



BITING INSECT MANAGEMENT PLAN



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1. CONTEXT

The Twin Bonanza project involves the establishment of the Old Pirate open-pit and gold processing operation. The project is located approximately 820km NW of Alice Springs (Figure 2) and approximately 16km east of the Northern Territory and Western Australian border. The site is located approximately 33km south of the Tanami Road, which runs North West from Alice Springs to the Northern Territory and Western Australian border (Figure 1).

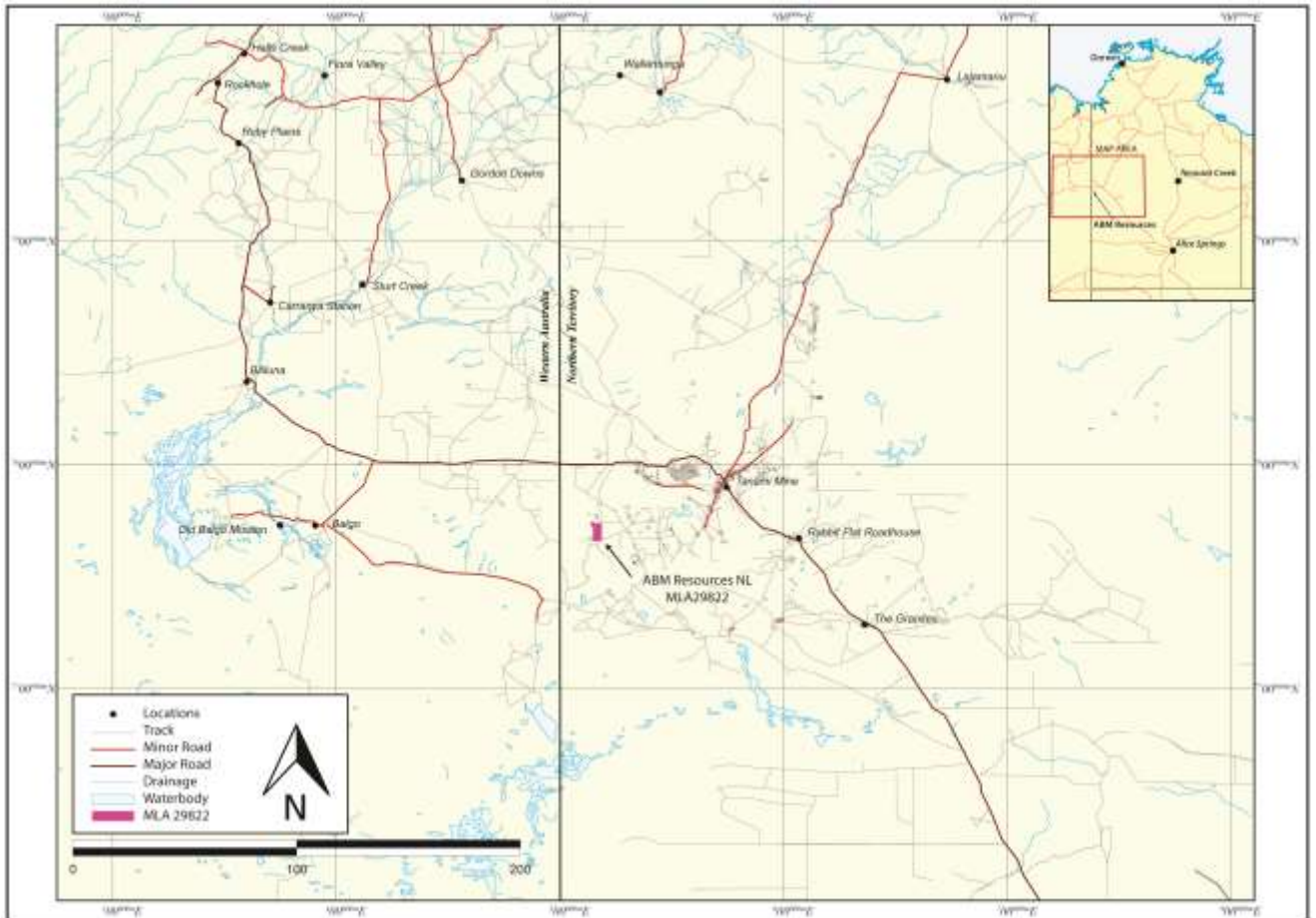


Figure 1-1 Project Location Map.

ABM plans open pit mining, and onsite processing as well as associated tailings dams, waste dumps and required infrastructure, including power station, accommodation, workshops and offices.

1.1 Purpose

The purpose of this Biting Insects Management Plan (BIMP) is to ensure that biting insect control practices are implemented on site to minimise the risk of creating biting insect breeding sites, namely mosquitos, associated with mining activities. The objectives of the plan are to:

1. prevent the occurrence of potential mosquito breeding sites and the presence of adult mosquitos
2. minimise mosquito breeding sites created by construction activities.

ABM Resources NL (ABM) BIMP has been developed with reference to the *Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites 2005* by the Northern Territory Government - Department of Health and Families.

The management plan is designed to provide information on how ABM intends to manage risks and how all staff on site may become informed about biting insect management as part of ABM's overarching environmental management, and health and safety systems.

1.2 Scope

This BIMP has been prepared to provide additional information to the Environmental Impact Statement (EIS) requested from the NT EPA and the Commonwealth Government in July 2013, in relation to the Mineral Lease Application and development of the Twin Bonanza Project.

The BIMP applies existing industry management practices and policies in regard to biting insect management and expands to include all biting insect management during construction, operation and closure of the proposed mine at Twin Bonanza. The BIMP will be subject to ongoing review and change to ensure that it remains relevant and effective throughout the life of the operation.

The vectors of disease that are of relevance to Australia are mosquitoes, flies, ticks and mites. Of these, mosquitoes are considered to be the most important (Whelan and Hurk 2003).

2. ENVIRONMENT & SPECIES

2.1 Surface water environment

No permanent surface water is located in the region. Seasonal creeks and ephemeral lakes exist over parts of the project area. There are no major drainage patterns in the region of the exploration leases that surround the project. Surface water can be found in rock holes for a considerable time after rain.

The largest groundwater resource of the Granites-Tanami mining region is provided by a paleodrainage system over 400 km in length (Domahidy 1990). The system flow westwards before turning southwards towards Lake Mackay. Calcrete occurs in the system within an area 400 km long and about 2 km wide and approximately 10 m deep. It can yield up to 10 L/s of saline water from the main channel, fresh to brackish water from channel margins and freshwater in some tributaries. At surface the paleochannels are dry during the majority of the year and hold no permanent surface water. Paleochannels are located to the east and west of the project 16km and 7km respectively.

2.2 Species

The biting insects that are considered vectors of disease that are of relevance to Australia are mosquitoes, flies, ticks and mites. Of these, mosquitoes are considered to be the most important

(Whelan and Hurk 2003).

The Tanami area is likely to harbour a number of mosquito species. Some of the species are potential disease vectors of arbovirus, while others are responsible for nuisance biting (Table 1). The arbovirus transmitted include Ross River virus (RRV), the most frequently transmitted mosquito borne disease in the Northern Territory, and Murray Valley Encephalitis (MVE), a potentially lethal disease.

Mosquitoes breed in standing water. There is no permanent standing water in the project area. The area's summer rainfall pattern potentially provides breeding habitat during the summer months. For example mosquito numbers increase during the summer months in Alice Springs and in Tennant Creek to the north. Summers with high levels of rainfall experience higher numbers of mosquitoes than lower rainfall years (Whelan and Hurk 2003). Similar patterns of mosquito abundance can be expected to occur at in the Tanami.

Alice Springs and Tennant Creek experience high level of RRV and MVE during summers with a December to February rainfall in excess of 100mm (Whelan et al., 2003) (Figures 1 & 2).

Numbers of adult biting mosquitoes can be expected to reach peaks within three weeks of heavy rainfall (Whelan and Hurk 2003).

The Department of Health and Families provides guidelines on the preventing mosquito breeding on mine sites (Whelan and Warchot 2005), and on personal protection from biting insects (Whelan 2004).

For more information on biting insect borne diseases contact the nearest Centre for Disease Control.

Centre for Disease Control.

Alice Springs 8951 7540

www.nt.gov.au/health/cdc

For more information on mosquitoes and virus ecology contact Centre for Disease Control, Medical Entomology on 8922 8901

Table 1 Species of mosquito likely to be encountered in the Tanami (from Anon. 2010 cited in ABM Resources report 2013).

Common name	Scientific name	Possible abundance	Breeding places	Disease potential
Brown house mosquito	<i>Culex quinquesfasciatus</i>	Domestic situations	Septic tanks, polluted pools, stormwater drains, sumps, gully traps, tins, drums tanks and discarded receptacles	Low, a biting pest
Common banded mosquito	<i>Culex annulirostris</i>	Most common biting mosquito in the NT	Freshwater swamps, vegetated streams, storm water drains, grassy edges of sewage ponds, inundated low lying grassy areas	Murray Valley encephalitis, Ross River virus*, Barmah Forest virus,
Receptacle mosquito	<i>Aedes notoscriptus</i>	Where there are breeding sites	Tree holes, rock pools, fallen palm fronds, rain filled receptacles e.g. tins, drums, tyres, tanks, gutters etc.	Probable Ross River virus
Pale larvae mosquito	<i>Aedes tremulus</i>	Regular presence	Tree holes and stumps, discarded receptacles	A biting pest
Northern salt marsh mosquito	<i>Aedes vigilax</i>	Uncommon to rare, carried south on north-westerly wind from monsoons/ cyclones	Brackish to salt water swamps and temporary pools	Ross River virus, Barmah Forest virus, potential for Murray Valley encephalitis
Salt water anopheles mosquito	<i>Anopheles hilli</i>	Very rare	Brackish coastal swamps margins and flood plains	Suspected malaria (no current malaria in the NT)
Common Australian anopheline	<i>Anopheles annulipes</i>	Rarely a pest	Temporary and permanent fresh water pools with grassy edges, discarded receptacles	Suspected malaria

* The common banded mosquito is the major vector for Ross River virus in the Northern Territory.

3. MANAGEMENT MEASURES

3.1 Prevention

Physical

The most effective means to control biting insects, more specifically mosquitos, is to prevent their introduction to a site and prevent breeding habitats. To achieve this, the following practices are used:

- Any ponds, dams, drains, sediment traps, bunded areas and on-site excavations filled with water will be inspected for the presence of mosquito larvae during the wet season. If larvae are detected, the Medical Entomology Branch of NT Health will be contacted for assistance in choosing a suitable method of control.
- Any depressions created in the ground surface where possible will be filled or drained to prevent the ponding of water and all drainage channels / spoon drains will be kept as shallow as possible to prevent ponding.
- Stockpiles will be placed in areas that do not impede drainage and will be shaped to prevent ponding.
- Sedimentation ponds will be emptied promptly after storm events to prevent long-term ponding.
- Ponds, dams and other water holding structures will be designed appropriately and maintained to minimise the potential for mosquito breeding (section 3.3.1).
- Care will be taken that ponding does not occur in rubbish storage areas.
- Erosion and wash-down practices will be controlled to prevent sediment and debris forming standing water pools around the site.
- All accommodation facilities and offices will be screened and air conditioned to discourage mosquitos.
- 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.
- 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.

Medical

Basic symptoms for mosquito borne diseases (Whelan and Hurk 2003) include:

- pain in joints of the extremities
- lethargy
- aching tendons
- skin rashes
- fever
- tiredness
- headaches and
- swollen lymph nodes
- headache

Less common symptoms include:

- sore eyes
- a sore throat
- nausea and
- tingling in the palms of the hands or soles of the feet

Note this is a very general list of symptoms and employees are advised to consult the onsite medic and a health professional (if offsite) for any of these symptoms.

3.1.1 Preventing breeding sites

This section outlines possible sources of breeding sites for biting insects. These areas will be constructed and are maintained in accordance with the *Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites 2005* by the Northern Territory Government – Department of Health and Families.

Camp

- potable water storage tanks
- septic systems
- storm water containment bunds
- stormwater drains and sediment traps
- cleared areas
- borrow pits for roads/building pad construction
- airstrip
- any additional potential water pooling receptacles associated with this area

Mine site

- storm water drains, storm water collection ponds, sediment traps, discharge sites
- excavation Pits
- water dams and water tanks
- tailings Dam
- waste rock dump
- processing plant
- process water/wash down water
- borrow pits for roads/building pad construction
- dust suppression water tanks
- truck wash down bay
- septic systems
- any additional potential water pooling receptacles associated with this area

Haul road and access tracks

In line with the Water Management Plan the haul roads and main access road will be constructed to minimise any potential for constricting flow to mitigate flooding potential; avoiding pooling of water for mosquito breeding sites.

Mine closure and rehabilitation

The Mine Closure Plan and progressive rehabilitation will minimise the potential mosquito breeding sites that will remain after the cessation of mining operations. All disturbed areas will be rehabilitated to be free draining where practicable.

3.2 Monitoring

ABM staff will periodically check mosquito activity within the accommodation and work areas, including the water storage dams, to identify the success of mitigation measures and to determine whether larval and adult eradication programs should be implemented. Refer to Appendix A – Mosquito monitoring program.

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
- minimal impacts and bites from mosquitos reported to medical officer on site.

3.3 Control

If mosquitos and larvae are identified at an area that is the result of ABM activities the following steps will be completed.

Define and map:

1. Define the water bodies, extent of the occurrence and associated control program.
2. Record the GPS locations (MGA 94) of the occurrences, size of infestation.
3. Send data to environmental manager or delegate to record within the biting nsect register.

Mosquito control:

Any significant mosquito activity will be reported to ABM's site manager and / or the Northern Territory Medical Entomology Branch.

Peter Whelan, Medical Entomology
Department of Health
PO Box 41326, Casuarina, NT 0811
Phone: (08) 8999 8901
Facsimile: (08) 8999 8820

ABM will seek advice from the Northern Territory Medical Entomology Branch, before proceeding with chemical eradication of the mosquitos.

3.3.1 Habitat modification

The first step in mosquito control will be habitat modification, specifically the modification of existing infrastructure and breeding receptacles to prevent mosquito breeding. The details of modification are similar to those outlined in section 3.1 – physical prevention.

The aim of habitat modification is to reduce the surface water ponding onsite to discourage and reduce mosquito breeding.

3.3.2 Chemical controls

If necessary, areas that cannot be managed with other management controls will be treated as required 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 and be detrimental to the environment.

The effectiveness of the various 'acceptable' agents, depending on appropriate formulations and local conditions and the target mosquito species, is of critical concern. Therefore ABM Resources will seek advice from the Northern Territory Medical Entomology Branch before proceeding with any chemical eradication of mosquitos.

Management actions:

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

- A licensed operator will be engaged to undertake the chemical treatment.
- Chemicals used will be registered and used in accordance with manufacturer's instruction.
- Treatments will not be undertaken prior to a breeding event.
- Areas identified for treatment will consider environmentally sensitive areas and buffer zones will be designated.
- A treatment register will be maintained and include:
 - areas treated
 - date and time of treatment
 - equipment
 - pilot/operator
 - insecticide dose
 - insecticide batch measure
 - result

3.4 Reporting

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

Peter Whelan, Medical Entomology
 Department of Health
 PO Box 41326, Casuarina, NT 0811
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4. RESPONSIBILITIES

Accountability for fulfilling the requirements of the BIMP is related to the stage of project development (exploration, construction, bulk sampling and mining).

The site supervisor or a delegate shall:

- approve policy and procedure
- ensure contactors and staff are aware of the BIMP and hygiene requirements
- work with contractors, field and environmental personnel to implement management measures to prevent and control the breeding of mosquitoes.

The environmental manager or a delegate shall:

- review/develop/implement the BIMP
- work with the contractors, field and management personnel to ensure there are no mosquito breeding habitats and hygiene measures are in place
- keep track of legislative requirements
- Plan and implement mosquito management programs,
- educate staff and contractors of mosquito species and obligations
- report occurrence of mosquito infestations to regulators and relevant management personnel.

Delegated onsite personnel shall:

- ensure contactors and staff are aware of the BIMP and hygiene requirements

- inspect equipment and complete hygiene checklist (including filing)
- plan and implement biting insect management programs
- track progress of management measures
- monitor the water dam areas and areas of biting insect control
- educate staff and contractors of mosquito species and obligations
- if required ensure biting insect management measures are discussed during daily/tool box meetings.

Site personnel shall:

- report mosquitos to environmental manager or delegated onsite person immediately
- follow biting insect management requirements
- ensure hygiene inspections are completed.

5. REFERENCES

ABM Resources NL 2013, *Environmental Management Plan & Existing Environment of the Tanami Exploration Area*. Internal report.

Centre for Disease Control 2013, *Mosquito-borne diseases*. Northern Territory Government. Available from: <[http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/45/02.pdf&siteID=1&str_title=Mosquito-borne diseases.pdf](http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/45/02.pdf&siteID=1&str_title=Mosquito-borne+diseases.pdf)> [2 August 2013].

Domahidy, G. 1990, *Hydrogeology of the Granites-Tanami mining region: Explanatory notes for 1:250,000 scale map*. Northern Territory Power and Water Authority. Report 74/1990, p. 23.

P Whelan 2004. 'Personal protection from mosquitoes and biting midges in the NT'. *Northern Territory Disease Control Bulletin*. Vol. 11, no. 2, p18. Available from: <http://www.health.nt.gov.au/Medical_Entomology/Publications/index.aspx.> [2 August 2013].

Whelan, P and Warchott, A, 2005 *Guidelines for the preventing mosquito breeding sites associated with mining sites*. Department of Health and Families, Northern Territory Government. Available from: <<http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/32/40.pdf&siteID=>>. [2 August 2013].

Whelan, P. I., 2010, '*Personal protection from mosquitoes and biting midges in the Northern Territory*', Medical Entomology, NT Department of Health, Northern Territory Government. Available from: <http://health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/70/75.pdf&siteID=1&str_title=Personal%20protection%20from%20mosquitoes%20and%20biting%20midges.pdf>

Whelan, P and Hurk, A., 2003, 'Medically important insects in the Northern Territory and how disasters may affect them'. *The Northern Territory Disease Control Bulletin*, Vol 10, No.1, pp. 27-38.

Whelan, P and Nguyen, H., 2011. *Mosquito Species Recorded From The Northern Territory*. Department Of Health, Northern Territory Government. Available from: <http://health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/51/48.pdf&siteID=1&str_title=Mosquito%20species%20recorded%20from%20the%20NT.pdf.>. [2 August 2013].

Whelan, P 2010, *Common Mosquitoes of the Northern Territory. Descriptions of species, habitats and disease potential*. Department of Health and Families, Northern Territory Government. Available from: <http://health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/51/36.pdf&siteID=1&str_title=Common%20mosquitoes%20in%20the%20NTin%20the%20NT.pdf.>. [2 August 2013].

Whelan, P Centre for Disease control. 2003. Biting Midges or 'Sandflies' in the Northern Territory. *The Northern Territory Disease Control Bulletin*. Centre for Disease control. Vol. 10, No. 3, September 2003 pp. 2-10.

6. CONTROL AND REVISION HISTORY

Document information

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1	27/05/2013	J. Robins	Initial Issue
2	28/08/2013	P. Hill	Minor revisions
3			
4			

Read by

	NAME	DATE	SIGNED
1	J. Robins	27/05/2013	
2	P. Hill	28/08/2013	
3			
4			

APPENDIX A – Mosquito monitoring program

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

Additional considerations for monitoring 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