JUNE 2021

Biting Insects Management Plan

LITTLE MINDIL HOTEL AND RESORT DEVELOPMENT

BPL Environmental

CONTROL AND REVISION HISTORY

Revisions

Version	Document	Author	Reviewer/Approver	Date Reviewed
Version 1.0	Draft BIMP	Sharon Arena – BPL	John Hamilton - Urbanscope	2 June 2021
Version 1.1	Final BIMP	Sharon Arena - BPL	John Hamilton - Urbanscope	3 June 2021

BPL Environmental

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Disclaimer

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
BPL	BPL Environmental
KTT	KTT Investment Pty Ltd
The Project	Little Mindil Hotel and Resort Development
BIMP	Biting Insects Management Plan
km	Kilometre
ha	Hectare
NSW	New South Wales
NT	Northern Territory
WA	Western Australia

1 INTRODUCTION

The Northern Territory (**NT**) coast has extensive areas of mangrove lined creeks, estuaries and freshwater floodplains, with much of the coastal zone being largely in its natural state. In general, development activities occurring within coastal areas in the NT will encounter biting insects. The main insects causing potential impacts are biting midges and mosquitoes.

The potential human health issues associated with biting insects include:

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

This Biting Insect Management Plan (**BIMP**) has been prepared to address biting insects during the construction and operational phases of the Little Mindil Hotel and Resort Development (the **Project**).

1.1 PROJECT OVERVIEW

KTT Investment Pty Ltd (**KTT**) propose to develop a multi-story hotel/resort, apartment complex at Little Mindil Beach (the **Project**). The Project, located at 25 Gilruth Avenue, The Gardens, Northern Territory, is approximately 2.5 kilometres (**km**) north-west of the Darwin Central Business District (**Figure 1-1**).

The 5.13 hectare (**ha**) Project site is largely cleared with a partially developed at-grade carpark, associated landscaping and a large lawn area. The north-eastern boundary of the site contains a densely vegetated tidal creek; an escarpment bounds the southern perimeter and Little Mindil beach is to the north-west.

The Project will consist of five buildings comprising the following:

- 168 hotel rooms;
- 53 serviced apartments;
- Six retail spaces;
- 277 car parks; and
- Beachfront food and beverage venue.

A constructed lagoon, roof top and ground level landscaping and water features will also be incorporated into the complex design.

1.2 PROPONENT DETAILS

Proponent details for the Little Mindil development are summarised in **Table 1-1**.

Table 1-1: Proponent Details

Proponent	KTT Investment Pty Ltd
Contact	John Hamilton – Urbanscope (Australia) Pty Ltd
Postal address	c/- 459 Harris Street Ultimo NSW 2007
Phone	+61 2 9042 0600
Fax	+61 2 9660 7681
Email	johnha@urbanscope.com.au
Proponent ABN	70 634 253 197

0 50 100 m

Project Location

Figure 1-1

Parcel 7651 boundary

Date: 26/02/2021
CRS: GDA 1994 MGA Zone 52
Author: eleanor@animalplantmineral.com.au

1.3 OBJECTIVES

This BIMP aims to:

- Control the effects of biting insects on patrons and personnel (construction and operation) working at the Project site;
- Ensure that control practices are implemented to deter adult biting insects on site and to prevent the occurrence of breeding sites;
- Inform about the risks regarding biting insects and the potential diseases they carry;
- Indicate the health and safety legislation and guidelines regarding biting insects; and
- Assist the Project to set and achieve goals for biting insect management and monitoring.

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 considers 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); and
- Constructed wetlands in the NT – Guidelines to prevent mosquito breeding (Warchot & Whelan, 2008).

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

2 BITING INSECT SPECIES AND EFFECTS

Given the locality of the Project within the coastal foreshore of the Darwin region and adjacent to a tidal creek, biting midges and mosquitoes are anticipated to be present on the site. Seasonal factors, food, habitat availability and breeding cycles influence the distribution and abundance of biting insects. Different species of biting insects have differing patterns of distribution and seasonal changes in abundance.

Biting midges cause irritation and nuisance, however, mosquitoes are potential vectors for disease to humans. The most commonly recorded mosquitoes in the Darwin region are Aedes and Culex species (Whelan, 2010), some of which are known carriers of the arboviral diseases such as Ross River Virus and Murray Valley Encephalitis.

2.1 BITING MIDGES

The mangrove biting midge *Culicoides ornatus* occupies mangrove areas throughout the NT coast and breeds in mud under dense mangrove canopies. *Culicoides ornatus* is the most common human pest biting midge species around coastal areas of the NT (Shivas 1999; Shivas & Whelan 2001; Whelan 2003). The proximity of the Project to Little Mindil Creek will result in occurrences of mangrove biting midge.

Biting midges do not transmit disease to humans in Australia (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).

Greatest effects are encountered for a period of 6 days around a full and new moon, during the 2 hours around sunset and sunrise. Night-time effects may also be encountered. The dry season poses a greater risk than wet season effects.

Two other species, *Culicoides flumineus* and *Culicoides sp*ec. (undescribed in 2009 but similar to *Culicoides immaculatus*) may cause pest problems, although are rarely found outside of mangrove forests (Whelan, 2003).

2.2 MOSQUITOES

Within the NT there are approximately 100 species of mosquitoes, with only 40 of these known to bite people and only 20 occurring in sufficient numbers to cause pest problems (Whelan, 2010a). The most common and important mosquitoes occurring in the NT are described in Table 2-1, along with a summary of distribution, breeding habitat, adult habits and disease potential.

Mosquitoes generally breed in stagnant 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).

Table 2-1: Summary of Common Mosquitoes in the Northern Territory

Species	NT Distribution	Breeding Habitat	Adult Habits	Disease Potential
Aedes notoscriptus Receptacle Mosquito	• Common throughout Australia • Found from Darwin to Alice Springs wherever artificial receptacles or natural tree holes exist	• Natural breeding places include tree holes, rockpools and fallen palm fronds • Breeds in all types of artificial rain filled receptacles such as boats, tyres, drums, domestic water tanks, roof gutters, pot plant trays etc	• Bites at night or in the day in shade • Persistent but easily disturbed minor domestic pest • Capable of flying 2-3 km but usually found within 200 m of water filled receptacles	• Suspected vector for Ross River Virus in the NT
Aedes tremulus Pale Larvae Mosquito	• Throughout Australian mainland north from Geraldton in WA across inland South Australia and Victoria and up to Queensland and the NT	• Natural breeding places are holes in trees and stumps that have filled with rainwater • Often found in artificial receptacles that have filled with rain water or artificially flooded.	• Becomes a minor domestic pest where suitable breeding sites exist • Do not travel more than 500 m from breeding sites • Frequently bite at dawn and during the late afternoon • Painful biters, although not usually present in large numbers	• Not known to transmit diseases in Australia
Aedes vigilax Northern Salt Marsh Mosquito	• Found coastally throughout much of Australia • In NT, it is seasonally common across the Top End	• Commonly breeds in sunlit brackish to salt water swamps and temporary pools that are filled after the highest tides of the month and after rain. • Breeding areas are often associated with salt water couch grass, various marsh grasses, salt tolerant succulents and reeds.	• Will bite people day or night • Peak flying or biting times are just after sunset and before sunrise • Plagues occur from mid to late dry season and early wet season	• Major pest in the NT • Principle vector for Ross River Virus and Barmah Forest Virus in late dry season to early wet season • Possible vector for Murray Valley Encephalitis
Anopheles annulipes Common Australian Anopheline	• Throughout Australia • In NT, occurs from Darwin to Alice Springs	• Can breed in all kinds of temporary and permanent freshwater ground pools, streams and vegetated swamp edges and floating algae or vegetation away from the banks	• Bits at night, particularly dusk and dawn • Species is abundant in the NT between February and April near paperbark and freshwater reed swamps but rarely becomes an appreciable pest in the Top End • Travels approximately 2 km from breeding grounds	• Capable of carrying malaria
Anopheles bancroftii Black Australian Anopheline	• Found broadly throughout the Top End	• Usually found in shaded freshwater swamps, waterholes and stream margins	• Bites principally at night, however readily attacks people in the day in	• Capable of carrying malaria, although not usually long lived

Species	NT Distribution	Breeding Habitat	Adult Habits	Disease Potential
	• Common around extensive coastal flood plains and vegetated swamps and lagoons associated with larger rivers	• Sometimes found in slightly brackish reed swamps where reeds shade the water • Paperbark trees and spike rush reeds are good indicators of suitable breeding places	shaded areas near its breeding grounds • Range is approximately 2 - 4 km from breeding areas • Usually more numerous in the late wet season and early dry season	enough to be an effective vector
Anopheles farauti s.l. Australian Malaria Mosquito	• In Australia it occurs in northern Queensland, Top End of the NT and rarely on the north east coastal area of WA	• Occurs in many kinds of permanent and semi-permanent fresh and brackish water sites • Usually in sunlit locations; uncommon in deep shaded areas	• Bites people readily • Flight range approximately 2 km • Numerous numbers occur in the late wet season and early dry season	• Confirmed vector for malaria
Anopheles hilli Salt Water Anopheles Mosquito	• Common across northern Australia	• Found in natural and artificial coastal ground pools, coastal swamp margins and tidally influenced flood plains in sunlit to partially shaded sites • Breeds in brackish to salt water • Numbers most numerous at the end of the wet season	• Bites mainly after sunset for the first two hours of the night • Range of approximately 4 km • Very high numbers usually found close to brackish swamps in the late dry season	• Capable of carrying malaria
Anopheles meraukensis Freshwater Reed Anopheles	• Occurs in the northern areas of Australia	• Breeds predominantly in sunlit grass or reed freshwater swamps • Occasionally breeds within artificial receptacles	• Readily bites people, predominantly just after sunset • Numerous during the late wet season when breeding areas are filled with water and lodged reeds	• A suspected but unproven vector of malaria • Not known to transmit viral diseases in Australia
Coquillettidia xanthogaster Golden Mosquito	• Occurs throughout Australia • In NT it is found commonly in coastal and subcoastal areas	• Breeds in permanent and semi-permanent swamps with aquatic vegetation	• Bites mainly at night but also known to bite during the day in shaded areas • May travel up to 4 km from breeding sites • Attracted to light • Seasonally numerous	• Not known to transmit human disease, although a potential vector for Ross River Virus
Culex annulirostris Common Banded Mosquito	• Common throughout Australia • Found in high numbers seasonally from Darwin to Alice Springs where suitable breeding sites exist	• Natural freshwater swamps, pools and streams that have vegetation • May also breed in artificial situations such as stormwater drains, grassy edges of sewerage ponds and discussed swimming pools	• Commonly bites people after sundown and in the early part of the night • Most common biting mosquito in the NT • Can travel up to 10 km, although most prolific within 2 km of breeding sites	• Major vector for Murray Valley Encephalitis • Probable major vector of Ross River Virus between January to April • Capable of carrying Kunjin Virus, Barmah Forest Virus and other viruses

Species	NT Distribution	Breeding Habitat	Adult Habits	Disease Potential
Culex quinquefasciatus Brown House Mosquito	• Common throughout towns/cities in the NT	• Polluted or organic water close to human habitation. • Sources include: unscreened septic tanks, stormwater drains, sumps, gully traps, rain water tanks and unused swimming pools	• Bites mainly at night • Occurs both indoors and outdoors; is the most common species found inside houses • Will harbour in dark humid areas such as cupboards, underneath sinks and near toilets and baths • Will travel 1-2 km from breeding sites	• Laboratory trials indicate it to be a poor vector for Murray Valley Encephalitis virus and Ross River Virus
Culex sitiens Salt Water Culex Mosquito	• Widespread throughout coastal areas within the NT and across Australia as far south as Perth WA and Batemans Bay NSW	• Brackish to salt pools, including artificial receptacles, influenced by tides and sea spray • Often found in salt marshes	• Bites mainly in the evening and at night • Will bite humans but not as avid a biter as some other species • Only an appreciable pest in the NT when very productive breeding sites are nearby • May travel up to 10 km, although most prolific within 2-3 km of breeding sites	• No evidence of causing disease in Australia, although a possible vector for Ross River Virus
Mansonia uniformis Aquatic Plant Mosquito	• Found throughout the Top End and coastal areas of the NT in association with permanent to semi-permanent vegetated swamps, creeks and wetlands	• In permanent and semi-permanent freshwater swamps and water-holes with aquatic and semi-aquatic plants	• Rests in the day in dense vegetation near swamps • Females bite mainly in the evening and night, however can also be active in the daytime near breeding areas. • Strongly attracted to light • Will travel up to 4 km from breeding grounds, although are generally in highest numbers within 1km of breeding sites • Serious pest during early dry season near aquatic areas	• Not known to spread human disease in Australia
Verrallina funereal Brackish Forest Mosquito	• Found in Australia from coastal NSW up to Queensland and across to northern WA • Extensively in coastal to sub-coastal areas in the Top End of the NT.	• Brackish to freshwater pools • Usually in shaded swampy areas of paperbarks, brackish ferns, Casuarina forests, beach hibiscus thickets and sedges near tidal areas	• Vicious and painful biter • An appreciable pest near productive breeding sites • Bites mainly in the day in the shade • Does not disperse outside of dense shade near breeding sites during the day and will rapidly attack in these areas during the wet season	• Probable vector for Ross River Virus in tropical Australia • Potential vector of Murray Valley Encephalitis and Kunjin Virus

3 POTENTIAL SOURCES OF BITING INSECTS

Biting insects may pose a risk during both the construction and operational phases of the Little Mindil Resort Development. Potential sources of biting insects associated with construction of the Project include:

- Little Mindil Creek (**Figure 3-1** and **Figure 3-2**)
- Erosion and sediment control structures (**Figure 3-3** and **Figure 3-4**), such as:
    - Level spreaders
    - Catch drains
    - Rock filter dams
    - Field inlet sediment barriers
    - Sediment basins
    - Sediment fences
    - Silt curtains
    - Stormwater pits
    - Swale discharge areas
- Pooling within vehicle track, ground depressions and lower topographic areas following heavy rainfall
- Pooling within artificial receptacles utilised at the site during construction following heavy rainfall

During operation of the Hotel and Resort Complex, the following potential sources of mosquito and midge breeding may occur:

- Little Mindil Creek
- Constructed Lagoon
- Water features
- Landscaped vegetated areas (both roof-top and ground level)
- Stormwater control structures (**Figure 3-5**), such as:
    - Stormwater drains
    - Swale discharge areas
    - Stormwater pits
    - Rock filter dams
    - Level spreaders
- Surface ponding following heavy rainfall
- Artificial receptacles collecting water following heavy rainfall

Light emission associated with the operation of the Resort may also act as an attractant to biting insects.

Management strategies to reduce the risks of increased biting insect numbers are described in Section 5.

Figure 3-1: Little Mindil Creek

Legend

- Parcel 7651
- Tidal Creek Riparian vegetation
- Escarpment vegetation

0 50 100 m

Figure 3-2: Little Mindil Creek Location

Sensitive and Significant Vegetation

Animal Plant Mineral Pty Ltd

Date: 26/02/2021
CRS: GDA 1994 MGA Zone 52
Author: eleanor@animalplantmineral.com.au

LEGEND

- EXISTING SURFACE CONTOURS
- PROPOSED FINISHED SURFACE CONTOURS
- EXISTING ROAD
- SITE BOUNDARY
- PROPOSED STORMWATER DRAINAGE (INDICATIVE LOCATION ONLY)
- PROPOSED SWALE DISCHARGE
- PROPOSED FOOTPATH
- PROPOSED ROAD PAVEMENT
- PROPOSED 'NO GO ZONE'
- PROPOSED LAGOON AREA
- PROPOSED TEMPORARY SEDIMENT BASIN
- PROPOSED TEMPORARY STOCKPILE
- PROPOSED STORMWATER PIT
- FIELD INLET SEDIMENT BARRIER (FOR CLEAN WATER DIVERSION)
- TEMPORARY IMPERMEABLE COVER FOR STORMWATER INLET PIT
- SEDIMENT FENCE (INDICATIVE LOCATION)
- EARTH BUND
- ROCK FILTER DAM
- LEVEL SPREADER
- CATCH DRAIN

CPESC CERTIFICATION

Mr Sam Warner
BEng(Hons) MIEAust, CPEng, NER, CPESC
Signature: .....
Date: 06.2021
CPESC #: 9562

SEDIMENT BASIN NOTES

DURING EARLY WORKS THE BASEMENT EXCAVATION SHALL BE USED AS A TEMPORARY SEDIMENT BASIN UNTIL THE BUILDING FLOOR SLABS HAVE BEEN POURED AND THE ROAD AND FOOTPATH AREAS HAVE BEEN STABILISED.

TIMOR SEA

INSTALL SILT CURTAIN TO HEADWALL OUTLET

ROCK FILTER DAM

EXISTING CREEK

FFL RL 6.0

NO GO ZONE

SEDIMENT BASIN EMERGENCY OVERFLOW DRAIN

SEDIMENT BASIN EMERGENCY OVERFLOW OUTLET

HATCH DENOTES BASEMENT EXCAVATION TO BE UTILISED AS SEDIMENT STORAGE AREA LOCALISED SUMP TO BE LOCATED AT INVERT OF SEDIMENT AREA (MULTIPLE SUMPS MAY BE REQUIRED) CONTRACTOR TO ACHIEVE SEDIMENT RELEASE GUIDELINES PRIOR TO DISCHARGE OF CAPTURED RUNOFF SITE

INDICATIVE TEMPORARY STOCKPILE LOCATION

EARTH BUND

CLEAN WATER DIVERSION DRAIN TYPE 2

CONSTRUCT LEVEL SPREADER TO CHANNEL OUTLET

DUMPED ROCK AT TO THE INLET TO THE SEDIMENT BASIN OFF THE CATCH DRAIN

CATCH DRAIN TYPE 3

CLEAN WATER DIVERSION DRAIN TYPE 2

CONSTRUCTION ENTRY/EXIT

DOWNSTREAM INGROUND STORMWATER MAIN TO BE UTILISED TO CONVEY CLEAN WATER FROM CATCHMENT B. INLETS WITHIN CATCHMENT C TO BE APPROPRIATELY BLOCKED AND SEDIMENT LADEN WATER DIRECTED TO SEDIMENT BASIN.

ROCK CHECK DAMS TO BE SPACED IN ACCORDANCE WITH THE ESC NOTES AND DETAILS ON C11.

CONTRACTOR LAY DOWN AREA AND SITE OFFICE (INDICATIVE LOCATION).

CLEAN WATER DIVERSION DRAIN TYPE 1

GILRUTH AVENUE

BURNETT PLACE

A B C D E F

ISSUED FOR
INFORMATION ONLY

Rev	Date	Description	By	Chk
A	1.06.21	ISSUED FOR INFORMATION	JL	HD

0 10 20 30m
SCALE 1:500
AT ORIGINAL SIZE (A1)

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Client: Arthur Winston Investments Pty Ltd	Discipline: CIVIL		Status: INFORMATION
Project Name: LITTLE MINDIL BEACH THE GARDENS, NORTHEN TERRITORY	Designed By: HD	Checked By: HD	Approved By: BL
	Project No.: 23085	Drawn By: DG	Scale at A1: AS SHOWN

Title: EROSION AND SEDIMENT CONTROL LAYOUT PLAN CONSTRUCTION STAGE - PHASE 1
Figure 3-3

Drawing No.: DA_C110
Revision: A

PLOT DATE: 6/1/2021 5:25 PM FILENAME: \\ADGDWN04\JOBS\23000\23085\CVL\DWG\DA\23085_DA_C110_EROSION AND SEDIMENT CONTROL LAYOUT PLAN CONSTRUCTION STAGE – PHASE 1.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- EXISTING SURFACE CONTOURS
- PROPOSED FINISHED SURFACE CONTOURS
- EXISTING ROAD
- SITE BOUNDARY
- PROPOSED STORMWATER DRAINAGE (INDICATIVE LOCATION ONLY)
- PROPOSED SWALE DISCHARGE
- PROPOSED FOOTPATH
- PROPOSED ROAD GRAVEL
- PROPOSED 'NO GO ZONE'
- PROPOSED LAGOON AREA
- PROPOSED BUILDING SLABS (CONSTRUCTED)
- PROPOSED STORMWATER PIT
- FIELD INLET SEDIMENT BARRIER (FOR CLEAN WATER DIVERSION)
- SEDIMENT FENCE (INDICATIVE LOCATION)
- EARTH BUND
- ROCK FILTER DAM
- LEVEL SPREADER
- CATCH DRAIN

CPESC CERTIFICATION

Mr Sam Warner
BEng(Hons) MIEAust, CPEng, NER, CPESC
Signature:
Date: 1.06.2021
CPESC #: 9562

TIMOR SEA

INSTALL SILT CURTAIN TO HEADWALL OUTLET

ROCK FILTER DAM

EXISTING CREEK

FFL RL 6.0

NO GO ZONE

CONTRACTOR TO APPLY MESH AND AGGREGATE INLET PROTECTION

CONTRACTOR TO INSTALL SUMP AT THE INVERT OF THE LAGOON AREA (MULTIPLE SUMPS MAY BE REQUIRED) CONTRACTOR TO ACHIEVE SEDIMENT RELEASE GUIDELINES PRIOR TO DISCHARGE OF CAPTURED RUNOFF SITE

CLEAN WATER DIVERSION DRAIN TYPE 2

CONSTRUCT LEVEL SPREADER TO CHANNEL OUTLET

DUMPED ROCK AT TO THE INLET TO THE SEDIMENT BASIN OFF THE CATCH DRAIN

CLEAN WATER DIVERSION DRAIN TYPE 1

DOWNSTREAM INGROUND STORMWATER MAIN TO BE UTILISED TO CONVEY CLEAN WATER FROM CATCHMENT B. INLETS WITHIN CATCHMENT C TO BE APPROPRIATELY BLOCKED AND SEDIMENT LADEN WATER DIRECTED TO SEDIMENT BASIN.

ROCK CHECK DAMS TO BE SPACED IN ACCORDANCE WITH THE ESC NOTES AND DETAILS ON C11.

CONTRACTOR LAY DOWN AREA AND SITE OFFICE (INDICATIVE LOCATION).

CONSTRUCTION ENTRY/EXIT

BURNETT PLACE

GILRUTH AVENUE

A B C D E F

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INFORMATION ONLY

Rev	Date	Description	By	Chk
A	1.06.21	ISSUED FOR INFORMATION	JL	HD

SCALE 1:500
AT ORIGINAL SIZE (A1)

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Client: Arthur Winston Investments Pty Ltd
Project Name: LITTLE MINDIL BEACH
THE GARDENS, NORTHEN TERRITORY

Discipline	Status
CIVIL	INFORMATION

Designed By	Checked By	Approved By
HD	HD	BL

Project No.	Drawn By	Scale at A1
23085	DG	AS SHOWN

Title: EROSION AND SEDIMENT CONTROL LAYOUT PLAN CONSTRUCTION STAGE - PHASE 2
Figure 3-4

Drawing No.: DA_C111
Revision: A

PLOT DATE: 6/1/2021 5:24 PM FILENAME: \\ADGDWN04\JOBS\23000\23085\CVL\DWG\DA\23085_DA_C111_EROSION AND SEDIMENT CONTROL LAYOUT PLAN CONSTRUCTION STAGE – PHASE 2.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

LEGEND

- EXISTING SURFACE CONTOURS
- PROPOSED FINISHED SURFACE CONTOURS
- EXISTING ROAD
- SITE BOUNDARY
- SWD — PROPOSED STORMWATER DRAINAGE (INDICATIVE LOCATION ONLY)
- PROPOSED SWALE DISCHARGE
- PROPOSED FOOTPATH
- PROPOSED ROAD PAVEMENT
- PROPOSED VEGETATION AREA
- PROPOSED BUILDING AREA
- PROPOSED LAGOON AREA
- PROPOSED STORMWATER PIT
- FIELD INLET SEDIMENT BARRIER
- SF — SEDIMENT FENCE (INDICATIVE LOCATION)
- RFD — ROCK FILTER DAM
- LS — LEVEL SPREADER

CPESC CERTIFICATION

Mr Sam Warner
BEng(Hons) MIEAust, CPEng, NER, CPESC

Signature: .....

Date: 1.06.2021

CPESC #: 9562

REMOVAL OF CONTROLS

CONTROLS MAY BE REMOVED ONCE ALL AREAS HAVE BEEN STABILISED AND 85% VEGETATION COVER HAVE BEEN ISSUED.

TIMOR SEA

SILT CURTAIN TO BE REMOVED FROM SITE AFTER 85% VEGETATION ESTABLISHMENT

PROPOSED VEGETATION AREAS (REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR DETAILS)

EXISTING CREEK

NO GO ZONE

SEDIMENT FENCE AND ROCK FILTER DAMS TO BE REMOVED FROM SITE AFTER 85% VEGETATION ESTABLISHMENT

CLEAN WATER DIVERSION DRAIN TYPE 3

LEVEL SPREADER TO CHANNEL OUTLET TO BE REMOVED FROM SITE AFTER 85% VEGETATION ESTABLISHMENT

INLET SEDIMENT TRAP TO BE REMOVED FROM SITE AFTER 85% VEGETATION ESTABLISHMENT

NO GO ZONE

CLEAN WATER DIVERSION DRAIN TYPE 2

NO GO ZONE

CLEAN WATER DIVERSION DRAIN TYPE 1

BURNETT PLACE

GILRUTH AVENUE

ISSUED FOR
INFORMATION ONLY

Rev	Date	Description	By	Chk
A	1.06.21	ISSUED FOR INFORMATION	JL	HD

0 10 20 30m
SCALE 1:500
AT ORIGINAL SIZE (A1)

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Client: Arthur Winston Investments Pty Ltd

Project Name: LITTLE MINDIL BEACH
THE GARDENS, NORTHEN TERRITORY

Discipline		Status
CIVIL		INFORMATION
Designed By	**Checked By**	**Approved By**
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Project No.	**Drawn By**	**Scale at A1**
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Title: EROSION AND SEDIMENT CONTROL PLAN
STABILISATION STAGE

Figure 3-5

Drawing No.: DA_C112

Revision: A

PLOT DATE: 6/1/2021 5:25 PM FILENAME: \\ADGDWN04\JOBS\23000\23085\CVL\DWG\DA\23085_DA_C112_EROSION AND SEDIMENT CONTROL PLAN STABILISATION STAGE.DWG

FULL SIZE ON ORIGINAL 0 10 20 30 40 50 60 70 80 90 100mm

4 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.

4.1 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 4-1.

Table 4-1: Potential Impact

	Situation
Biting Midges	Workforce disruption, particularly during construction (e.g. personnel new to the region will have less immunity to midge bites)
	Reduced amenity for Resort patrons due to nuisance midge populations
	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)
	Reduced amenity for Resort patrons due to nuisance mosquito populations
	Secondary effects after being bitten, such as pain at the bite location, intense itching, infection and scarring (following scratching)
	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.

5 MANAGEMENT AND MITIGATION

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

5.1 PERSONAL PROTECTION

Personal protection for staff and patrons in an important strategy in reducing the risks and impacts from biting insects. Table 5-1 details management measures to improve personal protection.

Table 5-1: Management and Mitigation – Personal Protection

	Mitigation Strategy
Employees / Contractors	Personal protective clothing adequate to protect against bites will be made available to all personnel
	Insect repellent will be accessible at all times
	Sources, risks and mitigation measures associated with biting insects will be incorporated into Site Inductions
	Entry of biting insects into indoor spaces, such as offices and work areas, will be prevented or at least minimised by sealing off and air-conditioning of buildings (where possible)
Resort Patrons	Information on biting insects, including personal avoidance strategies, will be provided to Resort patrons
	Where appropriate, insect repellent will be made available

5.2 STRUCTURES AND POTENTIAL BREEDING SITES

Elimination of potential breeding sites is the most important and effective control measure for biting insects. Table 5-2 identifies mitigation measures for the reduction of breeding site potential.

Table 5-2: Management and Mitigation – Breeding Habitat Potential

	Mitigation Strategy
Erosion and Sediment Control Structures	Design structures to be as shallow as possible to discourage pooling of water
	Residence time for standing water should be less than 5 days
	Drainage structures should be constructed as level as possible to prevent creation of small water pools. Structures should also be sloped to encourage full drainage
	Stormwater management should direct discharge to areas where regular flushing will occur (Department of Health, 2017). This is the case with Little Mindil Creek, which is tidally influenced
	Vegetation growth within structures should be removed to reduce breeding site potential
	The use or erosion control structures is encouraged to reduce instances of scouring within the landscape, which will create water pooling opportunities
	Sediment basins should be maintained, with sediment periodically removed, to ensure capacity is retained in the structures
Artificial receptacles	Remove or cover any artificial objects that could collect water following heavy rainfall events
	Consider avoidance of water collection in the detailed design phase of the Project
Landscape Features	Water features and the Lagoon to be designed with steep sides (greater than 45° angles)
	Water features and the Lagoon to have moving rather than stagnant water
	Lagoon will be devoid of vegetation. Where possible, water features will also be void of aquatic plants

	Mitigation Strategy
	Plants selection for use in landscaping will consider water holding capacity of plant species; avoid the use of species known to contain water following rains or reticulation (such as bromeliads)
	Landscaped areas will be designed to discourage pooling of water on ground surfaces
Resort Design	Consideration of lighting options will be incorporated into the final design stage, to discourage attraction of biting insects where possible
Construction Activities	Vehicle ruts, man-made or natural depressions occurring through construction activities will be rectified to avoid pooling of water following heavy rainfall.

As Little Mindil Creek is a natural feature adjacent to the Project site, it is expected that contouring of the creek bed and the dense riparian mangrove vegetation will result in potential breeding sites. Chemical control measures will be employed where required, as discussed in Section 5.4.

5.3 INSPECTIONS

An effective inspection regime can address biting insect control in the early stages, reducing the number of insects reaching the adult phase. Table 5-2 details inspection commitments.

Table 5-3: Management and Mitigation – Inspections

	Mitigation Strategy
Regular Inspections	Conduct inspections at least weekly
	Erosion and sediment control structures, water features, the Lagoon, Little Mindil Creek and any other water holding structures 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
	Erosion and sediment control structures, water features, the Lagoon and any other water holding structures will be inspected for the presence of incidental vegetation growth. If identified, vegetation or vegetation debris should be removed.
	Artificial receptacles will be checked and any contained water removed to avoid occurrence of biting insect larvae
	Inspect the site, particularly during construction, to ensure no newly created depressions or ponding areas have occurred. If so, these should be rectified
	Inspect landscaped vegetation and garden beds to ensure no water pooling is occurring. Rectify where appropriate
Records	Records of inspections are to be maintained
	If insect larvae are identified, the date, time, location, type of insect and size of infestation must be detailed and recorded on the Biting Insects Register

5.4 CHEMICAL CONTROL

Where larvae or adult insects are identified within the site or in high numbers in Little Mindil Creek, chemical control measures may be employed. Advice must be sought from the Northern Territory Medical Entomology Branch in regards to choosing a suitable method of control for the eradication of biting insects, prior to proceeding with chemical eradication options.

> 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

5.4.1 Biting Midge

Residual barrier insecticide (bifenthrin applied by a licensed pest controller) will be applied around the Resort grounds 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.

5.4.2 Mosquitos

The barrier insecticide Bifenthrin may be used around populated 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.

If necessary, areas that cannot be managed with non-chemical control measures should be treated with a control agent. Chemical control methods 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 will depend on appropriate formulations and local conditions and the target mosquito species.

When chemical controls are to be used the management actions detailed in Table 5-4 will be adhered to.

Table 5-4: Management and Mitigation – Chemical Control

	Mitigation Strategy
Chemical Control	Control measures will be determined in consultation with the NT Medical Entomology Branch
	Precautionary treatment will not be undertaken, i.e. prior to a breeding event. Chemical control will only be conducted as a result of larval or adult insect existence
	Environmentally sensitive receptors and human health impacts should be considered when determining treatment areas and options
	A licensed operator must be engaged to undertake chemical treatment
	Chemicals must be stored and used in accordance with manufacture guidelines
	Follow up inspections of treated areas should be undertaken to determine success of control measures
Records	A chemical treatment register will be maintained, as detailed in Section 6-2.

6 MONITORING AND REPORTING

Project 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. Staff will also monitor the number of incidents involving biting insects that are included on the Biting Insects Register.

Key performance indicators of the BIMP include:

- No increased larvae or adult mosquito activity present on site;
- No increased complaints from Resort patrons about amenity impacts from biting insects; and
- Minimal impacts and bites from mosquitos reported from staff or Resort patrons.

6.1 MONITORING METHODOLOGY

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

- Visual inspections – visual inspection of the site for pooled water and larvae.
- Sampling of mosquito larvae - Mosquito larvae will be surveyed by sampling using a scoop (note – use of a white scoop will allow larvae to be seen more readily)

Additional triggers for monitoring activities include:

- Rain events and duration
- Excessive irrigation/watering
- Larvae numbers
- Presence of biting adults

6.1.1 Guidelines for Visual Monitoring

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:

- Eggs - Small floating capsules float on the water in rafts (not all species)
- Larvae - may be observed resting at the water surface:
    - 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 - shaped like a comma and rounder than larvae:
    - "tumble" as they move
- Adults - delicate legs, a long proboscis and one pair of transparent wings.

All insect infestations must be reported to the Resort Manager or Delegate, who will include the records in the Biting Insect Register.

For further advice of species or control options, the Medical Entomology Branch should be consulted.

6.2 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 recorded on the Register, including recording the following data:

- 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.

6.3 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 by Resort Management. Data to be recorded includes:

- Date and time of treatment
- Location of treatment
- Equipment/chemicals used (including batch numbers)
- Dose rates applied
- Results of follow up inspections to determine treatment success
- Detail follow up actions required (if any)
- Details and signature of Operator applying chemical control

6.4 ROLES AND RESPONSIBILITIES

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

The BIMP is considered a minimum standard and compliance is mandatory. All personnel 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 Resort Manager has ultimate control will coordinate the implementation of the BIMP and will be supported by the other on-site Managers/Supervisors. The Resort Manager will identify a Responsible Delegate who will be suitably trained and will coordinate implementation of the BIMP. The BIMP roles and responsibilities are summarised in Table 6-1.

Table 6-1: BIMP Responsibilities

Project Team Position	Responsibilities
Resort Manager	• Approve policy and suggested BIMP revisions; and • Work with contractors and Project personnel to implement the BIMP requirements.
Responsible Delegate	• 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 Resort patrons of biting insect species and the related BIMP obligations; • Ensure seasonal biting insect matters are discussed during staff 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 biting insect 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)	• Report significant biting insect issues and (actual and potential) mosquito breeding locations to Resort Manager or Responsible Delegate immediately; • Follow BIMP requirements, e.g. be vigilant for ponded water and report to Management if observed; and • Leave/store all items in such a manner as to prevent water ponding. This includes all waste materials. • Undertake any rectification works, as instructed, to address water pooling.

The BIMP collects statistics and information:

- To monitor the effectiveness of implemented control practices and adjusting them as required;
- To review 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).

7 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.

Where activities have the potential to cause conflict with the BIMP, discussions will be held with Management to determine an acceptable outcome based on an appropriate level of consultation, education, training and/or experience.

BIMP requirements shall be explained during site induction, staff meetings, 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;
- Personal protection strategies to avoid effects of 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 supervisor or Resort Management.

All such inductions and other training shall be recorded in the 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 an appropriate 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.

7.1 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.

8 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.

9 REFERENCES

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