

APPENDIX BB: BITING INSECTS MANAGEMENT PLAN

TNG LIMITED

**BITING INSECTS
MANAGEMENT PLAN
DARWIN PROCESSING
FACILITY**

DARWIN, NORTHERN TERRITORY

NOVEMBER 2019



TNG006 – TNG Limited Darwin Processing Facility

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CONTROL AND REVISION HISTORY

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
TNG	TNG Limited
The Project	Darwin Processing Facility
BIMP	Biting Insects Management Plan
EIS	Environmental Impact Statement
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
km	Kilometre
ha	Hectare

1 INTRODUCTION

1.1 PROJECT OVERVIEW

TNG Limited (**TNG**) proposes to construct and operate the Darwin Processing Facility (**the Project**) at Lot 1817, Hundred of Ayers, Middle Arm Industrial Precinct, (658 Channel Island Road) Wickham. The Project is approximately 16 kilometres (**km**) south east of Darwin, Northern Territory (**NT**). The purpose of the Project is processing magnetite concentrate to produce higher value products for export from East Arm Wharf to international customers. The scope of the Project, is limited to activities within the Processing Facility allotment, encompassing construction, operation, decommissioning and closure of the Processing Facility.

The Project will comprise:

- Clearing of a partially vegetated allotment formerly utilised for extractive industries;
- Construction of a magnetite concentrate Processing Facility;
- Construction of a rail siding, unloading and loadout facilities on the Adelaide-Darwin railway;
- Unloading of concentrate from trains at the rail siding;
- Refining of concentrate; and
- Loading of trains at the rail siding with Processing Facility products.

The Project, with associated access roads, supporting infrastructure and services comprises a development envelope of approximately 264 hectares (**ha**), of which 180 ha has previously been disturbed. New infrastructure requirements on Lot 1817 Middle Arm include:

- Rail siding – 3.8 km long, adjoining the Adelaide - Darwin railway line;
- Processing Facility;
- Concentrate and coke stockpiles and conveyor tunnels;
- Process water, raw water, cooling water and waste water ponds;
- Filter cake stockpile area / hardstand;
- Workshop and stores;
- Offices, administration area, including kitchen / mess-hall, emergency services;
- Electricity sub-station;
- Potable water, raw water and fire water tanks;
- Gatehouse and weighbridge;
- Oxygen plant;
- Acid regeneration plant;
- Tank farm and reagent storage;
- Laydown areas; and
- Car parking.

Construction is scheduled to commence in late 2020 with first production in late 2022, subject to statutory approvals, finance and TNG Board Financial Investment Decision approval of the Mount Peake Project. The construction period is anticipated to be 24 months continuing over both wet and dry seasons.

The design life of the Processing Facility is 40 years. Processing of concentrate would occur at a rate of 700,000 tonnes per annum. The life of the Processing Facility mirrors the production of concentrate from the Mount Peake Mine, the primary source of concentrate for the Project. Additional concentrate may in future be sourced from the Mount Peake area (subject to the results of further exploration drilling and economic evaluation) or

from third parties. Ultimate decommissioning of the site would be evaluated throughout the operation of the Processing Facility and discussed with regulators as part of ongoing licence requirements.

1.2 PROPONENT DETAILS

TNG operates the Project. TNG's details are summarised in Table 1-1.

Table 1-1: Proponent Details

Company	TNG Limited
Contact	Paul Burton Managing Director
Postal address	PO Box 1126, Subiaco, WA 6904
Phone	+61 8 9327 0900
Fax	+61 8 9327 0901
Email	peb@tngltd.com.au
ABN	12 000 817 023
ASX code	TNG
Web	www.tngltd.com.au

1.3 SCOPE

The NT coast has extensive areas of mangrove lined estuaries and freshwater floodplains with much of the coastal zone being largely in its natural state. In general, development activities occurring on coastal floodplains in the NT will encounter human health issues associated with biting insects.

TNG's Darwin Processing Facility is located on the Middle Arm Peninsula in Darwin harbour. The local environment of the peninsula leads to the expectation that potentially significant biting insect issues may occur in the Project area. The main insects causing these issues are biting midges and mosquitoes.

The potential human health issues associated with biting insects on site include:

- Unbearable nuisance caused by biting insects in very high numbers;
- Painful bites, intense itching, infection and scarring (following scratching); and
- Transmission of viruses.

This Biting Insects Management Plan (**BIMP**) has been prepared for the construction and operational phases of the Project. It builds on the information provided in the Environmental Impact Statement (**EIS**) for the Project as required by the Northern Territory Environment Protection Authority (**NT EPA**) under the *Environmental Assessment Act*.

1.4 LEGISLATION

The BIMP will assist all personnel working at the Project site in the identification and management of issues and risks associated with biting insects. The BIMP will meet the requirements of the following legislation and guidance:

- *NT Public and Environmental Health Act 2011;*
- *NT Public and Environmental Health Regulations 2014;*
- *Work Health and Safety (National Uniform Legislation) Act 2011;*
- Mosquito breeding and sewage pond treatment in the NT (Warchot & Whelan, 2009);

- Constructed wetlands in the NT – Guidelines to prevent mosquito breeding (Warchot & Whelan, 2008); and
- Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites 2005 (NT Government - Department of Health and Families).

The BIMP will be subject to ongoing review and change to ensure that it remains relevant and effective throughout the life of the Project.

1.5 OBJECTIVES

The BIMP aims:

- To avoid, minimise or control the effects of biting insects on personnel (construction and operation) working at the Project site;
- To ensure that biting insect control practices are implemented to deter adult biting insects on site and to prevent the occurrence of breeding sites;
- To inform on site personnel about the risks regarding biting insects and the potential diseases they carry;
- To inform on site personnel about the health and safety legislation and guidelines regarding biting insects; and
- To assist Site management to set and achieve goals for biting insect management and monitoring.

2 ENVIRONMENT, SPECIES AND EFFECTS

Biting insects in the NT consist of biting midges and mosquitoes, both of which are known to be present at the Site. Mosquitoes are potential transmitters of disease to humans. Distribution and abundance of the biting insects vary according to seasonal and other changes in habitat and food availability. The risk of being bitten and/or transmission of disease to humans varies in relation to breeding cycles and abundance. Different species of biting insects have differing patterns of distribution and seasonal changes in abundance.

The most commonly recorded mosquitoes in the Darwin City, Outer Darwin, Rural Darwin and Palmerston areas are *Aedes* and *Culex* species (Medical Entomology Branch 2010), some of which are known carriers of Ross River virus, the most commonly recorded arboviral disease in the NT.

2.1 BITING MIDGES

The extensive mangrove areas surrounding the Project site are potential significant sources of the mangrove biting midge *Culicoides ornatus*. This is the most significant and most common human pest biting midge species around coastal areas of the NT (Shivas 1999; Shivas & Whelan 2001; Whelan 2003). Reactions to bites generally include itching, nuisance and discomfort. This can become unbearable if a rate of one to five bites per hour is experienced by someone unaccustomed to them (Warchot & Whelan 2011). A greater health risk is posed should bites progress to skin infections or are experienced by individuals who are allergic.

Culicoides ornatus is expected to occur in very high seasonal numbers as follows:

- Extremely high seasonal numbers from August to November (late dry season);
- Very high numbers from April to July (early to mid-dry season); and
- High numbers December to March (wet season).

The high numbers can lead to severe and unbearable personnel problems without personal protection including workforce disruption and secondary effects such as painful bites, intense itching, infection and scarring (following scratching). Personnel new to the region will have less immunity to midge bites.

Greatest effects are encountered for a period of 6 days around full and new moon during 2 hours around sunset and sunrise. Night time effects may also be encountered. Dry season effects will be much greater than wet season effects.

Two other species, *C. flumineus* and *C. spec.* (undescribed in 2009 but similar to *C. immaculatus*) may cause pest problems to workers inside the mangrove areas. Biting midges are not known to carry human pathogens in Australia.

The midges breed in mud under dense mangrove canopies.

2.2 MOSQUITOES

Although the Project area at present may contain rainwater pools at times (e.g. seasonal ponding), the general absence of freshwater swamps, flood plains and rivers as possible breeding habitat makes the presence of mosquitos in significant numbers unlikely. But the presence of tidal areas (such as poorly or restricted draining upper tidal areas) and natural or man-made depressions (e.g. vehicle tracks) allows for the expectation that seasonally raised numbers of the northern salt marsh mosquito *Aedes vigilax* may be present. *A. vigilax* is an aggressive biter both at night and at daytime in shaded areas. It is expected that mosquito numbers will be high

enough to cause a low to moderate seasonal pest problem. In addition to irritation by biting there is a low to moderate risk linked to this species for transmission of the associated Ross river and Barmah Forest viruses during September to January with the higher risk from December to January.

Other mosquito species (e.g. *Culex annulirostris*, *C. sitiens*, *Anopheles* spp., *Coquillettidia xanthogaster*, *Verrallina funerea*) can be seasonally important with minor numbers expected to be present during the wet season. Main breeding sites include ground pools, ponding areas (such as in the monsoon vine forest) and tide influenced depressions.

Although these other species are not likely to be present in high enough numbers to be a serious pest problem, they are known virus transmitters. This includes, but depends on the mosquito species: Ross River, Barmah Forest, Murray Valley Encephalitis and Kunjin viruses and potentially malaria. Of these Ross River virus is the most frequently transmitted mosquito borne disease in the NT, and Murray Valley Encephalitis is a potentially lethal disease.

Due to their expected low abundance, the risk of virus transmission by these mosquito species is considered minor. However, as any increase in mosquito populations could potentially increase the transmission of related diseases good mosquito conscious management remains important.

Mosquitoes breed in standing water which can be created by, for example, rainfall in any ponding areas or water holding receptacles. In general, seasons with higher levels of rainfall experience higher numbers of mosquitoes than lower rainfall years (Whelan & Hurk 2003). Development can be rapid, and numbers of adult biting mosquitoes can be expected to reach peaks within three weeks of heavy rainfall (Whelan & Hurk 2003).

3 IMPACT AND RISK ASSESSMENT

A systematic risk assessment process has been adopted by the Project for environmental and social management. This methodology is used to identify activities that have the potential to result in adverse impacts on social and environmental aspects. By developing management measures and controls to reduce the risks identified, "Residual Risks" can be reduced to as low as reasonably practicable. Details of the risk assessment methodology are outlined in Appendix H of the Draft EIS.

3.1 IMPACTS

The potential human health issues associated with biting insects on site include:

- unbearable nuisance caused by biting insects in very high numbers;
- painful bites, intense itching, infection and scarring (following scratching); and
- transmission of viruses.

The specific issues related to the different biting insects at the Project are provided in Table 3-1.

Table 3-1: Potential Problem Situations

Situation	
Biting Midges	Workforce disruption (e.g. personnel new to the region will have less immunity to midge bites)
	Severe and unbearable personnel problems without personal protection
	Secondary effects after being bitten, such as pain at the bite location, intense itching, infection and scarring (following scratching)
	Note: Biting midges are not known to carry human pathogens in Australia.
Mosquitos	Irritation by biting (night and day)
	Low to moderate risk for transmission of viruses: Ross River, Barmah Forest, Murray Valley Encephalitis and Kunjin viruses and potentially malaria. Ross river and Barmah Forest viruses during September to January with a higher risk from December to January.
	Note: Ross River virus is the most frequently transmitted mosquito borne disease in the NT, and Murray Valley Encephalitis is a potentially lethal disease.

4 MANAGEMENT AND MITIGATION

Management practices that are implemented on Site will focus on measures to avoid, minimise, and control biting insects and their effects and how to avoid potential breeding.

4.1.1 Personal Protection

The Project will make available personal protective clothing adequate to protect against bites, and insect repellents. At the very least all personnel must wear long sleeved shirts and trousers and regularly use insect repellent. Insect repellent will be available at all active work sites.

4.1.2 Structures and Potential Breeding Sites

Entry of biting insects into personnel areas such as offices, mess room, guard houses, outdoor recreational areas, and other places of work, will be prevented or at least minimised by sealing off and air-conditioning of such buildings (where possible).

The most important and effective control of mosquitoes relates to eliminating potential breeding sites. Where possible the Project will be designed and constructed to minimise the creation of biting insect habitat. The Site structures will be maintained in accordance with the Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites (2005 by the NT Government – Department of Health and Families). This also means rectifying any existing structures that will allow ponding of water (e.g. rainwater and tidal ponding) where mosquitoes can have access for the purpose of breeding.

The mosquito life cycle can be rapid and as a rule any water bodies older than 3 days in tidal areas and 5 days in mainland areas could see evidence of mosquito breeding and adult mosquitoes may be present at three weeks after rainfall. This aspect includes:

- Ponds, dams and other water holding structures necessary for the Project must be designed and maintained to minimise the potential for mosquito breeding;
- All drainage channels / spoon drains must be kept as shallow as possible to prevent ponding.
- Designing structures (e.g. borrow pits, storage areas; storm drains) to allow for full drainage to non-ponding areas;
- All accommodation facilities and offices must be screened and air conditioned to discourage mosquitos; and
- Stockpiles must be placed in areas that do not impede drainage and will be shaped to prevent ponding.

The avoidance and rectification of breeding sites for mosquitoes includes matters such as:

- Rectifying any depressions in the land, either man-made (e.g. vehicle tracks, storm drainage, effluent treatment) or natural (e.g. erosion) by draining or filling;
- Backfilling of trenches;
- Sedimentation ponds must be emptied promptly after storm events;
- Any depressions created in the ground surface must be filled or drained to prevent the ponding of water;
- Stocking necessary water containment bodies (e.g. sediment ponds) with locally native mosquito predatory fish;
- Removal of any artificial objects that may collect and contain water (e.g. rubbish, tyres, packaging, plastic sheeting, digger buckets); and

- Excess cleared vegetation will not be stockpiled onsite in low-lying, flat areas for extended periods of time as this could create breeding habitats for biting insects.

4.1.3 Inspections

Site inspections include:

- Conducting regular (at least weekly) site inspections, especially during the wet season, to identify existing or potential standing water bodies and implementing immediate actions to eradicate or remedy such areas, e.g.:
 - Any ponds, dams, drains, sediment traps, bunded areas and on-site excavations filled with water will be inspected for the presence of mosquito larvae. If larvae are detected the Medical Entomology Branch of NT Health must be contacted in advance for assistance in choosing a suitable method of control and acceptance of selected agents;
 - Existing or potential ponding areas must be reported as they should not occur anywhere, for example in rubbish storage areas. Such areas must be rectified so that ponding will not be possible;
 - Monitor on-site works to ensure activities such as ground disturbance do not lead to the creation of newly ponded areas; and
 - Erosion and wash-down practices must be inspected and cleared from sediment and debris that may be forming standing water pools.
- If mosquitos or their larvae are identified at a place that is related to or the result of the Project's activities the following steps must be completed:
 - Define the map the area and extent of the occurrence and suggested control program;
 - Record the GPS locations (MGA 94) of the occurrences;
 - Record the size of infestation; and
 - Send the above data to the environmental manager or delegate to record within the Biting Insect Register.

Note: The Project must seek advice from the NT Medical Entomology Branch, before proceeding with chemical eradication of mosquitoes.

4.1.4 Chemical Control

The Project must seek advice from the Northern Territory Medical Entomology Branch in regards to choosing a suitable method of control for the eradication of biting insects, before proceeding with chemical eradication of mosquitoes.

Address: Northern Territory Medical Entomology Branch, Department of Health and Community Services, PO Box 41326, Casuarina, NT 0811; (08) 8922 8901 or via email: MedicalEntomologyRDH.THS@nt.gov.au

4.1.4.1 Biting Midge

Residual barrier insecticide (bifenthrin applied by a licensed pest controller) will be applied to the outside of personnel area structures at appropriate times during the year to reduce the numbers of midges.

It is considered that affecting the midge's lifecycle at its mangrove breeding sites is not a viable nor environmentally acceptable option due to their breeding in mud under dense mangrove canopies. To affect their breeding sites very large doses of insecticides would be required in this sensitive habitat which would be environmentally unacceptable.

4.1.4.2 Mosquitos

The barrier insecticide Bifenthrin may be used around personnel areas to control adult mosquitoes when they occur in very high numbers.

Temporary mosquito larvae control in breeding sites may be achieved by using the biological control agents *Bacillus thuringiensis var. israelensis* or by using Methoprene. The Bacillus agent is a bacterium that produces toxins that will kill mosquitoes and thought to affect few non-target species. Methoprene breaks the biological lifecycle by preventing the mosquito larvae from reaching maturity. It is used in drinking water cisterns to control mosquitoes including those that may spread dengue fever and malaria.

The Medical Entomology Branch of NT Health must be contacted in advance of mosquito treatment for assistance in choosing a suitable method of control and acceptance of selected agents such as the ones mentioned above.

If necessary, areas that cannot be managed with non-chemical control measures should be treated with a control agent. The advantage of chemical control methods is that pesticides can be quickly applied with rapid results at relatively low cost. However, chemical usage will not be viewed as a long term control strategy as prolonged use can result in the development of resistance in mosquito populations..

The effectiveness of the various 'acceptable' agents, depending on appropriate formulations and local conditions and the target mosquito species, is of critical concern.

When chemical controls are to be used the following management actions will be adhered to:

- Treatments will not be undertaken as a precaution, i.e. prior to a breeding event;
- Must seek advice from the NT Medical Entomology Branch before proceeding with any chemical eradication of mosquitos;
- Areas identified for treatment must consider environmentally sensitive receptors (e.g. habitat, species) and buffer zones should be designated;
- A licensed operator must be engaged to undertake the chemical treatment;
- Chemicals used must be registered and their use must be in accordance with manufacturer's instruction; and
- A chemical treatment register will be maintained and include:
 - areas treated;
 - date and time of treatment;
 - pilot/operator with signature;
 - equipment;
 - insecticide dose;
 - insecticide batch measure;
 - result; and
 - possible follow up action.

5 MONITORING AND REPORTING

TNG staff will periodically check mosquito activity within the Site, to identify the success of mitigation measures and to determine whether larval and adult eradication programs should be implemented. TNG staff will also monitor the number of incidents involving biting insects that are reported to medical officers on Site.

Key performance indicators of the BIMP include:

- No increased larvae or adult mosquito activity present on site;
- Presence of personal protective equipment adequate to protect against bites; and
- Minimal impacts and bites from mosquitos reported to medical officer on site.

5.1 BITING INSECTS REGISTER

A Biting Insects Register is to be developed prior to Project commencement and updated whenever insect infestations are observed. All insect infestations must be reported to the environmental manager and/or delegate who will update the Biting Insect Register. This includes observations of mosquitos or their larvae at a place that is related to or the result of the Project's activities. The following data must be recorded:

- Area and extent of infestation. GPS location (MGA 94) is to be recorded;
- Type of water bodies; and
- Size of the infestation and suggested control method.

Any significant infestations of biting insects and/or sickness due to biting insects are to be reported to the Northern Territory Medical Entomology Branch, Department of Health and Community Services, PO Box 41326, Casuarina, NT 0811; (08) 8922 8901 or via email: MedicalEntomologyRDH.THS@nt.gov.au

5.2 CHEMICAL TREATMENT REGISTER

A Chemical Treatment Register for the control of biting insects must be developed and updated immediately after chemical control methods have been utilised. The register of mosquito control treatment will be maintained at the Site (Environmental Manager's office). Data to be recorded includes:

- Areas treated;
- Date and time of treatment;
- Pilot/operator with signature;
- Equipment;
- Insecticide dose;
- Insecticide batch measure;
- Result; and
- Possible follow up action.

5.3 ROLES AND RESPONSIBILITIES

Accountability for fulfilling the requirements of the BIMP is related to all stages of the Project development (construction, operation, decommissioning) and applies to all Project personnel, contractors and visitors.

The BIMP is considered a minimum standard and compliance is mandatory. All personnel on Site (e.g. Project personnel, contractors and their sub-contractors) are responsible for ensuring that the requirements of the BIMP that are relevant to their activities on the Project, are successfully implemented and maintained during their work on site.

The Environmental Manager will coordinate the implementation of the BIMP and will be supported by the other on-site Managers/Supervisors. The Environmental Manager will be suitably trained and will maintain awareness of relevant environmental legislation. The BIMP roles and responsibilities are summarised in Table 5-1.

Table 5-1: BIMP Responsibilities

Project Team Position	Responsibilities
Site manager	<ul style="list-style-type: none"> • Approve policy and suggested BIMP revisions; and • Work with contractors and Project personnel to implement the BIMP requirements.
The Environmental Manager	<ul style="list-style-type: none"> • Actively manage the implementation of the BIMP; • Plan and implement biting insect management programs; • Track progress of management actions and programs; • Educate personnel, contractors and visitors of biting insect species and the related BIMP obligations; • Ensure seasonal biting insect matters are discussed during daily/tool box meetings; • Conduct regular (weekly) site inspections for the presence of (actual and potential) water ponding or other water holding receptacles and record the results; • Work with contractors and Project site personnel to ensure there are no potential mosquito breeding habitats on site; • Record occurrence of mosquito infestations and report this to relevant Project management and the NT Medical Entomology Branch, Department of Health and Community Services; • Keep track of legislative requirements; and • Review and develop the BIMP as required with suggested revisions submitted to Management for timely approval.
All Site personnel (including contractors and sub-contractors)	<ul style="list-style-type: none"> • Report significant biting insect issues and (actual and potential) mosquito breeding locations to Environmental Manager or delegated onsite person immediately; • Follow BIMP requirements, e.g. be vigilant for ponded water and report to Environmental Manager if observed; and • Leave/store all items in such a manner as to prevent water ponding. This includes all waste materials.

The BIMP collects statistics and information:

- To monitor the effectiveness of implemented control practices and adjusting them as required;
- To check on achievements against the set goals for biting insect management and adjust goals if required; and
- To report on the BIMP's effectiveness to stakeholders (e.g. local and state government).

The BIMP will be reviewed by site management at least annually or sooner when circumstances require this, and adjustments made accordingly.

6 TRAINING AND AWARENESS

All personnel and subcontractors shall receive suitable BIMP induction/training. The aim of the training is to ensure that all site personnel are aware of the issues relating to biting insects, of their responsibilities and are competent to carry out the works. Persons performing tasks which have the potential to cause conflict with the BIMP shall be discuss requirements with the Environmental Manager and make competent decisions based on appropriate consultation, education, training and/or experience.

BIMP requirements shall be explained during site induction, via toolbox meetings, pre-starts, briefings, notifications, on-going training and other communication forums. Access to the BIMP will be made available during induction and maintained on the server. During inductions and training the following information will be provided to personnel:

- Description of the different types of biting insects likely to be encountered and the potential issues associated with them;
- How to protect themselves against the biting insects (e.g. avoidance of worst daily and seasonal periods, clothing requirements);
- How to keep up to date with information regarding this issue;
- Seasonal information e.g. a year calendar showing main pest problem periods and alerts to personnel at the start of worst periods;
- Early symptoms associated with exposure to mosquito borne diseases; and
- Instructions on the need to report any health-related symptoms to their manager or the on-site medical officer or Environmental Manager.

All such inductions, toolboxes and other training shall be recorded, e.g. in a Site Induction & Training Register.

The following list provides the basic symptoms for mosquito borne diseases (Whelan and Hurk 2003):

- Pain in joints of the extremities;
- Lethargy;
- Aching tendons;
- Skin rashes;
- Fever;
- Tiredness;
- Headaches;
- Swollen lymph nodes; and
- Tingling in the palms of the hands or soles of the feet;

Note: this is a very general list of symptoms and personnel must consult the on-site medic and, if off site, a health professional for any of these symptoms.

Any personnel suspected of suffering from malaria must be kept free from mosquito bites (e.g. no work after sundown or night time shifts) until medically declared clear to prevent the spread of the disease.

6.1 MORE INFORMATION

For more information on biting insect borne diseases in the Darwin area contact:

Public Health Unit (PHU), Disease Control, Royal Darwin Hospital
Phone: (08) 8922 8044, or 1800 008 002

For more information on mosquitoes and virus ecology contact:

Medical Entomology Branch, Department of Health
Email: MedicalEntomologyRDH.THS@nt.gov.au
Phone: (08) 8922 8901.

7 BIMP REVIEW

This BIMP should be reviewed annually at a minimum. The BIMP should also be reviewed following significant incidents and updated where appropriate to ensure that it remains relevant and effective throughout the life of the Project. All reviews, changes or updates are to be recorded using the Control and Revision History boxes on page i of this document.

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9 APPENDICES

Appendix A: Mosquito Monitoring Methodology

To determine the ongoing prevalence and distribution of mosquito and larvae and to enable timely control activities the following monitoring will be undertaken during the peak breeding season (December to March).

1. Visual inspections – visual inspection of the site for pooled water and larvae.
2. Sampling of mosquito larvae - Mosquito larvae will be surveyed by sampling using a scoop

Note: Use a white scoop as any larvae present will be easier to see against the white bottom.

Additional considerations for monitoring activities include:

1. rain events and duration
2. excessive irrigation/watering
3. larvae numbers
4. presence of biting adults

Signs of mosquito breeding – visual inspections Check suspected areas that hold surface water through visual inspection and if necessary, sampling to estimate numbers. The following descriptions provide guidelines for identifying mosquito larvae, eggs and active breeding sites:

1. Eggs - Small floating capsules float on the water in rafts (not all species)
2. Larvae - may be observed resting at the water surface:
 - a) Either held horizontally against the surface by float hairs or hanging at an angle to the surface by the siphon – generally in groups.
 - b) When disturbed, mosquito larvae either submerge or move over the water surface with a series of jerky movements.
 - c) Very small and range in size up to 3 mm.
3. Pupae - shaped like a comma and rounder than larvae:
 - a) "tumble" as they move
4. Adults - delicate legs, a long proboscis and one pair of transparent wings.

All insect infestations must be reported to the environmental manager and/or delegate who will include the records in the Biting Insect Register.

The Project must seek advice from the Northern Territory Medical Entomology Branch, before proceeding with chemical eradication of mosquitoes. The Medical Entomology Branch will in advance of mosquito treatment help in choosing a suitable method of control and acceptance of selected agents.