Significant Species Management Plan

Corunna Downs

179-LAH-EN-PLN-0001

Revision 3

Authorisation

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1	Compliance	Melissa Finlay	Esme Wink	Brendan Bow	10/01/17
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1. Introduction

1.1 Project Overview

The Corunna Downs Project (Project) is located 241km south east of Port Hedland, as shown in Figure 1. Mining will be via conventional open cut, crushing and screening mining methods above the groundwater table. Associated infrastructure will include open pits, waste rock dumps, mine infrastructure, borefield and accommodation camp.

1.2 Purpose

The Project has the potential to impact conservation significant species which are protected under the *Environment Protection and Biodiversity Conservation Act 1999* and *Wildlife Conservation Act 1950*. A desktop study identified 32 terrestrial fauna species considered to be of conservation significance that may potentially occur within a study area. Eight species of conservation significance were recorded in the Study Area during the multiple field surveys which were designed in accordance with the guidelines detailed in Chapter 3.

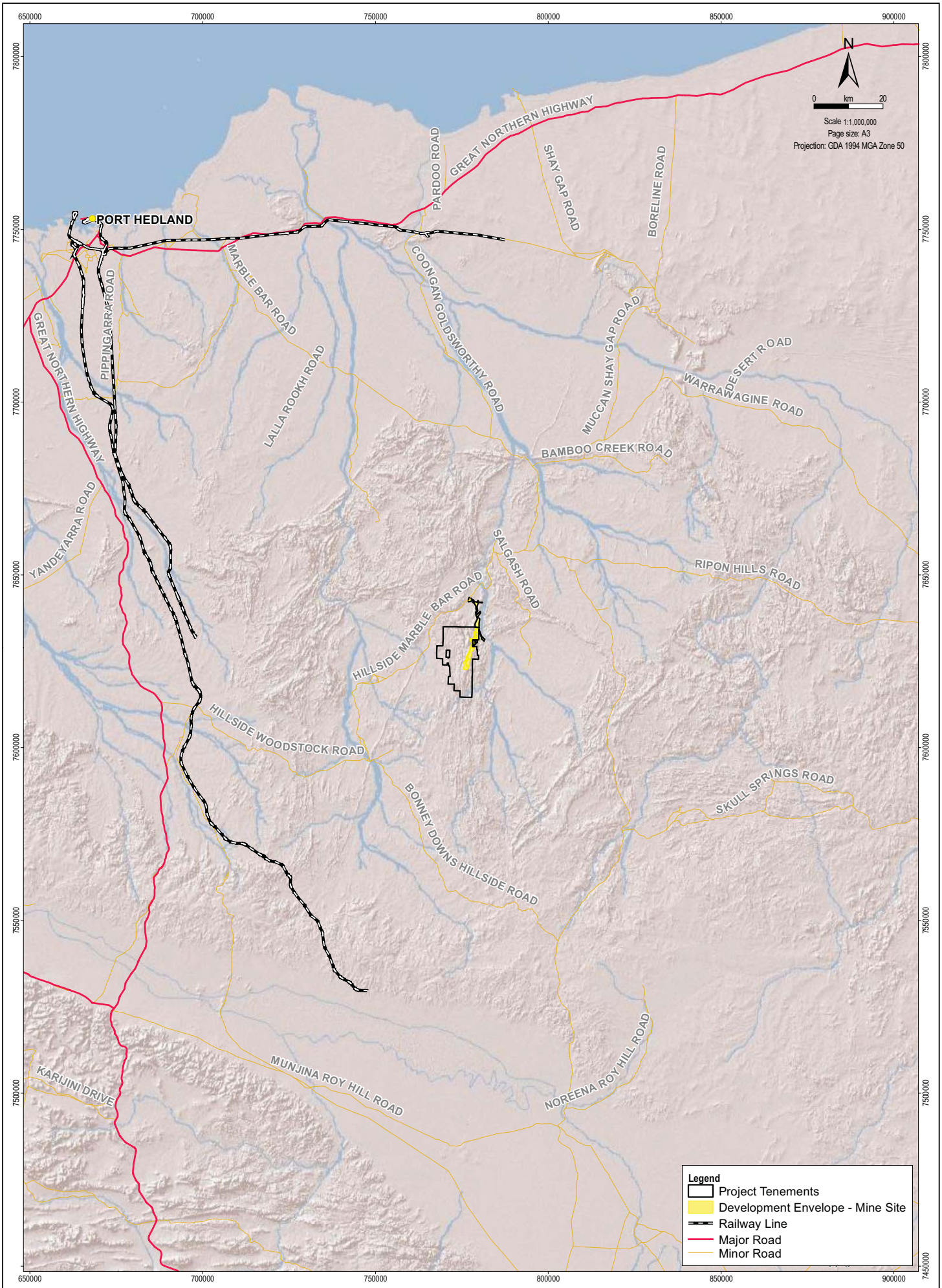
The purpose of this Significant Species Management Plan (SSMP) is to mitigate potential impacts to conservation significant fauna species and ensure the Project is developed in an environmentally acceptable manner.

The objectives of this SSMP are to:

- Maintain an inventory of conservation significant species that have the potential to be impacted by the Project.
- Maintain records of conservation significant species observed within the Project area.
- Avoid or minimise impacts to conservation significant species and habitats.
- Monitor for potential impacts to conservation significant species.
- Detail the reporting requirements relating to conservation significant species.

1.3 Legislative Context

Environmental legislation relevant to this management plan includes the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act) and the State *Environmental Protection Act 1986* (EP Act), *Wildlife Conservation Act 1950* (WC Act) and *Mining Act 1978* (Mining Act).



File Name: GIS_2115.mxd	Document Number : (QDMS number only)	**Corunna Downs Mine Site**
Date: 11/01/2017	Source & Notes:	**Regional Plan**
Author: thatchc	*Disclaimer: This figure has been produced for internal review only and may contain inconsistencies or omissions. It is not intended for publication.*	

1.3.1 Environment Protection and Biodiversity Act 1999

The EPBC Act provides for the protection of matters of national environmental significance. Actions likely to cause a significant impact to matters of national environmental significance are assessed under the EPBC Act. The main authority under this Act is the Department of the Environment and Energy (DoEE).

Nationally threatened species listed under the EPBC Act are considered to be matters of national environmental significance. Migratory species listed under international conventions and agreements that Australia is a party to, are also protected under the EPBC Act. Definitions of the various conservation categories for nationally threatened species and migratory species are provided in Appendix A.

Threatened species and migratory species have been confirmed as present in the vicinity of the Project.

1.3.2 Environmental Protection Act 1986

The 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 Environment Regulation (DER) and the Environmental Protection Authority (EPA).

Approvals can be required under two parts of the Act: Part IV, Environmental Impact Assessment; and Part V, Environmental Regulation. The criteria for referral/assessment under Part IV of the Act, is detailed within the Memorandum of Understanding (MoU) established between the Department of Mines and Petroleum (DMP) and the Environmental Protection Authority (EPA).

The EP Act also specifically deals with the clearing of native vegetation and is supported by the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Under this framework clearing of native vegetation is considered an offense unless a clearing permit is obtained or the clearing is exempt under the EP Act. Native vegetation clearing permits can be assessed by the Department of Mines and Petroleum under delegation from DER in accordance with the provisions of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*

1.3.3 Wildlife Conservation Act 1950

The WC 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 main authority under this Act is the Department of Parks and Wildlife (DPaW).

Threatened fauna are listed in government gazettes as Specially Protected Fauna. Definitions of the various conservation categories are provided in Appendix A.

1.3.4 Mining Act 1978

The Mining Act regulates mineral exploration and mining in Western Australia. The main authority under this Act is the Department of Mines and Petroleum (DMP). Under this Act the DMP 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

For the purpose of this SSMP, conservation significant species are defined as species listed under Commonwealth or State legislation or listed as priority species by the DPaW, or considered by qualified specialists to be locally important.

Commonwealth and State-listed species are discussed in Section 3 and related conservation category definitions are provided in Appendix A. Species of concern (i.e. those species that are poorly known, uncommon, rare or otherwise threatened) that are not listed under legislation may be prioritised by the DPaW and have been included in this SSMP. Their conservation significance is reviewed by the DPaW on a regular basis.

1.4.2 Likelihood of Occurrence

The following definitions of likelihood of occurrence are used in this SSMP:

- **Confirmed** – the presence of the species in the Study Area has been recorded unambiguously during the last ten years (i.e. during recent surveys of the Study Area or from recent records obtained via database searches).
- **Very Likely** – the Study Area lies within the known distribution of the species and contains suitable habitat(s), plus the species generally occurs in suitable habitat and has been recorded nearby within the last 20 years.
- **Likely** – the Study Area lies within the known distribution of the species and the species has been recorded nearby within the last 20 years; however, either:
  - the Study Area contains only a small area of suitable habitat, or habitat that is only marginally suitable; or
  - the species is generally rare and patchily distributed in suitable habitat.
- **Possible** – Outside chance of occurrence based on:
  - the Study Area is just outside the known distribution of the species, but it does contain suitable and sufficient habitat (the species may be common, rare, or patchily distributed); or
  - the Study Area lies within the known distribution of the species, but the species is very rare and/or patchily distributed; or
  - the Study Area lies on the edge of, or within, the known distribution and has suitable habitat, but the species has not been recorded in the area for over 20 years.

- **Unlikely** – the Study Area lies outside the known distribution of the species, the Study Area does not contain suitable habitat, and the species has not been recorded in the area for over 20 years.

1.4.3 Project Terminology

Project terminology is as follows:

- The Project refers to the Corunna Downs Project.
- Survey area is defined as the area over which field surveys have been conducted (>15,000 ha), as described in Chapter 3 and depicted in Figure 2.
- Development Envelope refers to the 2263.19 ha area within which Atlas intends to clear no more than 423.12 ha (Figure 2).
- Project footprint is defined as the area of ground disturbance (423.12 ha).

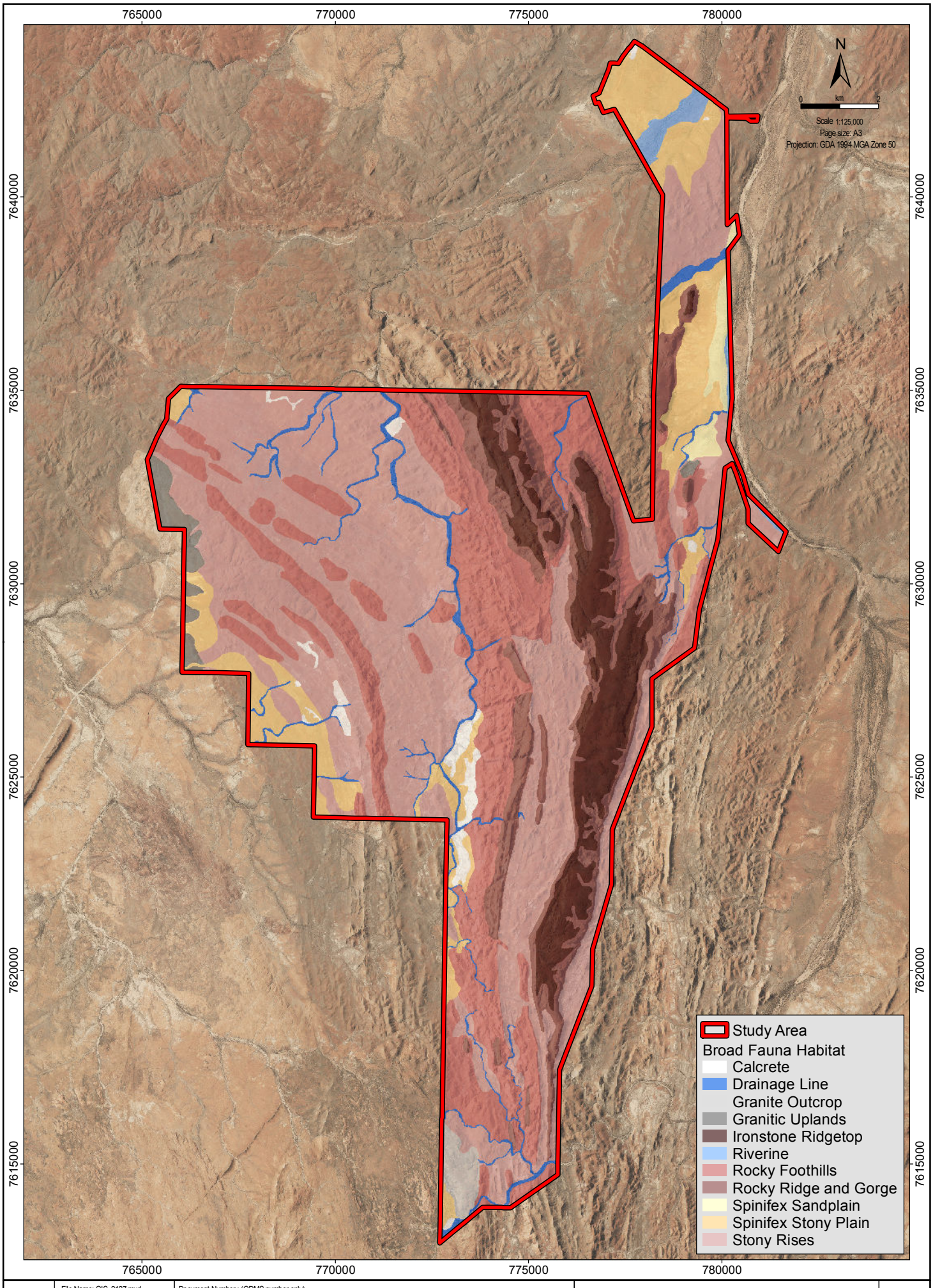
2. Roles and Responsibilities

Atlas is committed to managing its activities in an environmentally and socially responsible manner, as reflected in Atlas's Health, Safety and Environment Policy. 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' roles and responsibilities for the implementation of this SSMP are outlined in Table 1.

Table 1 – Atlas' roles and responsibilities for SSMP implementation

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 within the study area annually.
Corunna Downs Environmental Advisor	Implement monitoring programs. Maintain monitoring records. Deliver monitoring/reporting data to the DoEE, DPaW, DMP and DER. 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.



File Name: GIS_2127.mxd	Document Number : (QDMS number only)	**Broad Fauna Habitat**
Date: 11/01/2017	Source & Notes:	
Author: thatchc	*Disclaimer: This figure has been produced for internal review only and may contain inconsistencies or omissions. It is not intended for publication.*	

CORUNNA DOWNS *Atlas*

Role	Responsibility
Construction and Operation 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.

3. Fauna Values

MWH Australia Pty Ltd (MWH) conducted multiple field surveys in accordance with a Level 2 terrestrial fauna assessment for the Project. The survey methodology was aligned with the relevant sections of the following guidelines:

- EPA (2002), *Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection;*
- EPA (2004), *Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia;*
- EPA and DEC (2010), *Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment;*
- DEWHA (2010a), *Survey Guidelines for Australia's Threatened Bats;*
- DEWHA (2010b), *Survey Guidelines for Australia's Threatened Birds;*
- DSEWPaC (2011a), *Survey Guidelines for Australia's Threatened Mammals*;
- DSEWPaC (2001b), *Survey Guidelines for Australia's Threatened Reptiles;* and
- DotE (2016), EPBC Act Policy Statement: *EPBC Act Referral Guidelines for the Endangered Northern Quoll* Dasyurus hallucatus

The overall objective of the surveys was to gather background information on the terrestrial fauna, fauna assemblages and fauna habitats of the Study area. The specific objectives were to:

- Develop an inventory of the terrestrial vertebrate fauna identified or likely to occur in the Study area and surrounds;
- Assess the occurrence and likely distribution of fauna assemblages and fauna of conservation significance within the Study area;
- Identify, describe and map fauna habitat and any significant habitat in the Study area;
- Assess the survey findings in a regional context by comparing them with available data from other localities within the Pilbara bioregion; and
- Accumulate baseline population information on those species that may require referral under the EPBC Act.

3.1 Habitats

Eleven broad habitat types were identified and mapped over the Study area. These were consistent with habitat types known to occur elsewhere in the Chichester subregion. No habitat types identified were considered regionally significant, although four habitat types were considered locally significant:

- Rocky Ridge and Gorge;
- Drainage Line;
- Riverine; and
- Granite Outcrop.

These habitat types were identified as locally significant due to a variety of factors, including:

- Their importance as a refuge habitat for fauna of conservation significance;
- Their potential to host permanent and semi-permanent water sources which are important for a diverse range of fauna, and/or
- Their ability to support a diverse fauna assemblage.

The remaining seven habitat types; Stony Rises, Rocky Foothills, Spinifex Stony Plain, Ironstone Ridge Top, Granitic Uplands, Calcrete and Spinifex Sandplain, were noted as being widespread and/or being of limited importance to species of conservation significance and/or do not support a diverse fauna assemblage.

Several significant microhabitat features in the Development Envelope should be considered regionally significant as they are known to support, or have the potential to support, species of conservation significance. These features include a non-permanent breeding roost for the Pilbara Leaf-nosed Bat, four nocturnal refuges, two semi-permanent water sources and two permanent water sources, which provide potential habitat for the Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat and Pilbara Olive Python.

3.2 Conservation Significant Species

Eight species of conservation significance recorded in the survey study area and are detailed in Table 2.

Table 2 – Conservation Significant Species Confirmed Present

Common name (Species name)	Conservation Status	
	EPBC	In WA
Northern Quoll (*Dasyurus hallucatus)*	EN	S2
Pilbara Olive Python (*Liasis olivaceus barroni*)	VU	S3
Pilbara Leaf-nosed Bat (*Rhinonicteris aurantius*)	VU	S3
Ghost Bat (*Macroderma gigas*)	VU	S3
Peregrine Falcon (*Falco peregrinus*)	-	S7
Western Pebble-mound Mouse (*Pseudomys chapmani*)	-	P4
Spectacled Hare-wallaby (*L. conspicillatus leichardti*)	-	P3
Rainbow Bee-eater (*Merops ornatus*)	M	S5

Further information regarding each conservation significant species either known to occur or potentially occurring in the survey area is provided in Appendix B.

4. Potential Impacts

Each stage of the Project (construction, operation and closure/rehabilitation) has the potential to affect the abundance, distribution and condition of conservation significant fauna within the Project area and surrounds. Potential impacts of the Project on terrestrial fauna of conservation significance include:

- Loss and/or degradation of fauna habitat, resulting in a direct loss of species, habitat fragmentation and a reduction in the extent of breeding and/or foraging habitat.
- Injuries to and mortalities of fauna caused by interactions with vehicles, infrastructure, machinery and the workforce.
- Reduced diversity or abundance of foraging resources due to altered hydrological regimes.
- Alteration in behaviour of fauna due to dust, noise, vibration and light emissions.
- Increased presence of non-indigenous fauna species due to introduction of workforce and vehicles, inappropriate waste collection and storage practices, and inadequate rehabilitation of disturbed land, resulting in terrestrial vertebrate fauna mortality and/or competition for resources.
- Alteration to fire regimes (e.g. increased frequency, intensity, extent) from the presence of human activity in the area, resulting in the modification or loss of fauna habitat and conservation significant terrestrial vertebrate fauna.
- Loss and/or degradation of terrestrial vertebrate fauna habitat due to increased presence of weed species.

5. Management Measures

Management measures have been developed to control and mitigate impacts to conservation significant fauna from the Project. The management measures in this section have been classified as either Standard Management Measures; which are measures developed and implemented to manage and mitigate impacts to all conservation significant terrestrial vertebrate fauna, or Species-Specific Management Measures which are measures developed and implemented for a conservation significant fauna species that has been confirmed as present in the Project area and may potentially be impacted by the Project.

5.1 Standard Management Measures

This section details the management measures relevant to all conservation significant terrestrial vertebrate fauna. These management measures have been developed in consideration of baseline studies (Section 3), identified potential Project impacts (Section 4), specialist advice and industry best practices.

The following management measures will be implemented:

- Clearing in/of sensitive habitats including caves, cliff lines, waterholes, gorges, ridges, outcrops, drainage lines, scree slopes and crevices will be kept to the minimum necessary for safe construction and operation of the Project.
- Signage identifying the presence of conservation significant fauna will be installed along the roads, where they intersect suitable habitat, specifically:
  - Drainage line habitat.
  - Riverine habitat.
  - Rocky Ridge and gorge habitat.
- Borrow pits will be designed and constructed to permit egress of fauna.
- Turkey's nests will be fenced to at least 1.8m (to prevent fauna entry / mortality) and constructed to ensure a point of fauna ingress/egress.
- 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.
- The Corunna Downs Environmental Advisor will maintain a database and maps detailing, the location of:
  - Conservation significant species and habitat.
  - Impact exclusion zones.
  - Cleared areas.
  - Rehabilitated areas.
- The following vehicle speed limits will be imposed and enforced on Project roads:
  - 80 km/hr north of the Run-of mine pad.
  - 50 km/hr south of the Run-of-mine pad.
- Off-road driving will be prohibited unless otherwise authorised by Senior Management.
- Night-time vehicle movements will be restricted where possible to minimise the potential vehicle strikes.
- Noise, dust and light emissions will be controlled where possible to avoid excessive disturbance to native fauna, including directing lights to working areas, shielding lights to reduce glow, and using conventional dust suppression techniques (i.e. water trucks).
- All bins storing putrescible waste will have tightly secured lids to avoid fauna attraction and entry.

- 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).
- All fauna mortalities and injuries will be reported to the Corunna Downs Environmental Advisor within 24 hours and recorded within Atlas's incident reporting system.
- All sightings of non-indigenous fauna and conservation significant fauna will be reported to the Corunna Downs Environmental Advisor.
- The Corunna Downs Environmental Advisor will report all conservation significant fauna injuries and mortalities to DPaW within one week.
- Where required, fauna will be handled and transported in accordance with the procedures outlined in the DPaW Standard Operating Procedure No 11.1, *Transport and Temporary Holding of Wildlife*.
- Interactions with fauna (e.g. feeding, harassment, capture, killing) are not permitted unless specifically authorised by the Senior Environmental Advisor.
- Domestic pets are prohibited.
- Implementation of Atlas' Introduced Fauna / Pest Control Procedure (950-HSE-EN-PRO-0022), including recording all introduced fauna sightings and the implementation of a feral animal control program, as required (i.e., where sightings are regular and/or if nuisance or dangerous individuals are recorded).
- No more than 423.12 ha of vegetation within the 2263.19 ha Development Envelope will be cleared/ disturbed.
- Clearing and disturbance of vegetation will be kept to the minimum necessary for safe construction and operation of the Project.
- Clearing will occur in accordance with Atlas' Ground Disturbance Permit Procedure. No clearing will occur without prior authorisation from Atlas' Ground Disturbance Permitting System.
- Implementation of the following procedures to ensure weeds are controlled, as far as practicable:
  - Ground Disturbance Permit Procedure (950-HSE-EN-PRO-0001).
  - Flora Management Procedure (950-HSE-EN-PRO0010).
  - Weed Hygiene Procedure (950-HSE-EN-PRO-0002).
- Disturbed areas will be progressively rehabilitated as soon as practicable.

5.2 Species-Specific Management Measures

This section details management measures specific to species which have been confirmed to be present within the study area and are likely to be impacted by the Project; namely, the Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat and Pilbara Olive Python.

Following the implementation of the Standard Management Measures, the Project impacts on a local and regional scale to all other species confirmed to be present within the survey area (Table 3.1), are likely to be minimal (no population/ species decline expected) or negligible (no perceived effect on population/species). As a

result species specific management measures have not been developed for these species; namely the Western Pebble-mound Mouse, Rainbow Bee-eater, Peregrine Falcon and Spectacled Hare-wallaby.

5.2.1 Northern Quoll

The presence of Northern Quolls (*Dasyurus hallucatus*) within the survey area was confirmed from 38 records, including four records from Phase 1 (one opportunistic motion-sensor camera and three scat records), and 34 records from Phase 2 (eight direct captures, eight scat records and 18 motion sensor camera records).

This species was recorded in all 11 previous surveys conducted within the vicinity of the study area and was identified by two databases. The large number of previous records within the vicinity of the Study Area suggests that the species is relatively common in the local region. Additionally, the presence of two females indicated the presence of nearby den sites and confirms that a breeding population occurs within the study area. However, the lack of captures at targeted trapping sites suggests that the population's distribution is confined to specific systems (i.e. important gorge and rocky ridge systems) rather than uniform occurrence throughout broad habitat types. Such systems appear to be located in the central – eastern, northern and south-eastern areas of the study area within the Rocky Ridge and Gorge, Rocky Foothills habitat and in many cases in association with significant microhabitat features such as permanent and semi-permanent water sources.

In addition to the implementation of the Standard Management Measures, Atlas is committed to implementing the following Species-Specific Management Measures for the Northern Quoll:

- Implementation of a Northern Quoll monitoring program (Appendix C).
- Inductions will provide detailed information about the Northern Quoll, including identification of employee and contractor responsibilities.
- Northern Quoll sightings, injuries and mortalities will be reported to the Corunna Downs Environmental Advisor in accordance with Atlas' HSE Incident Management Procedure.

5.2.2 Pilbara Leaf-nosed Bat and Ghost Bat

The presence of the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) within the survey area was confirmed with 41 records during the survey, including four direct sightings, 37 echolocation recordings and one night of via video-census. The most important features identified in the Study area, and relevant to the species is CO-CA-01, a permanent diurnal roost, and CO-CA-03 a non-permanent breeding roost. These two roosts are supported by a large number of foraging resources, both nocturnal refuges and water sources, and extensive coverage of preferred foraging habitat. The objective of the management recommendations is for the long term protection of the Pilbara Leaf-nosed Bat colony at Corunna Downs.

The Ghost Bat was recorded on 10 occasions during the survey, comprising two sightings, three scat and five echolocation records. Echolocation recordings suggested low levels of activity at these sites and confirmed night-time visitation only. This species forages using echolocation during flight, but will also use passive sit and wait hunting techniques visually scanning and ambushing prey from high structures, such as rocky overhangs and trees (Churchill 2008). This species may

therefore forage over all habitats within the Study area, although the Rocky Ridge and Gorge is likely to be of particular importance for both foraging and roosting.

In addition to the implementation of the Standard Management Measures, Atlas is committed to implementing a number of species-specific management measures for the Pilbara Leaf-nosed Bat and Ghost Bat. These include:

- Implementation of a Pilbara Leaf-nosed Bat and Ghost Bat monitoring program (Appendix D).
- Bat roosts will be recorded in a site database and mapped on all mine plans. The database will be accessible to all Atlas departments.
- A 340 m buffer will be maintained around Cave CO-CA-01.
- A 50 m buffer will be maintained around Cave CO-CA-03.
- Access to caves known to be occupied by the Pilbara Leaf-nosed Bat and/or Ghost Bat will be restricted.
- Atlas will not install barbed-wire fences or other fences that could cause bat entanglements.
- Blasting techniques will be implemented to lower vibration levels in the vicinity of sensitive areas. This may include:
  - Minimising the number of holes being detonated at any one time within each blast;
  - Increasing initiation delays between holes;
  - Lowering hole charge weights; and
  - Firing to free faces or into broken material where practicable.
- No trapping of bats is to be undertaken.
- Mine site inductions will provide detailed information about Pilbara Leaf-nosed Bats and Ghost Bats and employee and contractor responsibilities.

5.2.3 Pilbara Olive Python

The Pilbara Olive Python (*Liasis olivaceus barroni*) was recorded in the Study area on four occasions, comprising of one direct sighting during the survey, two direct sightings by Atlas personnel and one record of an individual's skin sloth. This species commonly inhabits moist areas such as gorges, rivers, pools and surrounding hills but can be found in a range of habitats.

In addition to the implementation of the Standard Management Measures Atlas is committed to implementing Species-Specific Management Measures for the Pilbara Olive Python. These include:

- Pilbara Olive Pythons will be captured and relocated to suitable habitat by trained personnel should they be encountered during ground disturbance or operational activities.
- Inductions will provide detailed information about the Pilbara Olive Python and employee and contractor responsibilities.
- Pilbara Olive Python sightings, injuries and mortalities will be reported to the Corunna Downs Environmental Advisor in accordance with Atlas' HSE Incident Management Procedure.

6. Performance Criteria and Corrective Actions

Performance criteria for this SSMP are provided in Table 3. Should the performance criteria not be met, corrective actions will be implemented.

Table 3 – Performance criteria and corrective actions for conservation significant fauna

Performance Objective	Key Performance Indicators	Corrective Actions
No road kill incidents of conservation significant fauna.	No incident reports of road kill incidents of conservation significant fauna.	• Identify likely cause of incident. • Review speed limits and driving procedures. • Review number of and locations of fauna signposts. • Undertake further education and awareness training.
No more than 423.12 ha will be cleared within the Development Envelope.	Clearing of no more than 423.12 ha. No clearing outside the Development Envelope.	• Check demarcation of areas to be cleared/not cleared has been undertaken and is obvious to those on the ground. • Identify likely cause of incident. • Implement relevant corrective actions. • Report to relevant government authorities. • Undertake corrective rehabilitation. • Undertake further education and awareness training.
Persistence of the Northern Quoll within the Study Area during operations.	Absence of Northern Quoll at 50% of monitoring sites over two consecutive annual monitoring periods.	• Review likely cause[1]. • Review monitoring procedure; frequency and methodology. • Review northern quoll management within this plan. • Report to relevant Commonwealth and state agencies. • Undertake any corrective rehabilitation.
No unauthorised access to bat cave exclusion zones.	No ground disturbance within cave buffers. No incident reports of unauthorised access to cave buffers.	• Review training and induction programs. • Review number and locations of fauna signposts. • Review the size of and need for barriers to exclusion zone (e.g. fencing).

Performance Objective	Key Performance Indicators	Corrective Actions
No significant damage to identified caves that would prevent their ongoing use by Pilbara Leaf-nosed Bats.	No significant damage to Cave CA-CO-01 and Cave CA-CO-03. Ongoing use of Cave CA-CO-01 by Pilbara Leaf-nosed Bats during operation. Use of Cave CA-CO-03 by Pilbara Leaf-nosed Bats, following cessation of mining.	• Increase cave inspection and monitoring frequency. • Review blasting requirements. • Undertake any practical corrective rehabilitation (e.g., removal of significant rock fall or sealing of significant fractures), where any identified damage is considered likely to affect ongoing use by bats (i.e., damage which may prevent exit/entry or alter microclimate).
No significant decline in Pilbara Leaf-nosed Bat population.	No greater than 50 % decline of Pilbara Leaf-nosed Bat activity levels in CO-CA-01 over two consecutive monitoring periods compared to the average baseline level (between 2014 to 2017).	• Review likely cause[1]. • Review monitoring procedure; frequency and methodology. • Review bat management within this plan. • Review blasting requirements. • Report to relevant Commonwealth and state agencies.
	Recolonisation of CO-CA-03 by Pilbara Leaf-nosed Bat post-mining[2].	• Review likely cause. • Review monitoring procedure; frequency and methodology. • Undertake any practical corrective rehabilitation (e.g., removal of significant rockfall or sealing of significant fractures). • Report to relevant Commonwealth and state agencies.
Effective waste management procedures.	No records of feral animals within camp or administrative and landfill facilities (due to poor waste management).	• Identify likely cause of incident. • Review the Waste Management (950-HSE-EN-PRO-0023) and Landfill Management (950-HSE-EN-PRO-0020) Procedures. • Review/implement the Introduced Fauna / Pest Control Procedure (950-HSE-EN-PRO-0022. • Undertaking further education and awareness training.

Performance Objective	Key Performance Indicators	Corrective Actions
Effective operation of the Project to minimise the risk of Project related fire	No records of Project-related fires.	• Identify likely cause of incident. • Review any relevant procedures or guidelines (e.g., Hydrocarbon Management Procedure (950-HSE-EN-PRO-0005), Hydrocarbon (and Chemical) Spill Management Procedure (950-HSE-ENPRO-0007), Hot Work Guideline (SA_GDL_009). • Undertake further education and awareness training.
Effective weed control.	No new species of weeds recorded within the Project area.	• Identify likely cause of incident. • Review the Weed Hygiene Procedure (950-HSE-EN-PRO-0002) and the Flora Management Procedure (950-HSE-EN-PRO-0010). • Undertaking further education and awareness training.

1. If performance indicator is triggered, but the change is recorded regionally (across both impact and non-impact/control sites) and found to be indicative of a regional rather than project related change/impact (e.g., influencing environmental factor) no further corrective action is required.
2. Performance against this criteria only needs to be measured, where annual monitoring finds that the Pilbara Leaf-nosed Bat temporarily abandons cave CO-CA-03 during mining (as predicted).

7. Auditing and Review

7.1 Audits

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.

7.2 Reviews

Atlas will undertake an initial review of the SSMP once the Project has received final environmental approvals to ensure all approval conditions, recommendations and commitments are covered. The SSMP will then be reviewed every 12 months or as required. All reviews will consider:

- Outcomes of monitoring programs.
- Changes to the conservation status of fauna species.
- Specialist advice and stakeholder consultation.

- Implementation and effectiveness of management measures and monitoring programs.
- Performance indicators and any corrective actions.
- Changes to relevant legislation, policy, guidelines, management plans and industry practices.
- The identification of a conservation significant fauna species not previously confirmed within the Project area.
- Reoccurring incidents of death/injury to any conservation significant fauna.

8. Reporting

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

Table 4 – Reporting Requirements

Department	Detail	Timing
Atlas Internal	Incident Reporting	As required
Atlas Internal	Opportunistic Reporting	As required
Atlas Internal	Northern Quoll Monitoring Report	Annually
Atlas Internal	Bat Monitoring Report	Annually
DoEE	Annual Environment Report	Annually
DMP	Annual Environment Report	Annually
DPaW	Fauna injury or mortality Report	As Required

8.1 Internal Reporting

8.1.1 Incident Reporting

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

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

All fauna incidents are also recorded in the InControl database and summaries are included in Atlas's Annual Environmental Report (AER).

8.1.2 Opportunistic Reporting

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

A summary will be included in Atlas's Annual Environmental Report (AER).

8.1.3 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.

8.2 External Reporting

8.2.1 Department of the Environment and Energy

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 objectives, key performance indicators and corrective actions listed in Table 3.

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

- Northern Quoll Monitoring Program (detailed in Appendix C).
- Pilbara Leaf-nosed Bat and Ghost Bat Monitoring Program (detailed in Appendix D).

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

8.2.2 Department of Mines and Petroleum

DMP's AER will include a summary of the significant fauna monitoring results and compliance with DoEE approval conditions.

8.2.3 Department of Parks and Wildlife

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

9. References

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Appendix A Definitions of Conservation Significance Status for Flora and Fauna

Table A.1 – Definition of State and Commonwealth Conservation Codes for Fauna

Status	Code	Description
Categories used in Environment Protection and Biodiversity Act 1999		
Endangered	E	A taxon is Endangered when the best available evidence indicates that it is considered to be facing a very high risk of extinction in the wild.
Vulnerable	V	A taxon is Vulnerable when the best available evidence indicates that it is considered to be facing a high risk of extinction in the wild.
Migratory	M	Species migrate to, over and within Australia and its external territories.
Schedules of the Western Australian Wildlife Conservation Act 1950		
Schedule 1	S1	Fauna that is rare or likely to become extinct.
Schedule 2	S2	Fauna that is presumed to be extinct.
Schedule 3	S3	Birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds.
Schedule 4	S4	Fauna that is in need of special protection, otherwise than for the reasons mentioned above.
Priority Fauna Codes used by the Western Australian DPaW		
Priority 1: Taxa with few, poorly known populations on threatened lands.	P1	Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 2: Taxa with few, poorly known populations on conservation lands.	P2	Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 3: Taxa with several, poorly known populations,	P3	Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction

Status	Code	Description
some on conservation lands		or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 4: Taxa in need of monitoring	P4	Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
Priority 5: Taxa in need of monitoring	P5	Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Appendix B Likelihood of Conservation Listed Vertebrate Species Occurring over the Study Area

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Curlew Sandpiper *Calidris ferruginea*	Cr, Mi	S3, S5	The Curlew Sandpiper occurs in intertidal mudflats of estuaries, lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters (Geering *et al.* 2007).	Unlikely Nearest DPaW (2016a) record located ~250 km south of the Study Area, at Ophthalmia Dam and very few inland records of the species. Species only recorded from DoEE Protected Matters database, which is based on estimated species distribution, rather than actual field records.
Northern Quoll *Dasyurus hallucatus*	En	S2	In the Pilbara, ironstone ridges, scree slopes of sandstone or ironstone and granite boulders and outcrops (Cramer *et al.* 2016, Molloy *et al.* 2016).	Confirmed Five individuals were trapped from eight capture events during the Phase 2 survey. An additional 19 records were retrieved from motion-sensor cameras and another eleven scat records. All records were collected within Rocky Ridge and Gorge, Drainage Line, Riverine and Rocky Foothill (within the vicinity of Rocky Ridge and Gorge) habitats.
Night Parrot *Pezoporus occidentalis*	En	S1	Known to inhabit treeless or sparsely wooded long unburnt spinifex hummock plains often interspersed with chenopods (Davis and Metcalf 2008, Pyke and Ehrlich 2014).	Unlikely Nearest DPaW (2016a) record located ~135 km south-west from near the Fortescue Marsh (Davis and Metcalf 2008). Species only recorded from DoEE Protected Matters database, which is based on estimated species distribution, rather than actual field records.

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Australian Painted Snipe *Rostratula australis*	En	S2	Shallow, well-vegetated temporary or infrequently filled inland wetlands (Garnett *et al.* 2011, Knuckey *et al.* 2013).	Unlikely Nearest DPaW (2016a) record located ~170 km south of the Study Area, near Fortescue Marsh, but otherwise very few records within the Pilbara region (Knuckey et al. 2013). N Species only recorded from DoEE Protected Matters database, which is based on estimated species distribution, rather than actual field records.
Greater Bilby *Macrotis lagotis*	Vu	S3	Variety of habitats including spinifex hummock grassland and *Acacia* shrubland, on soft soils (Burrows *et al.* 2012). In the Pilbara often associated with major drainage line sandy terraces (How *et al.* 1991).	Possible Populations of the species are scattered and rare within its distribution (van Dyck and Strahan 2008). Nearest DPaW (2016b) records located ~30 km south-west of the Study Area and ~45 km south-east at McPhee Creek (Outback Ecology 2014). Species requires sandy substrates for burrowing and although such habitat was present in the Study Area (Spinifex Sandplain), this habitat did not contain deep sands suitable for deep burrows. Additionally substantial targeted search effort failed to record evidence of the species, which is relatively easy to identify (Burrows *et al.* 2012).
Ghost Bat *Macroderma gigas*	Vu	S3	The species roosts within deep humid caves, rock crevice and abandoned mines (Armstrong and Anstee 2000). The species will forage in most habitat types and will travel 2 km from a roost to hunt (Churchill	Confirmed The species was confirmed from 10 records within the Study Area, including one observation of a

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
			2008).	roosting individual at cave CO-CA-01 and one individual observed flaying into CO-CA-01 at night. Low level activity was also recorded by SM units from five caves, and scats were found at three locations. All records were within Rocky Ridge and Gorge and Ironstone Ridgetop habitats.
Pilbara Leaf-nosed Bat *Rhinonicteris aurantia*	Vu	S3	Species roosts within caves and abandoned mines with high humidity (95%) and temperature (32 °C). Species forages in caves and along waterbodies with fringing vegetation (Armstrong 2001, DoE 2016b).	Confirmed The species was confirmed from 41 records, including four direct sightings of 10-200 individuals. Two diurnal roosts recorded of the species, in addition to seven Nocturnal Refuges, within Rocky Ridge and Gorge habitat. Rocky Ridge and Gorge habitat provides suitable foraging habitat for the species.
Pilbara Olive Python *Liasis olivaceus barroni*	Vu	S3	Species commonly recorded along watercourses and areas of permanent water, particularly in rocky gorges, escarpments and gullies (Pearson 1993).	Confirmed The species was confirmed from four records within the Study Area. From three direct sightings and the remains of one skin sloth. The species is likely to reside in the Rocky Ridge and Gorge habitat and utilise Drainage Line and Riverine habitats for foraging and dispersal.
Grey Falcon *Falco hypoleucos*	-	S3	Timbered lowlands, particularly Acacia shrubland and along inland drainage systems. Also frequent spinifex and tussock grassland (Burbidge *et al.* 2010,	Possible Nearest DPaW (2016b) records located ~45 km east from 1994, ~45 km north from 2005 and ~60 km

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
			Olsen and Olsen 1986).	north-east from 1999. Species is generally scarce within region. If present, the species is likely to forage and nest within the Drainage Line and Riverine habitats of the Study Area.
Peregrine Falcon *Falco peregrinus*	-	S7	The species occurs along coastal cliffs, rivers and ranges as well as wooded watercourses and lakes nesting on cliffs, granite outcrops, quarries (Johnstone and Storr 1998).	Confirmed One individual was observed during this Survey within the Rocky Ridge and Gorge habitat. The species has was also recorded at Abydos-Woodstock Reserve by (How *et al.* 1991). The species may utilise the Rocky Ridge and Gorge habitat for nesting and foraging, and the Drainage Line and Riverine habitats for foraging only.
- *Anilios ganei*	-	P1	This species is endemic to the Pilbara and known from a relatively small number of specimens. Records are sparse and widespread, but it is thought to be linked to moist gorge and gully habitats (Doughty *et al.* 2011, Wilson and Swan 2014).	Likely Nearest DPaW (2016a) records located ~200 km south of the Study Area within the Hamersley Ranges. The species was however recorded during three surveys conducted within 30 km of the Study Area, in habitats equivalent to Rocky Ridge and Gorge (Outback Ecology 2010, 2013, 2014).
- *Ctenotus nigrilineatus*	-	P1	Little is known about the habitat preferences of the species. Previous records have however been collected from spinifex plains at the base of granite outcrops (How *et al.* 1991).	Possible Nearest DPaW (2016a) record located ~65 km west of the Study Area, from Abydos-Woodstock Reserve in 1990 (How *et al.* 1991), and ~85 km south near

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
				Nullagine. Specific habitat requirements of the species are not confirmed but the species may occur within the Spinifex Stony Plains of the Study Area.
- *Ctenotus uber johnstonei*	-	P2	The habitat requirements of the species are largely unknown although it is believed the species is associated compacted clayey soil with sparse plant cover (Wilson and Swan 2014).	Possible Nearest DPaW (2016a) record located ~20 km south of the Study Area. The species was also recorded at Mt Webber Outback Ecology (2014). Its habitat preferences are poorly understood, and in the absence of additional information it is considered unlikely to occur in the Study Area.
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	-	P3	The Spectacled Hare-wallaby in tussock and hummock grasslands and *Acacia* shrublands (Ingleby and Westoby 1992).	Confirmed An abandoned shelter site, with scats, was recorded within the Stony Rises habitat of the Study Area, and the species was also recorded during three previous surveys in the vicinity of the Study Area. The species is likely to utilise the Spinifex Stony Plain and Spinifex Sandplain habitats within the Study Area.
Brush-tailed Mulgara *Dasycercus blythi*	-	P4	Sand plains and gibber plains with moderately dense spinifex with 'runways' between clumps (van Dyck and Strahan 2008).	Possible Nearest DPaW (2016a) record located ~15 km east of the Study Area from 1959. Signs of this species (i.e. diggings/burrows) were recorded in three previous surveys in the vicinity of the Study Area.

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
				The Spinifex Sandplain habitat of the Study Area provides suitable habitat for the species.
Long-tailed Dunnart *Sminthopsis longicaudata*	-	P4	Typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Gibson and McKenzie 2009). Once considered rare but now shown to be relatively common and widespread in rocky habitats (van Dyck and Strahan 2008).	Likely Nearest DPaW (2016b) records located ~35 km east of the Study Area. The species was recently recorded at McPhee Creek (Outback Ecology 2012b), located 45 km from the Study Area. The Rocky Ridge and Gorge and Rocky Foothills habitat provides suitable habitat for the species.
Lakeland Downs Mouse *Leggadina lakedownensis*	-	P4	Tussock and hummock grassland, *Acacia* shrubland, and savannah woodland, on cracking clays and alluvial clays (Kutt and Kemp 2005, Moro and Morris 2000).	Unlikely Nearest DPaW (2016b) record, a WAM specimen, located ~20 km west of the Study Area. However suitable habitat for the species does not occur within the Study Area.
Western Pebble-mound Mouse *Pseudomys chapmani*	-	P4	Spurs and rocky hills with many small pebbles vegetated by spinifex islands (Anstee 1996, Anstee and Armstrong 2001, Anstee *et al.* 1997).	Confirmed The species was recorded on 13 occasions during the Survey, including 10 inactive mounds, one active mound and two direct captures. Nine of the records were recorded within Stony Rises habitat, three within Ironstone Ridgetop habitat and one within Spinifex Stony Plain. The species was recorded in ten of the 11 surveys conducted within the region and from two database searches. The species is likely to

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
				be widespread through the Stony Rises, Spinifex Stony Plains and Rocky Foothill habitats
Fork-tailed Swift *Apus pacificus*	Mi	S5	The Fork-tailed Swift is an aerial specialist that overflies numerous habitats (Pizzey and Knight 2012).	Possible Nearest DPaW (2016a) record located ~75 km north-west of the Study Area from 2011. The species was also recorded by How et al. (1991). The species may flyover the Study Area on an irregular basis, but is not dependent on habitats within the Study Area.
Oriental Plover *Charadrius veredus*	Mi	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Species predominantly occurs within near-coastal samphire and grass flats, also beaches, tidal creeks, saltwork ponds and sewage ponds (Johnstone et al. 2013).	Unlikely Nearest DPaW (2016a) record located ~25 km north-east of the Study Area. Preferred habitat for the species does not occur within the Study Area and the species is generally uncommon in region
Oriental Pratincole *Glareola maldivarum*	Mi	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Species favours open grassy plains (including airfields and sports ovals), samphire and open mudflats and beaches (Johnstone et al. 2013).	Unlikely Nearest DPaW (2016a) record located ~150 km north-west of the Study Area, from Port Hedland and no inland records of the species. Species only recorded from DoEE Protected Matters database, which is based on estimated species distribution, rather than actual field records.

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Sharp-tailed Sandpiper *Calidris acuminata*	Mi	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Species favours flooded samphire flats and grasslands, mangrove creeks, mudflats, beaches, river pools, saltwork ponds (where commonly located on hypersaline ponds) sewage ponds, and freshwater soaks (Johnstone et al. 2013).	Possible Nearest DPaW (2016a) record located ~25 km north-east of the Study Area, from freshwater pools east of Marble Bar. The species may occur as an irregular visitor to pools within the Riverine and Drainage Line habitats of the Study Area, but is not dependent on habitats within the Study Area.
Wood Sandpiper *Tringa glareola*	Mi	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows (Johnstone et al. 2013).	Possible Nearest DPaW (2016a) record located ~25 km north-east of the Study Area, from freshwater pools east of Marble Bar. The species may occur as an irregular visitor to pools within the Riverine and Drainage Line habitats of the Study Area, but is not dependent on habitats within the Study Area.
Common Sandpiper *Actitis hypoleucos*	Mi	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Species favours tidal and reef flats, beaches, saltwork ponds, river pools, flooded claypans, freshwater soaks and ephemeral waters (Johnstone et al. 2013).	Possible Nearest DPaW (2016a) records located ~25 km north-east of the Study Area at Marble Bar from 2005. The species may occur as an irregular visitor to pools within the Riverine and Drainage Line habitats of the Study Area, but is not dependent on habitats within the Study Area.

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Common Greenshank *Tringa nebularia*	Mi	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in Tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds (Johnstone et al. 2013).	Possible Nearest DPaW (2016a) record located ~25 km north-east of the Study Area, from freshwater pools east of Marble Bar. The species may occur as an irregular visitor to pools within the Riverine and Drainage Line habitats of the Study Area, but is not dependent on habitats within the Study Area.
Glossy Ibis *Plegadis falcinellus*	Mi	S5	Freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone et al. 2013).	Possible Nearest DPaW (2016a) record located ~50 km north of the Study Area, from the Coongan Riverine system. The species may occur as an irregular visitor to pools within the Riverine and Drainage Line habitats of the Study Area, but is not dependent on habitats within the Study Area.
Barn Swallow *Hirundo rustica*	Mi	S5	Open country in coastal lowlands, often near water, towns and cities. Also over freshwater wetlands, paperbark woodland, mesophyll shrub thickets and grasslands (Pizzey and Knight 2012).	Unlikely Nearest DPaW (2016a) record located ~150 km north-west of the Study Area, from Port Hedland and no inland records of the species. Species only recorded from DoEE Protected Matters database, which is based on estimated species distribution, rather than actual field records.

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Grey Wagtail *Motacilla cinerea*	Mi	S5	Little is known about the biology of the Grey Wagtail. This species occurs near fast-flowing water(Pizzey and Knight 2012).	Unlikely Nearest DPaW (2016a) record located ~550 km north-west of the Study Area, from Broome. Species only recorded from DoEE Protected Matters database, which is based on estimated species distribution, rather than actual field records.
Yellow Wagtail *Motacilla flava*	Mi	S5	Little is known about the biology of the Yellow Wagtail. This species occurs near salt works, paddocks and marshes (Pizzey and Knight 2012).	Unlikely No previous surveys in the vicinity of the Study Area have recorded the species and it was reported only by the DoE Protected Matters database, which is based on estimated species distributions rather than actual field records.
Cattle Egret *Ardea ibis*		S5	Occurs in a wide range of habitats including, marshes, reservoirs, lakes, swamps, and riverside woodlands and often forage in fields with grazing livestock (Pizzey and Knight 2012{Johnstone, 1998 #1545)}.	Unlikely Nearest DPaW (2016a) record located ~160 km south of the Study Area, from the Fortescue Marsh and generally very few inland records of the species. Species only recorded from DoEE Protected Matters database, which is based on estimated species distribution, rather than actual field records.
Eastern Great Egret *Ardea modesta*		S5	Forages in a wide range of wetland habitats including, flooded claypans, flooded samphire (inundated by rain or high tides), river pools, sewage ponds, mangrove	Likely Nearest DPaW (2016b) records located ~8 km east

Common name (*Scientific name*)	Conservation status		Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
			creeks and saltwork ponds (Johnstone et al. 2013). Breeding recorded in treed drainages lines and inland islands (Johnstone et al. 2013).	of the Study Area within Emu Creek, the same Riverine system that runs adjacent to the Study Area. Species also recorded by Outback Ecology (2010). Species is likely to forage and potentially nest within the Riverine and Drainage Line habitats occurring within the Study Area.
Rainbow Bee-eater *Merops ornatus*		S5	Lightly wooded, often sandy country, preferring areas near water (Johnstone et al. 2013).	Confirmed The species was recorded from 61 records within the Study Area. Species recorded from most habitat types within the Study Area. Species likely to forage and breed within the Drainage Line and Riverine habitats of the Study Area.

Appendix C Northern Quoll Monitoring Program

Northern Quoll Monitoring Program

Corunna Downs

179-LAH-EN-REP-0002

Revision 2

Authorisation

Rev	Reason for Issue	Prepared	Checked	Authorised	Date
1	Compliance	Melissa Finlay	Esme Wink	Brendan Bow	10/01/17
2	Regulator Comments	Natassja Bell	Brendan Bow	Brendan Bow	16/05/2017



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Contents

List of appendices

Northern Quoll Monitoring Program

The Northern Quoll (*Dasyurus* hallucatus) was recorded during the Corunna Downs Baseline Surveys from 38 records including, four records from Phase 1 (one motion-sensor camera and three scat records), and 34 records from Phase 2 comprising eight direct captures, eight scat records and 18 motion-sensor camera records (15 targeted site deployments, two opportunistic site deployments, and one systematic trapping site). The Northern Quoll was also recorded in all 11 previous surveys conducted within the vicinity of the study area and was identified by two databases. The large number of records within the vicinity of the Study Area suggests that the species is relatively common in the local region. Atlas is therefore committed to implementing the following monitoring program.

1. Overview

This monitoring program aims to monitor the presence of Northern Quoll during the life of the Corunna Downs Project and to ensure the effectiveness of Atlas' management measures.

This monitoring program includes:

- **Baseline population survey**: A level 2 terrestrial fauna survey to determine to presence of a Northern Quoll population within the Study area.
- **Annual monitoring**: The aim of this program is to monitor Northern Quoll population trends during the life of the Project.
- **Opportunistic monitoring**: The aim of this program is to provide additional data collected by site personnel to supplement the annual monitoring program and further the protection of the Northern Quoll.
- **Rehabilitation monitoring**: The aim of this program is to determine Northern Quoll recolonisation in rehabilitated Project areas and rehabilitation success.

2. Monitoring Methods

Atlas will undertake monitoring of Northern Quoll throughout the life of the Project. The various monitoring methods that have been and will be deployed to ensure the continued presence of the Northern Quoll within the Development Area and wider region are discussed below.

2.1 Baseline Population Survey

A desktop study, comprising of database searches and literature reviews, was conducted prior to the initial field survey. The objective of the desktop study was to gather background information on the local region, to provide an indication of fauna species and habitats likely to be present, suitable survey methodology, and to provide a regional context to inform the analysis of field survey findings.

Prior to any field work, broad habitat types within the Study Area were identified from aerial photography, satellite imagery and topographical maps. A reconnaissance visit was used to acquire a more detailed understanding of the geology, landforms, terrestrial fauna habitats and vehicular access within the Study Area. During this reconnaissance visit, habitat types in the Study Area were ground-truthed and mapped at a broad scale using an iterative approach that combined rapid on-ground assessment points in the field, satellite imagery, aerial photography and digital elevation models.

Subsequent to the identification and ground-truthing of broad habitat types, sites for systematic sampling and targeted survey effort were identified. The indicative placement of sampling sites broadly followed a stratified random sampling design, although it was ensured that sites were placed in representative habitat types, had good spatial coverage across the Study Area, and considered access restrictions and the likelihood of supporting species of conservation significance. All locations were ground-truthed in the field prior to site establishment to ensure locations were in representative habitats and avoided disturbances such as drill pads, tracks and recent fire.

Systematic sampling sites were established in the Study Area. The sampling program implemented at each of these sites consisted of standardised trapping, fixed-time avifauna census, systematic searching (active searching), nocturnal spotlighting, motion-sensor camera deployments and bat echolocation recordings.

Full baseline population monitoring results can be found in the Corunna Downs Project: Terrestrial Vertebrate Fauna Baseline Survey report (MWH, 2016).

2.2 Annual Monitoring

Monitoring will be undertaken annually for the life of the Project, exceeding the recommendations of the EPBC Act Policy Statement 3.2, which recommends monitoring to be undertaken annually for the first two years of operations and then once every three years after that for the life of the Project (DoE, 2016).

Atlas will undertake annual Northern Quoll Monitoring between April and September in line with relevant guidelines (Dunlop 2014, DOE 2016). The dates for the survey will be aligned with the most appropriate moon phase to maximise activity while pertaining to the most appropriate sampling season for Northern Quolls (and Pilbara Leaf-nosed Bat).

Eight locations, selected on their basis as previously recorded locations for this species, will be monitored (Attachment 1). Ten cameras will be established at each monitoring site over four nights. Each camera will be established on permanent mounting posts or similar, to ensure the same locations can be monitored each year and will be baited with a perforated piece of PVC pipe containing universal bait. This method has been successful in detecting Northern Quolls at other Atlas sites where population's densities are thought to be low.

The setup of the remote sensor cameras will be undertaken in accordance with the Department of Environment and Conservation (now Department of Parks and Wildlife) Standard Operating Procedure – Remote operation of cameras (SOP No:5.2) (April 2011).

The benefits for this type of monitoring are:

- Maximise the chance of detecting the species;
- Positioned in habitat critical for the survival of the species;

- Monitor all representative habitat types;
- Less labour intensive, more practical for working in remote areas;
- Becoming the preferred form of monitoring;
- Detect other species present as well, which may pose a threat to the Northern Quoll (e.g. Cats) and allow for further management measures to be implemented to protect the Northern Quoll;
- More effective at capturing shy wildlife;
- Monitor how many different species are in the area; and
- Non-invasive.

Absence/presence of Northern Quolls will be recorded using motion cameras across all sites. Cameras can also document patterns of movement and activity, and in certain circumstances individual Northern Quolls can be distinguished based on the timing of photos and the size and other physical characteristics of individuals captured (Hohnen et al. 2012).

Photo monitoring points will also be established at each monitoring location to document any changes to the site over time. The following parameters will be assessed and measured, where present:

- Landscape, soil features and structural composition.
- Vegetation cover, condition and species composition.
- The presence or absence of habitat structures.
- The presence or absence of water.
- Types of disturbance and levels of disturbance.

2.3 Opportunistic Monitoring

Targeted opportunistic surveys will also be undertaken at each of the monitoring sites (i.e., 10 hours per site) to obtain direct visual records of Northern Quolls, or indirect records such as bones, carcasses, tracks and scats. Any opportunistic observations of Northern Quolls will be documented. Other species of conservation significance will also be recorded, if observed.

Northern Quoll sightings (including scats and tracks), injuries and mortalities will be reported to the Site Environmental Advisor. All records will be entered into a site database (InViron) and summaries will be included in the Annual Environmental Report (AER).

2.4 Rehabilitation Monitoring

Permanent monitoring sites established during operations will continue to be monitored in accordance with the approved mine closure plan. Additional monitoring sites will be established in rehabilitated areas when they become available to determine re-colonisation trends and rehabilitation effectiveness.

3. Reporting

A standalone report at the conclusion of each annual monitoring period will be prepared. This report will include the following sections; methods, results, discussion and recommendations. This report will also be appended to Atlas' AER.

4. Performance Criteria and Corrective Actions

Performance criteria for the Northern Quoll have been provided in the SSMP. Should this monitoring program indicate that these performance criteria are not being met; the relevant corrective actions will be implemented.

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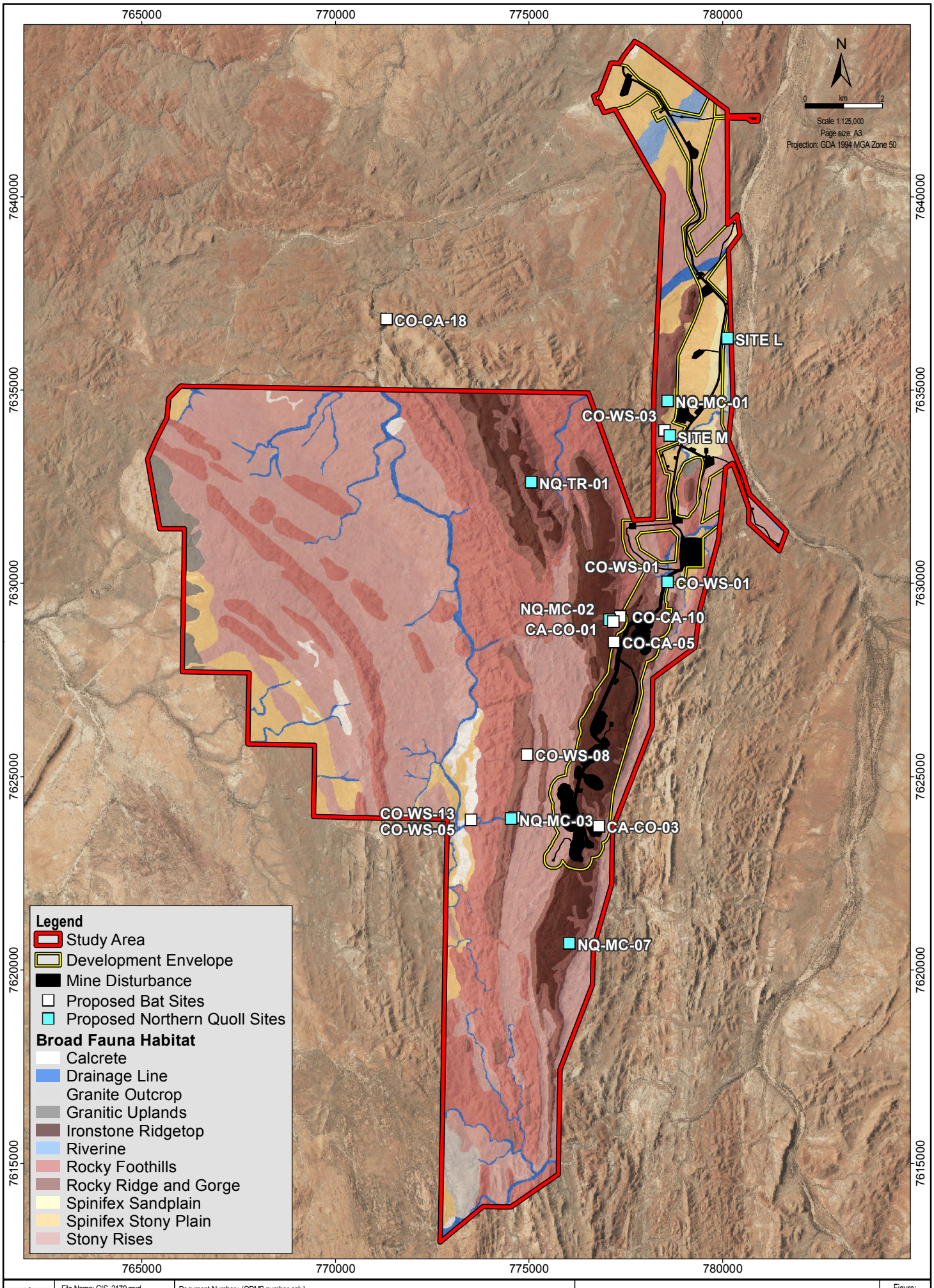
Appendix A Proposed Monitoring Locations



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Proposed Monitoring Locations

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Appendix D Pilbara Leaf-nosed Bat and Ghost Bat Monitoring Program

Pilbara Leaf-nosed Bat and Ghost Bat Monitoring Program

Corunna Downs

179-LAH-EN-REP-0003

Revision 3

Authorisation

Rev	Reason for Issue	Prepared	Checked	Authorised	Date
1	Compliance	Melissa Finlay	Esme Wink	Brendan Bow	10/01/17
2	Regulator Comments	Natassja Bell	Brendan Bow	Brendan Bow	16/05/2017
3	Regulator Comments	Natassja Bell	Brendan Bow	Brendan Bow	09/06/2017



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Contents

List of appendices

Pilbara Leaf–nosed Bat and Ghost Bat Monitoring Program

The Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) and the Ghost Bat (*Macroderma gigas*) have both been recorded at various sites within the Study Area, however the focus of the monitoring will be on the Pilbara Leaf-nosed Bat, given the occurrence of important roosts for this species within the Study Area. The lack of echolocation calls and secondary evidence of the Ghost Bat during the surveys suggests that it is unlikely that important roosts for this species occur within the Study Area, particularly given the intensity of sampling during the surveys.

The most important features identified in the Study area, are cave CO-CA-01, a permanent diurnal roost for the Pilbara Leaf-nosed Bat, and cave CO-CA-03 a non-permanent breeding roost for the Pilbara Leaf-nosed Bat. A 340 m buffer will be maintained around Cave CO-CA-01 and a 50 m buffer will be maintained around Cave CO-CA-03.

1. Overview

This monitoring program aims to document changes to Pilbara Leaf-nosed Bat population over the life of the Project, assess the effectiveness of Atlas' management measures and more generally to build on the knowledge of the Pilbara Leaf-nosed Bat and Ghost Bat across its operations for future management planning and approval.

This monitoring program will include:

- **Baseline population survey:** level 2 terrestrial fauna survey and a targeted survey of significant caves for the Pilbara Leaf-nosed Bat and Ghost Bat populations within the Project area.
- **Annual monitoring:** The aim of this program is to assess bat activity levels within significant caves during the life of the Project.
- **Opportunistic monitoring:** The aim of this program is to provide additional data and information collected by site personnel to supplement the annual monitoring program, and to generate interest amongst site personnel in the protection of the Pilbara Leaf-nosed Bat and Ghost Bat.
- **Rehabilitation monitoring**: The aim of this program is to determine Pilbara Leaf-nosed Bat recolonisation in Cave CO-CA-03 post-mining.

2. Monitoring Method

Atlas will undertake monitoring of Pilbara Leaf-nosed Bat and Ghost Bat throughout the life of the Project. The various monitoring methods that have been and will be deployed to ensure the continued presence of these species within the Development Area and wider region are discussed below.

2.1 Baseline Population Survey

A desktop study, comprising of database searches and literature reviews, was conducted prior to the initial field survey. The objective of the desktop study was to gather background information on the local region, to provide an indication of fauna species and habitats likely to be present, suitable survey methodology, and to provide a regional context to inform the analysis of field survey findings.

Prior to any field work, broad habitat types within the Study Area were identified from aerial photography, satellite imagery and topographical maps. A reconnaissance visit was used to acquire a more detailed understanding of the geology, landforms, terrestrial fauna habitats and vehicular access within the Study Area. During this reconnaissance visit, habitat types in the Study Area were ground-truthed and mapped at a broad scale using an iterative approach that combined rapid on-ground assessment points in the field, satellite imagery, aerial photography and digital elevation models.

Subsequent to the identification and ground-truthing of broad habitat types, sites for systematic sampling and targeted survey effort were identified. The indicative placement of sampling sites broadly followed a stratified random sampling design, although it was ensured that sites were placed in representative habitat types, had good spatial coverage across the Study Area, and considered access restrictions and the likelihood of supporting species of conservation significance. All locations were ground-truthed in the field prior to site establishment to ensure locations were in representative habitats and avoided disturbances such as drill pads, tracks and recent fire.

Systematic sampling sites were established in the Study Area. The sampling program implemented at each of these sites consisted of standardised trapping, fixed-time avifauna census, systematic searching (active searching), nocturnal spotlighting, motion-sensor camera deployments and bat echolocation recordings.

Full baseline population monitoring results can be found in the Corunna Downs Project: Terrestrial Vertebrate Fauna Baseline Survey report (MWH, 2016).

2.2 Annual Monitoring

Pilbara Leaf-nosed Bat and Ghost Bat will be monitored annually between April and September. The dates for each monitoring event will be aligned with the most appropriate moon phase to maximise activity while pertaining to the most appropriate sampling season for Pilbara Leaf-nosed Bat (and Northern Quolls).

An SM2BAT device will be established at each of the ten monitoring sites (i.e., caves and waterholes) during the initial annual monitoring survey (Attachment 1). Sites were selected on their basis as a previously recorded location for these species (particularly Pilbara Leaf-nosed Bats, as they appear to be more reliant on habitat within the study area than Ghost Bats) and to ensure geographical coverage over the Study Area. The number or monitoring sites may be reduced for subsequent monitoring surveys once appropriate caves for annual monitoring have been selected similar to the approach taken at Atlas' other operations. All SM2BAT devices will be deployed for a minimum of seven nights.

The deployed SM2 units record Pilbara Leaf-nosed Bat activity and Ghost Bat presence during the monitoring period. Individual bat calls are identified from the SM2 echolocation recordings using COOL EDIT 2000 (now available as AUDITION from Adobe Systems Inc.). Once calls are identified, the species is confirmed by an experienced observer with reference to a database of reference calls. When quantified, calls are referred to as "passes'. For Pilbara Leaf-nosed Bats, the number of passes is an approximate reflection of the species activity at the location as individuals emit navigation calls in the vicinity of the microphone. Often one individual is responsible for multiple passes if it is active in close proximity to the SM2 for a period of time; as such, the number of calls recorded is not necessarily related to the number of individuals inhabiting or visiting a structure. Estimates of activity based on passes should therefore be considered as minimum, as an unknown percentage of the call sequence counted may have two or more bats present.

Ghost Bats are discussed in presence-absence terms only, as individuals of this species are capable of hunting and navigating entirely visually without recourse to calling, and are known to hang from cave walls for many minutes calling both socially and ultrasonically (Armstrong and Anstee 2000). Additionally, Ghost Bats may depart important day roost caves on dusk and not return until dawn (Armstrong and Anstee 2000), meaning that activity levels quantified using passes do not necessarily have any relationship with the significance of the cave to the species.

As with Atlas' other monitoring programs, the Pilbara Leaf-nosed Bat echolocation data collected during each monitoring event will be statistically compared to the baseline survey and any previous monitoring event using Analysis of Variance (ANOVA) (Minitab 2010). Due to the uneven numbers of control and impact caves and uneven numbers of recording nights among caves, the ANOVA will be conducted using a General Linear Model (GLM), with two factors of greatest interest:

- 'category'- which groups data according to whether they are from impact or control caves.
- 'year'- which groups data according to whether they are from the current or previous survey.'

Because of the substantial difference in the number of calls between nocturnal refuge cave and permanent diurnal roosts, these two types of features will be analysed separately. Tukey post-hoc test will be used to verify where significant differences lay.

As a decline in bat activity has been observed at roosts in this area of the Pilbara in 2015/2016 potentially as a result of very low rainfall, the 2016 monitoring event may not represent a baseline level of activity under good conditions. To address this issue the monitoring program will incorporate baseline data for CO-CA-01 from 2014 (pre-drought), 2015 and 2016 and 2017 (planned for July 2017 ahead of Project commencement). Project performance (i.e., changes in bat activity) will be measured against the baseline average across these four years.

Annual monitoring will also compare any changes in activity at this cave to changes in activity at regional caves (MW-AN-27 monitored from 2014 – current, R2 (Lalla Rookh) monitored from 2012 – current and newly discovered regional cave near Mt Webber (MW-CA-02 aka Daltons)), to understand whether any changes in activity are occurring at a local or regional scale. Habitat assessments and photo monitoring points will also be established at all bat monitoring locations to document any changes to the site over time. The following parameters will be assessed and measured, where applicable:

- Presence of bats, scat material and/or odours.
- Roost characteristics and condition (for example, rock falls, cracking etc.).

- Surrounding landscape, vegetation and presence of water.
- Noise and vibration levels (where mining activity comes within close proximity to any significant roosts). Monitoring of these parameters may occur separately to the scheduled annual monitoring program on an as needs basis.
- Presence and/or the impact of any artificial light sources.
- Bat behaviour in response to noise, vibration and light emissions (on an as needs basis in line with the two points above).

2.3 Opportunistic Monitoring

During the activities on site it is possible to obtain direct visual records of Pilbara Leaf-nosed Bats and/or Ghost Bats, or indirect records such as carcasses and scats. Any opportunistic observations of Pilbara Leaf-nosed Bats or Ghost Bats will be documented.

Pilbara Leaf-nosed Bats or Ghost Bats sightings (including scats), injuries and mortalities will be reported to the Corunna Downs Environmental Advisor. All records will be entered into a site database (InViron) and summaries will be included in the Annual Environmental Report (AER).

2.4 Rehabilitation Monitoring

Cave CO-CA-03 will continue to be monitored post mining in accordance with Section 2.2, should Pilbara Leaf-Nosed Bats be found to temporarily abandon this roost during mining, in accordance with the approved mine closure plan.

3. Reporting

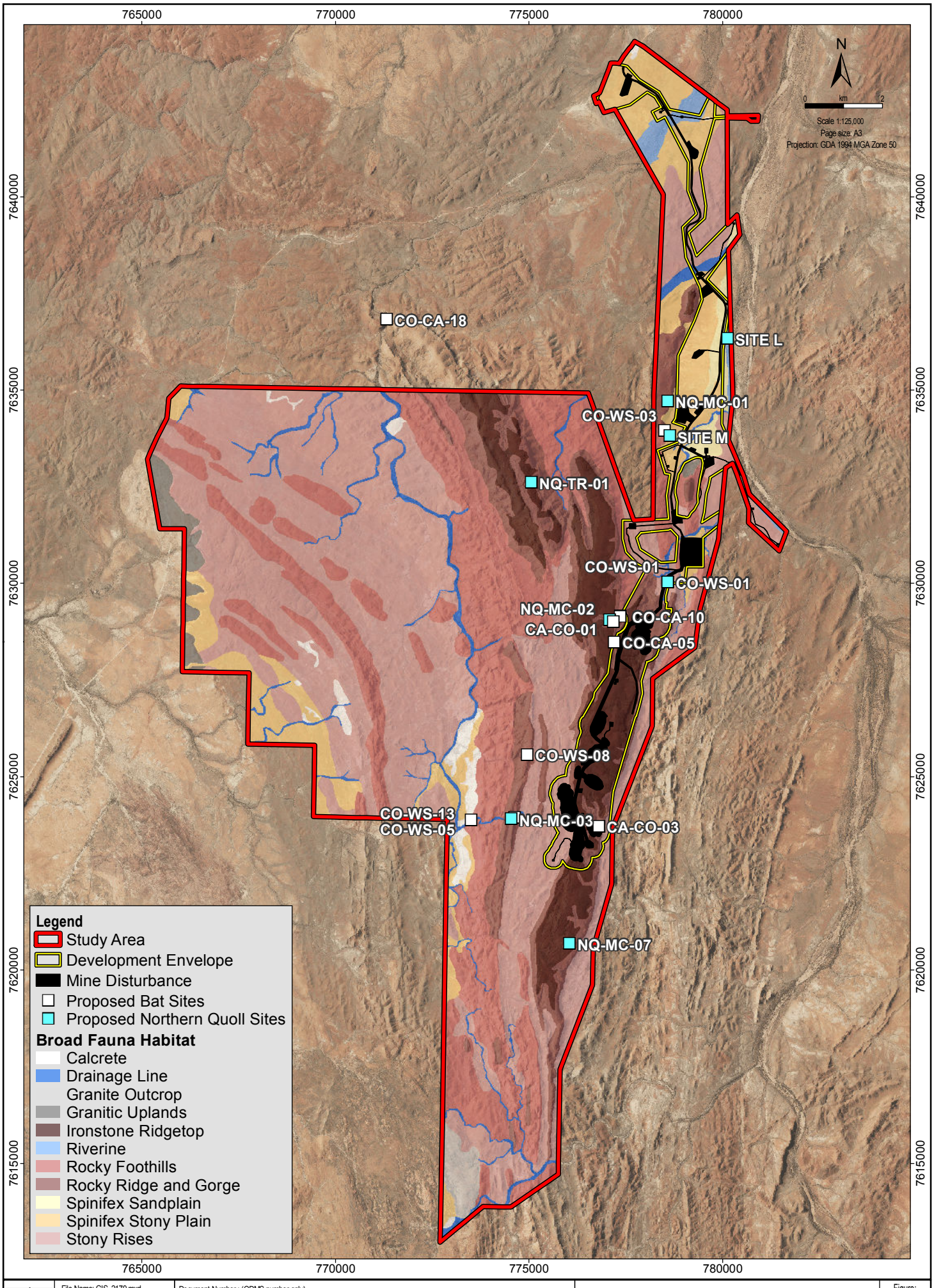
A standalone report at the conclusion of each annual monitoring period will be prepared. This report will include the following sections; methods, results, discussion and recommendations. This report will also be appended to Atlas' AER.

4. Performance Criteria and Corrective Actions

Performance criteria for the Pilbara Leaf-nosed Bat have been provided in the SSMP. Should this monitoring program indicate that these performance criteria are not being met; the relevant corrective actions will be implemented.

As surveys to date suggest that it is unlikely that important roosts for the Ghost Bat occur within the Study Area, no species specific performance criteria has been established for this species, rather the objective of monitoring for this species is to build on Atlas' knowledge of this species across its operations for future management planning and approval.

Appendix A Proposed Monitoring Locations



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