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Biting Insects Management Plan

Wellard's Darwin Integrated Live Export Facility

Report Number 23919.80026



Prepared for



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Table of Contents

1.	Introduction	1
1.1	Objectives	1
1.2	Document review	1
2.	Management of potential breeding grounds	2
2.1	Biting insect breeding grounds	2
2.2	Site and area description	2
3.	Implementation of the Biting Insects Management Plan	6
3.1	Prevention	6
3.2	Control	6
3.3	Monitoring	7
3.4	Reporting	8
3.5	Roles and responsibilities	8
3.6	Training and induction	8
4.	References	9
5.	Appendices	10

List of Tables

Table 1	Responsibilities under the BIMP	8
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List of Figures

Figure 1	Site plan including the immediate area around the property	4
Figure 2	Detailed site plan	5
Figure 3	Mosquito larvae (left) and mosquito pupae (right) live in standing water	A-2
Figure 4	Adult male mosquitoes feed on and live in vegetation	A-2

List of Appendices

Appendix A.	Mosquito monitoring program	A-1
Appendix B.	Potential biting insect species	B-1
Appendix C.	Management forms	C-1

1. Introduction

This Biting Insects Management Plan (BIMP) has been prepared to assist identification and management of issues and risks associated with biting insects during the operational phase of the Darwin Integrated Live Export Facility, 2658 Stuart Highway, Livingstone Northern Territory (NT) 0822. A BIMP will assist the landowner to meet any requirements under the following legislation:

- NT Public and Environmental Health Act and Regulations; and
- NT Workplace Health and Safety Act.

Under the Public and Environmental Health Regulations, an owner or occupier of a place, commits an offence if:

- There is water at the place and the water is, or may become, a mosquito breeding ground; or
- A circumstance exists at the place that may result in the accumulation of water; and if water were to accumulate it may become a mosquito breeding ground.

In addition, the BIMP will assist the land owner to adhere to the following issued guidelines:

- Mosquito breeding and sewage pond treatment in the Northern Territory (Warchot & Whelan, 2009); and,
- Constructed wetlands in the Northern Territory – Guidelines to prevent mosquito breeding (Warchot & Whelan, 2008).

1.1 Objectives

This BIMP aims to assist Wellard Rural Exports Pty Ltd to:

- Ensure that biting insect control practices are implemented to prevent the occurrence of breeding sites and deter adult biting insects onsite;
- Inform all personnel onsite about health and safety guidelines with regards to biting insects and the diseases they carry;
- Monitor the effectiveness of implemented control measures;
- Set and achieve insect management and monitoring goals; and,
- Report progress to local and state governments if required.

1.2 Document review

This BIMP applies current management practices, guidelines and policies and will be reviewed annually and when circumstances change that may affect the content of this plan.

2. Management of potential breeding grounds

2.1 Biting insect breeding grounds

The main biting insects that carry disease in Australia are flies, ticks and mites. Biting flies carry a range of disease causing viruses and bacteria in the NT, including Bovine Ephemeral Fever, Murray Valley Encephalitis Virus, Kunjin Virus, Japanese Encephalitis Virus, Ross River Virus and Barmah Forest Virus. Cattle ticks (*Boophilus microplus*) are of high importance to the livestock industry as they carry parasites such as *Babesia bovis*, *Babesia bigemina* and *Anaplasma marginale* that can result in tick fever and anaplasmosis. As well as these viruses, biting insects can affect livestock through serious blood loss and secondary infection through skin lesions (DPIF, 2009).

The biting flies of greatest significance for livestock and the people living around livestock industries in the NT are the mosquitoes (family Culicidae), biting midges (family Ceratopogonidae), and buffalo flies (*Haematobia irritans*).

Of these, mosquitoes are considered to be the most important (Whelan & Van Den Hurk, 2003). Female mosquitoes may lay a batch of 50-200 eggs every 48-96 hours dependent on species and temperatures. Wastewater and treated wastewater effluent have been identified as major artificial sources of mosquitoes near urban areas in the Northern Territory (Warchot & Whelan, 2009). Different mosquito species have varied breeding ground preferences. However, all species require standing water to lay eggs in, as their larval and pupal stages are aquatic. Adult mosquitoes require plants as they feed on nectar and plant fluids and adult females require a blood supply to produce eggs for reproduction (Whelan, 2010). In other words, if there is no water and no blood supply, mosquitoes should not be a problem.

As with mosquitoes, female buffalo flies require a blood meal for egg development, whilst males feed on nectar and plant juices. However, their larval and pupal development relies on the presence of manure or damp plant material. This means that manure, feed and hay will need to be disturbed regularly and moisture levels will have to be managed dutifully to ensure that larvae cannot develop.

Biting midges have a range of larval habitat preferences that overlap with that of mosquitoes and other flies, including freshwater pond margins (*Culicoides marksii*) and wet soils with a high content of animal wastes (*Culicoides brevitarsis*) (Whelan & Van Den Hurk, 2003). As a result, control measures for mosquitoes and buffalo flies should be adequate for biting midge prevention and control.

Tick nymphs hatch from eggs in grass and spend up to 9 months in this non-parasitic phase depending on temperature and humidity. Once an animal is found, ticks spend 18 – 35 days of their life on the animal consuming blood. Whilst grass will not be completely removed from the site, removing the blood supply by way of insecticides or repellents, will reduce the incidence of this biting insect onsite.

Species relevant to this area, their preferred habitat and disease potential (for humans and cattle) are listed in Appendix B.

2.2 Site and area description

The surrounding area is predominantly farm land, with one close neighbour to the south, which is the AA Co. meat processing facility. This property also has a swamp area, which may contribute to the mosquito population. However, regular monitoring of the ILEF's ponds and irrigation block will rule out this site as a biting insect breeding site.

The ILEF has several water and manure storage facilities that are important to this BIMP, including a primary wastewater pond, wet weather storage dam and a freshwater runoff dam in the north-western corner, as well as a freshwater supply turkey's nest for storage of bore and rain water in the centre of the property (Figure 2). Above ground drainage lines also run along the northern and eastern borders of the property, which are sloped towards the freshwater dam. Sedimentation basins run from the pens to the primary wastewater pond, precipitating the manure and sediment from the liquids for separate treatments. The treated wastewater will be used to irrigate the irrigation block on the eastern side of the property. The precipitated manure is transferred to the compost manure pad.

2.2.1 *Primary wastewater pond, wet weather storage dam and freshwater runoff dam*

All ponds will have compacted clay lining and where required a HDPE synthetic liner placed around the inner batter to prevent vegetation growth. All ponds will possess batters with a 33 degree angle and include a crest that can be accessed by a body truck so that sludges can be removed using a vacuum pump and/or front end loader. All Ponds will be 3-8 m deep, with an additional 0.75 m dead/storage space, and are designed for rapid dewatering.

In addition, the primary treatment pond will be constructed so that it is cut below the natural surface and will have an embankment of about 2-3m above the surface. The pond lining will be further “reinforced” to prevent lining ‘push out’ by the subsurface flow. Further, to reduce the risk of structural failure of the inner embankment and floor, a rock armouring will be implemented to improve stability during periods of heightened transient groundwater flow. Compacted material under the clay liner will undergo stability treatment. A piezometer should be placed above and below the pond to monitor shallow groundwater depth and quality and to function as an early warning leak detection system.

2.2.2 *Sedimentation basins*

A concrete lined shallow sedimentation system will discharge waste from the livestock pens to a common sedimentation basin. The concrete sedimentation basin will be cleaned out regularly with a frontend loader. The sedimentation basin is clay lined and armoured, and is terraced to slow flows and capture manure fines. This system will discharge to the primary wastewater pond.

2.2.3 *Drainage lines*

The drainage lines are trapezoid open channels sloped towards the ponds at >0.5% to eliminate ponding. They are grass lined and suitable for slasher access.

2.2.4 *Irrigation block*

The irrigation block is watered with effluent from the treatment pond via lateral mover irrigator fitted with drip lines.

2.2.5 *Compost pad*

Manure from the pens, sludge from the sedimentation basins and waste and spoilt feed from the feedmill will regularly be collected and transported to the compost manure pad. This pad will be windrowed and turned regularly for aeration, moisture and temperature control. This will increase the speed of composting and ensure optimal moisture levels.

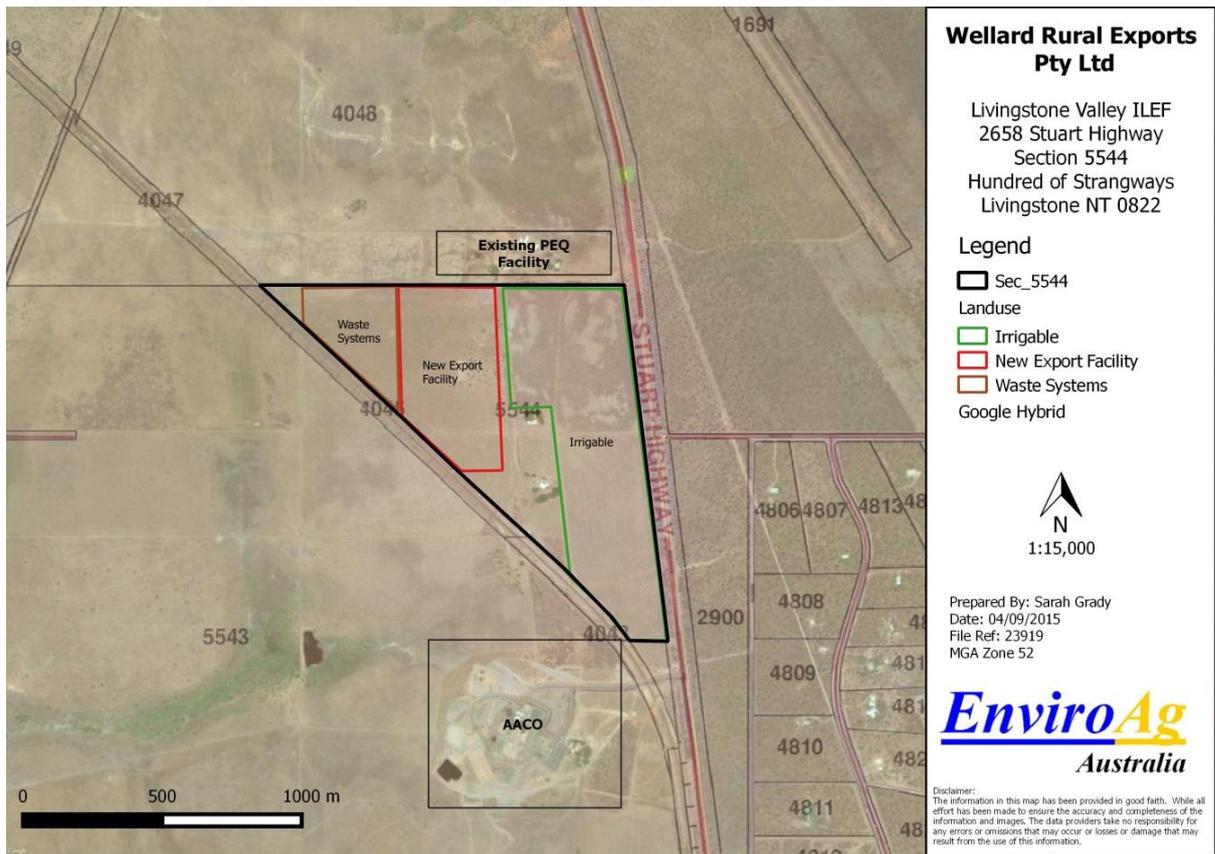


Figure 1 Site plan including the immediate area around the property



Figure 2 Detailed site plan

3. Implementation of the Biting Insects Management Plan

3.1 Prevention

This section outlines procedures required to make the site “undesirable” to biting insects based on guidelines provided by the NT Department of Health and Families (Warchot & Whelan, 2009).

To achieve this:

- Upon entry to the site, livestock will be back-lined with an insecticide to remove them as a blood source for female biting insects;
- Any ponds, dams, drains, sediment traps, bunded areas and on-site excavations filled with water will be inspected for the presence of mosquito/biting midge larvae weekly (methods described in Appendix A). If larvae/pupae are detected, control measures as outlined in Section 3.2 will be undertaken;
- Ponds, dams and other water holding structures will be maintained appropriately to minimise the potential for mosquito breeding. This includes slashing of grass and vegetation near ponds and along the top rims of the ponds to reduce food for adult biting insects;
- Any depressions created in the ground surface (e.g. pot holes, uneven ground in the irrigation block/pens), where possible, will be filled or drained to prevent the ponding of water;
- All drainage channels will be slashed regularly;
- Wastewater treatment ponds will be emptied promptly after storm events to prevent overflow and long-term ponding;
- Manure and other stockpiles will be placed in areas that do not impede drainage and will be shaped to prevent ponding;
- Manure will be turned regularly to disturb any larvae and reduce moisture levels within the windrows;
- If the irrigation area is saturated or if for any reason the ponds/dams cannot be emptied (e.g. pump failure), a larval insect control, such as Altosid (methoprene) will be applied to the ponds to ensure adult mosquitoes do not emerge. Altosid is not harmful to mammals or waterfowl and prevents larvae from maturing into adult mosquitoes. This does not kill larvae, but pupae should be sampled and emergence inhibition monitored;
- Wash-down areas will be controlled to prevent sediment and debris blocking drains and forming standing water pools around the site;
- All staff will be educated to be especially vigilant during the high mosquito borne disease risk periods (late dry to post wet) through the use of long sleeved shirts and trousers and the regular use of insect repellent. Insect repellent will be provided at work sites; and,
- Staff will be educated about the early symptoms associated with exposure to mosquito borne diseases and will be instructed on the need to report any symptoms to a medical officer.

3.2 Control

If biting insects are identified onsite, the Livestock Officer will be informed and the following details will be recorded in the biting insect register:

- Date and time;
- Type of biting insect found;
- Where the insects were found; and,
- Size of infestation (i.e.: how many insects).

The following control methods may be undertaken depending on the location of infestation.

Primary wastewater pond/ wet weather storage ponds:

- Emergency supply of lime is available next to ponds for infestations. Application of lime to the ponds will increase the pH of the water to a level unsuitable for larval growth.
- Pond can be drained and sediment at the bottom of the pond collected and placed thinly on the manure stockpile to kill larvae and pupa.
- Chemical treatment (Altosid) can be used in an emergency situation.

Fresh water runoff dam:

- Emptied by use of water through irrigation.
- Emergency supply of lime is available next to ponds for infestations. Application of lime to the ponds will increase the pH of the water to a level unsuitable for larval growth.
- Chemical treatment can be used in an emergency situation.

Sedimentation basins:

- Cleaned out with a frontend loader and spread thinly over the compost manure pad to dry out, desiccating larvae in manure.

Irrigation area:

- Land will be reformed to remove depressions to eliminate pooling.
- Lower irrigation rate will allow water to soak into soil and eliminate pooling.
- Use of drip lines to further reduce irrigation rate.

Compost manure pad:

- Compost/manure can be spread thinly over the compost manure pad to reduce moisture, desiccating larvae in manure.

Any significant mosquito activity will also be reported to the Northern Territory Medical Entomology Branch on (08) 8999 8901 prior to proceeding with any chemical eradication methods.

3.3 Monitoring

Any ponds, dams, drains, sediment traps, bunded areas and on-site excavations filled with water will be inspected for the presence of mosquito larvae weekly. The methods have been described in Appendix A and a Mosquito Monitoring Form will need to be completed and kept by the Livestock Officer. This will help to determine the success of mitigation measures and whether an eradication program is needed.

Key performance indicators of the BIMP include:

- No increased larvae or adult biting insect activity present on site; and
- Minimal impacts and bites from insects reported onsite.

In addition, staff will need monitor their health and be aware of the following mosquito borne disease symptoms (Whelan and Van Den Hurk 2003):

- Pain in joints of the extremities;
- Lethargy;
- Aching tendons;
- Skin rashes;
- Fever;

- Tiredness;
- Headaches; and,
- Swollen lymph nodes.

Less common symptoms include:

- Sore eyes;
- Sore throat;
- Nausea; and,
- Tingling in the palms of the hands or soles of the feet

This is a very general list of symptoms and employees are advised to consult a health professional for any of these symptoms. Under the NT Notifiable Diseases Act, mosquito borne diseases need to be reported to the Northern Territory Department of Health Centre for Disease Control on (08) 8922 8044.

3.4 Reporting

All infestations will be reported to the Livestock Officer to record in the biting insect register. Any significant infestations of biting insects and/or sickness due to biting insects are to be reported to the Northern Territory Medical Entomology Branch.

3.5 Roles and responsibilities

The roles and responsibilities pertaining to this plan are highlighted in table 1.

Table 1 Responsibilities under the BIMP

Position	Responsibilities
ILEF Manager	<p>Ensure that biting insects are controlled and their breeding grounds removed/made unsuitable as required by regulations</p> <p>Ensure that this BIMP is implemented</p> <p>Ensure that all personnel are aware of and adhere to BIMP procedures</p> <p>Carry out staff training and induction for biting insects and make staff aware of their obligations under the BIMP</p> <p>Review BIMP annually and additionally when changes occur (including any legislative changes)</p>
Livestock Officer	<p>Implement chemical back-lining procedures for all incoming livestock.</p> <p>Carry out monitoring program to identify biting insects onsite and undertake any control programs as necessary.</p> <p>Maintain and act upon biting insect register and maintain mosquito monitoring forms</p> <p>Ensure that pens are cleaned regularly and sedimentation basins are cleaned after rainfall</p>
All employees and contractors	<p>Report any occurrence of biting insects, their larvae or any new potential breeding sites to the Livestock Officer.</p> <p>Wear PPE to reduce insect bites</p>

3.6 Training and induction

All employees and contractors entering the site to undertake work activities will be inducted prior to commencing work. This will ensure that they are aware of their obligations under the BIMP. Re-training will be undertaken if there are any changes to the procedures outlined in this plan, or if there are any non-conformances to procedures noted by management or external authorities. Records of training will be kept onsite for a minimum of five years.

4. References

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5. Appendices

Appendix A.	Mosquito monitoring program	A-1
Appendix B.	Potential biting insect species	B-1
Appendix C.	Management forms	C-1

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Appendix A. Mosquito monitoring program

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Mosquito monitoring program

The mosquito monitoring program will allow for verification on whether biting insect prevention and control measures are working. The following will be undertaken by the Livestock Officer (or delegate) to determine the prevalence and distribution of mosquitoes onsite in areas with water present:

- Visual inspections of any pooled water for larvae, pupae and nearby adults
 - Larvae are either held horizontally against the surface by float hairs, or hanging at an angle to the surface by the siphon – generally in groups. When disturbed, mosquito larvae either submerge or move over the water surface with a series of jerky movements. Very small and range in size up to 3 mm
 - Pupae are shaped like a comma and rounder than larvae and "tumble" as they move
 - Adults have delicate legs, a long proboscis and one pair of transparent wings
- Sampling of mosquito larvae will be surveyed by sampling using a scoop (Use a white scoop as any larvae present will be easier to see against the white bottom).
- The biting insects monitoring form should document:
 - Date and time;
 - Weather for the day (including whether it is raining and whether there is rain predicted for the day); and,
 - Whether there were biting insects found.



Figure 3 Mosquito larvae (left) and mosquito pupae (right) live in standing water



Figure 4 Adult male mosquitoes feed on and live in vegetation

Appendix B. Potential biting insect species

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Species	Disease potential	Habitat	Larvae	Adult
Mosquitoes				
<i>Aedes notoscriptus</i> – Receptacle Mosquito	A suspected carrier of Ross River Virus (RRV). Very good carrier of heartworm of dogs.	Breeds: Rain filled receptacles such as boats, tyres, tins, drums, domestic water tanks, roof gutters, pot plant drip trays, particularly where there is some rotting vegetable matter. Eggs: Laid singly just above the water line and can withstand considerable periods of drying until they are flooded. Travel from breeding site: Adults are capable of flying 2-3 km.	Larvae: Dark grey larvae with a light brown head and short siphon with a distinct twisting movement. Larvae often forage at the bottom of the receptacle but hang down at the water surface when obtaining oxygen through their siphon.	Female: A small to mid-sized black mosquito with a unique shape on its back, a white stripe on its proboscis and striped legs
<i>Aedes tremulus</i> – Pale larvae mosquito	Not known to carry diseases in Australia	Breeds: Artificial receptacles such as tins, tyres, tanks and plant pot bases which have been filled with rain water or artificially flooded. Eggs: Laid singly on the insides of receptacles with water and can survive long dry periods. Travel from breeding site: Do not travel more than 500 metres from their breeding sites.	Larvae: Long white larvae with a light brown head and dark siphon. The siphon is short, stout and tapering. The larvae move with a twisting motion and remain on the bottom of the water when disturbed.	Female: A small thick-set black mosquito with white bands on the feet and a relatively short dark proboscis. The abdominal segments have white lateral patches.
<i>Anopheles annulipes</i> – Freshwater malaria mosquito.	Capable of carrying malaria. A carrier of rabbit <i>Myxomatosis</i> .	Breeds: Open, sunlit, temporary and permanent freshwater ground pools, streams or swamps. Rarely found in sewage ponds but frequently found in shallow, densely grassed areas where wastewater effluent flows. Eggs: Laid singly on the water and float by means of floats on each side. Travel from breeding site: Disperses up to 2 kilometres from breeding site.	The larvae are very variable in colour. They have no siphon. The head is as long as it is broad. It rests parallel to the surface of the water and feeds on particles on top of water by filtering with a series of brushes near its mouth.	Female: A speckled grey mosquito with extensively spotted wings. Three wide white bands on the mouthparts, separated by two narrow black bands.

Species	Disease potential	Habitat	Larvae	Adult
<i>Anopheles bancroftii</i> – Black Australian Anopheline	Capable of carrying malaria. A carrier of <i>Filariasis</i> in New Guinea.	Breeds: Shaded freshwater swamps, waterholes and stream margins. Sometimes found in slightly brackish reed swamps where reeds shade the water. Eggs: Laid singly on the water and float by means of floats on each side. Travel from breeding site: Disperses 2-4 km from breeding site.	Larvae: Dark larvae often with some irregular white patches. Has no siphon. The antennae have a conspicuous branched hair at mid length. Feeds parallel to the surface of the water by drawing in particles on the surface with a series of brushes near its mouth.	Female: Large black mosquito with bushy black palps and a black proboscis. Wings are mostly dark with few small white patches on the front edge. The top of the abdomen is black.
<i>Anopheles farauti</i> – Australian Malaria Mosquito	Confirmed carrier of malaria. A carrier of human <i>Filariasis</i> in West Papua.	Breeds: Usually sunlit locations in permanent and semi-permanent fresh and brackish water sites. Eggs: Laid singly on the water and float by means of floats on each side. Travel from breeding site: Flight range approximately 2 km.	Larvae: Has no siphon. Head is as long as it is broad. Larvae feed and rest horizontal to the surface of the water.	Female: A speckled grey mosquito with extensively spotted wings. There are three narrow black bands on the mouthparts, with the two most basal of these dark bands separated by a narrow white band.
<i>Anopheles meraukensis</i> – Fresh-water reed Anopheles	A suspected but unproven carrier of malaria. Not known to transmit viral diseases to humans in Australia, although a number of viruses have been isolated from this species.	Breeds: In sunlit grass or reeds in fresh water swamps. Occasionally collected from artificial breeding places such as wheel ruts and bomb craters. Eggs: Laid singly on the water and float by means of floats on each side. Travel from breeding site: Unknown.	Larvae: No siphon, head is as long as it is broad.	Female: A speckled grey mosquito with spotted wings. There are three wide white bands on the mouthparts, separated by two narrower black bands.

Species	Disease potential	Habitat	Larvae	Adult
<i>Coquillettidia xanthogaster</i> – Golden Mosquito	Not known to transmit human disease, but a potential carrier of Ross River virus.	<p>Breeds: Permanent and semi-permanent swamps with aquatic vegetation. Larvae attach to underwater roots or stems of plants.</p> <p>Eggs: Laid side by side and stuck together to form rafts which float on the surface.</p> <p>Travel from breeding site: May travel up to 4 km from the breeding places.</p>	Larvae: A pale/white larvae with tip of siphon dark and modified for piercing plants. A very sluggish swimmer. Larvae are attached to aquatic plants and rarely seen.	Female: A medium sized mosquito with a bright gold/orange thorax and abdomen. The legs are dark, and have purple reflections.
<i>Culex annulirostris</i> - Common Banded Mosquito	<p>Main carrier of Murray Valley Encephalitis Virus (MVEV) in NT and is capable of carrying Kunjin Virus (KV), RRV, Barmah Forest Virus (BFV) and other viruses.</p> <p>Can transmit heartworm to dogs.</p> <p>Capable of carrying human <i>Filariasis</i> in New Guinea.</p>	<p>Breeds: Natural freshwater swamps, pools, streams that have vegetation, stormwater drains, grassy edges of wastewater ponds and disused swimming pools. May also breed in large numbers in low lying grassy areas where the water lays for 1-3 weeks.</p> <p>Eggs: Laid in rafts on the water surface and can contain up to 200 eggs.</p> <p>Travel from breeding site: Can fly up to 10 km from its breeding place, but generally only found within 2km of breeding sites.</p>	Larvae: Pale with a long siphon with 6 groups of hairs along each side underneath the siphon. Larvae hang down from the surface of the water when obtaining air. Feed amongst submerged vegetation.	Female: A medium sized, brown mosquito with a square tipped abdomen and a wide white band on the middle of the proboscis. The segments on the top of the abdomen have white bands.

Species	Disease potential	Habitat	Larvae	Adult
<i>Culex gelidus</i> – Frosty mosquito	Potential carrier of Japanese encephalitis virus (JEV), MVEV, KV, RRV, BFV and other arboviruses.	Breeds: Freshwater ground pools, swamps, containers and is associated with high nutrient water bodies, such as wastewater treatment facilities and stormwater pipe discharge sites. Eggs: Laid in rafts on the water surface. Travel from breeding site: Unknown, but considered to be several kilometres.		
<i>Culex quinquefasciatus</i> – Brown house mosquito	Poor vector of MVEV and RRV. Carries human <i>Filariasis</i> in other countries. Capable of carrying dog heartworm.	Breeds: In polluted or organic water close to human habitation, particularly in unscreened septic tanks and wastewater systems. Eggs: Laid in rafts on the water surface. Travel from breeding site: Disperses 1-2 km from the breeding place.	Larvae: Grey brown with a light brown head and siphon. Antennae a grey colour. Siphon medium length with a characteristic bottle shape with 3-4 groups of hairs on the underside. Hangs down by siphon from surface of water.	Female: Brown mosquito with a square tipped abdomen. Curved white bands on top of the abdomen. Pale underneath the abdomen.
<i>Mansonia uniformis</i> – Aquatic plant mosquito	Not known to spread human disease in Australia Carries <i>Filariasis</i> in neighbouring countries.	Breeds: Permanent and semi-permanent freshwater swamps and water-holes with aquatic and semi aquatic plants. Adults rest by day amongst dense vegetation near water. Eggs: Laid in clusters under the surface of floating leaves such as water lilies. The larvae attach by the siphon to roots or stems of aquatic and semi aquatic plants. Travel from breeding site: Travels up to 4 km in search of a blood meal, but is generally in high numbers within 1 km of the breeding site.	Larvae: Grey, very sluggish swimmers. The tip of the black siphon is pointed and serrated so that it can insert its siphon into plant roots to obtain air.	Female: A gingery speckled mosquito with mottled wings of broad dark and pale scales and a dark wing fringe. It has a broad deep tip to the abdomen. There are white basal bands on hind legs. Eyes are green on living adults.

Species	Disease potential	Habitat	Larvae	Adult
Biting Midges				
<i>Culicoides marksi</i>	Bovine ephemeral fever.	Breeds: Freshwater pond margins. Eggs: Laid in damp soil along freshwater margins. Travel from breeding site: Usually up to 1 km.	Larvae: Worm-like, creamy white, and approximately 2 mm long.	Adults: Grey and less than 3mm long. Pigmentation patterns on the wings.
<i>Culicoides brevitarsis</i>	Bovine ephemeral fever, Akabane virus, Aino virus. No known human diseases in NT	Breeds: Wet soils with a high content of animal waste. Eggs: Laid on the surface of manure. Travel from breeding site: Usually up to 1 km, but with the right wind conditions swarms have travelled 130 km.	Larvae: Worm-like, creamy white, and approximately 2 mm long.	Adults: Grey and less than 3mm long. Pigmentation patterns on the wings.
Flies				
<i>Haematobia irritans</i> – Buffalo fly	No known diseases.	Breeds: Adult buffalo flies live permanently on their host, the females only leaving to lay eggs. Eggs: Laid in freshly deposited dung pats. Travel from breeding site: They can fly up to 10 km in search of a host.	Larvae: White, approximately 1.5 mm long with a slender pointed head.	Adults: Brown-grey or black bodies 3.5-5mm long, shiny, brown-red antennae which point downward.
Ticks				
<i>Boophilus microplus</i> – Cattle tick	Tick fever	Breeds: While attached to host animal. Eggs: Females climb off host and lay eggs in grass. Travel: Does not travel very far. Nymphs travel up blades of grass to latch onto animals. Adults prefer to stay on a single animal.	Young nymphs: Size and appearance of a poppy seed with legs.	Adults: Body oval to rectangular, legs pale cream.

Information from Whelan (2010), Whelan & Van Den Hurk (2003) and DPIF (2009).

Appendix C. Management forms

DRAFT

Biting insects register								
Biting insects found					Corrective action			
Date	Name	Type of biting insect found	Location of infestation	Size of infestation	Date	Name	Actions taken	Success?
<i>E.g.: 1/1/2015</i>	<i>Joe Smith</i>	<i>Mosquitoes</i>	<i>Wastewater pond</i>	<i>1x1m area, dense</i>	<i>2/1/2015</i>	<i>Joe Smith</i>	<i>Added XX kg lime to wastewater pond</i>	<i>Y</i>

Mosquito monitoring form							
Date	Time	Name	Weather	Rain forecasted (Y/N)	Area	Biting insects found?	Recorded in Biting insects register?
<i>E.g. 1/1/15</i>	<i>12:00</i>	<i>Joe Smith</i>	<i>Sunny, 9</i>	<i>Y</i>	<i>Primary wastewater pond</i>	<i>Y</i>	<i>Y</i>