvae when the water level reaches the eggs. People also provide shelter for the *Aedes aegypti* as it likes to rest in darker cool areas, such as closets and this leads to their ability to bite indoors. The *Aedes aegypti* flight range is generally no more than 400m but usually only about 100m.

It is very difficult to control or eliminate *Aedes aegypti* mosquitoes because they have adaptations to the environment that make them highly resilient. They are also able to rapidly bounce back to initial numbers after being disturbed by either natural phenomena (e.g., droughts) or human interventions (e.g., control measures). One such adaptation is the ability of the eggs to withstand desiccation (drying) and to survive without water for several months on the inner walls of containers. For example, if we were to eliminate all larvae, pupae, and adult *Aedes aegypti* at once from a site, its population could recover two weeks later as a result of egg hatching following rainfall or the addition of water to containers harboring eggs, (e.g. or when people water pot plants or top up pet water bowls). Recent research has also shown that the eggs are only killed if the temperature exceeds 45°C.

Social and environmental factors – including increased urbanization (particularly of poor populations lacking basic health services) as well as expansion of international travel and trade – are linked to the resurgence of the dengue disease. Climate change may also have affected transmission, as dengue mosquitoes reproduce more quickly and bite more frequently at higher temperatures. It should be noted that these mosquitoes do not breed in creeks or depressions in the ground, they breed in containers around people's dwellings.

Dengue is a mosquito-borne viral infection.

The dengue virus is not endemic in Australia, which means the virus is not normally present in Queensland. In Australia, most locally acquired cases of dengue occur in North Queensland, particularly around Townsville and Cairns. It is important to note that this disease does not spread directly from person to person and is not passed from mosquito to mosquito. It can only occur after a person is bitten by an infected mosquito. If a mosquito that is capable of transmitting Dengue Fever (eg *Aedes aegypti*) bites a person who is infected, and the infection is still active, then that mosquito will become infected; and if that mosquito then bites other people they will become infected. Patients who are already infected with Dengue Fever can transmit the infection (for generally 1 – 4 days; maximum of 12 days) after the first symptoms appear.

Dengue fever is a severe, flu-like illness that affects infants, young children and adults, and occasionally develops into a potentially lethal complication called DHF/Severe dengue.

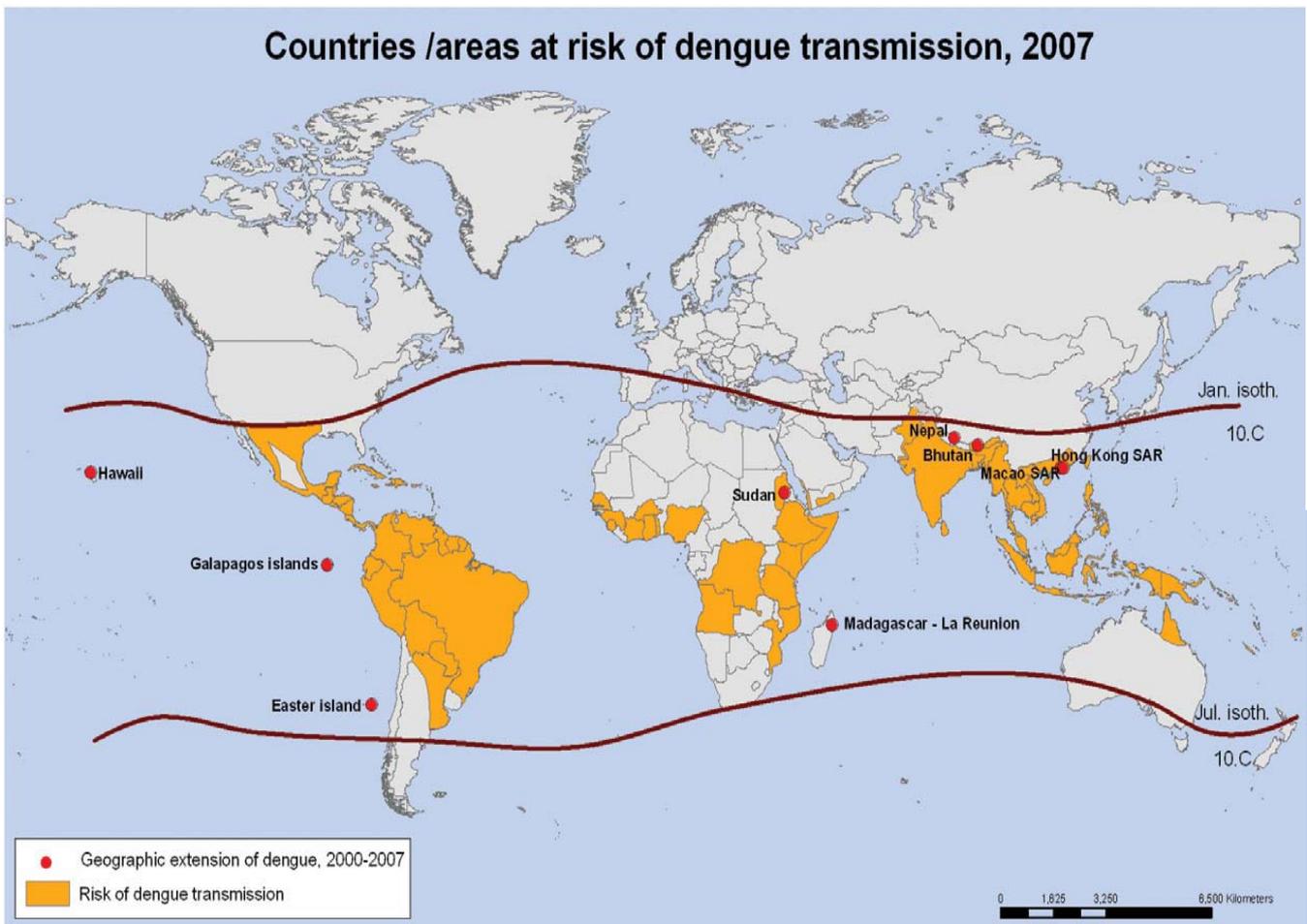
Dengue should be suspected when a high fever (40°C) is accompanied by two of the following symptoms: severe headache, pain behind the eyes, muscle and joint pains, nausea, vomiting, swollen glands or rash. Symptoms usually last for 2–7 days, after an incubation period of 4–10 days which can only occur after the bite from an infected mosquito. There are 4 types of the dengue virus that cause dengue fever – Dengue Type 1, 2, 3 and 4. People become immune to a particular type of dengue virus once they've had it, but can still get sick from the other types of dengue if exposed. People who catch different types of dengue, even years apart, are at risk of developing Severe dengue.

Severe dengue is a potentially deadly complication due to plasma leaking, fluid accumulation, respiratory distress, severe bleeding, or organ impairment. Warning signs occur 3–7 days after the first symptoms in conjunction with a decrease in temperature (below 38°C) and include: severe

abdominal pain, persistent vomiting, rapid breathing, bleeding gums, fatigue, restlessness, blood in vomit. The next 24–48 hours of the critical stage can be lethal; proper medical care is needed to avoid complications and risk of death.

The World Health Organisation currently estimates there may be 50–100 million dengue infections worldwide every year. Of those, about 500,000 people contract Dengue hemorrhagic fever (DHF)/ Severe dengue, which is a potentially life-threatening. In 2010, 1.6 million cases of dengue were reported in the Americas alone, of which 49 000 cases were severe dengue. An estimated 500000 people with Severe dengue require hospitalization each year, a large proportion of whom are children. About 2.5% of those affected die. There is no specific treatment for dengue or severe dengue, but early detection and access to proper medical care lowers fatality rates below 1%.

The global incidence of dengue has grown dramatically in recent decades. About half of the world's population is now at risk. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas. The largest outbreak on record so far for the Townsville/Cairns region was in 09/10 with over 1 000 cases and one fatality recorded.



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

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Data Source: DengueNet, World Health Organization
Map Production: Public Health Mapping and GIS
World Health Organization

Appendix 2 Ross River Virus

Ross River virus (sometimes called epidemic polyarthritis) is a disease caused by a virus which is spread by the bite of an infected mosquito. Ross River virus disease occurs widely in Australia. In northern and central Queensland, cases of Ross River virus occur throughout the year, but most cases occur between February and May. Areas under intensive irrigation and localities close to saltmarshes, are most productive for mosquito populations and hence tend to result in the highest number of human cases of disease. Outbreaks occur when local conditions of rainfall, tides and temperature promote vector abundance.

Everybody who becomes infected with Ross River virus will recover, however, the time taken to recover fully is prolonged in some people.

Ross River virus has been isolated from many mosquito species, indicating wide susceptibility among mosquitoes. In inland regions, the major vector is *Culex annulirostris* which breeds in freshwater habitats, especially in irrigated areas. Along coastal regions, saltmarsh mosquitoes represent the major threat, including *Aedes vigilax* and *Aedes camptorhynchus* in northern and southern coastal regions respectively. There is some evidence that 'floodwater' *Aedes* species such as *Aedes normanensis* play an important role in transmission in inland regions following heavy rains or floods, and *Coquillettidia linealis* is a secondary vector in areas with established wetlands. In the domestic urban situation, there is evidence to suggest that *Aedes notoscriptus* may be a vector, while *Culex quinquefasciatus* is not (although not all entomologists agree with this last point).

The virus infection cannot be spread from human to human but must first pass through an animal host. Serological studies and laboratory investigations have indicated that native mammals, most likely kangaroos and wallabies, are natural hosts for Ross River virus

Human infection with Ross River virus, may result in the clinical condition known as polyarthritis. The effects range from a symptomless condition, through a transient rash and mild illness with fever, to polyarthritis (joint pain and swelling) affecting chiefly the ankles, fingers, knees, and wrists, but other joints may be affected. The disease is not fatal. Symptoms become evident from 3 to 21 days (average 9 days) after infection, and mild cases may recover in less than one month but many persist for months to years. People of working age are most likely to be afflicted with the diseases, whilst symptoms are rare in children.

There is no specific drug treatment for Ross River virus infection. Treatment involves managing the symptoms that develop. Your doctor may provide advice on treatment for joint and muscle pains. A combination of plenty of rest and gentle exercise are important to keep joints moving and to prevent overtiredness, but medication may sometimes be necessary.

Appendix 3 Barmah Forest Virus

Barmah Forest virus is the name given to a virus that is carried by mosquitoes. The mosquito may have contracted the virus from infected marsupials particularly possums, kangaroos and wallabies or from infected humans. The infection is not fatal and all people who develop the disease do recover. Australia is the only country where Barmah Forest virus has been identified. There are over 400 cases of Barmah Forest virus reported in Queensland each year.

Barmah Forest virus has been isolated from a variety of mosquito species. In inland regions, the major vector is *Culex annulirostris* which breeds in freshwater habitats, especially in irrigated areas. Along coastal regions, saltmarsh mosquitoes represent the major threat, including *Aedes vigilax*. In the domestic urban situation, there is evidence to suggest that *Aedes notoscriptus* may be a vector.

Barmah Forest virus causes inflammation and joint pain and has similar symptoms to Ross River virus infection (epidemic polyarthritis), but usually lasts for a shorter duration. The symptoms may include fever, headache, tiredness, painful joints, joint swelling, muscle tenderness, and skin rashes. Some people, especially children, may become infected without showing any symptoms.

The initial fever and discomfort only lasts a few days but some people may experience joint pain, tiredness and muscle tenderness for up to six months. Most people can return to work within a few days of becoming ill, although joint and muscle pain may cause some longer term restrictions in some occupations.

The virus is passed to humans by the bite of an infected mosquito. It cannot be passed directly between humans.

Most people become unwell within 3 to 11 days after being bitten by an infectious mosquito.

There is no specific drug treatment for Barmah Forest virus infection. Treatment involves managing the symptoms that develop.

Appendix 4 Murray Valley Encephalitis / Kunjin Virus

Previously Murray Valley encephalitis virus and Kunjin virus were known collectively as Australian encephalitis. Infected patients contract the virus from the bite of an infected female mosquito. Murray Valley encephalitis is permanently present in the northern regions of Western Australia (Pilbara and Kimberley) with at least one encephalitic human disease case occurring every year.

For Murray Valley encephalitis virus infection, there is a high subclinical rate and perhaps only 1 in 500 or more infections become noticeably ill. Cases vary from the mild to severe and fatal. Symptoms almost invariably include a sudden onset of fever; anorexia and headache are common, while vomiting, nausea, diarrhoea and dizziness may also be experienced. Brain dysfunction may be experienced after a few days with lethargy, irritability, drowsiness, confusion, convulsions and fits; neck stiffness can be expected, and both coma and death may ensue. It is rare for recovery from the encephalitic syndrome to occur without some residual mental or functional disability.

Infection with Kunjin virus can cause symptoms that are similar to Ross River virus disease, such as swollen and aching joints, fever and rash. However in rare cases, Kunjin, like Murray Valley Encephalitis, can cause more severe symptoms which include headache, neck stiffness, fever, delirium and coma.

It is now generally acknowledged that both Murray Valley Encephalitis and Kunjin viruses have a natural endemic cycle, which involves water birds as the vertebrate host and *Culex annulirostris* (which breeds in freshwater environments) as the major vector, in northern regions of Australia.

There are no specific therapies to treat the disease or control the virus, therefore supportive treatments are used (such as respiratory support in severe disease).

Appendix 5 Malaria

Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected *Anopheles* mosquitoes. Australia was declared malaria free in the 1980's. In 2012, malaria caused an estimated 627 000 deaths (with an uncertainty range of 473 000 to 789 000), mostly among African children. Unlike the other diseases discussed in this document Malaria is preventable and curable. But non-immune travellers from malaria-free areas are very vulnerable to the disease when they get infected.

Malaria is caused by *Plasmodium* parasites. The parasites are spread to people through the bites of infected *Anopheles* mosquitoes, called "malaria vectors", which bite mainly between dusk and dawn.

There are four parasite species that cause malaria in humans:

- *Plasmodium falciparum*
- *Plasmodium vivax*
- *Plasmodium malariae*
- *Plasmodium ovale*.

The first two are the most common and most important, and *Plasmodium falciparum* infection often can be fatal in the absence of treatment.

The *Plasmodium* species are blood parasites, although some also invade liver cells where they lie dormant until later release brings a relapse with fevers associated with the destruction of red blood cells. The vector mosquitoes imbibe the parasites with the bloodmeal, and the sexual stages unite in the mosquito gut to create a stage which invades the gut wall and forms a cyst, which in turn releases many infective stages (sporozoites) which invade the salivary glands, and are injected into a new host when the mosquito feeds. The sporozoites invade liver cells and later developmental stages of the parasite invade red blood cells which they disrupt (causing fever), form sexual stages and the cycle is completed.

Malaria is an acute febrile illness. In a non-immune individual, symptoms appear seven days or more (usually 10–15 days) after the infective mosquito bite. The first symptoms – fever, headache, chills and vomiting – may be mild and difficult to recognize as malaria. If not treated within 24 hours, *Plasmodium falciparum* malaria can progress to severe illness often leading to death. Children with severe malaria frequently develop one or more of the following symptoms: severe anaemia, respiratory distress in relation to metabolic acidosis, or cerebral malaria. In adults, multi-organ involvement is also frequent. In malaria endemic areas, persons may develop partial immunity, allowing asymptomatic infections to occur.

For both *Plasmodium vivax* and *Plasmodium ovale*, clinical relapses may occur weeks to months after the first infection, even if the patient has left the malarious area. These new episodes arise from dormant liver forms known as hypnozoites (absent in *Plasmodium falciparum* and *Plasmodium malariae*); special treatment – targeted at these liver stages – is required for a complete cure.

Prevention of malaria in many countries has been heavily dependent on anti-malarial drugs and residual insecticides since the 1950s, but this has broken down in a lot of places for various reasons, including development of drug resistance by the parasites, insecticide resistance by the mosquitoes, and failures in administrative and logistical systems at central, regional and local government levels. Thus, the importance of self-protection for local inhabitants and visiting travellers in "at-risk" areas has become more and more emphasised in recent years.

Appendix 6 Chikungunya Virus

Chikungunya is a viral disease that is spread by mosquitoes. The virus is transmitted from human to human by the bites of infected female mosquitoes. Most commonly, the mosquitoes involved are *Aedes aegypti* and *Aedes albopictus*, two species which can also transmit other mosquito-borne viruses, including dengue. These mosquitoes can be found biting throughout daylight hours, although there may be peaks of activity in the early morning and late afternoon. Both species are found biting outdoors, but *Aedes aegypti* will also readily feed indoors. After the bite of an infected mosquito, onset of illness occurs usually between four and eight days but can range from 2 to 12 days.

Although locally-acquired Chikungunya has not been detected in Australia (to the end of January 2010), mosquitoes capable of transmitting the Chikungunya virus occur in Queensland. Chikungunya has been diagnosed in travellers from affected countries who have recently arrived in Australia.

It causes fever and severe joint pain. Other symptoms include muscle pain, headache, nausea, fatigue and rash. The joint pain is often very debilitating, but usually ends within a few days or weeks. Most patients recover fully, but in some cases joint pain may persist for several months, or even years. Occasional cases of eye, neurological and heart complications have been reported, as well as gastrointestinal complaints. Serious complications are not common, but in older people, the disease can contribute to the cause of death. Often symptoms in infected individuals are mild and the infection may go unrecognized, or be misdiagnosed in areas where dengue occurs.

There is no cure for the disease. Treatment is focused on relieving the symptoms.

Appendix 7 Black Fly Overview

Black flies are not generally present in large numbers within the North Burnett Region, but the population may increase significantly following heavy rain or a flood. Black flies are not known to transmit disease, but can cause allergic reactions and bacterial skin infections when bites are scratched.

Female black flies are blood feeders – they are aggressive daytime biters preferring low wind conditions.

Black flies often land and take off repeatedly without biting. Their numbers, and their tendency to bite, increase as sunset approaches. Their peak activity period tends to occur from sunrise to mid-morning (10am) and late afternoon (4pm) to sunset. Even when they are not biting, however, their buzzing presence and constant crawling is as irritating as the bloodsucking itself. Mercifully, relief comes after dark, for unlike mosquitoes and biting midges, black flies do not attack at night. They are not restricted to shaded or humid sites, and usually do not go indoors. Generally, if they enter a vehicle; once they sense being trapped their attention seems permanently diverted to escape and they spend the rest of the time crawling up the screen or window pane, until they can escape.

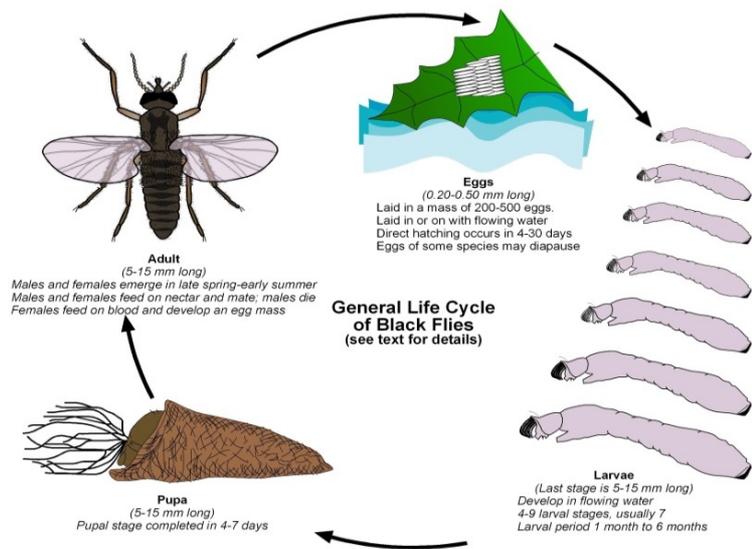
They are attracted to hosts from a distance by smell, heat, and by sight. The female flies swarm around and crawl on the host preferring the head, hair, and ears as well as any skin that is exposed or that they can crawl onto. Some people are very attractive to black flies and have strong feeding reactions. Others appear to repel black flies and are bitten little if at all.

Adult black flies are small insects that measure one (1) to five (5) mm in length, and possess a shiny thorax (middle of the fly) that ranges in colour from black to various shades of grey or yellow. They breed in running water – and once flood water recedes the numbers of black flies rapidly decrease.

All black flies require cool, running water for development and favor sites with cobbled bottoms (pebbles, small rocks) that are largely clear of silt. The black fly larvae attach themselves to rocks or other submerged materials and feed on organic particles they filter from the passing waters. Trailing vegetation or rotted aquatic plants also are attractive to black flies, providing sites for the larvae to attach for feeding. Breeding may also occur in rivulets formed by the flooding of fields.

7.1 Lifecycle

Females deposit eggs, 200 to 800 per female, on vegetation just below the water surface. This stage is the resistant stage of the life cycle for some species can withstand desiccation, then hatch after a flood/heavy rain event. Duration of the egg stage varies from one (1) day to nine (9) or ten (10) months depending on the species and water temperature. Larvae emerge from eggs and will remain at the hatching site if the substratum and food supply are adequate otherwise they will drift downstream on a silken thread to a more suitable site. Larvae attach themselves to aquatic or emergent vegetation as well as rocks. They will be particularly abundant near culverts under roads, attached to plants trailing in the water. Most black fly larvae are filter feeders, with the larvae feeding on nutrients in the water as it flows by. The larval period varies and in warm waters it generally lasts only a few weeks. Larvae



Larvae attach themselves to aquatic or emergent vegetation as well as rocks. They will be particularly abundant near culverts under roads, attached to plants trailing in the water. Most black fly larvae are filter feeders, with the larvae feeding on nutrients in the water as it flows by. The larval period varies and in warm waters it generally lasts only a few weeks. Larvae

pass through six (6) stages and during the final instar the larvae spin variously shaped silken cocoons that anchor and protect the developing pupae. Duration of the pupal stage varies according to water temperature, but usually lasts four (4) to seven (7) days. Adults emerge from the pupal case through a slit and float to the surface on a bubble of air. In most cases the adult immediately flies to a resting spot to allow its cuticle to harden.

Mating can occur shortly after emergence or just before oviposition and takes place in flight or while landed. Females of some species require a blood meal for maturation of the eggs, either before or after mating. Females lay their eggs in a variety of aquatic environments ranging from the smallest trickle to the largest rivers; the choice of habitat will vary with the species. Oviposition varies from the free distribution of eggs while the female taps her abdomen on the water surface during flight, or ovipositioning while landed on wet surfaces such as grass trailing in the water, or crawling underwater to deposit the eggs. As stated earlier, length of the cycle from egg to adult is variable, depending on the black fly species and water temperature. The time interval for *Simulium slossonae* is estimated to be from three (3) to four (4) weeks. Emerging adults live from two (2) to three (3) weeks, to as long as 85 days.

7.2 Control

Because black flies are widespread native insects, their eradication from any one locality seems unlikely. These insects are highly mobile and readily move away from breeding grounds in search of a meal. Adult control is problematic, again due to the migratory behavior of the insects. Effective chemical control of black flies targets the breeding and resting sites, which means it must be a community-based project.

Options for chemical control are extremely limited. A microbial pesticide containing *Bacillus thuringiensis israelensis* or Bti, is used in America, but unfortunately in Australia the target species on the label does not include black flies. Therefore this product cannot currently be used in Australia against black fly.

Spatial sprays and barrier applications of insecticides for adult black fly control may offer some temporary relief. A spatial spray is a fine spray, mist or aerosol, consisting of very small droplets of insecticide solutions that are dispersed by movement of air. The droplets contact adult black flies that are in flight or at rest. However, because spatial sprays produce no effective residual deposits of insecticides, the relief is temporary and treatments may have to be repeated daily while adults are a problem.

Spraying of vegetation and structures in areas where the black flies are known to rest; with insecticides that have residual properties (barrier treatments) may also provide temporary relief from black fly attack.

Pesticides containing organophosphorus compounds, bifenthrin or permethrin can be used. Pesticides must always be used in accordance with their label, which must state that it is suitable for the target pest and must always be dispersed by a suitably licensed operator. Treatments can be undertaken in areas where Black Fly rest along banks of running water, which should reduce their dispersion into the community areas. If emergence has already taken place and the Black Fly has dispersed treatment can be undertaken in resting areas within the Black Fly flight path (ie, vegetation). If significant numbers are observed (confirmed by special traps or biting counts), fogging (using Ultra Low Volume [ULV] or thermal fog) the high risk areas can be considered.

The best defence against Black Fly is personal protection.

'Note': Part E contains specific response methodologies and a risk assessment guide is located in Part E, Appendix 8.

7.3 Personal Protection

Black flies are small enough to pass through some window screen or come indoors on or in the hair. They do, however, prefer to bite outdoors.

Avoid being bitten by black flies by:

- *Applying insect repellent in accordance with manufacturer's recommendations. Personal repellents containing DEET or picaridin tend to last longer than other repellents depending on the concentration. Repellents containing less than 10 per cent DEET or picaridin are considered safe for children, however the use of topical repellents is not recommended for infants under three months of age. Young children should not apply repellents themselves. Repellents should be applied to the hands of a carer first, and then applied evenly to the child's exposed skin;*
- *using physical barriers, such as nets on prams and cots, to protect infants less than three months of age;*
- *where possible, avoid outdoor activity during the morning and afternoon;*
- *wear light coloured loose fitting clothing when contact with black flies is likely;*
- *keep shirt sleeves and your shirt front closely fastened (shirts with zippered fronts keep flies out better than buttoned shirts), and tuck trousers inside socks or high boots;*
- *ensure insect screens on doors and windows are intact; and*
- *use a knock-down insect spray in living areas.*

Media releases can be used to provide public health advice on managing Black Fly bites. The following actions are recommended to prevent secondary infections:

- *Use calamine lotion or other anti-pruritic cream to discourage scratching;*
- *Clean and cover open wounds; and*
- *Wash hands before and after touching open wounds.*

Medical advice should be sought if insect bites or scratches become infected (hot, red, swollen, painful) or if a fever arises. Rest and elevate the limb if there are multiple infected bites.

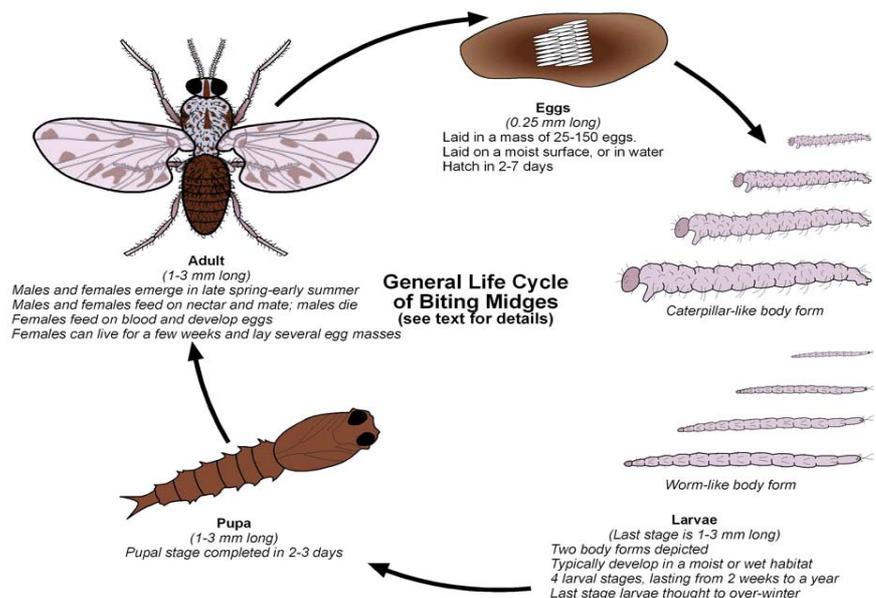
Appendix 8 Biting Midge Overview

Pest biting midges create an ongoing and at times substantial problem for some riverside residents within North Burnett Regional Council. There is no legal obligation to control biting midge, but they can have an adverse impact on resident's quality of life. The bites from biting midges inflict a burning sensation and can cause different reactions in humans, ranging from a small reddish welt at the bite site to local allergic reactions that cause significant itching. Persistent itching can result in open sores caused by prolonged scratching and in extreme cases, the sores can become infected and so itchy that they disturb sleep. Not all midge bite humans.

Queensland Health advises that midges do not transmit disease in humans in Australia.

8.1 Lifecycle

Midge life cycle is similar to that of a mosquito. The female lays eggs (rarely seen due to size and location). Larvae hatches and this is the main feeding stage of the life cycle. It grows from first to fourth instar, over a period of days, weeks or months according to the species and environmental factors. During the next phase, the pupae stage, the midge does not feed. The adults emerge from the pupae pelt after some days or weeks. If this cycle is related to tides the males will emerge about one day ahead of the females. As with the mosquito only the female midge bites humans as she requires a blood feed in order to lay her eggs.



8.2 Control

Biting midges are one of the most difficult groups of insects to control. In Australia, there are currently no chemicals that are registered for controlling biting midge in their breeding sites. "Fogging" with an adulticide can provide temporary relief, as it will knock down insects that are in the area whilst the droplets from the fog are airborne. Once the droplets settle the insects can reinfest the area. Residual surface sprays can be applied to external surfaces and these will knock down the insects that land on the surface, in some cases for up to 6 weeks. Unfortunately, both of these methods are not midge specific and will kill any insect that comes in contact with the insecticide whilst it is viable.

8.3 Personal Protection

Wear long, loose-fitting, light-coloured clothing and using insect repellents will provide protection when biting midge are present. As with all chemicals, repellents should be applied in accordance with the manufacturer's instructions. There are two ingredients commonly used: diethyl toluamide (DEET) and picaridin - which has only been available in recent years but is developing a good reputation.

When outdoors the use of mosquito coils and small lanterns, with an impregnated pad that has the same ingredient as mosquito coils, and barrier treatment, using a residual pesticide, around your house and yard can also be effective. It is recommended that a Licensed Pest Controller be

engaged if you intend to use the barrier treatment within your property, but you are able to purchase the product 'bifenthrin' at your local supermarket. If you apply the product yourself use extreme care and follow the manufacturer's instructions.

Appendix 9 Mosquito Species

Council's Vector, Black Fly & Biting Midge Management Program intends to target species of mosquitoes based upon vector capability, nuisance value and cohabitation with primary target species. The following sections will group mosquitoes according to:

- *Disease Carrying Species Groundwater Breeding Species*
- *Disease Carrying Domestic Container Breeding Species*
- *Nuisance and other Species*

9.1 Disease Carrying Mosquitoes – Ground/Fresh/Polluted Water Breeders

9.1.1 *Culex annulirostris* *

Culex annulirostris is an efficient vector of a range of arboviruses including Ross River, Barmah Forest, Japanese Encephalitis, and Kunjin viruses as well as being a vector for myxomatosis and an effective carrier of dog heartworm.



Culex annulirostris is wide spread throughout Queensland. Preferred breeding areas include freshwater wetlands and low lying grassy areas that are commonly inundated following rain as well as irrigation areas with heavy organic effluent component.

Peak feeding activity is predominantly at dusk (up to 2 hours following), and to a lesser degree at dawn. They feed off both animals and humans and have the capacity to travel 5 – 10 km from breeding sites.

9.1.2 *Aedes vigilax*

Aedes vigilax is the primary vector of Ross River (the etiological agent of epidemic polyarthritis) and Barmah Forest viruses in Queensland. Both Ross River and Barmah Forest disease are notifiable, and can have debilitating effects on those infected.



Throughout Queensland *Aedes vigilax* is widespread along the coastline, but may also be found inland. The major breeding sites of *Aedes vigilax* include temporary brackish pools and marshes filled as a result of tidal inundation, and are commonly associated with salt-water couch grass (*Sporobolus*). The habits of the adult mosquito include resting amongst dense foliage for shelter throughout the day where possible. They are a voracious biter, will feed off humans and animals day or night and can travel up to 50km from larval habitat. Peak feeding activity occurs at dawn and dusk.

9.1.3 *Coquillettidia linealis*

Coquillettidia linealis can be a significant nuisance pest in some localities in both coastal and inland areas but is not generally regarded as a major problem;

Ross River and Barmah Forest viruses have been isolated from the species on the north and south coasts of NSW and in the inland southwest, and it should be considered as a vector of concern.



* indicates that the mosquito has been found in the NBRC

9.2 Disease Carrying Mosquitoes - Container/Urban Breeders

9.2.1 *Aedes aegypti* *

Aedes aegypti is of great importance as it is the major carrier of Dengue Fever and Dengue Hemorrhagic Fever in Queensland (and throughout the world). This mosquito is associated with human habitation.

The *Aedes aegypti* can be found in natural breeding places such as tree holes, fallen palm fronds and plants such as bromeliads. It has however adapted very successfully to human habitation breeding in any available artificial container such as pot plant bases, buckets, tyres, rain water tanks and roof gutters. This mosquito has a limited flight range, up to 1 km (if necessary), in seeking a blood meal. This mosquito is very elusive, tending to bite persons around the feet, ankles, and under tables. The *aegypti* is generally an indoor day time biter.



9.2.2 *Ochlerotatus notoscriptus* * (also known as *Aedes notoscriptus*)

Ochlerotatus notoscriptus can be a domestic pest species. Its importance relates to the similarity with *aegypti* and the common breeding area shared.

As with *Aedes aegypti*, *Ochlerotatus notoscriptus* is primarily considered a domestic species taking advantage of a range of artificial containers. Laboratory studies have shown this mosquito capable of carrying a number of arboviruses and it is believed to be a suitable vector for Barmah Forest, Ross River and Heartworm in dogs.



The following table provides a summary of the above mosquitoes including their distribution, preferred breeding sites and potential vector ability.

9.3 Nuisance Species & Species Abundant in the Region

9.3.1 *Culex quinquefasciatus* *

This is the major domestic pest in many urban areas, particularly as indicated by indoor biting; with respect to human disease it has been shown to be able to carry Murray Valley Encephalitis (MVE) and West Nile viruses in laboratory studies, but its role in the transmission remains unclear.



It is a vector (not particularly efficient) of dog heartworm (and human filariasis in more northern tropical regions), an important vector of fowl pox, and possibly involved in myxomatosis transmission in some areas. Larvae of *Culex quinquefasciatus* can develop in a range of habitats, but is often found near human habitation in containers holding water.

9.3.2 *Culex sitiens*

Culex sitiens can become a major pest during summer months.

Current research indicates that this species is also a competent vector of Ross River Virus within the laboratory setting, with further research continuing to determine transmission efficiency as a possible field vector.



As with *Aedes vigilax*, *Culex sitiens* is found along most coast lines of Australia and has the ability to travel large distances (up to 35 km) in order to seek a blood meal. The major breeding site of the *sitiens* is the same as *Aedes vigilax* – temporary brackish pools and marshes filled as a result of tidal inundation. Larvae of *Culex sitiens* are often found in the same habitat with *Aedes vigilax* but *Culex sitiens* also has the ability to adapt to freshwater habits.

9.3.3 *Culex orbostiensis*

Breeds in vegetated ground pools in coastal regions. It is similar in appearance to *Culex cylindricus*. Uncommonly bites humans. Vector status unknown



9.3.4 *Coquillettidia xanthogaster*

A very distinctive mosquito of orange appearance. Larvae breed in swamps, lagoons and creeks. This species is a major pest in many parts of northern Australia. This species is susceptible to Ross River virus infection in the laboratory although vector status is largely unknown.



9.3.5 *Aedes kochi*

A relatively uncommon mosquito, in many parts of Australia, that breeds in leaf axils. Adults can be a pest near the breeding source. No information is known on its ability to transmit arboviruses



9.3.6 *Aedes clelandi*

Unlikely to be a pest nuisance in many circumstances, as it is uncommon in many areas, but may be abundant in some areas. There is no relevant information on any relation to disease in southeastern Australia. But the species has yielded Ross River virus from the southwest of Western Australia.



9.3.7 *Aedes lineatopennis*

Mainly found in coastal areas. Breeds in transient, rain filled grass pools. Known to be a vicious biter of humans but unlikely to be a serious vector.



9.3.8 *Aedes procax*

This is a medium sized species that breeds in temporary freshwater ground pools. It has a lighter brown coloring with distinct white bands on the abdomen and legs.

It is increasingly being recognised as a significant occasional pest, and has been shown to be a very efficient carrier of Ross River virus. Its breeding sites can be very cryptic and well hidden in bush land, where they may be dry for many months before producing hundreds of larvae after rain fills the site.



9.3.9 *Aedes vittiger*

Can be a significant pest in irrigation areas and after floods in rural riverine areas; has been shown to be able to carry Murray Valley Encephalitis virus in laboratory studies but there is no field evidence for any role in transmission of human disease.



9.3.10 *Anopheles annulipes* *

The species is only rarely a pest even when relatively abundant as it does not preferentially attack humans; it is known to be a laboratory vector of malaria and almost certainly has been responsible for transmission of malaria in many areas of southern Australia.

Can carry human filaria and dog heartworm (but is not an efficient vector), has yielded isolates of Ross River virus but overall is not thought to be an important vector of human disease.



9.3.11 *Aedes alternans*

Aedes alternans can reach reasonably high pest levels following extended periods of rain. They have the ability to breed both in temporary brackish pools and marshes on the coast along with *Aedes vigilax* and further inland in freshwater areas with *Aedes vittiger*.

Aedes alternans are very aggressive biters, will attack throughout the day and night and have the ability to travel 5-8 km from breeding sites in search of a blood meal. As with *Aedes vittiger*, this species may continue to be a pest from one to three weeks after breeding areas are inundated. Ross River Virus has been isolated from *Aedes alternans* (in the laboratory), however this is yet to be proven in the field.



9.3.12 *Verrallina Marks spp* 52

This species is collected occasionally in coastal areas in the region from Sydney to southeast Queensland. It has been found breeding in semi-permanent ground pools. Adults are known to bite humans, but it is unlikely a serious vector



9.3.13 *Verrallina funerea*

Verrallina funerea may be a major pest in communities where residential housing is in very close proximity to breeding sites. *Verrallina funerea* has the ability to breed in both fresh and slightly brackish water.

Verrallina funerea is considered a very aggressive and painful biter. This species travels very little distance from breeding ground and is thus not considered a major pest for areas not adjacent or in close proximity to their coastal breeding areas. *Verrallina funerea* has been shown to carry a number of arboviruses in the laboratory.



9.3.14 *Mansonia uniformis*

Mansonia uniformis has been identified as a major pest problem in North Burnett region particularly in rural areas after extensive rain events. It has the unique larval structure of a piercing siphon which allow it to attach to a wide range of aquatic plants such as water hyacinth, as well as aquatic grasses and sedges.



Mansonia uniformis are more aggressive during the night but willing to feed during the day in protected/shaded areas. The flight range of uniformis is limited to about 3 to 6 km making this species more of a nuisance to those living near fresh water areas. This species has been shown to be a competent vector for Ross River Virus, Murray Valley encephalitis and Kunjin viruses in the laboratory however there is no field evidence incriminating the species as a disease vector in Australia.

PART E - OPERATIONAL APPENDICES

Appendix 1 Surveillance and Monitoring Methods – Ground /Fresh/Polluted Water Breeding

An integral component of any mosquito surveillance program is the recording of data. Information collected from mosquito surveillance can be used to determine the need for a control program and to later evaluate the effectiveness of the program. The first step in the program will be the acquisition of relevant information concerning local mosquito problems:

- *What species are likely to be found in the area,*
- *Which of these are of concern as potential pest or vector species,*
- *What biological data relevant to the pest or vector species is available,*
- *What periods of the year the pest or disease situations are likely to occur,*
- *What triggers breeding cycles and treatment options?*
- *What resources and assistance are available for the institution of a local surveillance program,*
- *What resources and assistance are available for control of a pest or disease situation?*

1.1 Habitat mapping and record keeping

The next step will be production of a Vector Control layer in Council's mapping program. The layer will show all local features pertinent to actual and potential mosquito breeding habitats. The habitats will be plotted with GPS equipment and details of topography, vegetation type, and seasonal meteorological data which can be related to the production of habitats from rainfall, run-off of flooding will be gathered.

All mosquito habitats within a given area should be mapped; this is best done by foot, but often aerial photos, government drain maps, and other sources can be utilized. Inspecting by foot will visually confirm mosquito breeding habitat. Records of visits to these mapped sites for treatment or surveillance should be kept, noting presence of mosquitoes and changes in the habitat. Keeping records of habitat quality and where control is needed or taken place will help ensure an effective and efficient control program.

NBRC will collate a register of mosquito breeding and resting sites which will be categorised dependant on the associated risk; the type of breeding area; and other relevant information (e.g. 'No Go Zones' for treatment due to local industry).

NBRC will interpret gathered data to identify triggers (e.g. climatic conditions, rainfall) that will generally indicate the mosquito populations will increase to an unacceptable level. Protocol for instigating the appropriate response will also be developed.

1.2 Identifying species in the area

Two sampling techniques will be used for determining species within these areas:

- *Larval sampling, and*
- *Adult sampling.*

Both sampling methods will be incorporated due to the biology and lifestyle of the mosquito. Adult mosquitoes may breed outside the NBRC and come into the area to rest and feed and vice versa.

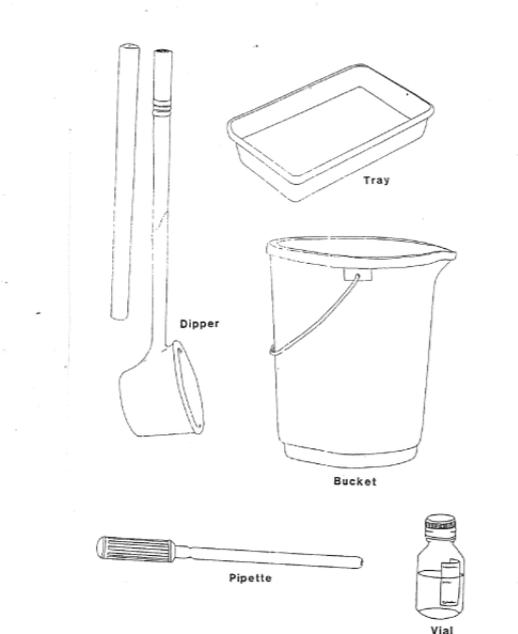
1.2.1 Larval Sampling

Local knowledge (e.g. Land Protection Officers) and Council's mapping system will be used to identify potential breeding sites. Typically larvae are found in non-moving water, in shallow habitats or at the edges of deeper water. However, floating and emergent vegetation will provide shelter and protection for larvae and pupae, and they may be found in deeper areas.

The aim is to sample every potential breeding site during the initial survey. For shallow areas, larvae are most commonly sampled with a white coloured, metal or plastic 'dipper' about 100mm in diameter and 300ml volume. An extendable or long handle is recommended for the dipper. Alternatively, a small fine-mesh net can be used in conjunction with a tray into which the net's contents can be washed. For larger habitats, a bucket can be used to strain large quantities of water with the residue poured into a shallow tray (preferable white) for inspection. When searching for larvae that attach themselves to plants (*Mansonia* and *Coquillettidia*), water plants and reeds should be quickly uprooted and transferred to a bucket of water which is then agitated. The water should then be poured into a shallow tray and allowed to settle, the dislodged larvae will tend to lie on the bottom of the container.

Equipment required for larval sampling

- *Dipper (white, 100mm in diameter and 300ml volume, extendable or long handle)*
- *White plastic dish*
- *Pipettes*
- *Sample bottles/tubes/vials*
- *Labels, pens, notebook, survey form*
- *Rubber boots*
- *Carry bag*
- *Esky (where necessary)*



Sampling Method

- *Mosquito larvae are very sensitive to light and movement and most species will dive to the bottom when disturbed. Approach the water body slowly and cautiously with the sun in your face so you do not create a shadow on the water surface;*
- *Quietly observe the water for signs of larvae before actually dipping alternatively wait quietly at the site for approximately 5minutes before taking a sample;*
- *Dip on the down-wind side of the water body (if possible) and close to the edge. The dipper should be placed in the water quickly and a scooping motion used to collect the larvae;*
- *Do not discard the water from each dip back into the water body so as not to disturb any other larvae in the water body;*
- *The same number of dip samples will be performed at each sampling point so that comparisons of larval numbers between sites or surveys can be determined. Generally at least 10 dips or samples will be collected at each sampling point and record the larvae per dip or samples will be recorded including the negative ones, representing the population density;*

- *In large habitats, such as a farm pond, the dips shall be taken from different points around or within the habitat to best represent the resident larval population. The number of dips and the number of larvae per dip, along with larval stage (instar) information will be collected and this information will assist control personnel with determining the emergence time and what control effort(s) to use;*
- *The larval collection form will also require details of the breeding site (so that the exact same place can be visited again) including vegetation type, shade, water body, predators etc.;*
- *Any larvae required to be kept for identification should be transferred into a labelled sample tube using a pipette into a clear, clean vial or small container, with a screw cap preventing leakage;*
- *The container will be labelled immediately with the date and details of the collection site; this is best done with a water proof pen/pencil.*
- *The larval collection will also be recorded on a larval collection form detailing sample numbers and after identification has been undertaken - larval identification.*
- *Sampling from a crab hole or tree hole may often require the use of a turkey baster (or flexible long tube on the end of a pipette).*

If larvae are not going to be kept for breeding purposes specimens may be placed into 70% alcohol (ethanol) in vials. Prior to placing in the ethanol larvae will be killed using hot water. These vials will be labelled with date and sample location and there must be a clear link to the information on the larval collection form.

When larval treatment is undertaken pre and post treatment larval surveillance will be undertaken. The pretreatment survey will be used to assess the need for treatment and assist with determining the type of product to be used. The post treatment larval survey allows for the quantitative visual evidence of a treatments success, and will assist in the determination of re-treatment activities.

1.2.2 Adult Sampling

The purpose of adult sampling is generally to detect potential pest or vector species and monitor population abundance trends and fluctuations; and as a measure of a program's success. Sampling can also be in response to a specific complaint or event. Methods for collecting mosquito adults can be classified as either 'attractive' or 'non-attractive'. 'Attractive' traps are usually used because they generally produce larger and more diverse samples. A number of commercial trapping units are available that utilise attractants (e.g. light, heat, carbon dioxide, odour etc.) to catch and/or kill adult mosquitoes.

Light traps.

Many, but not all mosquitoes are attracted to a light source. Light traps are available in a variety of models; some require mains power for operation, but others are more portable and operate from 6 volt battery to power a light source and a motor driven fan. The general design involves a light source to attract the mosquitoes into a down draft of air created by the motor-driven fan which directs the mosquitoes into a collection chamber. These traps are generally not very efficient capturing many *Aedes* species.

Dry-ice/CO₂ baited (light) traps.

The use of dry ice/carbon dioxide (CO₂) in conjunction with a light trap has been found to increase both the range of species and number of mosquitoes collected. These traps are generally preferred for routine surveillance as they not only collect a greater range and abundance of mosquito species but, they also collect much fewer numbers of non-target species (e.g. moths) due to the reduced influence of the light source.

Mosquitoes generally move upwind randomly during their host seeking flights. The area sampled by dry ice/CO₂ baited traps, will depend on the conditions, the dispersal of the attractant and the response of the individual species.

Animal baited traps

The use of animals as bait allows collection of species attracted to particular hosts and at times humans can be used as bait.

Determining Adult Populations

NBRC will generally use dry-ice/CO₂ baited light traps for adult mosquito surveillance. To monitor the activity of adult mosquitoes and assess the impact of control strategies, adult mosquito populations should be sampled on a weekly basis. Traps are usually set in the late afternoon (at least 1 -2 hours before sunset) and collected the following morning (approximately 1 – 2 hours after sunrise). Collections will be influenced by wind and rain, therefore it is important to select an appropriate site for the trap and also monitor the weather forecasts to select the best evening for surveillance.

Initial surveillance will be undertaken for an entire year to determine if there are any seasonal fluctuations in the adult mosquito population within the NBRC. Prior to surveillance a risk analysis will be undertaken to determine which areas should be monitored. A number of traps will be set in each area to enhance the capture rate and assist with identifying permanent locations for the routine monitoring traps. *Please note it is important to set the trap in the same location for comparisons between data collection and program evaluation purposes.*

Equipment required for dry-ice/CO₂ baited light traps

- CO₂ canister;
- Catch net and container (for mosquito);
- Killing Jar and catch net (for midge);
- 1.8m battery leads;
- Fan and light bulb (replaceable);
- Chain;
- 6V 7Ah rechargeable Battery;
- Optional - CO₂ gas cylinder, regulator hose and regulator;



6V 7Ah rechargeable batteries



CO₂ gas cylinder regulator and regulator hose

Sampling Method

- *Adult traps should be set away from other light sources (such as street or house lights) and animal host sources;*
- *Protected from strong winds, and where possible sheltered from the rain;*
- *It should be suspended from a tree, bush or post about 1-2m above the ground;*
- *Do not set the trap in any location where the top of the trap is over 1.5m off the ground, the closer to the ground the more effective the trap;*
- *The trap should preferably be placed in a concealed location to limit vandalism, interference and/or theft of the trap*
- *Traps should be placed near vegetation but not within too heavy vegetation cover as the attraction produced by a trap that is located in heavily vegetated areas may only be 100m downwind from the trap.*

A light rain may increase capture numbers, but strong wind and rain will seriously reduce collections; winds above 10km/hr can be expected to preclude mosquito activity; and temperatures below 10°C usually reduce mosquito activity. Cloud cover is also important, as clouds reduce competing moonlight, increase humidity and temperature.

Trap construction

- *Use the chain provided to secure the light trap in a hanging position in a suitable tree or secure location;*
- *Attach the catch net and collection container to the base of the light trap securely on the lip provided;*
- *Check that there are no holes or tears in the catch net. The catch net requires regular inspection to avoid mosquito escaping (net material is easily torn);*
- *Ensure clear tubing for CO₂ dispersal is clear and open (ie no kinks) and placed in through the hole provided so that the gas is released downwards;*
- *Attach battery leads to the battery and place battery in a secure position;
Ensure the battery leads are not tight and straight (allow for some slack) as this can interfere with battery operation particularly in wet weather;
If using CO₂ gas cylinders - use a shifting spanner to attach the regulator to the gas cylinder;
Securely fix the regulator hose in the hole where the CO₂ is dispersed from when using dry ice;*
- *End of hose should be placed in same position as the end of the tube when using dry ice;*
- *Ensure the hose is correctly fitted to allow flow, filter is near the regulator and green connector should be at the opposite end to the regulator;*
- *Ensure gas cylinder is placed in a secure, inconspicuous position;*
- *Do not adjust flow on the regulator as this is set in the factory;
Light trap is now ready to run.*



Trap Operation

- *Once the trap is running check for the sound of the fan to ensure the fan is working and that the light bulb is lit;*
- *If required - Turn of the gas only a small amount, you can usually hear a slight hissing sound that indicates that the gas is on;*
- *The fan must be running when the catch net and container bag is collected to prevent mosquitoes escaping;*
- *If relevant, switch off gas and remove regulator hose from the trap;*

- *Place your hand gently around the outside of the catch net and gently tap at the sides of the net and container to ensure that all the mosquitoes are inside the catch container;*
- *Carefully remove the net by loosening the toggle marginally so that it can be removed from the base of the light trap;*
- *Once removed tighten the toggle until firm and ensure there is no gap in the top of the catch net;*
- *Ensure catch container is clearly labelled with trapping details;*
- *Switch off fan and light by disconnecting the battery and where necessary gas bottle and regulator;*
- *The label (collection details) for the Collection container should be well secured so as to ensure the label does not fall off;*
- *Carefully push the net down into the collection container so as to avoid tears;*
- *Ideally, the collected mosquitoes will be transported within an esky to keep them alive and in good condition;*
- *The label for the collection container should contain the following information date, time, location and any location specific details e.g.number;*
The maximum time a light trap should be left running is for a 24 hour period so as to ensure the battery does not run flat and allow mosquitoes caught to escape. Generally traps for mosquito surveillance must set at least 1 -2 hours prior dusk and retrieved 1 -2 hours after dawn;
- *Two blocks of dry ice (made with a snow pack) should last for approximately 14 hours. If using dry ice pellets from BOC each container requires about 1kg of ice;*
- *If the trap is not working check the connecting plugs as sometimes the wires become loose and the power doesn't reach the fan;*
- *On return to depot/office recharge the batteries immediately so that they are ready for the next surveillance session;*
Light traps and components are currently purchased from Pacific Biologics;
- *Gas cylinders and dry ice pellets are supplied and refilled by BOC gases.*

Adult mosquitoes collected for identification must be handled with great care. Collection containers should be rigid (to protect the mosquito) and enable airflow through the trap. On retrieval the collection container will be removed from the base of the light trap and placed in an esky or box to prevent damage during transit. On arrival back to the depot/office the collection containers will be placed in a freezer, to preserve the catch. Alternatively adults can be killed using carbon dioxide or chloroform in a killing jar.

Collection and identification details will be recorded on a standard form. Information that must be captured includes; date, location/trap run, site location of trap, site characteristics (e.g. rural/open ground/sheltered), weather conditions (e.g. clear/cloudy, overnight and weekly rainfall/ wind speed and direction/moon phase/ max and min temperature/ humidity), details of collection (e.g. time set/ time collected/ any other relevant comments – battery dislodged), species type and number.

Routine maintenance is required to ensure the traps remain operational. Each time the collection net and container is returned to the depot/office for the collection to be identified the netting MUST be carefully checked for holes; the collection netting requires washing (in warm soapy water) on a regular basis to keep it white and prevent dust interfering with air flow; the collection container also require regular washing in warm soapy water to keep them clean and clear of residual insects, dust etc.

Appendix 2 Response/Control Methods – Ground/Fresh/Polluted Water Breeding

The term response refers to action taken in response to a complaint, surveillance programs, disease notification, exotic incursion or disaster management. Response and control methods will be determined after undertaking a risk analysis. Other factors that will impact on the type of response will include budget restraints and resources.

NBRC will attempt to lead by example. Council land/facilities that are identified as either breeding or resting sites for mosquitoes will be assessed to determine the associated risk and an appropriate response will be actioned.

2.1 Complaint Response

NBRC will develop a procedure for recording mosquito related complaints that will enable the collection of relevant data. The following information is required:

- *Is the complaint concerning mosquito biting?*
- *What times are the mosquitoes biting?*
- *When are the mosquitoes most active?*
- *Where are the mosquitoes most active?*
- *Is the breeding site known?*
 - *Location (e.g. address, private land, Council property, State Land)*
 - *Type (e.g. pool, drain, sewerage treatment plant)*

2.2 Response/Control Measures

2.2.1 Source Reduction

Physical control generally involves source reduction or environmental modification in the order to reduce or eliminate the mosquito larval habitat, although there is some overlap between environmental modification and the first three classifications. Physical methodologies can usually be classified in the following:

Filling

Often self-explanatory, the literal filling-in of mosquito larval habitats with sand or earth or other material so that the depression that retained water no longer exists.

Draining

Is also self-explanatory, and is often required prior to filling. Drainage can be less expensive than filling but the drainage system will require maintenance to ensure a mosquito habitat does not return. (e.g. Structures associated with stormwater retention or drains may contain free-standing water that persists and provides suitable habitats for some mosquitoes). The production of mosquitoes from these areas can be avoided by ensuring that the structures are self-draining have the siltation depth shallow enough to encourage evaporative drying, and that the accumulation of organic material is maintained at low levels. In addition to the design of these structures, a routine maintenance program is essential to remove the inevitable buildup of organic material that can create blockages and, subsequently, opportunities for mosquito breeding.

Water management

Is a very important technique for controlling mosquito populations when the first two classifications cannot be used (e.g. in large reservoirs, farm dams and irrigated land). Proper management requires detailed knowledge of the biology of the species targeted for control. Mosquito production from natural and constructed freshwater wetlands is dependent on a combination of physical and vegetative characteristics. Aquatic vegetation management is the most useful strategy for mosquito management in these habitats. When wetlands contain large areas of open water and vegetation at the margin is sparse, wind/wave action is relatively high and predatory fish have unobstructed access to the larvae – all these contribute to a reduction in larval population but may not completely eliminate mosquito production.

Environmental modification

Indicates that one or more of the environmental conditions within the mosquito habitat is modified creating an environment that does not encourage larval growth. Activities which alter habitat include varying the salinity of the habitat; removal or addition of shade; removal of floating or

emergent vegetation; providing water surface agitation; periodic flushing of slow moving streams from dam storage; alteration of pH, oxygen, chemical or organic pollution; or increasing retention time to alter the nature of vegetation.

Source reduction of larval mosquitoes may involve: (1) installation of catchments; (2) installation of tile leading to a catchment or drain; (3) modification of grade to permit drainage; or (4) conversion of a mosquito-producing area to a non-mosquito-producing body of water such as an ornamental pond, water hazard, or permanent wetland. For tiling purposes, "sock" tile, which allows water entry but prevents roots and debris from clogging the tile, is very useful when dealing with woodland mosquito habitats. Another type of source reduction is the removal of artificial habitat, such as the filling of abandoned swimming pools or collection and shredding of abandoned tyres.

2.2.2 Chemical control

Larviciding

Breeding sites that have been identified as posing an unacceptable risk or nuisance value to the community will be continually monitored throughout the year/season. Treatment shall only be undertaken by a Licensed Pest Management Technician (PMT), or alternatively by a person undertaking study to become a PMT who is being supervised by a PMT. Chemical application will always be undertaken in accordance with the label. The timing of treatment is to be established and will be put in place to intercept the mosquitoes' breeding cycle.

Bacterial

Three bacterial formulations are available for larviciding activity: *Bacillus thuringiensis israelensis* (*Bti*), *Bacillus sphaericus* (*BS*) and a larvicide derived from the bacterium *saacharopolyspora spinosa*. These bacterium affect larval mosquitoes and some midges by causing cellular breakdown in the midgut resulting in rapid death, usually within 8 to 12 hours. It is important to note that these formulations must be ingested by actively feeding mosquitoes so they have no effect on late 4th instar larvae or pupae. These products are generally available in liquid, briquet, and granular formulation from commercial sources under trade names such as Vectobac®, Aquabac®, and Teknar®. *Bti* works well in a variety of freshwater habitats. Granular formulations are particularly effective against mosquitoes when the larvae are in their second and third stage. *Bacillus sphaericus* does not have the *Bti*'s broad spectrum of activity, but has a longer period of larvicidal activity. In addition, *Bacillus sphaericus* works well in highly organic habitats. Because of its extended control and effectiveness in organic water, *Bacillus sphaericus* is effective in treating catch basins. These larvicides will last only a few weeks in water and pose no danger to humans, non-targeted animal species, or the environment when used according to directions.

Insect Growth Regulators

Insect growth regulators. Methoprene, disrupts the mosquito larvae's normal growth pattern by artificially limiting its development making it impossible to reach the adult stage. It may be used to control 2nd, 3rd, and 4th instar larvae. Treated larvae will pupate but adults will not emerge from the pupal stage; it is not toxic to existing pupal or adult stages. Mode of delivery includes liquid, charcoal pellet, and briquet. This product can be applied to larger bodies of water in the form of time-release briquets which can last from one to five months. Use of this larvicide does not pose unreasonable health risks to humans or other wildlife and it will not leach into the ground water supply. There is a small acute and chronic risk to some fish and freshwater invertebrate species.

Organophosphate

Tempehos, marketed as Abate and ProVect, is an organophosphate which prevents mosquito larvae from developing resistance to bacterial larvicides which can be delivered as a plaster pellet, liquid, or sand granule. Due to the small amount needed and the fast rate that temephos breaks down in water, this type of larvicide does not pose an unreasonable health risk to humans, but at large doses it can cause nausea or dizziness. This insecticide has been used by the World Health Organization to treat stored drinking water. However, careless handling or ingestion of any

organophosphate increases health risks. As with any insecticide special attention to the label is necessary relative to site use, mixing, and application of material. Similarly, there is not a large risk to terrestrial species, but there is a toxic concern for non-targeted aquatic species. Therefore, temephos should be limited only to sites where less hazardous larvicides are ineffective and with intervals between applications.

Equipment and Dispersal

The use of a four-wheel drive vehicle is recommended for larviciding large areas. A tray back four wheel drive utility can be equipped with a chemical-container tank, a high-pressure, low-volume electric or gas pump, and a spray nozzle. A switch and an extension hose allows the driver to operate the equipment and apply the larvicide from inside the vehicle's cab. Roadside ditches, swales, retention ponds, treatment ponds, and other similar bodies of water can be treated with this setup.

Increasingly, mosquito control agencies are moving towards the use of all-terrain vehicles (ATVs), which allow operators to reach larval habitats that are inaccessible by a larger vehicle. These units can carry a reasonable payload allowing operators to treat a number of remote sites consecutively without having to return to replenish pesticides. As with a utility, a chemical container is mounted on the ATV, a 12-volt electric pump supplies a high-pressure low-volume flow, and a hose and spray tip allow for manual application by an unaccompanied operator while steering the ATV with the other hand. ATVs are ideal for treating areas such as agricultural fields, pastures, salt marsh areas, and other off-road sites. Training in ATV safety and handling should be provided to employees operating these machines.



ATV with equipment suitable for larviciding mounted

Vehicle mounted fertilizer spreaders can also be used to dispense large amounts of granules and pellets.



Vehicle mounter Spreader



Hand Held Spreader

Additional equipment used in ground applications includes dippers, hand held fertilizer spreaders, handheld sprayers, and backpack blowers and sprayers. Dippers and hand held fertilizer spreaders may be used to broadcast small amounts of granular or pelletized larvicides in spots that require minimal treatment. Hand-held sprayers are standard 5 – 10 litre garden style pump-up sprayers used to treat small isolated areas with liquid larvicide formulations. Backpack sprayers usually have a gas-powered blower with a chemical tank and calibrated proportioning slot. Generally, pellet or small granular material is applied with a gas-powered backpack sprayer. They are extremely useful for treating tire piles. Pump-up backpack sprayers are sometimes used for dispensing liquid larvicides.



Back pack sprayer



Powered back pack sprayer

2.2.3 Adulticiding

At times, it may be necessary to undertake a program to control adult mosquitoes that have emerged due to either an interrupted larviciding program; a confirmed outbreak of a vector borne disease; or during a disaster situation. It is accomplished by ground-based applications or via aerial application of residual chemical insecticides. Adulticiding programs are often considered to be the method of last resort. Adulticides are broad-spectrum pesticides and that have the potential to impact non-target organisms.

Information on the biology of the pest organism is required, and thresholds must be determined before treatments begin. Once the thresholds have been met, the target can be defined as flying insects, a barrier (vegetation), and/or a solid surface. Then, the appropriate equipment and chemical must be chosen, and the application must be made in a timely fashion. The chemical dose and type has a significant effect on the outcome of an application. The chemical must reach the adult mosquito through the most appropriate use of available methods. Chemicals can be dispersed by the following methods:

Space Sprays

Typically use Ultra Low Volume (ULV) technology, sometimes referred to as cold fogging. Space sprays are applied with specialised spray equipment mounted in aircraft, on the back of trucks, or even carried by hand. With space sprays, aerosols are released to drift through a target zone. Chemical concentrates most often are used and, even if diluted, volumes of material used remain low. The aerosol persists in the air column for an appreciable length of time at suitable droplet densities to contact the flying mosquito and is only effective while the droplets remain airborne. Hence, a space spray is short-lived and is not expected to have any residual effect.



Vehicle mounted ULV

Thermal Fogging

Is appropriately named since it is a device that uses heat to produce a fog without degrading the active ingredient. A thermal fogger produces a range of droplet sizes including a large number of very small droplets. This makes a thermal fogger the preferred type of equipment to reach air spaces in areas highly obstructed by vegetation, or other physical obstructions in buildings. The large number of very small droplets produced in a thermally generated fog also make the fog highly visible. This can help the operator to monitor the fog and ensure thoroughness of application. Thermal foggers can be small enough to be hand large enough to require vehicle mounting.



Hand held fogger

Residual Sprays

Are often referred to as barrier or surface treatments. The mosquito is required to land on a surface deposit of the insecticide to pick up a toxic dose. A barrier treatment can be applied to kill and/or prevent adult mosquitoes from moving into an area such as a stadium, park, or resident's yard. When small areas are treated handheld devices such as a backpack mist blower or a compression sprayer are employed. For larger areas the chemical can often be applied with a modified vehicle mounted hydraulic sprayer.



Hand held sprayer



Sprayer

Barrier treatments can be used around schools, parks, public meeting places and also along known breeding sites for both midge and mosquitoes.

Timing

Timing is essential for space sprays to target actively flying mosquitoes. The timing needs to be precise because different species are active at different times. In general, most mosquito species targeted by space sprays are active around dusk and dawn, and, hence, most adulticide applications occur around those times. Problems may arise with timing applications because:

1. *the meteorology is inappropriate for good downwind dispersal;*
2. *continuous late nights and overtime can cause personnel management problems; and*
3. *ground spray missions are typically not conducted when people are on the streets.*

Meteorological parameters also influence mosquito activity and timing of the application. Some general trends are:

- *Increased humidity = increased activity*
- *Increased temperature = increased activity (to a limit above which activity decreases)*
- *Increased wind = decreased activity*
- *Lunar illumination = increased activity and an extended activity period*

Timing of residual spraying is not nearly as critical as the timing of space spraying. Residual spraying targets the mosquito in harbourage at rest on vegetation or other surfaces. An effective residual spray uniformly coats a target surface with an insecticide that will last an appreciable length of time. Applications should be conducted when conditions are conducive to provide the best coverage. Timing is not critical in relation to mosquito behaviour; instead, applications must be made to achieve the best deposit. Winds should be low or favourable to the direction of the target related to the sprayer. Conditions should be dry since while most compounds are considered rain-fast, they need time to dry.

Choosing the Chemical

Once the application type has been determined, the chemical to be applied and the dose rate must be selected. This decision is dictated in part by the size of the application area. For example, large area spraying with some compounds can be cost prohibitive. The habitat can have some influence. For example, the use of some chemicals may have to be restricted around waterways. The species that is being targeted also may affect the choice of compound. The comparative efficacy of one compound over another is disputable, but one thing that is known is the effect that mosquito species, habitat preference, and behaviour has on ease of control.

Adulticides

Pesticides kill or alter an organism by disrupting some vital physiological function. The method by which this occurs is called the pesticide's mode of action. The most typical mode of action involves disruption of the insect's nervous system. The most common compounds used for adult mosquito control in Australia are the Pyrethroids.

Pyrethroids are synthetic chemicals whose structures mimic the natural insecticide pyrethrum. Pyrethrins are found in the flower heads of some plants belonging to the family Asteraceae (e.g., chrysanthemums). These insecticides have the ability to knockdown insects quickly. Pyrethrums can be degraded very easily by ultraviolet light which oxidizes the compounds. In general, this phenomenon leads to lower environmental risk. Pyrethroids can pose significant hazards to aquatic organisms, and the potential for build up within sediment is a concern. Pyrethroids are highly toxic to insect pests at very low rates. Synthetic pyrethroids have been chemically altered to make them more stable and safer to mammals. Pyrethroids are axonic poisons; they poison the nerve fiber by binding to a protein in nerves called the voltage-gated sodium channel. Normally, this protein opens causing stimulation of the nerve and closes to terminate the nerve signal. Pyrethroids bind to this gate and prevent it from closing normally which results in continuous nerve stimulation. Control of the nervous system is lost, producing uncoordinated movement and ultimately mortality.

Products typically used for adult mosquito control include:

- *Aqua K-Othrine® from Bayer Environmental Science is a space spray concentrate containing 2% deltamethrin. Deltamethrin is a highly active pyrethroid insecticide which will effectively flush insects out of their hiding places and kill through direct contact. Due to the high activity of deltamethrin Aqua K-Othrine® can be applied at extremely low dose rates of 0.5 - 1.0 g/ha of active ingredient to control public health insect pests including vectors of disease as well as nuisance flies and mosquitoes.*
- *Garrards Pyrethrin Drift is pyrethrin based and utilises a Liquid Hydrocarbon solvent. The product is applied through misting or fogging equipment and is registered for the control of mosquitoes, midges and flies in outdoor situations and flies in indoor areas.*
- *Pyrocide® Mosquito Adulticide ULV Extra Strength Concentrate is a high concentration (11.8% active constituent) formulation that is great for larger programs, particularly those that use modern truck mounted application equipment. Pyrocide is available in 5 Litre bottles, and using an oil-based diluent, operators can adjust the spray mix to a wide range of concentrations to suit all situations. The Natural Pyrethrins give excellent flushing and knock-down characteristics, short persistence, and rapid breakdown in sunlight.*
- *Twilight® ULV Mosquito Adulticide Concentrate is a highly effective phenothrin adulticide. It is a highly concentrated formulation that has extremely low mammalian toxicity.*

Appendix 3 Surveillance Methods – Container/Urban Breeding

The reasons for undertaking surveillance and the record keeping requirements are similar to those required for groundwater/freshwater/polluted water breeding, therefore that information will not be rehashed. The methods or surveillance differ and will be covered in this section.

Surveillance activities are designed to:

- *detect the relevant abundance of Aedes aegypti;*
- *identify the types and availability of breeding sites; and*
- *can also provide an early warning system for the possible importation of Aedes albopictus.*

Most surveillance will require entry onto private property, therefore the occupiers consent will be required unless entry is conducted under an 'Approved Inspection Program' under the *Local Government Act 2009*, or an 'Authorised Prevention and Control Program' under the *Public Health Act 2005*. There are two main differences between these programs: the 'Approved Inspection Program' can be approved by Council and treatment cannot be undertaken without owner/occupier approval; the 'Authorised Prevention and Control Program' must be approved by Queensland Health and treatment can be undertaken without owner/occupier consent.

Routine surveillance can be undertaken at locations that represent a high risk:

- *premises where Aedes aegypti has been identified*
- *backpackers/hostels/guest houses*
- *hospitals*
- *major truck/vehicle stops*
- *farms or businesses that use transient labour (in close proximity to urban areas)*
- *tyre dealers*
- *schools*
- *travel transit centers*

The type of sampling undertaken will be determined after conducting a risk analysis, identifying available resources and in most cases advice from the entomologist from Queensland Health who is responsible for this.

3.1 Identifying species and density of vector in the area

Three sampling techniques will be used for determining species and density of vector:

- *Ovi/egg sampling;*
- *Larval sampling; and*
- *Adult sampling.*

In many cases equipment can be used for more than one type of sampling.

3.2 Ovi/egg sampling

The ovitrap is useful for collecting information on container breeding mosquitoes. Counting the number of eggs on the substrate can estimate the number of container mosquitoes that may hatch following the next rain, as well as the number of adult females present within the sampling area. It is also possible to rear the eggs from this trap to either larval or adult stage for identification purposes.

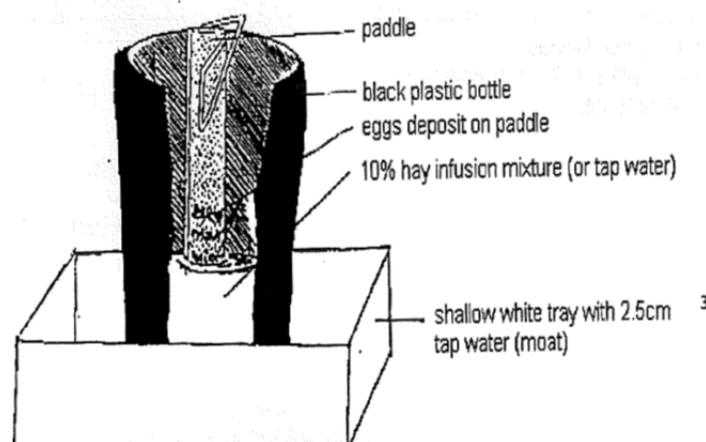
3.2.1 Equipment required for ovi/egg sampling

- *Divot Buckets (1.2L)*
- *Masonite paddle or tongue depressor*
- *Distilled Water or Tap Water and Lucerne Pellets*
- *Warning Labels*
- *Moat and tap water (if required due to ants)*
- *Sealed containers for transport of water and paddle from ovi trap*

- Rearing Trays – only required if the intention is to rear to larval or adult stage
- Ground Fish Food - only required if the intention is to rear to larval or adult stage

Sampling Method

- Use a black container (golf divot buckets are suitable), it is important the container has not been used before that it is seasoned first. This is achieved by placing water in the black container and part of a Lucerne pellet, place the container outside in the sun for approximately a week;
- Ensure the bucket has the appropriate identifying sticker i.e. Monitoring site only;
- Prepare a paddle by cutting a Masonite sheet (2cm W x 12cm L) or alternatively use a wooden tongue depressor roughened with sandpaper or a red strip of flannelette (15cm W x 200cm L);
- If ants are a problem place the bucket in a white plastic shallow tray filled with about 2.5cm of tap water;
- Set each ovitrap in an area protected from the weather (e.g. under steps, house eaves, or under house), out of direct sunlight but visible to the mosquitoes. Preferably near vegetation and protected from rain and disturbance from animals. They also need to be adjacent to areas where there is regular human activity;
- Add appropriate level of distilled water or tap water and Lucerne pellets (x 2, or @ 0.5g). Water depth should be approximately 10cm;
- Place the numbered paddle into the bucket;
- There is no limit on the number of traps that can be placed on a property. When monitoring a town area set between 10 to 20 traps with one trap per property;
- Collect paddles/flannelette strips weekly or once every 10 days and top up water if needed;
- Place paddle/flannelette in a marked container or bag, and if rearing to larval or adult stage place in a rearing jar or take-away food container;
- Wipe out the bucket with paper towel and refill with water (as above) and place a new paddle in the bucket; Label transport container with Date and Location and place for record keeping;
- Return paddles/flannelette or rearing trays to depot/office for counting or rearing;
- If rearing for larval identification fourth Instar larvae can be identified using a microscope;
- Keep accurate records of locations and properties with ovitraps.



Ovi/egg trap construction

Larval or Adult rearing

- Larval rearing should be carried out in an un-airconditioned room, and with natural light (where possible);
- Each larval rearing trap should be monitored for at least 3 weeks.
- If larvae are present but growth is slow the room temperature may need to be increased;
- Hatched larvae need to be reared under hygienic condition

- Larvae should be feed on ground fish flakes (tropical fish food is satisfactory). The ground fish flakes are soaked in water for one hour and the suspension added with pipette below the water surface to reduce bacterial problems on the water surface;
- Food should be added at Day 1 to aid hatching. Do not add too much food or put fingers into water as this can promote bacterial growth (evident by the presence of white scum on the surface of the water);
- Identify larvae once they reach fourth instar; alternatively they can be placed in a adult rearing container;
- Once the adults have emerged they can be placed in the freezer for 24 hrs (to kill them) and then identified under a microscope.



Adult Rearing Container

Used paddles/flannelette can be disposed of paddles in to a waste bin. If using Masonite they can be left to dry for one week, then scrubbed clean to remove any old unhatched eggs and scum, sterilised in boiling water and dried. Wash buckets in hot/boiling water to remove any extra eggs and organic matter.

3.3 Larval Sampling

There are two methods that are routinely used for larval sampling:

- Ovi/egg traps – with eggs reared to larval stage; and
- House –to- house surveys

Refer to the previous section on ovi/egg sampling and Appendix 7 in Part E for details on conducting larval sampling.

House-to-house surveys although extremely labour intensive, provide direct access to the owner/occupier. This face to face contact can be used to educate the community about steps they can take to prevent mosquito breeding. House-to-house surveys also identify the specific types of containers within the community that have the potential for breeding and/or breeding mosquitoes. This information can then be used during media campaigns.

3.4 Adult Sampling

Traditionally container/urban mosquito surveillance involved inspecting commercial and domestic yards and premises for mosquito breeding containers. However, recent research has led to the introduction of alternate methods for sampling and controlling container breeding mosquitoes.

There are three methods that can be used for adult sampling:

- BGS traps;
- Gravid Aedes Traps (GATs); and
- Sticky ovitraps.

3.4.1 BGS Traps

These traps require a power source to operate and an attractant can be added to increase the mosquito activity.

Placement rules

- *The trap needs to be set up in a position out of the wind, rain and direct sunlight;*
- *The trap should not be placed under any structures/objects where there is less than 1m gap above the trap;*
- *Do not set the trap in any location where the top of the trap is over 1.5m off the ground, the closer to the ground the more effective the trap;*
- *Traps can be placed either in door or outdoors and should always be placed in areas where human activity is high;*
- *Running the trap on mains power is preferred over battery operation. If the trap is to function correctly, then the battery must be 12V with a maximum 24Ah output. Batteries last approximately 26 hours.*

Trap Construction

- *Gently pull the trap into the upright position;*
- *Slot the mounting poles into the gaps at the base of the trap, ensuring that the groove in the base of the pole is aligned over the bottom frame wire, very gently bend the pole until you are able to slot the top of the pole around the top frame wire;*
- *Gently push the pole so that it sits against the side of the trap – see Figure 1*



Figure 1

- *Ensure that the suction tube is fully expanded and the fan is not damaged;*
- *Add the white gauze cover - ensure that the lead has not pulled the fan to one side of the trap. The cover must sit neatly over the trap with no gaps around the outside of the suction tube - see Figure 2*



Figure 2

- *The funnel net needs to sit high on the catch pipe (over the top of the groove on the catch pipe - see Figure 3 - to allow mosquitoes uninterrupted access to the catch bag. Once the funnel net is in place, the catch bag is placed over the funnel net- see Figure 4*



Figure 3



Figure 4

- Check that there are no holes or tears in the catch bag. The stitching of the catch bag must be on the outside of the bag to avoid mosquitoes becoming caught in the stitching and not being removed for identification. The catch bag requires regular inspection to avoid escapees (bag material is easily torn);
- Ensure there is a gap between the bottom of the funnel net and the catch bag. Tighten the toggle on the catch bag until the bag is firm around the funnel net and catch pipe;
- Place the catch bag in the suction tube, the BG trap is now ready to run – see Figure 5



Figure 5

- Once the trap is running check the sound of the fan to ensure the fan is working and that the catch bag is not touching the fan. The sound of the fan will change if the catch bag, or part of the suction tube, is interfering with the airflow.

Collection of the catch bag

- The fan must be running when the catch bag is collected to prevent mosquito escapees;
- Run your hand around the inside of the catch pipe and rattle the catch pipe to ensure that all the mosquitoes are inside the catch bag;
- Carefully lift the catch pipe until the toggle of the catch bag is visible above the rim of the suction tube;
- Loosed the toggle until the catch pipe and funnel net can be removed from the catch bag;
- Leaving the catch bag within the suction tube, tighten the toggle until firm and there is no gap in the top of the catch bag. Attach label with trapping details to the elastic of the catch bag.

Transport of the collected catch bag

- The label (collection details) for the catch bag should be attached to the elastic of the bag, preventing the label from falling off or damaging the collected mosquitoes;
- Ideally, the collected mosquitoes will be transported within an esky to keep them alive and in good condition. A piece of dowel wedged in the esky, from which the catch bag can be hung, prevents the mosquitoes being squashed or badly rubbed during transport.

Maintenance

White Gauze Cover

The cover needs to be inspected regularly as they are prone to elastic degradation and can easily be torn. The cover requires washing (in warm soapy water) on a regular basis to keep it white and prevent dust interfering with air flow.

Funnel Net

The funnel net requires washing (in warm soapy water) on a regular basis to keep it clean and prevent dust interfering with the airflow. The elastic in the funnel net is also prone to degradation.

Catch Bag

Each time the catch is returned to the lab for the collection to be identified it MUST be carefully checked for holes, especially around the edges. The catch bags also require regular washing to keep them clean and the airflow unhindered.

The manufacturers recommend that the catch bag be replaced every 3-4 days to maintain quality of the mosquito specimens. After this time the damage to the caught mosquitoes increases and identification becomes more difficult. If the trap is not working check the connecting plugs as sometimes the wire becomes loose and the power doesn't reach the fan. CO₂ gas can be added to the trap increase the catch of *Aedes aegypti*, as well as other mosquito species. The gas is added from the bottom of the trap, escaping upward. BG Lure Attractant can be added to the trap to increase the chances of catching target mosquitoes such as *Aedes aegypti*. A small net pocket is located inside the trap on the outside wall of the suction tube for the attractant to be placed. Ants can become a problem with long term surveillance trapping locations. Move the BG trap to a different location within the trapping property to deter the ants or treat the ground around the BG with surface spray (remove the BG trap from the area first and allow any excess chemical to dissipate before returning the trap). At no time should any part of the BG trap be treated with chemical. The trap will work effectively without the funnel net, which is only required to assist in the prevention of insect escape if the power is interrupted. On return to depot/office plug in the battery charger and recharge the batteries so they are ready for use.

3.4.2 *Gravid Aedes Traps (GATs)*

These traps can be used instead of undertaking a house-to-house survey. If surveillance is only being undertaken on one property multiple traps should be deployed. The number will only be limited by the availability of traps and the number of suitable locations. If surveillance is for a street or town, at least two traps should be placed within one property and if possible traps should be placed in every second or third property.

Equipment required

- *Black 10L bucket (“base”) with overflow hole drilled in side;*
- *Clear container/bucket with circular section removed from base & with interior roughened/scratched (“central chamber”);*
- *Circular mesh cut out approx. 43cm diameter (1mm aperture) “gauze”;*
- *Cylindrical black “funnel”;*
- *Lucerne pellets*
- *Residual insecticide- “Mortein Outdoor Surface Spray” (0.3 g/kg imiprothrin and 0.6 g/kg deltamethrin)*
- *Tap Water*
- *Talcum powder (optional)*
- *Saucer (optional- big enough to hold base of 10L bucket)*
- *Labels/pens*
- *Sample jars*
- *Tray/large container*

Trap Preparation

- Pretreatment of mesh and central chamber should be conducted **≥ 24hrs prior to deployment**;
- Using disposable gloves, spray the inside surface of the central chamber with the surface spray (1-2 second burst);
- Still wearing gloves, spray the central area of the gauze (approximately an area the diameter of the central chamber opening). It may be a good idea to place the gauze on a piece of scrap cardboard to catch the overspray;
- The surface spray should last 1 month but respray central chamber and gauze prior to each deployment.

Note: always apply the surface spray in a well-ventilated area.

Field Deployment

- Fill base bucket with 3-3½ L tap water;
- Add 4 lucerne pellets to water;
- Assemble (as per figure below) by pressing the gauze into the base followed by the central chamber, keeping gauze out of the water;
- Add the inverted funnel;
- Choose a shaded location (preferably 80-90% shade) that is protected from rain;
- If ants may be a problem, a saucer of talcum powder may be used to hold the bucket base;
- Be sure to **label** your GAT trap for identification.

Field Collection

- Holding the gauze and central chamber together, remove from base bucket (note that the mosquitoes will be held on the gauze so care must be taken to prevent them falling into the water);
- Transfer/tip mosquitoes into tray or large container before placing into sample jar;
- Be sure to **label** sample jar with corresponding details of GAT trap.

3.4.3 Sticky Ovitrap

Provide a relatively new method to measure the relative abundance of egg-laying female container/urban mosquitoes. Sticky Ovi traps are useful for gauging the prevalence of *Aedes aegypti* mosquitoes and the risk of dengue transmission. Access to the glue required to create the trap is limited and currently the only known supplier is in the USA. The cost for the glue may make the production of this trap cost prohibitive.

Construction

- Cover a bench top with protective sheeting. Wear disposable gloves whenever appropriate;
- Ensure the bucket has the appropriate identifying sticker (no reference to bifenthrin);
- Drill two overflow holes (6mm diam) 50mm from bucket brim and on opposite sides of bucket (to prevent glue strips being submerged in water);
- Cut glue sheet into strips Dengue Action Response Team (DART) prefer 5cmW x 15cm L by starting from the edge of the glue sheet (where the glue is closest to the edge) and cutting at every 8th corrugation. The narrow piece can be discarded (Figure 1A;)



Figure 1A Glue Strips (approx 5cm W)

- *Cut each strip into half to complete sticky trap panel (Figure 1B). Two panels are required for each bucket;*



Figure 1B Glue sticks cut into panels

- *Attach panels to the bucket with paper clips or a folding clip (Figure 2). Paper clips need to be pressed down firmly to prevent the panel slipping;*



Figure 2 Panels attached with a giant paper clip or fold back clip

- *Fit mesh over top of bucket, using a rubber band to complete the Sticky Trap (Figure 3)*



Figure 3 Assembled Sticky Ovi Trap

Components

- *Anti-bird mesh*
- *Divot Buckets (1.2L)*
- *Material Grade Cutter or scissors*
- *Glue Panels*
- *Rubber bands - size 64*
- *Giant paper clips or 32mm fold back clips*
- *Distilled Water or Tap Water and Lucerne Pellets*
- *S-methoprene Pellet*
- *Warning Labels*

Trap Deployment

- *Set each ovitrap in an area protected from the weather (eg. under steps, house eaves, or under house), out of direct sunlight but visible to the mosquitoes;*
- *Add appropriate level of distilled water or tap water and Lucerne pellets (x 2, or @ 0.5g);*
- *Add Prolink pellet (s-methoprene) to water to prevent mosquito breeding in traps;*
- *There is no limit on the number of traps that can be placed on a property;*
- *Place traps in the field for 2 to 4 weeks, can be checked weekly for water top up. Keep accurate records of locations and properties with ovitraps.*

Retrieval

- *Retrieve traps after 1 -2 week;*
- *Adult ID may be possible in the field using a hand lens;*
- *Egg number assessment is best done at the depot/office;*
- *Label both glue strips with Date and Location and place in a plastic bag for transport.*

Clean Up

- *Dispose of used glue panels and paper clips into waste bin;*
- *Wash buckets in hot water to remove any extra eggs and organic matter. Avoid harsh scrubbing of buckets to ensure mosquitoes lay eggs on ovistraps.*

Appendix 4 Response – Container/Urban Breeding

4.1 Source Reduction/Larval Control

Source reduction can be achieved at the household level with individuals complying with legislation by screening tanks, removing or regularly cleaning artificial containers. House-to-house surveys and the use of any of the above detailed surveillance traps will also assist with source reduction.

4.2 Chemical control

Controlling adult container/urban breeding mosquitoes can be achieved by using a 'lure and kill' trap or interior residual spraying.

4.2.1 Lethal Ovitrap

Lethal ovitraps employ a "lure and kill" strategy: egg-bearing females are lured into the bucket by the water and they are killed when they come in contact with the flannelette strip whilst laying their eggs. They provide a 'green' alternative to adult mosquito control due to the minimal use of pesticides, minimal contact with non-target insects/animals/humans, a minimal chemical exposure of pesticides to health workers.

Preparing Flannelette

- Using Bifenthrin mix chemical at the initial mosquito control application rate into a 10L plastic bucket. Ensure there is sufficient room for the flannelette strips to be added to the bucket without allowing the chemical emulsion to overflow;
- Cut flannelette into strips (15cm W x 200cm L);
- Add flannelette strips/sheet to bucket, completely submerge and soak (2 mins per strip);
- Without wringing flannelette, spread strips/sheet on a plastic 'drying sheet' where strips can dry undisturbed, out of sunlight.

Please note this must be done in a secure area to prevent chemical contamination.



Treated strips drying on plastic

- Label Drying Sheet with information of each batch (Date of treatment, Batch No & Signed);
- Allow 24hrs for flannelette to dry completely. A fan can be used to speed up the drying process; Cut flannelette strips to size (5cm W x 15cm L);
- Keep three random strips from each sheet for efficacy testing. Store in Labelled plastic bag (Batch No and Date) then put in freezer (in door pocket);
- Store 100 treated strips in a container out of sunlight (eg brown paper bag, cardboard box). With batch No Date and your Initials; Affix "warning label"

Note: The DART team may be able to provide the lethal strips - contact either the DART team leader or the QLD Health Entomologist for our region.

Trap Construction

- Ensure that bucket has the appropriate identifying sticker (reference to bifenthrin);
- Drill two holes (8mm diam) opposite each other just under the top rim (approx. 15mm down);
- Use gloves to affix one treated strip per bucket with a giant paper clip/fold back clip. (Ensure treated strip is in date and use oldest stock first); Use rubber band to attach anti-bird mesh, to the top of the black bucket;



Lethal ovitrap ready for deployment

- Record the Batch No. and Date for the treated strips;
- Lethal Ovitrap should be deployed as soon as possible.

Components

- Anti-bird mesh
- Divot Buckets (1.2L)
- Material Grade Cutter or scissors
- Treated Flannelette strips
- Rubber bands - size 64
- Giant paper clips or 32mm fold back clips
- Distilled Water or Tap Water and Lucerne Pellets
- Warning Labels

Chemical Application Equipment

- Bucket (10L)
- Bifenthrin insecticide (suitable for mosquito treatment)
- Container to store treated strips (eg brown paper bag)
- Disposable Gloves
- Drying Plastic
- PPE for Chemical use
- Red Flannelette

Deployment

- Set each ovitrap in an area protected from the weather (eg. under steps, house eaves, or under house), out of direct sunlight but visible to the mosquitoes;
- Add appropriate level of distilled water or tap water and Lucerne pellets (x 2, or @ 0.5g). Ensure that the flannelette strip is touching the water. A damp strip will be more effective (better dispersal of chemical to adult mosquito) than a dry strip;
- Maximum of four lethal ovitraps per property;
- Place traps in the field for 2 to 4 weeks, can be checked weekly for water top up. Keep accurate records of locations and properties with ovitraps.

Retrieval

- Retrieve traps after 3 - 4 weeks. Adult ID may be possible in the field using a hand lens. Egg number assessment is best done in the depot/office;

- *Place the flannelette strip in a container to prevent chemical contamination of the microscope when counting eggs;*
- *Label container with Date, Location, place for transport and record Keeping;*
- *Keep lethal ovitrap mesh separate from any other mesh to avoid contamination.*

Clean Up

- *Dispose of paper clips and damaged flannelette strip into waste bin;*
- *Rinse out intact flannelette strips in hot soapy water and store at depot for future chemical treatment and reuse, as necessary;*
- *Wash buckets in hot water to remove any extra eggs and organic matter. Avoid harsh scrubbing of buckets to ensure mosquitoes lay eggs on ovistraps.*

The low dose of insecticide in Lethal ovitraps ensures that the trap is safe to humans and pets.

4.2.2 Residual Spraying

An effective way to kill adult mosquitoes is to apply a residual insecticide onto the areas where they prefer to rest. Most container breeding/urban mosquitoes prefer to rest in dark areas around houses and other occupied buildings. Residual insecticide can be applied by a Licensed Pest Management Technician as a surface spray in and around premises. If domestic insecticides are used around the house by residents they must be used as directed on the label. Although external truck-based 'fogging' or 'misting' is highly visible and can be used for groundwater breeding mosquitoes, it is not effective against container/urban breeding mosquitoes.

4.3 Approved Inspection Program

The legislative power for an Approved Inspection Program's is found in the *Local Government Act 2009*. Mosquitoes are designated pests under the *Public Health Act 2005*. Programs must be run in accordance with all legislative requirements

Sections 133 and 134 of the Local Government Act 2009 deal with Approved Inspection Programs. Program must first be approved at a Council Meeting, generally by resolution. The resolution must state the following:

- *the purpose of the program;*
- *when the program starts; and*
- *the period (not more than 3 months) over which the program will operate; and*
- *for a systematic program:- the type of property that will be entered; and*
- *for a selective program - the criteria for selecting the properties.*

The program can be either systematic or selective (refer to Local Government Act for terminology). NBRC must give a written notice to the occupier of a property (this can be in the form of a letter drop in the letterbox of a property). The Notice must state the following:

- *Local Government's intention to enter the property; and*
- *The reason for entering the property; and*
- *An estimation of when the property will be entered.*

NBRC must notify the public of the program approval, at least 14 days, but not more than 28 days, before the program commences. The notice must be published in the local newspaper and on Council's website. The Notice must state the following information:

- *North Burnett Regional Council is operating the program;*
- *Purpose and scope of the program, in general terms;*
- *Start date for the program;*
- *How long the program will last;*
- *That the public may inspect a copy of the resolution at Council's office until the end of the program;*
- *The cost of purchasing a copy of the resolution;*
- *The cost of the copy is no more than the cost to NBRC for making the copy available;*

- For the entire time that the program is running the public may view or purchase a copy of the resolution from Council's public office/s;
- An authorised person may enter a property (but not a home) without the permission of the occupier of the property, at any reasonable time of the day or night, under an Approved Inspection Program;
- The authorised person on entering a property must attempt to inform any occupier of the property; the reason for entering; and that the authorised person is authorised under the Local Government Act to enter without their permission.

Survey Preparation

- Determine the number of properties to be inspected;
- Identify the number of staff available. A team of 2 people should not be allocated more than 30 properties a day. (Teams generally manage 15 - 20 properties);
- If treatment is to be undertaken ensure that at least one member of each team has a Pest Management Technician Licence;
- Group properties together for inspection and produce maps/create a spreadsheet for each group;
- Ensure sufficient equipment is available for each team;
- Provide educational material and Pest Advices documentation to each team/ licensed operator;
- Ensure accurate records are maintained. Use of QLD Health tablets or paper copies of larval survey forms;
- Ensure each team has a mobile phone and contact numbers for all relevant staff.

Equipment & Documentation

- Authorised Officer ID
- Pest Management Technician Licence (if applicable)
- Insect Repellent and sunscreen
- Suitable clothing including Hat, sunglasses etc.
- Dipper
- White plastic dish
- Pipettes
- Turkey baster
- Sample bottles/tubes/vials
- Labels, pens, notebook, survey form, map/spreadsheet
- Pest Advice
- Carry bag
- Ladder/extended mirror for rainwater tank or gutter inspection
- Esky (where necessary)
- Mobile phone
- s-methoprene (sand, pellets, briquettes)

Method

- Check for locked gates or dogs (if access is not possible leave a letter in the letterbox requesting that occupier contact Council to arrange a suitable inspection time);
- Enter the property and try and locate occupier and advise of reason for entry;
- Work your way around the property and look for containers that are holding water or have the potential to hold water. All containers are to be recorded;
- Small containers holding water - empty the entire contents into the white plastic dish. If larvae are present take a minimum of six larvae and place in a sample bottle. Ensure the bottle is appropriately labelled or if using QLD Health tablet scan the bar code;
- Large containers holding water that can be emptied - tap container to force any larvae to the bottom and then tip off most of the water. Pour the remaining water into the white plastic dish. If larvae are present take a minimum of six larvae and place in a sample bottle. Ensure the bottle is appropriately labelled or if using QLD Health tablet scan the bar code;

Large container holding water that cannot be emptied - approach without casting a shadow. Look for larvae on the surface; if present use a turkey baster to take samples. If larvae are present take a minimum of six larvae and place in a sample bottle. Ensure the bottle is appropriately labelled or if using QLD Health tablet scan the bar code;

If breeding is found and the water source cannot be removed request permission from the occupier to treat the water source. Treatment should not occur without occupiers approval; If treatment occurs provide the occupier with a pest advice;

- If no one is home leave a door hanger and where necessary an information brochure. If treatment is required leave a request for the owner to contact Council at their earliest convenience;
- All larvae to be identified by a suitably competent person and records kept;
- If larvae are not to be identified that day preserve larvae in ethanol;
- If using QLD Health Tablet ensure the larvae details are entered and then sync the system.

QLD Health Tablets (this may become redundant)

- QLD Health use "Motion" tablets to record and download mosquito survey data into VEDs.
Turn tablet on using "on" button on side of machine;
Ensure that battery is fully charged (green lights on front of tablet)
Press Windows Security button (key symbol) on side of machine (below 'on' button) All of the following steps require the use of the Digitizer Pen provided:
Press OK
Click on "M" icon Initial login page
Enter the password
Check the power setting - it should be on power saver setting - so as to increase the battery life.
Click on the icon on the bottom right of the screen that looks like a battery and a power cord - Power icon;
Double click WinMossie Icon - Enter User Name and Password
Click - Offline Maps (the system often brings up error warning generally can ignore); the Data for Offline Maps will take a while to load
Enter "Location" from the drop down box from the top of screen (data will be slow to load);
Click on the Cursor icon (beside the location drop down box) Map page
Select street name from internal drop down box on the top left hand side;
Click on the property number (if applicable);
(use the pen to drag down screen view to locate the property you need)
Click Add Property (top right side of screen)
Check correct property is loaded (if incorrect click Cancel and try again), Initial property page
Complete the Property and Premise drop down boxes
Click "Add Consent" - Consent must be given to proceed. If verbal consent is granted add name in the relevant box or alternatively get the occupant to sign in the box provided using the digitizer pen
Click "SAVE"
Click "SAVE" again the property screen;
Click "Survey" icon to add container, complete screen as necessary. The pen can be used to mark container location on the diagram; alternatively use the drop down box provided.

Note This step has to be completed for every container type wet or dry. If there is more than one of the same type of container at the same location on the property you can specify the number in the box provided e.g. a garden of bromeliads estimate the number e.g. 15. If container type is classified as "Other" a drop down of numerous different container types, ensure you click on wording for it to be recognised.

- Click "SAVE"
- If a larvae sample is taken, press SELECT Adding sample;
- On the new screen, press ADD SAMPLE (in the bottom RH corner) - you can then scan the container bar code using the inbuilt scanner on the top RH side of the tablet. Alternatively you can enter the number manually
- Click "OK"

- Continue to add samples and containers as above and ensure all are entered into the system.
- When complete click "End Survey" (located centre top screen)
- Confirm end DateTime for Survey when prompted.
- When all properties have been added close the program with the "X" at the top right of the screen downloading Data to VEDS
- Ensure that a sim card is installed (remove battery to check). Note if the sim card is not inserted correctly it is very difficult to remove. Refer to diagram below for correct position. Inserting sim card
- Click on the 'Motion CM' logo at the bottom left of the screen once
- Connect to the internet - click on the icon similar to a pad lock at the bottom left of the screen. Icons for downloading
- Click on the diagram - Connect to VPN
- Click connect
- Enter password - Q1dh3a1th - this will take you back into the program (you may need to minimise the screen to see the WinMossie program).
- Enter your password and login
- Click on the Sync box at the top of the screen - this will take you to a new screen
- "SYNC" will appear on screen - hover stylus over the box and click in the blue area (that will appear when you hover over the box)
- Program will run, information will scroll through the box and when the bar turns green the screen will advise the sync is complete press OK
- Close program as per normal computer - Click on icon bottom left corner and then click on 'Shut down'.
- Recharge the battery for the tablet

Appendix 5 Management of a Dengue Outbreak

5.1 *Aedes aegypti*

5.1.1 *General*

Dengue Fever is an acute febrile disease which is transmitted by the bite of an infected *Aedes aegypti* mosquito. The organism occurs in a number of serotypes and it is now believed the re-infection of a sufferer with a different serotype can lead to development of the potentially fatal hemorrhagic form of the disease. Control of the mosquito is the only viable form of control of the disease.

5.1.2 *House-to-House Surveys*

To detect and eliminate the breeding of *Aedes aegypti* mosquitoes, house-to-house surveys will be conducted following:-

- *Initial identification of Aedes aegypti breeding sites.*
- *The direct import of a Dengue Virus sufferer to an area.*
- *The presence of a suspected locally acquired case of Dengue.*
- *The presence of a confirmed locally acquired case of Dengue.*
- *A general (epidemic) outbreak of Dengue.*

It is generally accepted that the *Aedes aegypti* mosquito will travel up to a maximum of 400m from its breeding site in search of a blood meal. In an attempt to limit the spread of the mosquito/eliminate secondary infections of dengue, the following inspection distances will be adopted.

Inspections after the initial identification of breeding will only be undertaken as per advice from Queensland Health (QLD Health) Central Region's entomologist, the current belief is that the use of GAT traps may be more appropriate. All other inspections will be conducted of every premise in a radius zone of 100m to 200m of the sufferer's home. All breeding found is to be recorded on inspection sheets or within (Vector-borne Disease Early Detection and Surveillance) VEDS. Information highlighting control options for the *aegypti* mosquito will be provided to the effected residences. QLD Health may provide the necessary Officers to inspect the 0 to 100m zone. In the instance of an outbreak, QLD Health can treat the inside of dwellings to eliminate harbouring adult mosquitoes.

In an epidemic, these distances may be reduced due to human resource shortages when multiple suburbs are affected.

5.1.3 *Notification*

Notification of the presence of a case is received from the Wide Bay Public Health Unit. Following notification, the Local Government in the area will initiate action to conduct the necessary survey and will:

- *Conduct a thorough house-to-house survey within the 100m to 200m zone in accordance with the principles outlined below.*
- *Note on the maps the location of each premises surveyed, the location of breeding detected and the location of premises treated.*
- *If necessary, seek the assistance of from QLD Health to expedite the conduct of the survey and treatment*

5.1.4 Survey Equipment

It is recommended the following survey equipment be available for use in house-to-house surveys:

- *Suitable identification for the officer.*
- *Maps, survey forms, tablets (if available for data collection), information resources and 'Health Warning' door hangers.*
- *A suitable carrying container holding:-*
 - *A container of suitable larvicide;*
 - *A turkey baster to collect large samples;*
 - *A white bowl to collect larval samples;*
 - *A pipette to collect individual specimens;*
 - *Vials for transport of larvae for subsequent identification;*
 - *Insect repellent;*
 - *Sun screen; and*
 - *Water.*

5.1.5 Conduct of House-to-House Surveys

The conduct of house-to-house surveys involves several steps:

Pre survey meetings

- *Confirm the location/case information.*
- *Hold meeting with all Officers involved.*
- *Brief staff on all details.*
- *Assign inspection teams and ensure team communications.*
- *Ensure all inspection bags are fully stocked with equipment.*

Face to Face Communication

- *Introduce yourself and explain the purpose of your visit.*
- *Deliver Information Materials.*
- *Explain the dangers of Dengue Fever and DHF and the role of the mosquito including its life cycle and flight range. Correct any long-held misconceptions.*
- *Explain the mechanisms of *Aedes aegypti* control (Tip 'em out, Store 'em dry, Throw 'em out).*
- *Thank the occupier for letting you check the premises and give them contact numbers for further information if required.*

Source Reduction

- *If it can be emptied, **Empty it***
- *If it can't be emptied or moved, **treat it.***
- *If it is required, have the occupier **clean it, dry it and store it** in a dry place.*
- *If it is not required, have the occupier **throw it out** or do it for them.*
- *If larvae are located, **show them to the occupier**, explain their legal responsibilities.*
- *Check inside the house if the occupier advises they have indoor plants or cut flowers (only required if Dengue Fever inspection).*
- *Ask if there is a **disused septic tank or well** on the property.*
- *Check tree holes.*
- *Check **Toilets** especially disused ones.*

REMEMBER – It only takes one breeding container in twenty houses to sustain an outbreak. Get it right the first time.

If owner or occupier is not home

In accordance with legislation, Council Officers cannot enter premises without the permission of the occupier. In order to gain access at a later time:

- *Leave the usual information materials in the letterbox.*
- *Hang a 'Health Warning' card on the doorknob, making sure the identifier for the correct contact number is marked or highlighted.*
- ***Re-inspect** as soon as possible after the occupier makes contact.*

Records

Accurate records of the investigation of an *Aedes aegypti* /Dengue Case are vital.

- *Maps should be made as described above.*
- *Survey forms have been standardized and must be completed.*

5.1.6 Public Relations – Media

Media releases may be required throughout dengue instances. The level of public relations response is dependent on the number and location of these cases. The purpose of the release is threefold.

- *Ensures the public is made aware of a potential serious public health issue.*
- *Provides an opportunity for additional and widespread public education messages.*
- *Facilitates the house-to-house inspection process by making the public aware of Council inspection activities.*

For the purpose of media activities, dengue cases can be grouped under the broad headings – Imported Cases and Local Transmission Cases.

5.1.7 Imported Cases

Within Individual Council Boundaries

Where imported dengue cases occur solely within the jurisdiction of a Council area, i.e. Greater than 1.0km from a common boundary, the following procedures apply:

- *The responsible Council to deal with media responses and releases according to set policies.*
- *Information and briefing notes will be provided by the investigating Officers to management and public relations section for media dissemination.*
- *Information will be limited to the number of cases, inspections conducted, general health advice and protection measures, and generalized location of cases **by suburb only**.*

Border cases

Where an imported dengue case occurs close to the border of adjoining Council areas, inspections are required in both areas.

Council's Environment & Public Health section will liaise and share all information and jointly prepare proposed media briefs. Council will present media releases, separately or jointly as deemed appropriate.

5.1.8 Local Transmission Cases

Where local transmission of dengue exists, the above protocol (focusing upon cooperation and sharing of information) for both case scenarios will be followed. In addition to this, Council's Environment & Public Health section will liaise closely with QLD Health.

Council may wish to present additional media releases, separately or jointly as deemed appropriate.

Appendix 6 Mosquito, Black Fly & Midge Control during an Emergency or Disaster Situation

Mosquitoes Black Flies and Midge numbers can rapidly develop into plague proportions in an uncontrolled environment following/during a disaster or emergency. Mosquitoes have the potential to transmit disease and cause a nuisance. Black Flies and biting midge can cause severe skin irritation and/or a nuisance. The impact these insects have on the community can be influenced by:

- *Excessive rain; Flood waters;*
- *Existing seasonal abundance;*
- *Unprotected community due to damaged infrastructure;*
- *Confinement of displaced persons into temporary facilities; and*
- *Lack of personal protection supplies.*

Disasters do not generate 'new diseases', however, by altering the environment, they may increase transmission of diseases that already exist in a region through:

- *Direct effect of the physical event itself, such as fecal contamination;*
- *Indirect effects which may result in such conditions as overcrowding and poor sanitation;*
- *Promoting or causing increase in the movement of populations;*
- *Disrupting routine mosquito management programs; or*
- *Altering the distribution of vector and nuisance species.*

During a disaster or emergency the Environmental Health Section should:

- *Coordinate pest control services;*
- *Follow Council's Mosquito, Black Fly & Biting Midge Management Plan and extend the Program to include habitable areas created by the disaster,*
- *Follow the Queensland Health – Guidelines for Controlling Public Health Risks relating to Mosquitoes, Flies and Black flies in a Flood Event, and*
- *Monitor waste management.*

Information on waste management; mosquito control and surveillance; and personal protection should be distributed throughout the community via all media outlets and the use of signage in prominent locations and areas where people are congregating e.g. schools, shopping centers, evacuation centers and council offices.

Appendix 7 Resources

7.1 Personnel

NBRC currently has access to 5 Part Time Land Protection Officers (LPO) and 2 Environmental Health Officers (EHO) to assist with implementing the Mosquito, Black Fly and Biting Management Program.

7.2 Equipment

Each LPO has access to a utility with a spray unit. An all-terrain vehicle (ATV) and a boat with a 200L spray unit is also located at the Gayndah depot. Additional vehicle mounted spray units and knapsack sprayers are also available.

- 4 x Hand held foggers.
- 1 x ULV Fogger
- 1 x Microscopes and limited identification tools
- 7 x Larval surveillance kit (yellow toolbox)
- 9 x BGs traps for container/urban breeding surveys
- 9 x CO₂ Light Traps
- 2 x GAT traps for container/urban breeding surveys
- 5 x 12 V 12 Ah 20hr batteries
- 6 x 6V 12Ah batteries
- 1 x Battery Charger with leads to charge multiple batteries at once

7.3 Chemicals

The control program utilises specialised chemicals to maintain effective control of vectors.

- s-Methoprene - briquets
- Auqa K
- ProLink Pellets
- Twilight

8.1.3 Advice/Record of a Pest Control Activity

North Burnett Regional Council Vector Management Plan
Environmental Health Department



Advice/Record of a Pest Control Activity

Section 13 and 14 Pest Management Regulation 2003

DATE	/ /	TIME	START	am/pm	FINISH	am/pm
------	-----	------	-------	-------	--------	-------

PEST MANAGEMENT TECHNICIAN NAME		PMT LICENCE NO.	
PEST MANAGEMENT TECHNICIAN NAME		PMT LICENCE NO.	
VEHICLE REGISTRATION			
ADDRESS WHERE ACTIVITY CARRIED OUT			
OWNER/OCCUPIER NAME		TELEPHONE NUMBER	

TYPE OF PREMISES: Residential (single) Commercial Hotel/Motel
 Residential (Multi) Other (specify) _____

Pesticide	Active Constituent	Rate	Quantity Used

DILUTANT: Water Hydrocarbon Nil Other _____

EQUIPMENT USED: Fogger Spray Tank Hand Rega Spreader

AREA TREATED: Dense Scattered Sparse Plants/Trees Regrowth
 Grass Water Rock Wall River Bank Structure
 Other _____

METHOD OF APPLICATION: High Vol. Low Vol. Long Hose Hand Broom
 Fog

WIND SPEED: 0-10 km/hr 11-20 km/hr
 21-30 km/hr _____

WEATHER CONDITIONS: Fine Showers Humid Overcast Cool Warm
 Hot Other _____

PURPOSE: Mosquito Control Midge Control

Signature (Licensed PMT) _____ Signature _____

North Burnett Regional Council is collecting this information in order to comply with its responsibilities and obligations as a Local Government. The information will only be used by Council Officers or Agencies which may have a legitimate need for the information to process applications. Your information will not be given to any other person or Agency until you have given us permission or we are required by law.

8.1.4 Laval Collection Form

Mosquito Larval Surveillance



Project: _____	Date: _____
	Officer: _____

Site Location: _____ _____			
Site ID: _____			
Surveillance Type: (Circle)	New	Routine	Other
GPS ID: _____	GPS Coordinates		S
			E
Site Marker ID: _____			

Site Status:	Breeding Present	No Breeding	Potential		
Habitat Type:	Swamp Natural Drain	Marsh Artificial Drain	Permanent Pound Natural Container	Temporary/Depression Artificial Container	Other
Water Type:	Fresh	Saline	Brackish	Polluted	
Water Status:	Stagnant	Flowing	Wind Swept	Tidal	
Vegetation:	Fringing	Emerging	Floating	Timbered	Other
Bottom:	Organic	Mud	Sand	Artificial	Rock
Shade:	Exposed	½ Shade	Deep Shade		
Aquatic Fauna:	None	Fish	Tadpoles	Dragonflies/Beetles	Other
Current Water Event:	No	Tide	Rainfall		

Surveillance Dip Number	Number of Larvae		Pupae per Dip	Species Lab ID	Collection ID
	1 st /2 nd	3 rd /4 th			

Comments: _____ _____ _____
--

8.1.5 Larval Collection Sheet

DATA SHEET – LARVAL COLLECTION											
Date:			Time:			Collector:					
Site No.:			GPS:			Rain (mm)			High Tides		
Street:			Map Ref:			Previous 24hrs:			Previous 24hrs:		
Photograph:						Previous week:			Previous week:		
Breeding Site characteristics (circle the relevant descriptors):											
Site type	Size class	Water	Vegetation	Bottom	Shade						
Swamp	< 5m ²	Fresh	Fringing	Organis	Exposed						
Marsh	>5 – 10m ²	Saline	Emergent	Mud	½ Shade						
Permanent pond	>10 – 20m ²	Running	Floating	Sand	Deep shade						
Temporary pool/depression	>20-50m ²	Stagnant	Algal mat	Rocks							
Natural/semi natural drain	>50-100m ²	Clear	Other	Concrete							
Artificial drain	>100-200m ²	Turbid		Other							
Tyre track	>200-500m ²	Foul									
Container	>500-1000m ²										
Other (specify)	>1000-5000m ²										
	>0.5-1ha										
	>1ha										
	Other										
Surrounding vegetation, within 50M (circle the relevant description)											
Protective foliage cover of tallest stratum											
Tallest stratum	Dense (70-100%)	Mid dense (30 – 70 %)	Sparse (10 – 30 %)	Very sparse (<10%)							
Trees >30m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland							
Trees 10–30m	Closed forest	Open forest	Woodland	Open woodland							
Trees 5-10m	Low closed forest	Low open forest	Low woodland	Low open woodland							
Shrubs 2-8m	Closed scrub	Open scrub	Low scrubland	Low open scrubland							
Shrubs <2m	Closed hearth	Open hearth	Low shrubland	Low open shrubland							
Herbs/grasses (<2m)	Closed grassland	Grassland	Open grassland	Low open grassland							
Larval collections:											
Dip	No.	Instar	Pupae	Dip	No.	Instar	Pupae	Dip	No.	Instar	Pupae
1				6				11			
2				7				12			
3				8				13			
4				9				14			
5				10				15			
Species											
Sketch map of site on back of sheet											

8.1.7 Adult trapping excel spreadsheet example

Adult Trapping Data																		
Trap No.	Location:																Total Number per Trap	Comments
	Date:	<i>Aedes aegypti</i>	<i>Aedes alternans</i>	<i>Aedes vittiger</i>	<i>Anopheles annulipes</i>	<i>Culex annulirostris</i>	<i>Coquillettidia xanthogaster</i>	<i>Mansonia uniformis</i>	<i>Ochlerotatus notoscriptus</i>	<i>Culex halifaxii</i>	<i>Culex quinquefasciatus/fatigans</i>	<i>Mimomyia elegans</i>	<i>Toxorhynchites</i>	Damaged	Male			
1																		
2																		
3																		
4																		
5																		
6																		
Weekly Total:																		
Weather Conditions																		
	Fine	Scattered Cloud			Overcast			Light Rain										
	Temperature	Min:			Max:			Wind Speed:			Wind Direction:							
	Tides	Low:			High:						Overnight Rainfall:							
	Moon Phase:				Humidity:						Weekly Rainfall:							

8.1.8 Ovi trap excel spreadsheet example

Ovi/Egg Collection Data											
Trap No.	Location: Date/Date Range	<i>Aedes aegypti</i>	<i>Toxorhynchites</i>	<i>Culex annulirostris</i>	<i>Culex quinquefasciatus/fatigans</i>	<i>Culex halifaxii</i>	<i>Ochlerotatus notoscriptus</i>	<i>Tripterooides sp.</i>	Totals	Comments:	
1											
2											
3											
4											
5											
6											
Totals:											
Weather Conditions											
		Temperature:			Min:		Max:				
		Weekly Rainfall:									
		Fine			Scattered Cloud			Overcast			
		Light Rain			Heavy Rain						

8.1.10 Risk Assessment Guide

Risk Assessment Table

Risk outcome: _____

Location/Town	<i>Ae. aegypti</i> present	<i>Ae. aegypti</i> infestation	<i>Ae. albopictus</i> present	<i>Ae. albopictus</i> infestation	Human population size	# DENV importations	# CHIKV importations	Industry traffic/conduit to industry	Location of major transport route	Tourist destination	Proximity to transient workers	Prevalence of other key factors	Latitude/longitude	Human density/urbanisation	Proximity to known breeding ground

8.1.11 Mosquito Species

Fresh Water Mosquito Species

Species	Vector of	Breeding Habitat	Other
<i>Aedemoyia catasticta</i>		Semi & Permanent Pools	
<i>Aedes aculeatus</i>		shallow depressions in moist peaty soil	Large and bites humans
<i>Aedes alboannulatus</i>		Bushland Ground Pools	Minor pest
<i>Aedes australis</i>		Rock pools above high tide	
<i>Aedes bancroftianus</i>		Roadside ditches ground pools	Nuisance after extensive rain
<i>Aedes Burpengaryensis</i>		Coastal Regions and Tablelands	Day biting
<i>Aedes clelandi</i>		Ground pools with and without vegetation	Can be nuisance in tea tree scrub
<i>Aedes imperfectus</i>		Shaded grasses, groundpools filled with floodwater	Bite humans
<i>Aedes lineotopennis</i>		Temporary Grass Pools	Vicious biter of humans
<i>Aedes normanensis</i>	Ross River & MVE	Casual groundpools, sunlit	
<i>Aedes rubrithorax</i>		Usually shaded areas	Nuisance pest
<i>Aedes rupestris</i>		Rockpools in bushland	Nuisance pest
<i>Aedes vittiger</i>		Grassed sunlit temporary ground pools – irrigation areas	Major pest
<i>Anopheles amictus</i>		Semi & permanent pools	Host for malaria
<i>Anopheles annulipes</i>		Various	Host for malaria
<i>Anopheles bancrofti</i>		Common in Hyacinth Swamps	Host for malaria
<i>Culex annulirostris</i>	Ross Rive, MVE	Freshwater swamps	Dog heart worm
<i>Culex australicus</i>		Groundpools	
<i>Culex bitaeniorhynchus</i>	unclear	Semi permanent lagoons	MVEV overseas
<i>Culex cubiculi</i>		Farmland freshwater	
<i>Culex orbostiensis</i>		Vegetated ground pools	Bites humans
<i>Culex gelidus</i>	JEV overseas	Freshwater groundpools	Bites humans
<i>Culex globocoxitus</i>		Swamps and small ground pools	
<i>Culex halifaxii</i>		Polluted Domestic Sites	
<i>Culex hilli</i>		Shallow swampy pools melaleuca canopies	
<i>Culex pullus</i>		Various freshwater	Carries Kunjin disease but rarely bites humans
<i>Culex quinquefasciatus</i>		Polluted Water	Major pest
<i>Coquillettia linealis</i>	Potential Ross River	Vegetated permanent ground pools	Nuisance pest
<i>Coquillettia xanthogaster</i>		Swamps, lagoons, creeks	Major pest
<i>Mansonia uniformis</i>		Associated with water plants	Major pest
<i>Mimomyia elegans</i>		Freshwater	
<i>Mimomyia</i>		Freshwater	
<i>Verallina Marks No 52</i>	Not known	Coastal Semi-permanent Ground Pools	
<i>Uranoaenia pygmaea</i>		Groundpools	

Salt Water Mosquito Species

Species	Vector of	Breeding Habitat	Other
<i>Aedes alternans</i>	Possible Ross River from Laboratory Tests	Brackish & fresh pools	Nuisance pest
<i>Aedes procax</i>	Possible Ross River	Casual groundpools	Minor pest
<i>Aedes vigilax</i>	Ross River	Brackish water high tides	Major pest & can transmit dog heart worm
<i>Culex sitiens</i>		Coastal brackish water	Major pest
<i>Verallina funereus</i>	Potential for Ross River	Well shaded groundpools slightly brackish to fresh water – tidal areas	Major pest in tea tree swamps etc

Container/Natural Breeding Mosquito Species

Species	Vector of	Breeding Habitat	Other
<i>Aedes aegypti</i>	Dengue Fever	Containers	
<i>Aedes kochi</i>		Leaf axils of plants	Potential for dog heartworm
<i>Aedes tremulus</i>		Tree holes and containers	Nuisance pest
<i>Ochlerotatus notoscriptus</i>	Possible Ross River from Laboratory Tests	Container breeder and plants	Major pest, heart worm
<i>Toxorhynchites</i>		Containers	Larval predator
<i>Tripteroides Sp</i>		Natural environments	Nuisance pest

8.2 Letter Templates

8.2.1 Generic Complaint response

24 April 2014

Your Reference:

Our Reference: 592014

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: MOSQUITO PREVALENCE

Council is receipt of your concerns raised regarding the number of mosquitoes in and around your home. An Environmental Health Officer will be investigating the matter further by setting a Mosquito Light Trap in your area; this will give an indication into the numbers and species of mosquitoes around your community. Further surveillance will then be carried out pending the results from the trap. Council will contact you should they require any further information with regards to this matter.

You are advised that mosquitoes live and breed in a diverse array of environments and have very specific requirements in order to breed effectively. Some live and breed in containers holding water around your house and yard; while others are found in salt marshes or freshwater pools in the natural environment. Some species can actually travel up to 50 kilometers from their breeding site. The presence of ponding water alone is not necessarily an indicator of mosquito breeding. The water depth, flow rate, temperature and the presence of food for the mosquito larvae are far more important factors as to why a female mosquito chooses to lay her eggs in a particular body of water. Furthermore, only certain mosquitoes can spread disease to humans and animals; most mosquito species are merely a nuisance.

You can manage mosquito breeding on your property. A product called "Nomozz" can be used for treatment of any ponding water around the home to prevent any mosquito larvae emerging into adults. You can also arrange to have a Licensed Pest Management Technician treat any garden foliage, walls and fences with mosquito barrier products to deter mosquitoes from harboring in and around your home.

It is also recommended that you always use personal protection against mosquitoes. Including the use of suitable insect repellents and wearing long, loose, light-coloured clothing when in areas where mosquitoes are present. Ensuring that all windows and doors are fitted with insect screens will also reduce the impact on your family.

Should you have any queries regarding this matter please do not hesitate to contact Council's Environmental Health Department, at the Gayndah office or by phone on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.2 *Domestic breeding*

24 September 2013

Your Reference:

Our Reference:

587200

Business Name

Address

TOWN STATE PC

Dear Sir/ Madam

RE: MOSQUITO BREEDING

North Burnett Regional Council has received complaints regarding the number of mosquitoes in your area. Subsequent mosquito monitoring has revealed that the type of mosquitoes being captured are predominately those that breed in domestic containers in and around the home.

There are a number of things residents can do to reduce the number of mosquitoes breeding on their property. The first is to remove all containers holding water, as little as 100ml is enough for over 400 adult mosquitoes to develop, in a week. If the container can not be removed it should be emptied, dried and wiped out once a week so as to prevent mosquito breeding.

Please find attached an information brochure "Mozzies and You..." that provides some important information regarding these types of mosquitoes.

If you require any further information, please contact Council's Environmental Health Department on 1300 696 272.

Yours faithfully

MJP Pitt

Chief Executive Officer

8.2.3 Ponding water alleged offender letter

4 April 2014

Your Reference:

Our Reference:

587209

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ACT 2005 – PUBLIC HEALTH RISK – PONDING OF WATER

Council's Health & Regulatory Services has recently received advice regarding water ponding (insert exact location on the land) at the abovementioned property. Subsequently, Council Environmental Health Officers have investigated the matter and found that due to the amount and longevity that the water remains in the area, it is likely to become a breeding ground for mosquitoes if it is not drained or filled in.

You are therefore required to remove the public health risk by ensuring the following work is carried out within thirty (30) days:

1. Ensure that all drains are at all times maintained and kept free from obstructions; and
2. Maintain the surface of the land at appropriate levels so that at all times water or other liquid does not accumulate on any portion of private property .

If the remedial action results in a change in level of your land, you may be required to make a development application for operational works before commencement of any work. For enquiries in this respect please contact Council's Infrastructure & Planning Section on 1300 883 699.

A reinspection will be carried out on or after the specified time to ensure compliance with the Public Health Act 2005. Failure to comply with the requirements of this correspondence may result in the issuing of a public health order.

If you require any further information, please contact Council's Environmental Health Department on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.4 Rainwater tank potential breeding letter

4 April 2014

Your Reference:

Our Reference:

587215

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ACT 2005 – PUBLIC HEALTH RISK – RAINWATER TANK

An officer from Council's Health & Regulatory Services has observed a rainwater tank (relevant tank) located at the abovementioned property which is likely to become a breeding ground for mosquitoes. The relevant tank is therefore considered to be a public health risk and is in breach of the Public Health Act 2005.

You are therefore required to remove or reduce the public health risk by undertaking the following work within fourteen (14) days:

Repair or replace all mosquito-proof screens and/or flap valve to the relevant tank to ensure that every opening of the tank prevents the ingress of mosquitoes into the tank.

Mosquito proof screens and flap valves are to comply with the provisions of PART 1A Division 2 of the Public Health Regulation 2005, as follows:

Mosquito-proof screens that-

Are made of brass, copper, aluminum or stainless steel gauze; and

Have a mesh size of not more than 1mm; and

Are installed in a way that does not cause or accelerate corrosion; and

Stop mosquitoes passing through the openings; or

Flap valves that when closed, stop mosquitoes passing through the openings.

A re-inspection will be carried out on or after the specified time to ensure compliance with the Public Health Act 2005. Failure to comply with the requirements of this correspondence may result in the issuing of a public health order.

If you require any further information, please contact Council's Environmental Health Department on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.5 Receptacle / guttering potential breeding letter

4 April 2014

Your Reference:

Our Reference:

587217

Business Name

Address

TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ACT 2005 – PUBLIC HEALTH RISK – RECEPTACLE/GUTTERING (REMOVE WHICHEVER ONE DOES NOT APPLY)

Council's Health & Regulatory Services recently received advice regarding receptacle/guttering (cross out whichever is not applicable) located at the abovementioned property which is likely to become a breeding ground for mosquitoes. Subsequently, Council's Environmental Health Officer has investigated the matter and has confirmed that the water located in the (state whether receptacle or roof guttering etc.) is a public health risk and is in breach of the Public Health Act 2005.

You are therefore required to remove the public health risk by undertaking the following within seven (7) days:

Completely empty all water from every (EHO state whether a bowl, bucket, flowerpot, tyres etc.) or other receptacle kept on the property so that the water is not, or is not likely to become, a breeding ground for mosquitoes.

Clean out and remove from all roof guttering, any obstruction including leaves, vegetation or other debris, to ensure all water drains away and is not, or is not likely to become, a breeding ground for mosquitoes.

A re-inspection will be carried out on or after the specified time to ensure compliance with the Public Health Act 2005. Failure to comply with the requirements of this correspondence may result in the issuing of a public health order.

If you require any further information, please contact Council's Environmental Health Department on 1300 696 272.

Yours faithfully

MJP Pitt

Chief Executive Officer

8.2.6 *Swimming pool alleged offender letter*

4 April 2014

Your Reference:

Our Reference:

587221

Business Name

Address

TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ACT 2005 – PUBLIC HEALTH RISK – SWIMMING POOL

Council's Health & Regulatory Services recently received advice regarding a swimming pool located at the abovementioned property which is likely to become a breeding ground for mosquitoes. Subsequently, Council Environmental Health Officer's have investigated the matter and confirmed that the swimming pool is a potential public health risk and is in breach of the Public Health Act 2005.

You are therefore required to remove the public health risk by undertaking one (1) or more of the following actions within fourteen (14) days:

Clean the pool (including the pool pump and equipment); and maintain as such so that the water quality is kept at a suitable level for swimming. Water in private swimming pools should have a free range chlorine content of between 0.25ppm and 0.75ppm and a pH range of 7.5 – 8.0;

Take measures to prevent the accumulation of stagnant water and organic material in the pool;

Ensure that the pool, if in use, is filled to the appropriate level, filtered and treated using commercial preparations to control the algae and ensure that mosquitoes can not breed; OR

Keep the water stocked with mosquito-larvae-destroying fish.

A reinspection will be carried out on or after the specified time to ensure compliance with the Public Health Act 2005. Failure to comply with the requirements of this correspondence may result in the issuing of a public health order.

If you require any further information, please contact Council's Environmental Health Department on 1300 696 272.

Yours faithfully

MJP Pitt

Chief Executive Officer

8.2.7 PHO generic - (check penalty unit value)

4 April 2014

Your Reference:

Our Reference: 587225

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ORDER – PUBLIC HEALTH ACT 2005 – SECTION 23

TAKE NOTICE that under the provisions of the Public Health Act 2005 a Public Health Order is hereby issued to you <<offenders name>> as being responsible for a public health risk existing at the place described as <<real property description>> and situated at <<street address>>.

The nature of the public health risk identified at the place is (provide details of public health risk)

This is considered to be a public health risk by virtue of Section 11(1)(insert subsection) of the Act.

In order to remove or reduce the risk to public health from the public health risk, or prevent the risk to public health from recurring, you are required to take the following action:

- 1 Provide detailed specification of works.

DUE DATE FOR COMPLIANCE WITH THIS ORDER IS (DAY), (DATE) (YEAR)

Under Section 387 of the Act, an authorised person may, at reasonable times, enter the place to check whether this Order has been complied with. Procedures for entry of the place are set out under Section 392 of the Act.

As the recipient of a Public Health Order it is an offence not to comply with the Order, unless you have a reasonable excuse. This is punishable upon conviction with a fine not exceeding 200 penalty units (\$22, 000). Alternatively you may be issued with a penalty infringement notice of 5 penalty units (\$550) for an individual, or 25 penalty units (\$2750) for a corporation.

Notwithstanding any action that may be taken as described above, should you fail to comply with the requirements of this Public Health Order by the due date, one or more of the following courses of action may be taken to ensure compliance with the requirements of this Public Health Order:

Under Section 24 of the Act, Council may make application to a magistrates court for an enforcement order.

Under Section 388 of the Act, Council by its employees or agents may at reasonable times, enter the place to take steps stated in this Order. Procedures for entry of the place are set out under Section 393 of the Act. Any costs and expenses incurred, including interest accrued in exercising these powers, is recoverable from you as a debt or a charge over the land the subject of this Order. [Include this section only when the Order is issued to the owner of the subject land]

Further, in relation to a corporation, Section 448 of the Act provides that the executive officers of the corporation must ensure that it complies with the Act. If a corporation commits an offence against the Act, each of the

corporation's executive officers also commits an offence, namely the offence of failing to ensure the corporation complies with the Act, and is subject upon conviction to a penalty not exceeding 200 penalty units (\$22 000).

[Include this paragraph when the Order is issued to a Corporate entity including a Body Corporate]

If you require any further information, please contact Council's Environmental Health Department on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.8 PHO ponding water

4 April 2014

Your Reference:

Our Reference: 587228

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ORDER – PONDING WATER

TAKE NOTICE that under the provisions of the Public Health Act 2005 a Public Health Order is hereby issued to you <<insert offenders name>> as being responsible for a public health risk existing at the place described as <<insert real property description>> and situated at <<insert street address>>.

The nature of the public health risk identified at the place is that water is ponding on the land that is a breeding ground for designated pests, namely mosquitoes.

This is considered to be a public health risk by virtue of Section 11(1)(a)(i) of the Act.

In order to remove or reduce the risk to public health from the public health risk, or prevent the risk to public health from recurring, you are required to take the following action:

- 3 Ensure that all drains are at all times maintained and kept free from obstructions; and
- 4 Maintain the surface of the land at appropriate levels so that at all times water or other liquid does not accumulate on any portion of private property .

If the remedial action results in a change in level of your land, you may be required to make a development application for operational works before commencement of any work. For enquiries in this respect please contact Council's Infrastructure & Planning Section on 1300 883 699.

DUE DATE FOR COMPLIANCE WITH THIS ORDER IS (DAY) (DATE) (YEAR)

Under Section 387 of the Act, an authorised person may, at reasonable times, enter the place to check whether this Order has been complied with. Procedures for entry of the place are set out under Section 392 of the Act.

As the recipient of a Public Health Order it is an offence not to comply with the Order, unless you have a reasonable excuse. This is punishable upon conviction with a fine not exceeding 200 penalty units (\$22, 000). Alternatively you may be issued with a penalty infringement notice of 5 penalty units (\$550) for an individual, or 25 penalty units (\$2750) for a corporation.

Notwithstanding any action that may be taken as described above, should you fail to comply with the requirements of this Public Health Order by the due date, one or more of the following courses of action may be taken to ensure compliance with the requirements of this Public Health Order:

Under Section 24 of the Act, Council may make application to a magistrate's court for an enforcement order .

Under Section 388 of the Act, Council by its employees or agents may at reasonable times, enter the place to take steps stated in this Order. Procedures for entry of the place are set out under Section 393 of the Act. Any costs and expenses incurred, including interest accrued in exercising these powers, is recoverable from you as a debt or a charge over the land. [Include this section only when the Order is issued to the owner of the subject land]

Further, in relation to a corporation, Section 448 of the Act provides that the executive officers of the corporation must ensure that it complies with the Act. If a corporation commits an offence against the Act, each of the corporation's executive officers also commits an offence, namely the offence of failing to ensure the corporation complies with the Act, and is subject upon conviction to a penalty not exceeding 200 penalty units (\$20 000).

[Include this paragraph when the Order is issued to a corporate entity including a Body Corporate]

If you require any further information, please contact Council's Environmental Health Department on 1300 696 272

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.9 PHO Pool

24 April 2014

Your Reference:
Our Reference: 591990

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ORDER – POOL

TAKE NOTICE that under the provisions of the *Public Health Act 2005* a *Public Health Order* is hereby issued to you <<insert offenders name>> as being responsible for a *public health risk* existing at the place described as <<enter real property description>> and situated at <<insert street address>>.

The nature of the *public health risk* identified at the place is water located in the swimming pool is a breeding ground for designated pests, namely mosquitos. This is considered to be a *public health risk* by virtue of Section 11(1)(a)(i) of the Act.

In order to remove or reduce the risk to public health from the *public health risk*, or prevent the risk to public health from recurring, you are required to take the following action:

Clean the pool (including the pool pump and equipment); and maintain as such so that the water quality is kept at a suitable level for swimming. Water in private swimming pools should have a free range chlorine content of between 0.25ppm and 0.75ppm and a pH range of 7.5 – 8.0;

Take measures to prevent the accumulation of stagnant water and organic material in the pool;

Ensure that the pool, if in use, is filled to the appropriate level, filtered and treated using commercial preparations to control the algae and ensure that mosquitoes can not breed; OR

Keep the water stocked with mosquito-larvae-destroying fish.

DUE DATE FOR COMPLIANCE WITH THIS ORDER IS (DAY), (DATE) (YEAR)

Under Section 387 of the Act, an authorised person may, at reasonable times, enter the place to check whether this Order has been complied with. Procedures for entry of the place are set out under Section 392 of the Act.

As the recipient of a *Public Health Order* it is an offence not to comply with the Order, unless you have a reasonable excuse. This is punishable upon conviction with a fine not exceeding 200 penalty units (\$22, 000). Alternatively you may be issued with a penalty infringement notice of 5 penalty units (\$550) for an individual, or 25 penalty units (\$2750) for a corporation.

Notwithstanding any action that may be taken as described above, should you fail to comply with the requirements of this *Public Health Order* by the due date, one or more of the following courses of action may be taken to ensure compliance with the requirements of this *Public Health Order*:

Under Section 24 of the Act, Council may make application to a magistrates court for an *enforcement order* .

Under Section 388 of the Act, Council by its employees or agents may at reasonable times, enter the place to take steps stated in this Order. Procedures for entry of the place are set out under Section 393 of the Act. Any costs and expenses incurred, including interest accrued in exercising these powers, is recoverable from you as a debt or a charge over the land the subject of this Order. **[Include this section only when the Order is issued to the owner of the subject land]**

Further, in relation to a corporation, Section 448 of the Act provides that the executive officers of the corporation must ensure that it complies with the Act. If a corporation commits an offence against the Act, each of the corporation's executive officers also commits an offence, namely the offence of failing to ensure the corporation complies with the Act, and is subject upon conviction to a penalty not exceeding 200 penalty units (\$22 000).

[Include this paragraph when the Order is issued to a Corporate entity including a Body Corporate]

Should you have any queries regarding this matter please do not hesitate to contact Council's Environmental Health Department, at the Gayndah office or by phone on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.10 PHO Rainwater Tank

24 April 2014

Your Reference:

Our Reference:

591992

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ORDER – RAINWATER

TAKE NOTICE that under the provisions of the Public Health Act 2005 a Public Health Order is hereby issued to you <<insert offenders name>> as being responsible for a public health risk existing at the place described as <<insert real property description>> and situated at <<insert street address>>.

The nature of the public health risk identified at the place is that the mosquito-proof screens and/or flap valve to the rainwater tank are defective, which is a breeding ground for mosquitoes.

This is considered to be a public health risk by virtue of Section 11(1)(a)(i) of the Act.

In order to remove or reduce the risk to public health from the public health risk, or prevent the risk to public health from recurring, you are required to take the following action:

- 1 Repair or replace all mosquito-proof screens and/or flap valve to the relevant tank to ensure that every opening of the tank prevents the ingress of mosquitoes into the tank.
- 2 Mosquito proof screens and flap valves are to comply with the provisions of PART 1A Division 3 of the Public Health Regulation 2005, as follows:
 - a Mosquito-proof screens that -
 - i are made of brass, copper, aluminum or stainless steel gauze; and
 - ii have a mesh size of not more than 1mm; and
 - iii are installed in a way that does not cause or accelerate corrosion; and
 - iv stop mosquitoes passing through the openings; or
 - b flap valves that when closed, stop mosquitoes passing through the openings.

DUE DATE FOR COMPLIANCE WITH THIS ORDER IS DAY DATE YEAR

Under Section 387 of the Act, an authorised person may, at reasonable times, enter the place to check whether this Order has been complied with. Procedures for entry of the place are set out under Section 392 of the Act.

As the recipient of a Public Health Order it is an offence not to comply with the Order, unless you have a reasonable excuse. This is punishable upon conviction with a fine not exceeding 200 penalty units (\$22, 000). Alternatively you may be issued with a penalty infringement notice of five (5) penalty units (\$550) for an individual, or 25 penalty units (\$2750) for a corporation.

Notwithstanding any action that may be taken as described above, should you fail to comply with the requirements of this Public Health Order by the due date, one or more of the following courses of action may be taken to ensure compliance with the requirements of this Public Health Order:

- Under Section 24 of the Act, Council may make application to a magistrate's court for an enforcement order.
- Under Section 388 of the Act, Council by its employees or agents may at reasonable times, enter the place to take steps stated in this Order. Procedures for entry of the place are set out under Section 393 of the Act. Any costs and expenses incurred, including interest accrued in exercising these powers, is recoverable from you as a debt or a charge over the land the subject of this Order. [Include this section only when the Order is issued to the owner of the subject land]

Further, in relation to a corporation, Section 448 of the Act provides that the executive officers of the corporation must ensure that it complies with the Act. If a corporation commits an offence against the Act, each of the corporation's executive officers also commits an offence, namely the offence of failing to ensure the corporation complies with the Act, and is subject upon conviction to a penalty not exceeding 200 penalty units (\$22 000).

[Include this paragraph when the Order is issued to a Corporate entity including a Body Corporate]

Should you have any queries regarding this matter please do not hesitate to contact Council's Environmental Health Department, at the Gayndah office or by phone on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.11 PHO Receptacle/ guttering

24 April 2014

Your Reference:
Our Reference: 591992

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: PUBLIC HEALTH ORDER – RECEPTACLE/GUTTERING

TAKE NOTICE that under the provisions of the *Public Health Act 2005* a *Public Health Order* is hereby issued to you <<offenders name>> as being responsible for a *public health risk* existing at the place described as <<insert real property description>> and situated at <<insert street address>>.

The nature of the *public health risk* identified at the place is <<deleting as required>>

Receptacles are being kept at the place, namely **(EHO state whether a bowl, bucket, flowerpot, tyres etc.)** which area breeding ground for designated pests, namely mosquitoes.

Roof guttering at the place is ponding water which is a breeding ground for designated pests, namely mosquitoes.

This is considered to be a *public health risk* by virtue of Section 11(1)(a)(i) of the Act.

In order to remove or reduce the risk to public health from the *public health risk*, or prevent the risk to public health from recurring, you are required to take the following action:

Empty and dispose of any receptacle holding water if the item is no longer required;

Completely empty all water from every **(EHO state whether a bowl, bucket, flowerpot, tyres etc.)** or other receptacle kept at the place so that the water is not a breeding ground for mosquitoes. The receptacle should also be wiped clean to remove any mosquito eggs;

Clean out and remove from all roof guttering, any obstruction including leaves, vegetation or other debris, to ensure all water drains away and is not a breeding ground for mosquitoes.

DUE DATE FOR COMPLIANCE WITH THIS ORDER IS (DAY), (DATE) (YEAR)

Under Section 387 of the Act, an authorised person may, at reasonable times, enter the place to check whether this Order has been complied with. Procedures for entry of the place are set out under Section 392 of the Act.

As the recipient of a *Public Health Order* it is an offence not to comply with the Order, unless you have a reasonable excuse. This is punishable upon conviction with a fine not exceeding 200 penalty units (\$22, 000). Alternatively you may be issued with a penalty infringement notice of 5 penalty units (\$550) for an individual, or 25 penalty units (\$2750) for a corporation.

Notwithstanding any action that may be taken as described above, should you fail to comply with the requirements of this *Public Health Order* by the due date, one or more of the following courses of action may be taken to ensure compliance with the requirements of this *Public Health Order*:

Under Section 24 of the Act, Council may make application to a magistrate's court for an *enforcement order*.

Under Section 388 of the Act, Council by its employees or agents may at reasonable times, enter the place to take steps stated in this Order. Procedures for entry of the place are set out under Section 393 of the Act. Any costs and expenses incurred, including interest accrued in exercising these powers, is recoverable from you as a debt or a charge over the land the subject of this Order. [Include this section only when the Order is issued to the owner of the subject land]

Further, in relation to a corporation, Section 448 of the Act provides that the executive officers of the corporation must ensure that it complies with the Act. If a corporation commits an offence against the Act, each of the corporation's executive officers also commits an offence, namely the offence of failing to ensure the corporation complies with the Act, and is subject upon conviction to a penalty not exceeding 200 penalty units (\$22 000).

[Include this paragraph when the Order is issued to a corporate entity including a Body Corporate]

Should you have any queries regarding this matter please do not hesitate to contact Council's Environmental Health Department, at the Gayndah office or by phone on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.12 Notice of Entry

24 April 2014

Your Reference:
Our Reference: 592007

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: NOTICE OF ENTRY

Public Health Act 2005
Sections 392(5) and 393(7)

TAKE NOTICE that under the provisions of the *Public Health Act 2005* a *Notice of Entry* is hereby issued to you in relation to the issuing of a *Public Health Order* on(insert order date) for a *public health risk* at the place described as (EHO insert real property description) and situated at (EHO insert street address).

While exercising powers under the Act you were unable to be located, and entry to the above place was gained by an authorised person to take steps required under the *Public Health Order*, namely:

(EHO Provide details of steps taken to reduce public health risk – should be the same as wording stated in 'Notice of Intention to Enter a Place')

The time and date of entry was

If you require any further information, please contact Council's

Should you have any queries regarding this matter please do not hesitate to contact Council's Environmental Health Department, at the Gayndah office or by phone on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.13 Notice Intention to Enter

Your Reference:
Our Reference: 592008

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: NOTICE OF INTENTION TO ENTER A PLACE

**Public Health Act 2005
Sections 393(2) and 393(3)**

TAKE NOTICE that under the provisions of the *Public Health Act 2005* a *Notice of Intention to Enter a Place* is hereby issued to you(EHO insert owner/occupiers name - notice to be issued to both, unless the occupier is the owner) in relation to the issuing of a *Public Health Order* for a *public health risk* at the place described as (EHO insert real property description) and situated at (EHO insert street address). The *Public Health Order* was issued by Council on(insert order date), a copy of which is attached to this Notice. **(EHO attach copy of Order)**

The *public health order* required(insert the name of the person who the Order was issued to) to take steps at the place to remove or reduce the risk to public health from the *public health risk*, or prevent the risk to public health from recurring. It is evident that the requirements of the *Public Health Order* have not been complied with, in that a *public health risk* still exists at the place.

FURTHER TAKE NOTICE that the Council, by its employees or agents, intends to enter the place to take the following steps, as required under the *Public Health Order*:

Treat the water contained in the in-ground swimming pool with an approved mosquito larvicide, namely *ProLink XR* Residual Briquets. Three (3) briquets will be placed into the in-ground swimming pool. This treatment is intended to control mosquito growth for up to six (6) months.

It is intended that entry to the place will be carried out on(insert date) at(insert time).

Should you have any queries regarding this matter please do not hesitate to contact Council's Environmental Health Department, at the Gayndah office or by phone on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

8.2.14 Letter Container breeding monitoring site

24 April 2014

Your Reference:

Our Reference: 592009

Business Name
Address
TOWN STATE PC

Dear Sir/ Madam

RE: MOSQUITO MONITORING

As part of North Burnett Regional Council's commitment to supporting preventative public health programs; we are endeavoring to set up mosquito monitoring sites around our region in order to minimize the community exposure to potential health risks

With this in mind, we are requesting your assistance in allowing us to place mosquito monitoring equipment on your property. This will be monitored by an officer of Council every 7-14 days depending on the season. The officer will simply collect the water from the trap and take it away for further monitoring for mosquito breeding. We ask that the trap not be disturbed and for permission to access the monitoring equipment in your absence (consent form to be signed).

Should you have any queries regarding this matter please do not hesitate to contact Council's Environmental Health Department, at the Gayndah office or by phone on 1300 696 272.

Yours faithfully

MJP Pitt
Chief Executive Officer

PART F ACTION PROGRAMS

Action 1 Operations

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Control methods	Ground based applications for Groundwater/freshwater/polluted water	The majority of the proposed program will involve this depending on seasonal demands. Larviciding is recognised as the most efficient method of control. It is envisaged that a pre- treatment program of Methoprene briquettes, pellets or sand distribution in areas that may be affected by rainfall.	<ul style="list-style-type: none"> ➤ <i>Identify breeding sites</i> ➤ <i>Identify resting sites</i> ➤ <i>Initiate and review ground based control methods.</i> ➤ <i>Identify treatment areas.</i> ➤ <i>Initiate and review all ground based activities.</i> ➤ <i>Vector Task Calendar to be developed and implemented.</i> 	MES, EHO, NRMO,LPO & EHO cadet	Within 18 months
	Ground based applications for container/urban breeding	Undertaken as part of the current surveillance program to establish and identify the presence of container breeding mosquitoes such as <i>Aedes aegypti</i> . Review the benefits of the program as required.	<ul style="list-style-type: none"> ➤ <i>Ovi trapping will always remain as an option for dengue response and for the program in general.</i> ➤ <i>Investigate the need for a routine monitoring sites over the summer months using either BGs or GAT traps</i> 	MES, EHO, NRMO,LPO & EHO cadet	Within 18 months

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Control Methods continued.	Aerial applications	Have it set up as an alternative should the need to utilize such an application be required.	<ul style="list-style-type: none"> ➤ <i>Aerial application for mosquito control is an expensive exercise however it is often recognised as an essential part of a treatment program and is known to produce significant results.</i> ➤ <i>Council would have to establish a good working relationship with the helicopter/light plane operator/company to establish possible treatment</i> 	MES, EHO, NRMO,LPO & EHO cadet	Within 18 months
	Adulticiding	Adult mosquito, black fly and midge control would most likely be achieved through the use of foggers or ULV applicators. Adulticiding would be carried out early morning, low winds in densely vegetated known harbourage sites. Usually undertaken during the late spring and Summer months. It should be noted that this type of treatment will have some impact on non-target species.	<ul style="list-style-type: none"> ➤ <i>Identify suitable areas for adulticiding treatments.</i> ➤ <i>Monitor light trap numbers to identify adult mosquito activity.</i> 	MES, EHO, NRMO,LPO & EHO cadet	Within 18 months

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Control Methods Continued	Barrier Treatments	This treatment can be used to reduce the impact of both mosquito, black fly and midge. Treatment should only be undertaken where there is a suitable barrier. It should be noted that this type of treatment will have some impact on non-target species.	<ul style="list-style-type: none"> ➤ <i>Identify possible locations where barrier treatments may be effective against mosquito, black fly and/or biting midge</i> ➤ <i>Determine the most efficient method of providing this service on both Council, State and private land</i> ➤ <i>Investigate suitable locations for the introduction of barriers</i> 	MES, EHO, NRMO, LPO & EHO cadet	Within 18 Months
Monitoring program	Light trapping	Allows Council to identify mosquito numbers and species found within the region?	<ul style="list-style-type: none"> ➤ <i>Initiate light trapping program.</i> ➤ <i>Identify routine trapping locations.</i> ➤ <i>Ensure target areas are monitored as required.</i> ➤ <i>Determine frequency and duration of trapping program.</i> ➤ <i>Integrate data into a treatment program.</i> 	LPO & EHO cadet	Conduct weekly light trapping from at least 4 sites from October to April each year.
	Pre/post dipping	Pre/post dipping is an important part of the treatment program to assist in determining mortality rate/efficacy.	<ul style="list-style-type: none"> ➤ <i>Collect and record data to determine appropriate response.</i> 	LPO & EHO Cadet	Within 12 months

Action 2 Data Collection

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Site Identification and characteristics	Breeding Site Identification and characteristics	The mosquito breeding areas of the region are numerous and varied. Breeding occurs in temporary ground pools and permanent water bodies.	<ul style="list-style-type: none"> ➤ <i>Site identification process to be initiated.</i> ➤ <i>Site identification to be incorporated with the mapping of the breeding sites.</i> 	MES, EHO, NRMO, LPO & EHO cadet	Within 18 months
GIS integration	Mapping Known Breeding Sites	Breeding sites and treatment areas are yet to be loaded onto Council's mapping system.	<ul style="list-style-type: none"> ➤ <i>Creation of a layer in Councils mapping system for mosquito related information</i> ➤ <i>Incorporate treatment data into the mapping system e.g. Pre-</i> 	MES, EHO, NRMO, LPO & EHO cadet	Within 18 months
Records	Surveillance, Response and Treatment data	<p>Identify necessary data for recording e.g. chemical application, Met. Bureau data and how the information will be recorded.</p> <p>A simple system that is easy to access and maintain should be implemented.</p>	<ul style="list-style-type: none"> ➤ <i>Continue to improve data recording systems.</i> 	MES, EHO, NRMO, LPO & EHO cadet	Ongoing

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Annual Reports	All details relating to the Mosquito Management Program	Identify what information is needed and how it should be presented.	<ul style="list-style-type: none"> ➤ <i>Identify any season highlights</i> ➤ <i>Provide an overview of climate and rainfall data,</i> ➤ <i>Larval Monitoring and Treatment</i> ➤ <i>Adult Monitoring and Light Traps</i> ➤ <i>Complaint Monitoring</i> ➤ <i>Specific Township Activities</i> ➤ <i>Mosquito Breeding Areas</i> ➤ <i>Mosquito Management Plan</i> ➤ <i>Future Opportunities</i> ➤ <i>Community Awareness and</i> 	MES, EHO, NRMO, LPO & EHO cadet	Within 12 months

Action 3 Competencies

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Staff training	Mosquito Training	Identify staff needs and available training.	<ul style="list-style-type: none"> ➤ Ensure relevant staff can access ID and mosquito management courses e.g. MOZ01 course. ➤ Ensure that all staff undertaking treatment is appropriately Licensed. ➤ Ensure all staff is provided with in-house training on mosquito management aspects where practicable. 	MES, EHO, NRMO, LPO & EHO cadet	Within 18 months
	First Aid	Identify training as determined by program requirements.	<ul style="list-style-type: none"> ➤ Ensure all staff has access to first aid training. 	MES, EHO, WH&S, NRMO, LPO & EHO cadet	Within 12 months
	Vehicle/Driver Safety Courses	Presently staff undertake necessary training as determined by program requirements.	<ul style="list-style-type: none"> ➤ Ensure staff have access to 4WD ➤ Quad bike training. ➤ Ensure staff has access to driver safety courses. 	MES, EHO, WH&S, NRMO, LPO & EHO cadet	Within 12 months
	Other Licences and Permits	Staff are required to hold any licence, permit or authority to safely undertake their duties.	<ul style="list-style-type: none"> ➤ Ensure staff have access to required training e.g. Manual handling, Forklift licence etc. ➤ Identify and develop further training requirements 	MES, EHO, WH&S, NRMO, LPO & EHO cadet	Within 12 months
Pest Management Technician Licences	Pest Management Technician Licences	Relevant staff are required to hold a current Pest Management Technician Licence.	<ul style="list-style-type: none"> ➤ Ensure all relevant staff have current Pest Management Technicians Licences. Assistance will be provided where required. 	MES, EHO, WH&S, NRMO, LPO & EHO cadet	Within 12 months

Action 4 Program Performance Review

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Legislative compliance	LGAQ – Mosquito Management Code of Practice Pest Management Technician Licences Public Health Act 2005	Continue to evolve the Mosquito Management Plan to ensure compliance with relevant legislation.	<ul style="list-style-type: none"> ➤ <i>Operate under the principles outlined in the Mosquito, Black Fly & Biting Midge Management Plan.</i> ➤ <i>Produce and operate in accordance with - Work Procedures and Instructions and the Mosquito Management Plan.</i> ➤ <i>Comply with relevant statutory legislation.</i> ➤ <i>Produce and comply with a Public</i> 	MES, EHO, NRMO, LPO & EHO cadet	Within 18 months
Budget controls	Plant and equipment	Identify plant needs. Identify sections that have suitable plant and determine if these can be used by the Mosquito Control Unit. Future budgets to include provisions for suitable plant.	<ul style="list-style-type: none"> ➤ <i>Ensure continued review of plant adequacy. Specific plant and equipment to be replaced regularly.</i> ➤ <i>Ensure laboratory instruments are adequately maintained e.g. Microscopes, microscope camera.</i> ➤ <i>Undertake an annual plant review.</i> 	MES, EHO, NRMO, LPO & EHO cadet	Ongoing

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Budget Controls Continued	Larviciding Program	Undertake larviciding treatments as required.	<ul style="list-style-type: none"> ➤ <i>Utilise larviciding as an integral part of the mosquito program where necessary</i> 	LPO & EHO cadet	
	Pesticides	Pesticides are provided for the treatment program within current resources.	<ul style="list-style-type: none"> ➤ <i>Identify chemical stock needs and quantities to be held and acquire as necessary to deal with routine and emergency situations.</i> ➤ <i>Identify areas of improvement within the program including operational efficiencies and addition of further treatment sites will demand more pesticides.</i> 	MES, EHO, NRMO, LPO & EHO cadet	Within 12 months
	Promotional Brochures	Environmental Health Section has developed information brochures on numerous topics including Mosquito Management and dengue awareness.	<ul style="list-style-type: none"> ➤ <i>Continue to provide information brochures on Council's vector control program.</i> ➤ <i>Develop additional information as the need is identified.</i> ➤ <i>Review information, including documents sourced from Queensland Health prior to each season</i> ➤ <i>Provision of ongoing funding, within the sections awareness program.</i> 	MES, EHO, NRMO, LPO & EHO cadet	Within 18 months
Management Plan	Review & Evaluation	Continue to review and evaluate the Mosquito Management Plan to ensure compliance with relevant legislation and best practice.	<ul style="list-style-type: none"> ➤ <i>Undertake a review and evaluation of the Mosquito management Plan</i> ➤ <i>Undertake a review and evaluate Standard operating procedures</i> ➤ <i>Undertake a review and evaluation of operational guidelines.</i> 	MES, EHO, NRMO, LPO & EHO cadet	Minimum of every 3 years.

Action 5 Community Awareness

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Awareness and Education	Website	Council's website contains only a minimum amount of information on Vector, Black Flies & Biting Midge Management mainly mosquitoes.	<ul style="list-style-type: none"> ➤ <i>Environmental Health section continue to try and increase public awareness by making information readily available via the NBRC website and social media.</i> 	MES, EHO & NRMO	Ongoing
	Promotional Material	Council provides promotional material in several formats including brochures/handouts and on their website and other social media forums.	<ul style="list-style-type: none"> ➤ <i>Continue to provide promotional material in all formats.</i> ➤ <i>Increase public awareness of personal responsibilities.</i> 	MES, EHO & NRMO	Ongoing
Paid media advertising	Paid Media advertising.	Major stakeholders in Mary Burnett Vector Management Group Public awareness focusing on <i>Aedes aegypti</i> mosquito and Dengue fever prevention.	<ul style="list-style-type: none"> ➤ <i>Ensure continued participation in this beneficial committee.</i> ➤ <i>Further develop North Burnett Regional Council's proactive mosquito awareness campaign e.g. TV/radio advertising, promotional materials etc.</i> 	MES, EHO & NRMO	Ongoing
Media Releases	Media releases through all relevant local press outlets	Utilise media releases to promote Vector disease awareness throughout the community.	<ul style="list-style-type: none"> ➤ <i>Ensure a number of media releases occur each year.</i> 	MES, EHO & NRMO	Ongoing

Action 6 Stakeholders

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
Local Government Authorities	Fraser Coast Regional Council Bundaberg Regional Council Gladstone Regional Council Gympie Regional Council South Burnett Regional Council	Fraser Coast, Bundaberg and Gympie Regional Councils are members of the Mary Burnett Vector Management Group (MBVMG) which meets quarterly. Information and resources are shared between these Councils Gladstone Regional Council and South Burnett Regional Council both share a boundary with NBRC.	<ul style="list-style-type: none"> ➤ <i>Maintain communication and relationship with MBVMG</i> ➤ <i>Establish communication and formalise relationship with Gladstone and South Burnett Regional Councils.</i> ➤ <i>Liaise with other Council department e.g. Engineering and Natural Resources</i> 	MES	Ongoing
Other Organisations	Sunwater Main Roads Burnett Mary Regional Group Burnett Catchment Care Association	Sunwater provides irrigation throughout the region Road side drainage issues	<ul style="list-style-type: none"> ➤ <i>Establish communication; and formalise a relationship with Sunwater. Investigate research breeding in Sunwater irrigation channels</i> ➤ <i>Establish communication channels with Main Roads</i> ➤ <i>Establish communication with local catchment care groups.</i> 	MES	Within 12 months

Scope	Inclusions	Present	Actions	Accountability	Performance Outcomes
State & Federal Bodies	<p>Department of Environment & Heritage Protection (EHP)</p> <p>Queensland Health</p>	<p>No formal lines of communication</p> <p>QLD Health is a member of the MBVMG and a good working relationship has been fostered</p>	<ul style="list-style-type: none"> ➤ <i>Establish communication and formalise relationships with EHP</i> ➤ <i>Maintain communication and relationship with QLD Health</i> 	MES	Ongoing