Significant Species Management Plan

Miralga Creek DSO Project

16/10/2020

180-LAH-EN-PLN-0001
Revision 1

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Authorisation

Revision	Reason for Issue	Prepared	Checked	Authorised	Date
A	Internal review	F. Jones S. Springer	D. Morley M. Goggin		30/03/2020
B	Internal review	F. Jones	D. Morley	M. Goggin	02/04/2020
0	Inclusion with EPA referral	F. Jones	D. Morley	M. Goggin	06/04/2020
1	Revised to address DWER, DAWE and DMIRS comments	D. Morley	N. Bell	N. Bell	16/10/2020

Table of Contents

List of Tables

List of Figures

List of Appendices

Abbreviations

AER	Annual Environmental Report
Atlas	Atlas Iron Pty Ltd
BC Act	*Biodiversity Conservation Act 2016*
Biologic	Biologic Environmental Survey Pty Ltd
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity and Conservation and Attractions
DMIRS	Department of Mines, Industry Regulation and Safety
DWER	Department of Water and Environment Regulation
EP Act	*Environmental Protection Act 1986*
EPA	Western Australian Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GDP	Ground Disturbance Permit
GIS	Geographic Information System
MNES	Matters of National Environmental Significance
SSMP	Significant Species Management Plan

1 Introduction

1.1 Project Overview

The Miralga Creek DSO Project (the Project) is located approximately 100 km southeast of Port Hedland (Figure 1.1). Mining will be conducted via conventional open cut, crushing and screening mining methods above the groundwater table. The Project will include open pits, waste rock dumps and other supporting infrastructure.

Approvals for the Project have been sought under the Western Australian *Environmental Protection Act 1986* (EP Act) (EPA Assessment No. 2246) and the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC reference 2019/8601).

1.2 Purpose

The purpose of this Significant Species Management Plan (SSMP) is to mitigate potential impacts to conservation significant fauna species and to ensure that the Project is developed in an environmentally acceptable manner.

The specific objective of this SSMP is to avoid where possible, and otherwise minimise, direct and indirect impacts to significant fauna and their habitat. Significant fauna includes the following conservation significant species, which the Project has the potential to have an impact on:

- Northern Quoll.
- Ghost Bat.
- Pilbara Leaf-nosed Bat.
- Pilbara Olive Python.
- Northern Brushtail Possum.
- Grey Falcon.

This SSMP focuses particularly on the Ghost Bat (*Macroderma gigas*) and Northern Quoll (*Dasyurus hallucatus*). These two species were considered to be at risk of significant impact from development of the Project (Biologic, 2020c).

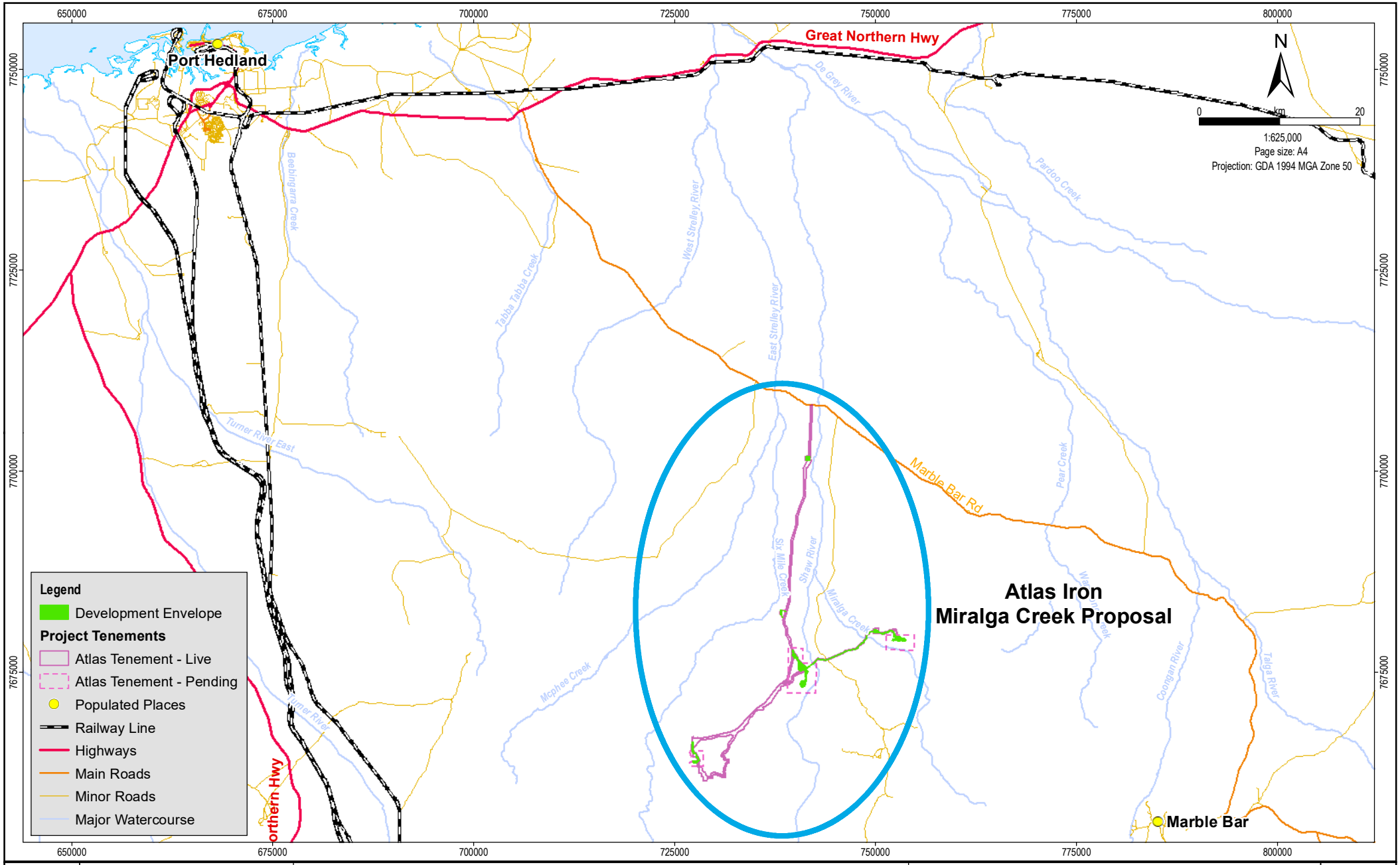
No invertebrate fauna of conservation significance were considered likely to be significantly impacted by development of the Project (Biologic, 2020b) so this SSMP focuses on vertebrate fauna only.

This SSMP has also been prepared to satisfy the conditions of future approvals under the EP Act and EPBC Act. Draft EP Act approval conditions relating to this SSMP are shown in Table 1-1.

Table 1-1: Draft Approval Conditions Under the Environmental Protection Act 1986

No.	Draft Condition Text
6	**Significant Species Management Plan**
6-1	The proponent shall ensure implementation of the proposal achieves the following **environmental objective**: (1) avoid where possible, otherwise minimise direct and indirect impacts to significant fauna and their habitat, including: (a) northern quoll (*Dasyurus hallucatus*); (b) ghost bat (*Macroderma gigas*); (c) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*); (d) Pilbara olive python (*Liacis olivaceus barroni*); (e) northern brushtail possum (*Trichosurus vulpecula arnhemensis*); and (f) grey falcon (*Falco hypoleucos*).
6-2	To achieve the objectives in condition 6-1 and prior to ground disturbing activities, the proponent shall update and submit a revision of the Significant Species Management Plan (180-LAH-EN-PLN-0001, Rev 0, April 2020) to the requirements of the CEO. The Plan shall:
	(1) specify **trigger criteria; threshold criteria; trigger level actions; threshold contingency actions**; monitoring locations, methodologies, indicators and timing; investigations in the event of a failure to meet a criteria or action; and reporting to demonstrate that the objective in condition 6-1(1) will be met;
	(2) specify **management actions** and reporting to demonstrate that the objective in condition 6-1(2) will be met;
	(3) show significant fauna monitoring sites presented in a figure;
	(4) design blasts to perform to the blast criteria at threshold 100 mm/s at caves CMRC-13, CMRC-14 and CMRC-15, and any other category 1 and 2 caves in the development envelope where ghost bats are found to roost;
	(5) avoid blasting within 100 metres of the lateral extent of caves CMRC-13, CMRC-14 and CMRC-15 until the results of monitoring validate predictions with a reasonable degree of confidence;
	(6) ensure no significant damage to caves CMRC-13, CMRC-14 and CMRC-15, or any other diurnal roosting cave, such that the caves remain viable as habitat (including for diurnal roosting) for ghost bats and Pilbara leaf-nosed bats in the future once mining has ceased;
	(7) minimise disturbance to significant fauna habitats; hillcrest/hillslope, gorge/gully and low stony hills;
	(8) ensure decline of northern quoll activity does not exceed 50 % of the baseline population levels at any monitoring site, during an annual monitoring period; and
	(9) include a threshold criterion that northern quoll is not absent from more than 50 percent of monitoring sites for more than two consecutive annual monitoring periods;
6-3	The proponent shall not implement the proposal until the CEO has confirmed in writing that the Significant Species Management Plan satisfies the requirements of condition 6-2.
6-4	The proponent: (1) may review and revise the Significant Species Management Plan; or (2) shall review and revise the Significant Species Management Plan as and when directed by the CEO by a notice in writing.

No.	Draft Condition Text
6-5	The proponent shall implement the latest revision of the Significant Species Management Plan approved by the CEO.
6-6	The proponent shall continue to implement the Significant Species Management Plan until the CEO has confirmed by notice in writing that the proponent has demonstrated that the objective in condition 6-1 has been met.
6-7	Where monitoring or investigations indicate a failure to meet or implement management action(s) or target(s) detailed in the approved Significant Species Management Plan, the proponent shall meet the requirements of condition 4-5 (Compliance Reporting) and shall implement the measures outlined in the approved Significant Species Management Plan, including, but not limited to, actions and investigations to be undertaken.
6-8	The proponent shall provide the results of ongoing monitoring to the agency responsible for the administration of the *Biodiversity Conservation Act 2016* (being at the time of this Statement to the Department of Biodiversity, Conservation and Attractions).



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	Date: 5/10/2020	Source & Notes:	**Project Location** 1-1
	Author: Chris.Maude	*Disclaimer: This figure has been produced for internal review only and may contain inconsistencies or omissions. It is not intended for publication.*	

1.3 Environmental Legislation

Environmental legislation relevant to this management plan includes the EPBC Act, EP Act, *Biodiversity Conservation Act 2016* (BC Act) and *Mining Act 1978* (Mining Act).

1.3.1 *Environmental Protection and Biodiversity Conservation Act 1999*

The EPBC Act provides for the protection of Matters of National Environmental Significance (MNES). Actions likely to cause a significant impact to MNES require assessment and approval under the EPBC Act. The EPBC Act is administered by the Department of Agriculture, Water, and the Environment (DAWE).

Threatened species and migratory species have been confirmed as present in the vicinity of the Project. The Project was referred under the EPBC Act in December 2019 and was considered a Controlled Action (EPBC 2019/8601). An approval decision is expected by end November 2020.

The MNES targeted by this SSMP include Northern Quoll, Ghost Bat, Pilbara Leaf-nosed Bat and Pilbara Olive Python. Two other species nominated to be listed as MNES are also targeted: Northern Brushtail Possum and Grey Falcon.

1.3.2 *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislation that governs environmental impact assessment and protection in Western Australia. The aim of this Act is to prevent, control and abate environmental pollution for the conservation, preservation, protection, enhancement, and management of the environment. Authorities under this Act include the Department of Water and Environment Regulation (DWER) and the independent Environmental Protection Authority (EPA).

Atlas referred the Project to the EPA in April 2020 for the Project's potential impacts to the environment. It was determined under Part IV of the EP Act to require formal assessment. The EPA published its assessment of the Project on 30 September 2020, recommending approval subject to conditions. The approval decision currently rests with the Minister for Environment.

1.3.3 *Biodiversity Conservation Act 2016*

The BC Act provides for the protection of native flora and fauna if they are under identifiable threat of extinction, rare, or generally in need of protection. The principal authority under this Act is the Department of Biodiversity and Conservation and Attractions (DBCA).

Threatened fauna are listed in the Government Gazette as Specially Protected Fauna, including the following species targeted by this SSMP: Northern Quoll, Ghost Bat, Pilbara Leaf-nosed Bat, Pilbara Olive Python, Northern Brushtail Possum and Grey Falcon.

1.3.4 *Mining Act 1978*

The Mining Act regulates mineral exploration and mining in Western Australia. The principal authority under this Act is the Department of Mines, Industry Regulation and Safety (DMIRS). Under this Act, DMIRS prescribes environmental protection conditions on mining tenure through the assessment of Mining Proposals and Mine Closure Plans, which outline the potential environmental impacts and management practices for individual projects.

1.4 Terminology and Definitions

1.4.1 Conservation Significant

When discussing the general assemblage of fauna in this SSMP, species of conservation significance refers to species that are:

- Listed under federal or state legislation.
- Listed as priority species by DBCA.
- Considered by qualified specialists to be locally important; e.g., populations at the edge of their known distribution.

1.4.2 Likelihood of Occurrence

The likelihood of occurrence for fauna of conservation significance within the Study Area was determined using a matrix based on known information relating to species' distribution, habitat preferences, locality records and previous studies (Biologic, 2020a). The fauna assessments assigned each species to one of six categories as follows:

- Confirmed.
- Highly Likely.
- Likely.
- Possible.
- Unlikely.
- Highly Unlikely.

1.4.3 Project Terminology

Project terminology is as follows:

- 'Project' refers to the Miralga Creek DSO Project.
- 'Study Area' is defined as the area over which field surveys for terrestrial fauna have been conducted (8,124.3 ha), as described in Section 2 and depicted in Figure 2.1.
- 'Development Envelope' refers to the 556.8 ha area within which Atlas will clear no more than 219.8 ha (Figure 2.1).

2 Environmental Context

Biologic Environmental Survey Pty Ltd (Biologic) conducted a two-season Level 2 vertebrate and short-range endemic (SRE) invertebrate fauna survey for the Project in May and July 2019 (Biologic, 2020a) in order to identify the occurrence of vertebrate and SRE invertebrate fauna species within the Study Area and their supporting habitats. A smaller area around the camp and explosives magazine was surveyed previously by Outback Ecology (2012), with results from a resurvey of these areas in August 2020 pending. Baseline monitoring for Northern Quoll and Ghost Bat also commenced in August 2020, however results are not yet available.

2.1 Habitats

Seven vertebrate fauna habitat types were recorded and mapped within the Study Area. These comprised, in decreasing order of extent:

- Low Stony Hills.
- Stony Plain.
- Sandy Plain.
- Major Drainage Line.
- Hillcrest/Hillslope.
- Spinifex Sandplain[1].
- Gorge/Gully.

Additionally, a small portion of the Study Area comprised cleared areas from previous clearing and tracks.

In the Study Area, a number of caves and water sources were recorded. These features are recognised for providing sources of shelter, food and water for species of conservation significance. Many of these features were recorded within the Gorge/ Gully and Hillcrest/ Hillslope habitats.

A total of 16 caves were recorded across the Study Area, with Ghost Bats or evidence of their occurrence recorded at 12 caves (Biologic, 2020a). Occasional usage by Pilbara Leaf-nosed Bat was recorded at a limited number of caves.

A total of 15 natural water sources (other than creeks and rivers) were recorded by Biologic, plus one turkey's nest dam. All water sources in the Study Area provide foraging habitat for fauna when water is present, however only two permanent water sources were recorded, approximately 1 km south of Miralga East.

2.2 Conservation Significant Species

The desktop component of the assessment identified 38 vertebrate species of conservation significance which had been recorded in the vicinity of the Study Area or whose distribution overlapped with the Study Area, comprising ten mammals, 24 birds and four reptiles (Biologic, 2020a). Seven of these species were recorded during the associated surveys (Table 2-1). This comprised five mammals (Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat, Northern Brushtail Possum and Western Pebble-mound Mouse) and two birds (Grey Falcon and Peregrine Falcon).

[1] The Spinifex Sandplain habitat is from the Outback Ecology (2012) survey and is more extensive than indicated by its position in this list. The Outback Ecology (2012) data will be replaced by the results of the August 2020 survey when available.

A vertebrate fauna impact assessment completed for the Project highlighted the potential for a significant impact to the Ghost Bat and Northern Quoll (Biologic, 2020c). Hence, this SSMP focuses on mitigating and monitoring impacts to these two species. Importantly, however, the controls to be implemented will also assist in mitigating impacts to other conservation significant species which were not predicted to be significantly impacted by the Project.

Table 2-1: Conservation Significant Species Confirmed Present

Common Name (Species Name)	Conservation Status	
	EPBC Act	In WA[1]
Northern Quoll (*Dasyurus hallucatus)*	Endangered	Endangered
Northern Brushtail Possum (Trichosurus vulpecula arnhemensis)	(Vulnerable[2])	Vulnerable
Pilbara Leaf-nosed Bat (*Rhinonicteris aurantius*)	Vulnerable	Vulnerable
Ghost Bat (*Macroderma gigas*)	Vulnerable	Vulnerable
Pilbara Olive Python (Liasis olivaceus barroni)	Vulnerable	Vulnerable
Grey Falcon (Falco hypoleucos)	(Vulnerable[2])	Vulnerable

[1] Western Australian conservation status codes.
[2] This species has been nominated for 'Vulnerable' listing status under the EPBC Act, however it is not currently listed under the EPBC Act.

2.2.1 Northern Quoll (*Dasyurus hallucatus*) (Endangered – EPBC Act; Vulnerable – BC Act)

The presence of Northern Quoll within the Study Area was confirmed from 89 records during the survey, including 44 trapped individuals (comprising 28 unique individuals), 35 captures on motion camera (comprising 10 or 11 unique individuals) and ten observations from secondary evidence (six scats and four tracks) (Biologic, 2020a).

Two young males were captured at Phase 1 systematic trapping sites in Low Stony Hills and Sandy Plain habitats. Due to the timing of their capture coinciding with the early stages of the breeding season (when males are most active and mobile), it is most likely they were dispersing or traversing the habitat while migrating from other areas of more suitable habitat rather than using those habitat types as a key refuge (Hernandez-Santin et al., 2019).

During the Phase 2 survey, 18 individuals were captured at one site in Hillcrest/ Hillslope habitat at Miralga West. The high number of females captured (11 individuals) highlighted the significant value of denning/shelter habitat for the species in the area.

Evidence of the Northern Quoll was recorded within a range of fauna habitats within the Study Area, including Gorge/ Gully, Hillcrest/ Hillslope, Low Stony Hills, and Sandy Plain habitats. Northern Quoll are likely to occur throughout the Study Area, particularly within Gorge/ Gully and Hillcrest/ Hillslope habitats, where suitable denning/shelter and/or foraging habitat is present, in addition to Major Drainage habitat for foraging and/or dispersal. These habitats form part of the core habitats critical to the survival of Northern Quoll (DoE, 2016). To a lesser extent, all habitats occurring within the Study Area may be utilised by the species to forage and or during dispersal activities; however, other habitats' significance to the species will vary depending on resource availability and connectivity. Foraging habitat within the Study Area is likely to vary depending on resource availability and recent fires (estimated 2018 or 2019) within large sections of the Study Area.

Baseline monitoring for Northern Quoll was completed at four impact sites and four control sites in August 2020. Results are not yet available.

2.2.2 Ghost Bat (*Macroderma gigas*) (Vulnerable – EPBC Act / BC Act)

Ghost Bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong & Anstee, 2000). These features often occur within habitats including gorges, gullies, ridgelines and low hills (Armstrong & Anstee, 2000). Ghost Bats have previously been recorded within the Study Area, near Sulphur Springs within the Sandtrax deposit (DBCA, 2019). The species has also been recorded on numerous occasions within 10 km of the Study Area, including at the Lalla Rookh roost site and in the vicinity of the Abydos DSO Project during annual monitoring of the species at the site (Biologic, 2019).

The Ghost Bat was recorded a total of 25 times within the Study Area during the most recent survey (Biologic, 2020a). The species was recorded five times from direct observation (individuals observed at night and within or flushed from caves), ten times from ultrasonic call recordings and ten times from secondary evidence (scats). The species was recorded within Major Drainage, Hillcrest/ Hillslope, Gorge/ Gully and Stony Plain habitat within the Study Area.

Timing of calls from most sites were consistent with bats from both species originating from Lalla Rookh (Armstrong & Anstee, 2000). Lalla Rookh is a permanent bat roost which lies outside of the Development Envelope, approximately 700 m south of the existing Abydos Link Road, which connects Sandtrax to Miralga West. From Lalla Rookh, Sandtrax is approximately 9 km southwest, Miralga West 3 km northeast and Miralga East 19 km northeast. Any bats exhibiting short-term abandonment from the caves in the Project area are expected to use Lalla Rookh as their preferred location (Bat Call, 2020).

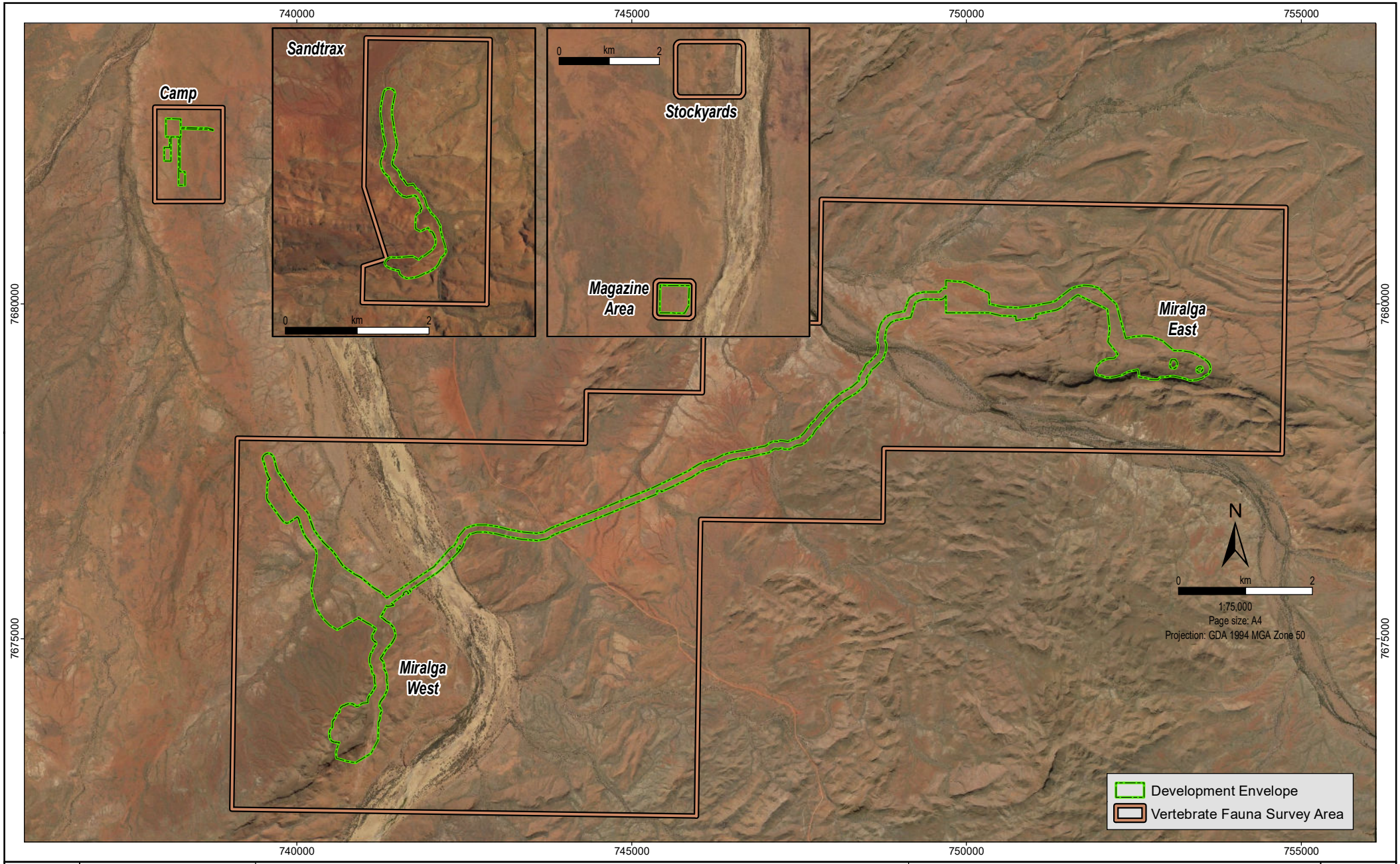
Within the Study Area, Ghost Bat are likely to occur and forage within all mapped broad fauna habitat types, with roosting more likely to be concentrated in areas of significant habitat where suitable caves are present, such as in Hillcrest/ Hillslope and Gorge/ Gully habitats. The species' occurrence is likely to be regular, particularly when roosting occurs within the Study Area. Gorge/ Gully represent significant habitat for the Ghost Bats as caves are often formed within this habitat type, which can be utilised for roosting and foraging. Drainage areas provide suitable foraging habitat for Ghost Bats. Water features are also important for the species as foraging and drinking sources.

Thirteen caves were confirmed or identified as potential roost caves for Ghost Bat. Cave locations are summarised in Table 2-2.

Table 2-2: Ghost Bat Caves Recorded in the Study Area and their Distance to Nearest Proposed Pit

Cave	Habitat Value to and Use by Ghost Bat	Roost Category[1]				Distance From Cave Entrance to Nearest Proposed Pit[2]
		1	2	3	4	
Sandtrax						
CMRC-03	Nocturnal roost			✓		185 m
CMRC-07	Diurnal roost			✓		225 m
CMRC-19	Night roost				✓	385 m
Miralga West						
CMRC-02	Potential nocturnal roost				✓	Within pit
CMRC-04	Nocturnal roost				✓	340 m
CMRC-06	Diurnal roost		✓			400 m
CMRC-08	Nocturnal roost			✓		470 m
CMRC-10	Nocturnal roost			✓		450 m
CMRC-12	No usage				✓	340 m
Miralga East (near pits 2 and 3)						
CMRC-01	Nocturnal roost				✓	50 m
CMRC-13	Nocturnal roost				✓	95 m
CMRC-14	Diurnal roost			✓		117 m
CMRC-15	Diurnal roost / possible maternity roost		✓			55 m
Miralga East (west of pits)						
CMRC-16	No usage				✓	~1,000 m
CMRC-17	No usage				✓	~1,000 m
CMRC-18	Potential diurnal roost			✓		~1,000 m

Sources: Biologic (2020a), Bat Call WA (2020).
1 Cave category definitions (full definitions in Appendix A of Bat Call WA (2020)):
Category 1 – diurnal roosts with permanent occupancy
Category 2 – diurnal roosts with regular occupancy
Category 3 – roosts with occasional occupancy
Category 4 – nocturnal roosts with opportunistic usage
2 Distance is measured from nearest edge of proposed pit disturbance to the cave entrance.



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	Date: 14/09/2020			
	Author: Chris.Maude			

2.3 Potential Impacts and Key Threats

Eight potential impact sources were identified during the impact assessment (Biologic, 2020c) as having the potential to impact upon terrestrial fauna of conservation significance as part of the Project's development, comprising:

- Removal, fragmentation or modification of habitat.
- Vehicle strike.
- Introduced species.
- Increased light.
- Noise and vibration.
- Dust.
- Changed fire regimes.
- Modification of water regimes.

Each of these impacts will be managed as part of this SSMP.

Key threatening processes listed under the EPBC Act were also considered where applicable – specifically the Threat Abatement Plans associated with each of these processes. The EPBC Act defines a threatening process as a "key threatening process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community". The key threatening processes listed under the EPBC Act that are most relevant to this Project are:

- Land clearance.
- Predation by feral cats.
- Predation by European Red Fox.
- The biological effects, including lethal toxic ingestion, caused by cane toads (*Bufo marinus*).

Threats to the Northern Quoll and Ghost Bat have been identified in a range of external documents including guidelines, conservation advices and recovery plans, including:

- National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill & Ward, 2010).
- The Action Plan for Australian Mammals 2012 (Woinarski et al., 2014).
- EPBC Act referral guideline for the endangered northern quoll *Dasyurus hallucatus* (DoE, 2016).
- Conservation Advice: *Macroderma gigas*, Ghost Bat. (TSSC, 2016).
- Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPaC, 2011).
- Threat abatement plan for predation by the European Red Fox (DEWHA, 2008).
- Threat Abatement Plan for Predation by Feral Cats (DoE, 2015).

The threats identified in these documents are listed in Table 2-3.

Table 2-3: Recognised Threats and Potential Impacts to Northern Quoll and Ghost Bat

Species	Recognised Threats to the Species	Potential Impact Category Addressed in This SSMP[1]
Northern Quoll	• Habitat clearing, modification or land use change (DoE, 2016) • Habitat degradation (Hill & Ward, 2010) • Habitat destruction (Hill & Ward, 2010) • Habitat loss and fragmentation (Woinarski et al., 2014)	• Removal, fragmentation and modification of habitat • Modification of water regimes
	• Urbanisation	• Interactions with fauna

Species	Recognised Threats to the Species	Potential Impact Category Addressed in This SSMP[1]
	• Introduction and increases of invasive species (DoE, 2016) • Cane toads (Hill & Ward, 2010) • Feral predators (Hill & Ward, 2010) • Weeds (Hill & Ward, 2010) • Poisoning by cane toads (Woinarski et al., 2014) • Predation by feral cats (Woinarski et al., 2014) • Predation by wild dogs (Woinarski et al., 2014) • Habitat degradation due to invasive pasture grasses (Woinarski et al., 2014) • Predation by Red Fox (Woinarski et al., 2014)	• Introduced species
	• Pastoralism (DoE, 2016) • Habitat degradation caused by livestock (Woinarski et al., 2014)	Not applicable
	• Traffic (DoE, 2016)	• Vehicle strike • Removal, fragmentation, or modification of habitat
	• Inappropriate fire regimes (Hill & Ward, 2010; Woinarski et al., 2014)	• Changed fire regimes
	• Disease (Hill & Ward, 2010) • Disease and parasitism (Woinarski et al., 2014)	Not applicable
	• Hunting (Hill & Ward, 2010)	Not applicable
	• Population isolation (Hill & Ward, 2010)	• Removal, fragmentation, or modification of habitat
	• Poisoning (Woinarski et al., 2014)	• Introduced species
Ghost Bat	• Habitat loss (destruction of, or disturbance to, roost sites and nearby areas) due to mining (TSSC, 2016; Woinarski et al., 2014)	• Removal, fragmentation, or modification of habitat
	• Disturbance of (human visitation at) breeding sites (TSSC, 2016; Woinarski et al., 2014)	• Interactions with fauna
	• Modification to foraging habitat (TSSC, 2016)	• Removal, fragmentation, or modification of habitat • Modification of water regimes
	• Collision with fences, especially those with barbed wire (TSSC, 2016; Woinarski et al., 2014)	• Interactions with fauna
	• Collapse or reworking of old mine adits (TSSC, 2016; Woinarski et al., 2014)	Not applicable
	• Contamination by mining residue at roost sites (TSSC, 2016; Woinarski et al., 2014)	Not applicable

Species	Recognised Threats to the Species	Potential Impact Category Addressed in This SSMP[1]
	• Disease (TSSC, 2016; Woinarski et al., 2014)	Not applicable
	• Poisoning by cane toads (TSSC, 2016)	• Introduced species
	• Competition for prey with foxes and feral cats (TSSC, 2016)	• Introduced species

1 This SSMP addresses only the threats that are associated with potential impacts of the Project.

2.3.1 Northern Quoll

The Northern Quoll is likely to be mostly affected by removal, fragmentation and modification of habitat, but also potentially vehicle strike and the increased threat of introduced species (Biologic, 2020c). Low level impacts may also be experienced by the Northern Quoll due to increased light and noise and changed fire regimes (Biologic, 2020a).

2.3.2 Ghost Bat

The Ghost Bat is likely to be impacted primarily by removal, fragmentation and modification of habitat (including caves), but also potentially noise and vibration and dust (Biologic, 2020b). Low level impacts may also potentially be experienced due to vehicle strike, introduced species and changed fire regimes.

The caves considered for use by Ghost Bats are detailed in Table 2-2. Only CMRC-02 will be removed by the Project. The most important cave complex in the area is the grouping of CMRC-13, -14 and -15, which are also the caves closest to impact areas. Atlas commissioned a number of specialist investigations to help better understand this cave complex (in particular CMRC-15) to tailor management and mitigation. This has involved close consultation with leading experts including Bob Bullen of Bat Call WA. Bat Call WA was engaged to guide the scoping of additional studies by geotechnical and blasting consultants to ensure the ability to protect CMRC-15. Following the completion of additional investigations and studies, the habitat values of the cave complex for Ghost Bat are not expected to be significantly impacted by the Project. Ghost Bats are expected to return to the complex after mining is completed (Bat Call, 2020).

3 Key Measures

3.1 Management Frameworks

To ensure that management provisions are proportionate to the risk, Atlas has developed an **outcome-based** management framework for species at higher risk. A **management action-based** framework has been developed to target both the higher risk species and other species. Table 3-1 briefly outlines these two frameworks.

Table 3-1: Overview of Management Frameworks in This SSMP

Species	Management Framework	Key Elements of Framework
Species at higher risk: • Northern Quoll • Ghost Bat	Outcome-based	Trigger criteria, threshold criteria, trigger level actions, threshold contingency actions, monitoring, indicators and timing, investigations, reporting.
Species at higher risk: • Northern Quoll • Ghost Bat Other species, including: • Pilbara Leaf-nosed Bat • Pilbara Olive Python • Northern Brushtail Possum • Grey Falcon	Management action-based	Management actions.

Key terms used in the **outcome-based** management framework are explained in Table 3-2. The trigger and threshold concept is illustrated in Figure 3-1.

Key terms used in the **management action-based** management framework are explained in Table 3-3.

Table 3-2: Framework for Outcome-based Management

Environmental objectives	Overarching objectives or goals for environmental values managed by this SSMP.
Threshold criteria	Criteria representing the limit of acceptable impact beyond which there is likely to be a significant effect on the environment and the environmental outcome is not being met.
Trigger criteria	Criteria that provide advance indication that the threshold criteria are being approached and trigger level actions need to be taken to ensure the threshold criteria are not reached.
Threshold contingency actions **Trigger level actions**	Actions that are taken in response to the trigger or threshold criteria being reached or exceeded, in order to avoid the threshold criteria being reached (in the case of the trigger criteria being exceeded) or to ensure that the environmental outcome will be met (in the case of the threshold criteria being exceeded).
Monitoring Methods	Monitoring to determine whether the trigger and threshold criteria have been exceeded, and in turn whether the environmental outcome is being met. The monitoring requirements proposed for each set of potential impacts and key threats is detailed in Table 3.3. Additionally, a detailed monitoring procedure for Northern Quoll and Ghost Bat is detailed in Appendix A and Appendix B, respectively.
Indicators	The parameters that will be monitored to provide the data for evaluating whether the trigger and threshold criteria have been exceeded.
Timing	The timing of monitoring, including when and how often monitoring will be undertaken. The timing of reporting.

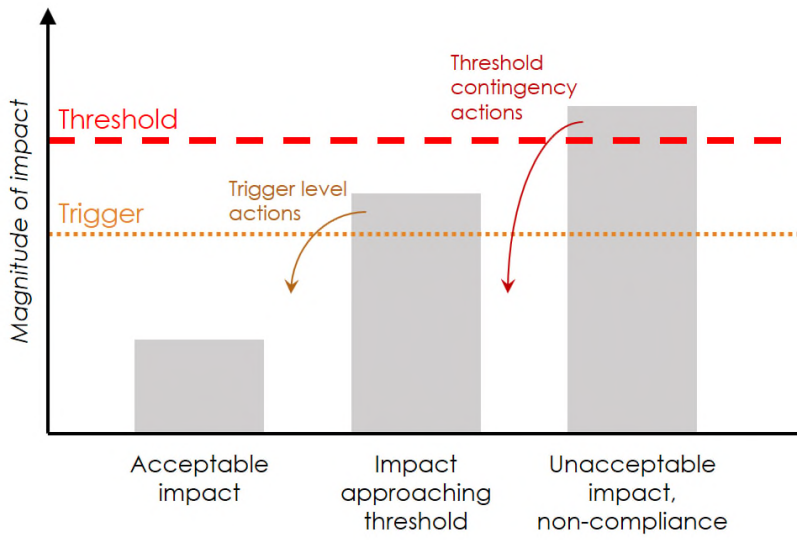

Figure 3-1: Triggers and Thresholds in the Outcome-based Management Framework

Table 3-3: Framework for Management Action-based Management

Environmental objectives	Overarching objectives or goals for environmental values managed by this SSMP.
Potential impacts and key threats	Identifies potential impacts to conservation significant species which will be the target of management in this SSMP. This includes potential impacts outlined in Section 2.3, which includes key threats identified in relevant guidelines or other documents including conservation advices, recovery plans and threat abatement plans.
Management measures	Management commitments that Atlas will implement as part of the Project. Management measures are targeted at addressing the identified potential impacts, which includes key threats. They have been developed in consideration of the conservation significant species present or potentially present (Section 2.2), identified potential impacts of the Project (Section 2.3), specialist advice and industry best practices. Note that the implementation of management measures will also benefit species other than those explicitly listed in the environmental objectives.

3.2 Provisions of This SSMP

The **outcome-based** provisions of this SSMP are set out in Table 3-4.

The **management action-based** provisions of this SSMP are set out in Table 3-5.

Table 3-4: Outcome-based Provisions

Environmental Objective	Threshold Criteria	Trigger Criteria	Monitoring Method	Indicators	Monitoring Timing	Threshold Contingency Actions	Trigger Level Actions	Reporting
Avoid where possible, otherwise minimise direct and indirect impacts to significant fauna and their habitat, including: • Northern Quoll. • Ghost Bat.	Actual clearing totals more than 219.8 ha.	Actual and planned clearing totals more than 210 ha.	For actual clearing – determine extent of ground disturbance in accordance with the Impact Reconciliation Procedure (180-LAH-EN-PLN-0004). For planned clearing – using GIS, determine (i) extent of clearing authorised by GDPs but not yet undertaken, plus (ii) extent of clearing under GDP application.	Actual clearing (i.e. existing ground disturbance). Clearing authorised by a GDP but not yet undertaken. Clearing under GDP application.	Actual clearing – in accordance with the Impact Reconciliation Procedure (180-LAH-EN-PLN-0004). Planned clearing – each time a GDP is applied for or closed out.	• Cease all clearing activities. • Do not authorise any further GDPs, and cancel all active GDPs. • Report occurrence to DWER and DAWE. • Investigate causes. • Undertake corrective rehabilitation, and/or seek amendment to approvals, in consultation with DWER and DAWE.	• Confirm extent of existing ground disturbance via audit of clearing records. • Do not authorise any further GDPs if threshold criterion would be exceeded. • Notify Registered Manager for forward planning purposes. • Consider whether approvals require amending.	Performance against criteria – annually in AER. Exceedance of trigger criteria – in AER. Exceedance of threshold criteria – to DWER and DAWE within 7 days. Clearing – every two years in accordance with the Impact Reconciliation Procedure (180-LAH-EN-PLN-0004).
Avoid where possible, otherwise minimise direct and indirect impacts to significant fauna and their habitat, including: • Ghost Bat. Ensure no significant damage to caves CMRC-13, CMRC-14 and CMRC-15, such that the caves remain viable as diurnal roosts for Ghost Bat in the future once mining has ceased.	Blast vibration is 100 mm/s or more.	Blast vibration is 85 mm/s or more.	Blast vibration measured at caves CMRC-13, CMRC-14 and/or CMRC-15, whichever cave(s) are closest to each blasting activity in Miralga East pits 2 and 3.	Blast vibration velocity.	For each blast at Miralga East pits 2 and 3.	• Identify likely cause. • Cease blasting near the relevant cave and review blasting parameters. • Recalibrate blast vibration model and design next blast to achieve lower blast vibration at relevant caves. • Review blast management. • Review blast monitoring procedure, frequency and methods. • Increase cave inspection and monitoring frequency. • Report to relevant DWER and DAWE. • For fallen rock or significant deterioration in potential value of cave to Ghost Bat—Undertake corrective actions, e.g. if possible clear rockfall to ensure roosting area is accessible to bats.	• Review against predicted and recorded blast vibration. • Recalibrate blast vibration model and/or design next blast to achieve lower blast vibration at relevant caves. • Investigate extent and severity of rock fall. • Review observed rock fall or other damage against predicted and recorded blast vibration. • Inspect cave for any signs of significant deterioration in potential value to Ghost Bat. • Review and, if necessary, recalibrate blast vibration model. • Recalibrate blast vibration model and/or design next blast to achieve lower blast vibration at relevant caves.	Performance against criteria – annually in AER. Exceedance of trigger criteria – in AER. Exceedance of threshold criteria – to DWER and DAWE within 7 days.
	Significant deterioration in potential value of cave to Ghost Bat, i.e., blocked entrance, new entrance created, cave collapsed.	Fallen rock during blasting event.	Inspection of caves CMRC-13, CMRC-14 and/or CMRC-15, whichever cave(s) are closest to each blasting activity, before and after each blast in Miralga East pits 2 and 3. Inspections may be conducted in person or remotely (e.g. via cameras) and will look for changes in rock fall on the cave floor as well as any other damage incurred.	Rock fall. Changes to cave structure, i.e. blocked entrance, new entrance created, cave collapsed.	Before and after each blast at Miralga East pits 2 and 3.			Performance against criteria – annually in AER. Exceedance of trigger criteria – in AER. Exceedance of threshold criteria – to DWER and DAWE within 7 days.

Environmental Objective	Threshold Criteria	Trigger Criteria	Monitoring Method	Indicators	Monitoring Timing	Threshold Contingency Actions	Trigger Level Actions	Reporting
Avoid where possible, otherwise minimise direct and indirect impacts to significant fauna and their habitat, including: • Ghost Bat.	Ghost Bat are recorded at fewer than 6 of the 11 Ghost Bat impact monitoring sites in each of two consecutive monitoring events during or following operations.	Ghost Bat are recorded at fewer than 6 of the 11 Ghost Bat impact monitoring sites in a single monitoring event during or following operations.	11 caves (impact sites) plus 1 control site (Lalla Rookh). Operational – to monitor Ghost Bat trends during operations. Post-mining – to monitor Ghost Bat post-closure to confirm ongoing occupation and use of Study Area. Refer to the Ghost Bat Monitoring Procedure (180-LAH-EN-PLN-0003) for detailed method and locations (Appendix B).	Ghost Bat presence, recorded via: • Scats. • Calls (e.g. from recording on an SM 4). • Visual observations.	Operational – annually during mining. Post-mining – for a minimum of 3 monitoring events, the first event being in the first year after mining of pits ceases, and subsequent events occurring every 2 years thereafter.	• Identify likely cause. • Check whether caves have been disturbed. • Compare results with control site or other impact sites where mining is not occurring to determine if decline may be attributable to the project. • Review monitoring procedure, frequency and methods. • Review Ghost Bat management within this plan. • Review training and induction programs. • Review number and locations of fauna signposts. • Report to DWER and DAWE.	• Identify likely cause. • Check whether caves have been disturbed. • Compare results with control site or other impact sites where mining is not occurring to determine if decline may be attributable to the project. • Review monitoring procedure, frequency and methods. • Review Ghost Bat management within this plan. • Review training and induction programs. • Review number and locations of fauna signposts.	Performance against criteria – annually in AER. Baseline – monitoring report. Operational – monitoring reports. Post-mining – monitoring reports. Exceedance of trigger criteria – in AER. Exceedance of threshold criteria – to DWER and DAWE within 7 days.

Environmental Objective	Threshold Criteria	Trigger Criteria	Monitoring Method	Indicators	Monitoring Timing	Threshold Contingency Actions	Trigger Level Actions	Reporting
Avoid where possible, otherwise minimise direct and indirect impacts to significant fauna and their habitat, including: • Northern Quoll.	Northern Quoll are recorded at fewer than 2 of the 4 Northern Quoll impact monitoring sites for more than two consecutive monitoring events.	Northern Quoll numbers at a site are less than half of the baseline numbers for that site.	4 impact sites and 4 controls sites. Operational – to monitor Northern Quoll trends during operations. Post-mining – to monitor Northern Quoll post-closure to confirm ongoing occupation and use of Study Area. Refer to the Northern Quoll Monitoring Procedure (180-LAH-EN-PLN-0002) for detailed method and locations (Appendix A).	Northern Quoll presence, recorded via: • Camera traps. • Scats and tracks. • Visual observations.	Operational – annually during mining. Post-mining – for a minimum of 3 monitoring events, the first event being in the first year after mining of pits ceases, and subsequent events occurring every 2 years thereafter.	• Identify likely cause. • Compare results with control sites or other impact sites where mining is not occurring to determine if decline may be attributable to the project. • Review monitoring procedure, frequency and methods. • Review the implementation of Northern Quoll management actions within this plan. • Review training and induction programs. • Review number and locations of fauna signposts. • Report to DWER and DAWE. • Investigate additional actions, e.g. additional habitat features that could function as daytime den sites or refugia (e.g. hollow logs and potentially piles of boulders) could be placed in suitable areas.	• Identify whether trigger criteria exceedance is due to sampling variability (e.g. influence of variations in numbers recorded against low baseline numbers). • Identify likely cause. • Compare results with control sites or other impact sites where mining is not occurring to determine if decline may be attributable to the project. • Review monitoring procedure, frequency and methods. • Review the implementation of Northern Quoll management actions within this plan. • Review training and induction programs. • Review number and locations of fauna signposts.	Performance against criteria – annually in AER. Baseline – monitoring report. Operational – monitoring reports. Post-mining – monitoring reports. Exceedance of trigger criteria – in AER. Exceedance of threshold criteria – to DWER and DAWE within 7 days.

Table 3-5: Management Action-based Provisions

Environmental Objective	Potential Impacts and Key Threats (Where Applicable)	Management Actions
Avoid where possible, otherwise minimise direct and indirect impacts to significant fauna and their habitat, including: • Northern Quoll. • Ghost Bat. • Pilbara Leaf-nosed Bat. • Pilbara Olive Python. • Northern Brushtail Possum. • Grey Falcon.	**Removal, fragmentation, or modification of habitat** • *Land clearance* regarded as a Key Threatening Process under the EPBC Act. • *Habitat degradation* listed as a threat to the Northern Quoll in the species Recovery Plan, and *Habitat clearing, modification or land use change* identified in the species referral guidelines (DoE, 2016). • *Habitat degradation* is listed as a threat to the Northern Quoll in the National Recovery Plan for the Northern Quoll (Dasyurus hallucatus) (Hill & Ward, 2010). • *Habitat loss (destruction of, or disturbance to, roost site and nearby areas) due to mining*; and *Modification to foraging habitat* regarded as a threat to the Ghost Bat by TSSC (2016) and Woinarski et al. (2014). • *Modification to foraging habitat* listed as a threat to the Ghost Bat within the *Conservation Advice* Macroderma gigas *Ghost Bat* (TSSC, 2016).	• Clearing will occur in accordance with Atlas's Ground Disturbance Permit (GDP) Procedure. No clearing will occur without prior authorisation from Atlas's Ground Disturbance Permitting System. • Clearing in/of sensitive habitats including caves, gorges and drainage lines will be kept to the minimum necessary for safe construction and operation of the Project. • New borrow pits and turkey's nests will be designed and constructed to permit egress of fauna. (See Appendix D for indicative locations of existing and proposed borrow pits and turkey's nests.) • Fauna egress matting shall be installed in all lined dams / ponds / turkey's nests. • Turkey's nests will be fenced. • Retention of 15 out of 16 cave features identified by Biologic (2020a), with a 30 m buffer to be demarcated around the entrance of caves that are within 100 m of planned disturbance. • All caves recorded by Biologic (2020a) will be recorded in a site database and mapped on all mine plans. The database will be accessible to all Atlas departments. • Implementation of a blast monitoring program including recommendations for cave protection provided by Blast It Global (2020) (Appendix B).
	Vehicle strike • *Traffic* identified as a threat and key impact to Northern Quoll in the species referral guidelines (DoE, 2016) • *Urbanisation*, including road kill and misadventure, identified as a threat and key impact to the	• Speed limits will be enforced across the site. The maximum speeds allowable on all Project roads will be 50 km/h with the exception of the existing Abydos Link Road East, which will be 80 km/h. • Off-road driving will be prohibited unless otherwise authorised by senior management to minimise potential vehicle strikes.

Environmental Objective	Potential Impacts and Key Threats (Where Applicable)	Management Actions
	Northern Quoll in the species referral guidelines (DoE, 2016).	• Night-time vehicle movements will be restricted where possible to minimise potential vehicle strikes.
	Introduced species • Predation by European red fox listed as a Key Threatening Process under the EPBC Act, and for which a Threat Abatement Plan has been developed: Threat Abatement Plan for Predation by the European Red Fox (DEWHA, 2008). • Predation by European red fox listed as a Key Threatening Process under the EPBC Act, and for which a Threat Abatement Plan has been developed: Threat Abatement Plan for Predation by Feral Cats (DoE, 2015). • The biological effects, including lethal toxic ingestion, caused by Cane Toads (Bufo marinus) listed as a Key Threatening Process under the EPBC Act, and for which a Threat Abatement Plan has been developed: Threat Abatement Plan for the Biological Effects, including Lethal Toxic Ingestion caused by Cane Toads (DSEWPaC, 2011). • Introduction and increases of invasive species identified as a threat and key impact to the Northern Quoll in the species referral guidelines (DoE, 2016); • Consistent with 'Specific Objective 7 Reduce the impact of feral predators on Northern Quolls' from the National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill & Ward, 2010); • Weeds are listed as a threat in the National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill & Ward, 2010);	For introduced fauna: • All bins storing putrescible waste will have tightly secured lids to avoid fauna attraction and entry. • The landfill will be operated and managed in accordance with the Environmental Protection (Rural Landfill) Regulations 2002. This will include fencing to reduce the potential for attracting fauna. • Domestic pets are prohibited to avoid interactions with or disturbance to conservation significant fauna. • Implementation of Atlas's Introduced Fauna / Pest Control Procedure (950-HSE-EN-PRO-0022) at all times, including recording all introduced fauna sightings and the implementation of a feral animal control program, as required (i.e., where sightings are regular, if nuisance or dangerous individuals are recorded and/or evidence that native species have been preyed on by introduced predators is found). For introduced fauna: • Implementation of the following procedures to ensure weeds are controlled, as far as practicable: o Flora Management Procedure (950-HSE-EN-PRO-0010). o Weed Hygiene Procedure (950-HSE-EN-PRO-0002).

Environmental Objective	Potential Impacts and Key Threats (Where Applicable)	Management Actions
	• Competition for prey with foxes and feral cats listed as a threat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016). • Poisoning by cane toads listed as a threat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016). • Modification to foraging habitat, including the simplification of vegetation due to weeds, listed as a threat to the Ghost Bat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016).	
	Increased light • Regarded as a potential impact source for native wildlife and for which national guidelines have been produced: National Light Pollution Guidelines for Wildlife (DoEE, 2020)	• Light emissions will be controlled where practicable, including directing lights to working areas and shielding lights to reduce glow.
	Noise and vibration • Habitat loss (destruction of, or disturbance to, roost site and nearby areas) due to mining, listed as a threat to the Ghost Bat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016).	• Blasting operations will be limited to daytime only to limit disturbance to fauna including bats. • Blasting will not occur within 100 m of caves CMRC-13, CMRC-14 and CMRC-15 until the results of vibration monitoring validate vibration predictions with a reasonable degree of confidence. • The entrance to cave CMRC-15 is to be closed during initial blasting and drilling activities at Miralga East pits 2 and 3. The process of closure should be designed and implemented with the aid of a suitably qualified specialist and in consideration of the cave disturbance guidelines (Appendix C). The specialist will need to demonstrate that no bats remain in the cave once closed and that no bats have entered the cave for three nights after the closure apparatus is installed, prior to blasting commencing. The closure apparatus design should

Environmental Objective	Potential Impacts and Key Threats (Where Applicable)	Management Actions
		consider access for monitoring purposes. The cave may be reopened when the results of blast vibration monitoring validate the blast vibration predictions.
	Dust	• Dust will be controlled where possible to avoid excessive disturbance to native fauna, including using conventional dust suppression techniques (i.e. water trucks), through implementation of the Dust Management Procedure (950-HSE-EN-PRO-0026).
	Changed fire regimes • Inappropriate fire regimes is listed as a threat in the National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill & Ward, 2010); • Inappropriate fire regimes identified as a threat and key impact to the Northern Quoll in the species referral guidelines (DoE, 2016); • Modification to foraging habitat, including the simplification of vegetation due to fire, listed as a threat to the Ghost Bat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016).	• Minimise the risk of Project related fire occurring through implementation of the Hydrocarbon Management Procedure (950-HSE-EN-PRO-0005), Hydrocarbon (and Chemical) Spill Management Procedure (950-HSE-EN-PRO-0007) and Hot Work Guidelines (SA_GDL_009).
	Modification of water regimes • Land clearance regarded as a Key Threatening Process under the EPBC Act. • Habitat degradation is listed as threat to the Northern Quoll in the species Recovery Plan, and Habitat clearing, modification or land use change identified in the species referral guidelines (DoE, 2016). • Habitat degradation is listed as a threat to the Northern Quoll in the National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill & Ward, 2010).	• Clearing will occur in accordance with Atlas's Ground Disturbance Permit Procedure (GDP). No clearing will occur without prior authorisation from Atlas's Ground Disturbance Permitting System. • Retention of all water features identified by Biologic (2020a). • Culverts installed under roads at creeklines in Development Envelope where required to maintain surface water flow. • Clearing of sensitive habitats including drainage lines will be kept to the minimum necessary.

Environmental Objective	Potential Impacts and Key Threats (Where Applicable)	Management Actions
	• Habitat loss (destruction of, or disturbance to, roost site and nearby areas) due to mining; and Modification to foraging habitat regarded as a threat to the Ghost Bat by TSSC (2016) and Woinarski et al. (2014). • Modification to foraging habitat listed as a threat to the Ghost Bat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016).	
	Interactions with fauna • Disturbance of (human visitation at) breeding sites, listed as a threat to the Ghost Bat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016). • Collision with fences, especially those with barbed wire, listed as a threat to the Ghost Bat within the Conservation Advice *Macroderma gigas* Ghost Bat (TSSC, 2016).	• Awareness training will identify conservation significant fauna and habitat and discuss relevant management measures, personnel/ contractor responsibilities, and incident reporting requirements (i.e. reporting of fauna observations and/or incidents). • Where required, fauna will be handled and transported in accordance with the relevant procedures outlined in the DBCA Standard Operating Procedure Transport and Temporary Holding of Wildlife (DBCA, 2017). • Interactions with fauna (e.g. feeding, harassment, capture, killing) are not permitted unless specifically authorised by the Senior Environmental Advisor. Such interactions with fauna will not be allowed unless in the best interest of the individual animal(s) or species. Acceptable reasons could include capturing an injured animal for veterinary attention or for approved research. • All sightings of conservation significant fauna will be reported to the Miralga Creek Environmental Advisor. • All fauna mortalities and injuries will be reported to the Miralga Creek Environmental Advisor within 24

Environmental Objective	Potential Impacts and Key Threats (Where Applicable)	Management Actions
		hours and recorded within Atlas's incident reporting system. • The Miralga Creek Environmental Advisor will report all conservation significant fauna injuries and mortalities to DBCA within one week. • Access will be prohibited within 30 m of the entrance of any cave known to be occupied by Ghost Bats, except where access is required for survey or monitoring purposes. • Barbed wire fences that could cause bat entanglements will not be used.

4 Implementation

4.1 Roles and Responsibilities

Atlas is committed to managing its activities in an environmentally and socially responsible manner, as reflected in Atlas's Health, Safety and Environment Policy (950-HSE-HS-POL-0001). This policy is based on the recognition that mining projects affect the environment. Through prudent planning and excellence in management, most significant impacts can be avoided or mitigated.

Atlas's indicative roles and responsibilities for the implementation of this SSMP are outlined in Table 4-1.

Table 4-1: Roles and Responsibilities for SSMP Implemetation

Role	Responsibility
Senior Environmental Advisor	Implement and maintain the SSMP. Review the SSMP. Annual Audit of Compliance. Review and update, where applicable, the conservation status of fauna occurring within the Study Area annually.
Miralga Creek Environmental Advisor	Implement monitoring programs. Maintain monitoring records. Deliver monitoring/reporting data to the DAWE, DBCA, DMIRS and DWER. Implement and deliver awareness training programs to personnel, contactors, and visitors. Record all sightings of or incidents involving conservation significant fauna. Assess ground disturbance and access applications. Ensure all personnel involved in fauna surveys are appropriately licensed and qualified. Investigate any incidents involving conservation significant species and implement findings where relevant.
Construction and Operations Managers	Endorse implementation of the SSMP by Project personnel and contractors.
All personnel, contractors and visitors	Participate in awareness training prior to commencing duties. Implement SSMP in daily activities, where relevant. Report all sightings and/or incidents involving conservation significant fauna.

4.2 Reporting

This section provides details of Atlas's reporting requirements by this SSMP. A summary of reporting requirements is provided in Table 4-2.

Table 4-2: Reporting Requirements

Reporting	Report To	Timing
Incident reporting	Atlas internal	As required
Opportunistic reporting	Atlas internal	As required
Northern Quoll monitoring report	Atlas internal DBCA	Annually
Bat monitoring report	Atlas internal DBCA	Annually
Annual Environmental Report (AER)	DAWE DMIRS DWER	Annually
Fauna injury or mortality report	DBCA	As required
Exceedance of threshold criteria	DAWE DWER	Within 7 days of identifying the exceedance, and as part of the AER
Exceedance of trigger criteria	DAWE DWER	As part of the AER

4.3 Internal Reporting

4.3.1 Incident Reporting

All fauna injuries and mortalities within the Project area will be reported to the Miralga Creek Environmental Advisor, in accordance Atlas's HSE Incident Management Procedure.

All incidents are reported through Atlas's Incident Reporting System (InControl) and will be investigated appropriately with additional management measures implemented where required to prevent reoccurrences.

All fauna incidents are recorded in the InControl database and summaries are included in Atlas's AER.

4.3.2 Opportunistic Reporting

All fauna sightings are reported through Atlas's Incident Reporting System (InControl) and will be investigated appropriately with additional management measures implemented where required.

A summary will be included in the AER.

4.3.3 Fauna Specialist Reports

The fauna specialist conducting monitoring for conservation significant species for which species-specific management has been implemented will report to Atlas on each monitoring event. The specialist reports will be reviewed internally to ensure compliance with the SSMP objectives and performance criteria.

These specialist reports will be attached to the AER.

4.4 External Reporting

4.4.1 Department of Water and Environmental Regulation

The AER will provide a summary of conservation significant fauna sightings, injuries and mortalities within the Project area, as well as performance in accordance with the threshold and trigger criteria listed in Table 3-4 and implementation of the management actions in Table 3-5.

The AER will report on the results of the following monitoring programs:

- Northern Quoll Monitoring Program (detailed in Appendix A).
- Ghost Bat Monitoring Program (detailed in Appendix B).

Any significant changes to this SSMP will be also noted in the AER.

4.4.2 Department of Agriculture, Water and the Environment

The AER will include Atlas's performance in accordance with the threshold and trigger criteria listed in Table 3-4 and implementation of the management actions in Table 3-5.

The AER will report on the results of the following monitoring programs:

- Northern Quoll Monitoring Program (detailed in Appendix A).
- Ghost Bat Monitoring Program (detailed in Appendix B).

Any significant changes to this SSMP will be also noted in the AER.

4.4.3 Department of Mining, Industry Regulation and Safety

The AER to be provided to DMIRS will include a summary of the significant fauna monitoring results and compliance with approval conditions.

4.4.4 Department of Biodiversity, Conservation and Attractions

Any mortality to conservation significant fauna will be reported to the DBCA, with their standard Fauna Report Form. This will determine if further actions are appropriate.

The results of ongoing monitoring will be provided to the DBCA, generally on an annual basis as set out in Table 4-2.

4.4.5 Scientific Community

The results of ongoing monitoring provided to the DBCA will also be made available to the science community.

4.5 Auditing

The Senior Environmental Advisor will be responsible for ensuring a compliance audit against the requirements of this SSMP is conducted every 12 months over the life of the Project while this SSMP is required to be implemented.

4.6 Review

Atlas will undertake an initial review of the SSMP once the Project has received final environmental approvals to ensure all approval conditions and commitments are captured in operational procedures. The SSMP will then be reviewed every 12 months and as required.

All reviews will consider:

- Outcomes of monitoring programs.
- Implementation and effectiveness of management measures and monitoring programs.
- Threshold/trigger criteria and threshold/trigger level actions.
- Changes to relevant legislation, policy, guidelines, management plans and industry practices.
- Changes to the conservation status of fauna species.
- The identification of a conservation significant fauna species not previously confirmed within the Project area.
- Recurring incidents of death/injury to a conservation significant fauna species.
- Specialist advice.
- Stakeholder consultation.

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Appendix A. Northern Quoll Monitoring Procedure

Northern Quoll Monitoring Procedure

Miralga Creek DSO Project

16/10/2020

180-LAH-EN-PLN-0002
Revision 1

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Authorisation

Revision	Reason for Issue	Prepared	Checked	Authorised	Date
A	Internal review	F. Jones	D. Morley M. Goggin		30/03/2020
B	Internal review	F. Jones	D. Morley	M. Goggin	02/04/2020
0	Inclusion in SSMP	F. Jones	D. Morley	M. Goggin	06/04/2020
0A	Revised draft	C. Knuckey	D. Morley		29/06/2020
1	Address regulator comments	D. Morley	N. Bell	N. Bell	16/10/2020

Table of Contents

List of Tables

List of Figures

1 Background

The Northern Quoll (*Dasyurus hallucatus*) was recorded during baseline studies for the Miralga Creek DSO Project (the Project) from 89 records including 44 captured individuals (comprising 28 unique individuals), 35 times from motion camera captures (comprising 10–11 unique individuals) and ten times from secondary evidence (six scats and four tracks) (Biologic, 2020a). Prior to the current survey, Northern Quoll had previously been recorded both within and in close proximity to the Project Area (Biologic, 2020a). The species was recorded in the Project Area from a range of fauna habitats, however suitable denning and/or foraging habitat was represented by the Hillcrest/Hillslope, Gorge/Gully and Major Drainage Line habitats (Biologic, 2020a). The large number of records within the vicinity of the Project Area suggests that the species is relatively common in the local region (Biologic, 2020a).

An impact assessment arising from the baseline survey indicated that the Northern Quoll population occurring within the Project Area was likely to receive a Low to Moderate level of impact at the local scale (Biologic 2020b) due to the development of the Project. This impact was primarily from removal, fragmentation and/or modification of habitat, vehicle strike and the increased threat of introduced predators (Biologic 2020b). The impacts relating to the removal, fragmentation and/or modification of habitat were deemed permanent and likely to occur in areas where core habitat intersects areas planned for development; i.e. the habitats Hillcrest/Hillslope, Gorge/Gully and Major Drainage Line (Biologic 2020b). The threat of introduced predators was also determined to be permanent, while the impact of vehicle strike was likely to span only the duration of mining activities (Biologic 2020b).

One of the outcomes from the impact assessment was the recommendation for the Significant Species Management Plan (SSMP; 180-LAH-EN-PLN-0001) and the monitoring of species likely to be significantly impacted by the Project. Atlas will therefore implement the following monitoring procedure for Northern Quoll.

2 Overview and Timing

This monitoring program aims to monitor the presence of Northern Quoll throughout the life of the Project (including its post-mining phase) and to ensure the effectiveness of Atlas Iron Pty Ltd's (Atlas's) management measures for the species. The program will also assist Atlas to build on the knowledge of the species across its operations for future management planning and approvals.

This monitoring program comprises three components:

- **Baseline monitoring:** The aim of this component is to establish the monitoring program, monitoring sites and, in conjunction with the results of the baseline survey (Biologic, 2020a), define the pre-mining population against which the results of the operational monitoring can be compared. A minimum of one baseline monitoring survey will be undertaken prior to the commencement of mining-related clearing for the Project.
- **Operational monitoring:** The aim of this component is to monitor Northern Quoll population trends during the operational life of the Project. Results of the operational monitoring are to be compared with the results of the baseline monitoring and measured against the performance criteria defined in the SSMP. Operational monitoring will be undertaken annually during mining, in line with the recommendations of Department of Agriculture, Water and the Environment (DAWE) (DEE, 2016).
- **Post-mining monitoring:** This component will monitor Northern Quoll population trends once mining activity has ceased and the Project is considered to be in the closure phase. Results of

the post-closure monitoring will be compared with the baseline and operational monitoring and measured against the performance criteria defined in the SSMP. The aim of this component is to assess the long-term viability of the Northern Quoll population within the Project area. Post-mining monitoring will be undertaken for at least three monitoring events, the first event being in the first year after mining of pits ceases, and subsequent events occurring every two years thereafter until the performance criteria defined in the SSMP have been met.

Due to the large distances between the three mining areas and the differing timeframes for mining at each mining area, monitoring may be at different phases (i.e. baseline, operational or post-mining) for each mining area.

3 Monitoring Method

3.1 Timing

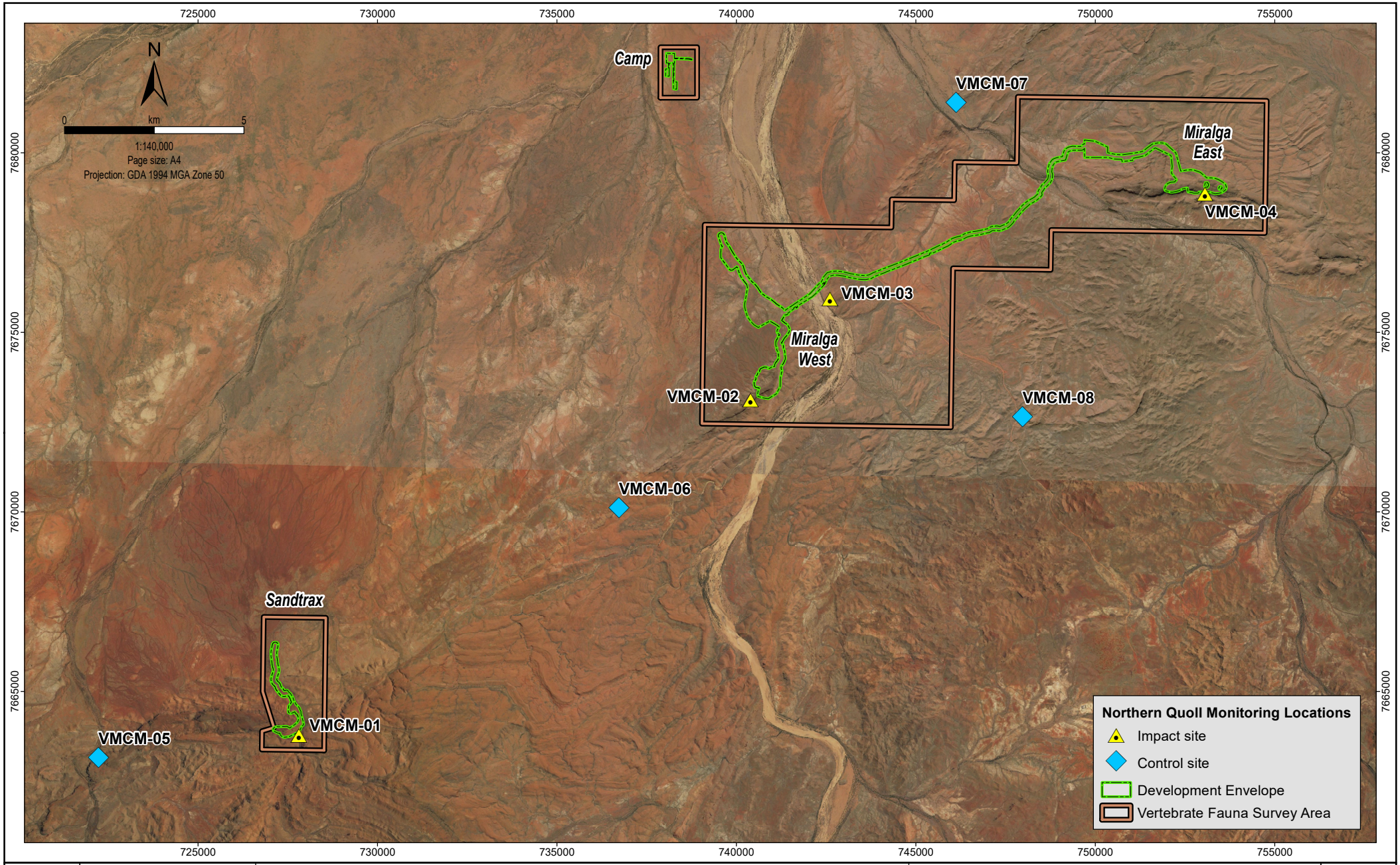
Monitoring will be undertaken between April and September in line with relevant guidelines (DEE 2016). The timing (i.e. the month) of the monitoring surveys should be aligned between monitoring years, where possible.

3.2 Sites

Four 'impact' sites will be located near (<1,000 m) the Project's disturbance footprint, where Northern Quoll have previously been recorded and/or within core habitat (Hillcrest/Hillslope, Gorge/Gully, Major Drainage Line, as defined by Biologic 2020a). At least one site is to be located near each of the main mining areas: Sandtrax, Miralga East and Miralga West. An additional four 'control' sites will be monitored outside of potential impact areas (>2,000 m), to provide regional and contextual information against which results from the impact sites can be compared, specifically changes in estimated population size. Where possible, the same sampling sites should be monitored each monitoring survey to maximise consistency between monitoring events. In the event the original sites cannot be adequately surveyed (e.g. due to access limitations) suitable alternatives meeting the criteria above will be identified. Monitoring sites are listed in Table 1 and shown in Figure 1.

Table 1: Northern Quoll Monitoring Sites

Site	Site Type	Area
VMCM-01	Impact	Sandtrax
VMCM-02	Impact	Miralga West
VMCM-03	Impact	Miralga West / Shaw River
VMCM-04	Impact	Miralga East
VMCM-05	Control	Sandtrax
VMCM-06	Control	Lalla Rookh
VMCM-07	Control	Miralga Creek
VMCM-08	Control	North Pole Road



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Date: 15/10/2020			
Author: Chris.Maude			

3.3 Motion Cameras

Ten motion cameras, spaced 50–100 m apart following the contours of suitable habitat, will be deployed for a period of four consecutive nights at each site. Each camera will be mounted on a permanent post, setup during the baseline monitoring survey, ensuring consistent camera locations between each monitoring survey. Each motion camera will be baited with a non-reward lure containing universal bait as the attractant. Cameras will be oriented to allow for the differentiation of individuals using spot patterning (Hohnen et al. 2012). Spot analysis will be used to differentiate individuals and determine a population estimate for each site. Population estimates obtained at each site will be compared against those obtained during the baseline monitoring survey to ensure adherence with the performance criteria defined in the SSMP.

3.4 Active Searching

Active searching will be undertaken at each of the monitoring sites for a total of one person-hour to obtain supplementary information of Northern Quoll occurrence. Such data will include direct visual records of Northern Quolls, or indirect records such as bones, carcasses, tracks and scats. Other species of conservation significance or introduced predators will also be recorded, if observed.

3.5 Habitat Assessments

Photo points will also be established at each monitoring site to document any changes to habitat over time, should information be required to investigate population fluctuations. Photos will be collected at the time of monitoring. The following parameters will be assessed and measured, where present:

- Vegetation cover, condition and species composition.
- The presence or absence of habitat structures.
- The presence or absence of water.
- Types and level of disturbance.

4 Reporting

A standalone report at the conclusion of each annual monitoring period will be prepared documenting the status of Northern Quoll occurrence and abundance within the Project area. This report will include the following sections: methods, results, discussion and recommendations. This report will be appended to Atlas's AER.

5 References

Biologic. (2020a). Miralga Creek: Level 2 Terrestrial Fauna and Short-range Endemic Invertebrate Fauna Assessment. Unpublished report prepared for Atlas Iron Pty Ltd.

Biologic. (2020b). Miralga Creek Project: Conservation Significant Vertebrate Fauna Impact Assessment. Unpublished report prepared for Atlas Iron Pty Ltd.

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Appendix B. Ghost Bat Monitoring Procedure

Ghost Bat Monitoring Procedure

Miralga Creek DSO Project

16/10/2020

180-LAH-EN-PLN-0003
Revision 1

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Authorisation

Revision	Reason for Issue	Prepared	Checked	Authorised	Date
A	Internal review	F. Jones	D. Morley M. Goggin		30/03/2020
B	Internal review	F. Jones	D. Morley	M. Goggin	02/04/2020
0	Inclusion in SSMP	F. Jones	D. Morley	M. Goggin	06/04/2020
0A	Revised draft	C. Knuckey	D. Morley		29/06/2020
1	Address regulator comments	D. Morley	N. Bell	N. Bell	16/10/2020

Table of Contents

List of Tables

List of Figures

1 Background

The Ghost Bat (*Macroderma gigas*) was recorded on 25 occasions during baseline studies for the Miralga Creek DSO Project (the Project) (Biologic, 2020a). The species was recorded five times from direct observation (individuals observed at night and within or flushed from caves), ten times from ultrasonic call recordings and ten times from secondary evidence (scats) (Biologic, 2020a). Sixteen caves or cave-like structures such as overhangs (hereafter referred to as caves) have been recorded in the Project Area, including ten which were confirmed as being used by the Ghost Bat. Thirteen caves were confirmed or identified as a potential habitat feature for the species, comprising one potential night roost, seven confirmed night roosts, one potential day roost, three confirmed day roosts and one potential maternity roost (Biologic, 2020a).

An impact assessment arising from the baseline survey indicated that the Ghost Bat population occurring within the Project Area was likely to receive a Low to Moderate level of impact at the local scale (Biologic, 2020b) due to development of the Project. The source of this impact was primarily due to the removal, fragmentation and/or modification of habitat, but also noise, vibration, dust and changes in water regimes (Biologic, 2020b). Low level impacts may also be experienced by vehicle strike, introduced species, increased light and altered fire regimes (Biologic, 2020b). Of primary concern to the species is the potential impact to cave CMRC-15, a cave identified as a potential maternity roost for the species.

One of the outcomes from the impact assessment, was the recommendation for the Significant Species Management Plan (SSMP; 180-LAH-EN-PLN-0001) and the monitoring of species likely to be significantly impacted by the Project. Atlas Iron will therefore implement the following monitoring procedure for Ghost Bat.

2 Overview and Timing

This monitoring program aims to monitor the presence of Ghost Bat throughout the life of the Project (including its post-mining phase) and to ensure the effectiveness of Atlas Iron Pty Ltd's (Atlas's) management measures for the species. The program will also assist Atlas to build on the knowledge of the species across its operations for future management planning and approvals.

This monitoring program comprises four components:

- **Baseline monitoring of Ghost Bat:** The aim of this component is to establish the monitoring program, monitoring sites and, in conjunction with the results of the baseline survey (Biologic, 2020a), define the pre-mining activity patterns at monitoring caves against which the results of the operational monitoring can be compared. A minimum of one baseline monitoring survey will be undertaken prior to the commencement of mining-related clearing for the Project.
- **Operational monitoring of Ghost Bat:** The aim of this component is to monitor Ghost Bat activity throughout the operational life of the Project. Results of the operational monitoring are to be compared with the results of the baseline monitoring and measured against the performance criteria defined in the SSMP. Operational monitoring will be undertaken annually during mining.
- **Post-mining monitoring of Ghost Bat:** This component will monitor Ghost Bat activity at the Project once mining activity has ceased and the Project is considered to be in the closure phase. Results of the post-mining monitoring will be compared to the baseline and operational monitoring and measured against the performance criteria defined in the SSMP. The aim of this component is to determine whether the Project area still supports a viable Ghost Bat population once mining has ceased. Post-mining monitoring will be undertaken for at least three monitoring events, the first

event being in the first year after mining of pits ceases, and subsequent events occurring every two years thereafter until the performance criteria defined in the SSMP have been met.

- **Blast monitoring:** The aim of this component is to monitor vibrations received at caves within the vicinity of blasting activities so that vibration can be managed to the performance criteria defined in the SSMP. The monitoring also includes inspections of caves to identify whether any damage is occurring.

Due to the large distances between the three mining areas and the differing timeframes for mining at each mining area, monitoring may be at different phases (i.e. baseline, operational or post-mining) for each mining area.

3 Monitoring Method

3.1 Baseline, Operational and Post-mining Monitoring of Ghost Bat

Monitoring will be undertaken between April and September to align with the Northern Quoll monitoring procedure. This timing also ensures minimal disturbance to reproducing females and their young during the most important part of their reproductive cycle (October to December). The timing (i.e. the month) of the monitoring surveys should be aligned between monitoring years, where possible. Guidelines on cave entry are provided in Appendix C of the SSMP.

Due to the variability frequently recorded in the species' use of caves (Armstrong & Anstee, 2000), an array of caves will be monitored to demonstrate presence across the Project. Monitoring will be undertaken at 10 caves (hereafter referred to as monitoring sites) which have previously been confirmed to be utilised by Ghost Bat (Biologic, 2020a): CMRC-01, CMRC-03, CMRC-06, CMRC-07, CMRC-08, CMRC-13, CMRC-14, CMRC-15 and CMRC-18, plus Lalla Rookh (VLRM-02). The Lalla Rookh mine, a permanently occupied Ghost Bat maternity roost, will provide regional and contextual information for which to compare results obtained from the ten monitoring sites closer to the Project. Where possible, the same sites should be monitored each monitoring survey to maximise consistency between monitoring events (Figure 1). In the event that a site cannot be adequately monitored (e.g. due to access limitations) suitable alternatives will be identified. As data on Ghost Bat activity and roosting is collected over time, it may be desirable to adjust monitoring sites adaptively to account for new information or changes in Ghost Bat roost usage in future. Figure 1 therefore also shows other potential roosting locations that have potential to be used as monitoring locations if the need arises.

A combination of monitoring techniques will be used to monitor the species, including scat counts, ultrasonic recordings and censuses.

Monitoring sites are listed in Table 1 and shown in Figure 1. Other potential monitoring sites are listed in Table 2 and shown in Figure 1; however, these are not currently required to be monitored.

Table 1: Ghost Bat Monitoring Sites

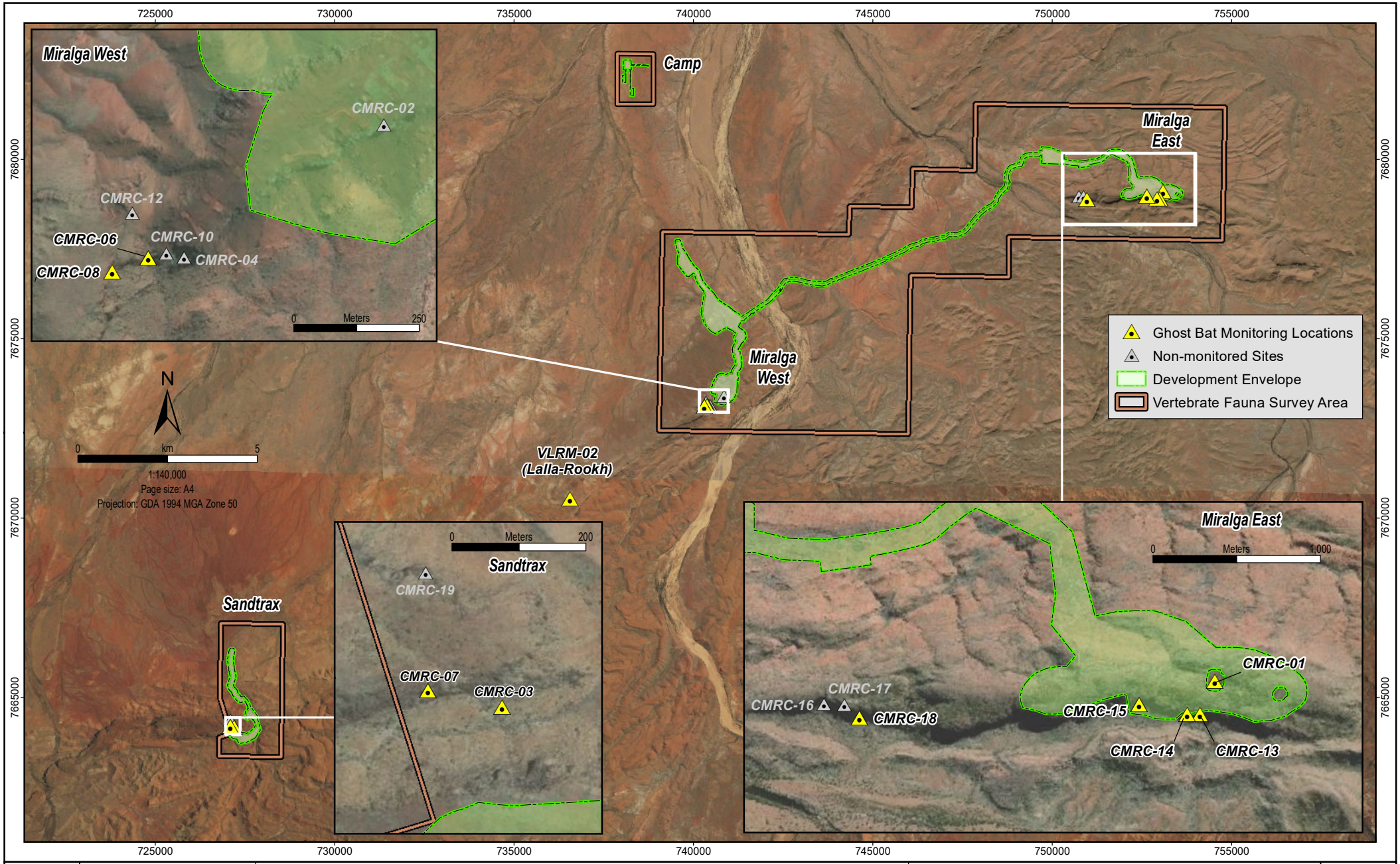
Area	Monitoring Site	Roost Category[2]	Distance From Cave Entrance to Nearest Proposed Pit[3]	Potential Control Site For[1]
Sandtrax	CMRC-03	Category 3	185 m	Miralga West, Miralga East
	CMRC-07	Category 3	225 m	
Lalla Rookh	VLRM-02	Category 1	~5,000 m	Sandtrax, Miralga West, Miralga East
Miralga West	CMRC-06	Category 2	400 m	Sandtrax, Miralga West
	CMRC-08	Category 3	470 m	
Miralga East (near pits 2 and 3)	CMRC-01	Category 4	50 m	Sandtrax, Miralga West
	CMRC-13	Category 4	95 m	
	CMRC-14	Category 3	117 m	
	CMRC-15	Category 2	55 m	
Miralga East (west of pits)	CMRC-18	Category 3	~1,000 m	Sandtrax, Miralga West, Miralga East

Sources: Biologic (2020a), Bat Call WA (2020).
1 Due to the large distances between the mining areas and the likelihood that a staged approach will be taken to mining each area, it is possible for sites at an area to act as control sites if no mining has occurred yet at that area at the time of monitoring. This column identifies which areas a site can act as a control for if mining is not occurring nearby the site.
2 Cave category definitions (full definitions in Appendix A of Bat Call WA (2020)):
Category 1 – diurnal roosts with permanent occupancy
Category 2 – diurnal roosts with regular occupancy
Category 3 – roosts with occasional occupancy
Category 4 – nocturnal roosts with opportunistic usage
3 Distance is measured from nearest edge of proposed pit disturbance to the cave entrance.

Table 2: Other Potential Ghost Bat Monitoring Sites

Area	Cave	Roost Category[1]	Distance From Cave Entrance to Nearest Proposed Pit[2]	Potential Limitations as a Monitoring Site
Sandtrax	CMRC-19	Category 4	385 m	Lower usage
Miralga West	CMRC-04	Category 4	340 m	Lower usage
	CMRC-10	Category 3	450 m	Lower usage
	CMRC-12	Category 4	340 m	No recorded usage
Miralga East (west of pits)	CMRC-16	Category 4	~1,000 m	No recorded usage
	CMRC-17	Category 4	~1,000 m	No recorded usage

Sources: Biologic (2020a), Bat Call WA (2020).
1 See footnotes to Table 1 for cave category definitions.
2 Distance is measured from nearest edge of proposed pit disturbance to the cave entrance.



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	Date: 16/10/2020		Figure No: 1
	Author: Chris.Maude		

3.1.1 Scat Counts

During the baseline monitoring survey, sheets will be placed over middens or large scat piles within each cave. As Ghost Bats are known to use the same roosting spot within a cave, the sheets aim to collect all scats deposited between monitoring surveys. During each monitoring survey, the number of scats on the sheets within a cave will be counted, and the sheets cleared, or replaced. A representative number of scats should be collected in the event that further analysis is required (e.g. genetic or hormone analysis). The number of scats recorded within a cave should be used to determine a scat deposition rate (the number of scats recorded divided by the number of days since sheets were last cleared) that can be compared between caves and monitoring surveys. Note scat counts will not be completed at Lalla Rookh due to access restrictions.

3.1.2 Ultrasonic Recordings

Due to the potential for access restrictions within caves (e.g. for heritage or safety reasons) ultrasonic sampling will be completed at each monitoring site to supplement the data obtained from the scat counts. Ultrasonic sampling will be completed at the monitoring sites for a total of seven nights each, to align with state recommendations for vertebrate fauna sampling (EPA, 2016). Attempts will be made to align the sampling nights across all sampling sites. Note, Ghost Bat calls can be difficult to detect due to their seemingly weak calls which can only be detected at close-range (McKenzie & Bullen, 2009), and the fact that the species is somewhat capable of navigating without the need to echolocate (Kulzer *et al.*, 1984). For these reasons, absence of ultrasonic recordings should not be interpreted as complete absence of species at monitoring sites. Where possible, confirmation of species presence through ultrasonic recordings should be used to indicate roosting location, e.g. were calls recorded soon after dusk indicating diurnal roosting at a monitoring cave, or not.

3.1.3 Censuses

A census should be completed at Lalla Rookh each monitoring survey. This method is the most accurate method to indicate the likely colony size inhabiting the structure. Censuses can be completed by field personnel manually counting bats as they leave the roosting structure soon after dusk and/or via infrared lit video camera. Results from the census should be used to indicate regional population fluctuations and to help explain results in lieu of presence and activity changes at other monitoring sites.

3.1.4 Habitat Assessments

Assessments will be undertaken at each monitoring site each survey to document changes at and surrounding the monitoring site, which may explain changes to Ghost Bat presence and activity. The location of the assessment will be established and permanently marked during the baseline monitoring survey and revisited and compared each monitoring survey thereafter. Each assessment will record the characteristics set out below.

At the entrance of each monitoring site:

- Entrance photographs (taken from two established photo monitoring points).
- Evidence of structural damage, if any, with reference to the following questions:
    - Are there any new open or intersecting joints or fractures along the roof, wall or bedding planes of the cave?
    - Are there any loose rocks or signs of fresh rockfall within the cave? If yes, make notes about the amount of dust, debris and/or fallen rocks, including an estimation of the size of the largest rock.

- Presence of water.
- Presence of target species, including number of individuals and/or secondary evidence such as scats, evidence of foraging, etc.

In the landscape surrounding each monitoring site:

- Condition of vegetation.
- Presence of water.
- Presence of any artificial light sources or other disturbances.

3.2 Blast Monitoring

Blast monitoring was recommended by Blast It Global (2020) to measure vibration received at Ghost Bat caves and validate predicted vibration. Key monitoring elements are shown in Table 3.

Table 3: Blast Monitoring

Monitoring	Location	Method	Timing
Vibration monitoring	Caves CMRC-13, CMRC-14 and CMRC-15	Vibration monitor installed in (or close to) the nearest cave to the blast location. Permanent monitoring blocks (a fixture installed in the ground to which a vibration monitor can be affixed, allowing the monitor to be moved between several sites) may be used.	During each blast at Miralga East pits 2 and 3.
Cave inspection	Caves CMRC-13, CMRC-14 and CMRC-15	Inspection of cave to assess whether any damage has been sustained in the cave and, if so, an estimate of the extent of the damage using the evidence of structural damage criteria in Section 3.1.4. The preferred inspection method is visual and in-person, e.g. by entering the cave. However it is recognised that unlimited access may not always be possible, e.g. for safety reasons, or to comply with the Ghost Bat cave entry guidelines set out in Appendix C of the SSMP.	After each blast while vibration predictions have not yet been established with a reasonable degree of confidence. After any blast where vibration at the cave exceeds the trigger criterion in the SSMP (85 mm/s). At least annually while mining activities involving blasting are ongoing.

Due to the difficulties of access to cave sites situated on the lower regions of the escarpment, Blast It Global (2020) recommended that representative monitoring locations be installed on top of the escarpment. A permanent blast vibration monitoring block will be located as close to the lateral extents of CMRC-13, CMRC-14 and CMRC-15 as possible (ideally within 10 m) and positioned between the cave and the proposed blasting locations. A surveyor must use the surveyed location of the cave void to determine the closest blast monitoring location to the cave in the event that the cave entrance is not an appropriate location for the monitoring block.

The desktop blast modelling and predictions will require calibration for actual on-site conditions. This will be achieved by the blasting engineer comparing the results of initial blasts with the predictions of the model. The various inputs to the model will then be adjusted based on monitoring results, so that the model more closely replicates the recorded results. Adjustments are applied iteratively with successive blasts. The calibrated site-specific version of the model is also known as the 'site law' or 'site prediction equations'. A reasonable degree of confidence in the site law is achieved when the blasting engineer is satisfied that the model is reliably predicting (and not underestimating) the blast vibrations as measured.

Personnel using and installing blast monitoring equipment, and the blast designers and shotfirers in charge, should hold industry training for blast monitoring to ensure sufficient competency to undertake the requirements of this specific blasting scenario. All blasting practices should adhere to documented procedures and design standards to achieve above average confinement of the explosives' charge.

4 Reporting

A standalone report at the conclusion of each monitoring period will be prepared documenting the occurrence and status of Ghost Bat at monitoring sites within the Project area. This report will include the following sections: methods, results, discussion and recommendations. This report will be appended to Atlas's AER.

5 References

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McKenzie, N. L., & Bullen, R. D. (2009). The echolocation calls, habitat relationships, foraging niches and communities of Pilbara microbats. *Records of the Western Australian Museum Supplement, 78*, 123-155.

Appendix C. Cave Disturbance Guidelines

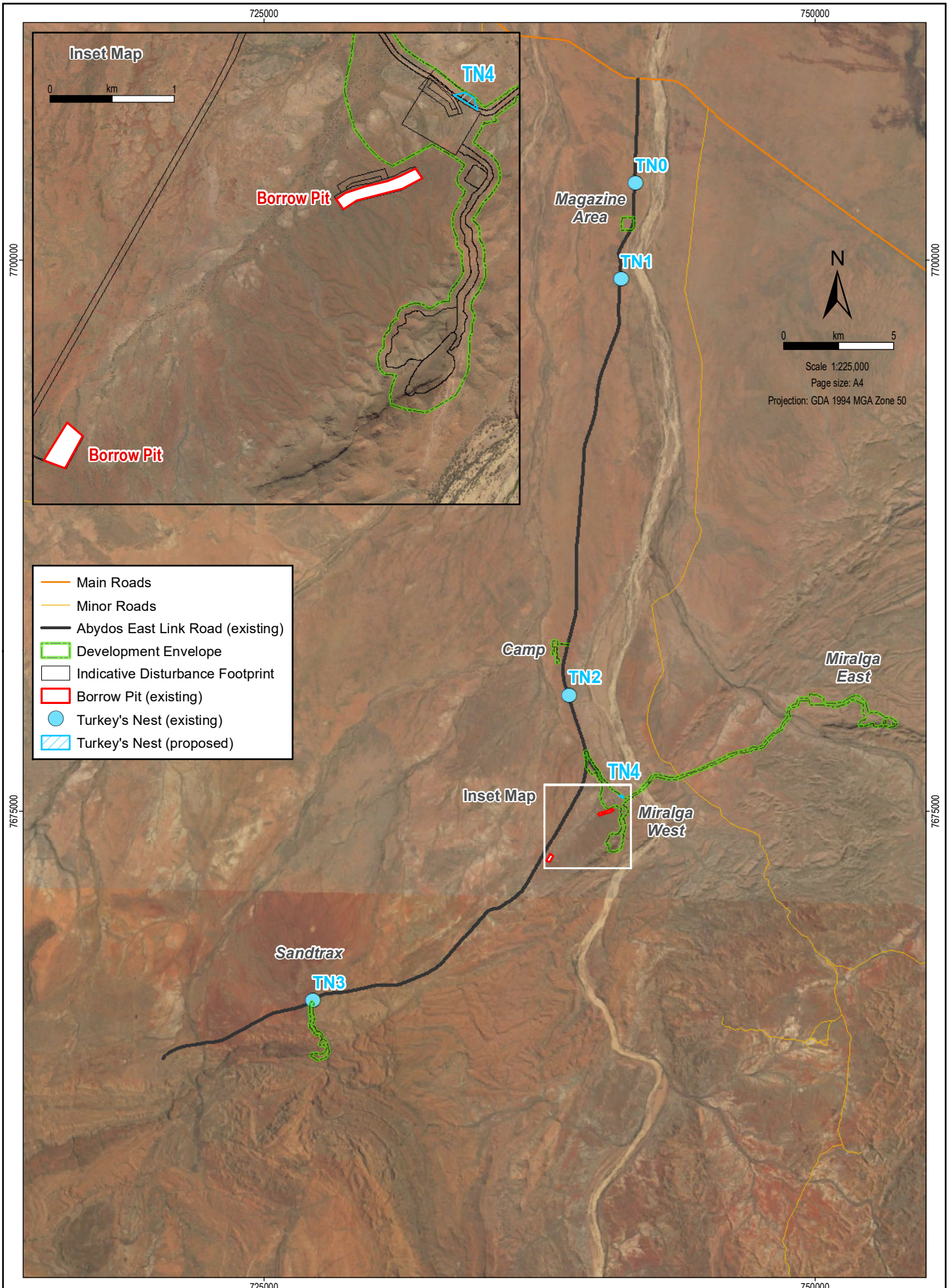
A conservative protocol is recommended to protect the reproducing females and their young during the most important part of their reproductive cycle. This covers the periods when:

- Gravid females are subject to premature birth due to either capture and handling or repeated flushing the bats from their diurnal roost caves.
- Females carrying newborns are subject to dropping them due to capture or disturbance.
- Non-volant young in nurseries are subject to abandonment due to repeated disturbance of the mothers.
- Newly volant young during the early adolescent period are subject to premature abandonment due to repeated disturbance of the mothers and/or young.

For Ghost Bat category 1, category 2, and category 3 roost caves that are part of an important cave grouping, it is recommended that restrictions tighter than Governmental licencing limitations be applied:

1. Surveys with higher disturbance to Ghost Bats (i.e. when Ghost Bats are captured, or are present and are disturbed) should be limited to once per cave during August, September, and January.
2. Multiple lower disturbance survey entries per cave are allowed in August, September, and January. The surveys should be done by one ecologist working quietly to minimise stressing the bats present and hopefully not flushing them. If a Ghost Bat(s) is disturbed and flushed, the caves and their entrance areas should be vacated to allow the bat(s) to return and settle. Restrictions per item 1 above then apply.
3. No cave entries should be carried out in October, November and December inclusive. Any damage assessments required during blasting operations in this time period should be carried out from the cave entrance.
4. Survey entries in accordance with Governmental licencing limitations should be allowed outside these periods.

Appendix D. Additional Reference Material



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