

**BASELINE STUDY:
VERTEBRATE FAUNA AND FLORA ASSOCIATED
WITH THE KOKOSEB GOLD MINE PROJECT (EPL
4818), OKOMBAHE AREA**

SPECIALIST CONTRIBUTION:

Prepared by:

Peter L Cunningham

Environment and Wildlife Consulting Namibia

P. O. Box 417

Karasburg

Namibia

Mobile: +264 81-3004080

E-mail: pckkwrc@yahoo.co.uk

Prepared for:

Mr Stephan Bezuidenhout

Environmental Compliance Consultancy

Windhoek

Namibia

Mobile: +264 81-669-7608

www.eccenvironmental.com

E-mail: info@eccenvironmental.com

CONTENTS**Vertebrate fauna and flora associated with the Kokoseb Gold Mine Project (EPL 4818): Okombahe area**

1	Introduction	2
2	Methods	4
2.1	Literature review	4
2.2	Field survey	4
3	Results	7
3.1	Reptile Diversity	7
3.2	Amphibian Diversity	16
3.3	Mammal Diversity	21
3.4	Avian Diversity	31
3.5	Tree and Shrub Diversity	42
3.6	Grass Diversity	55
3.7	Other Species	62
3.8	Important Species	66
3.9	Important Areas	68
4	Impact Assessment	72
4.1	Introduction	72
4.2	Faunal Impacts	73
4.3	Floral Impacts	75
4.4	Impacts – Methods	78
4.5	Assessments	80
4.6	Impacts	82
5	Conclusion	85
6	References	86

1 Introduction

A desktop study (i.e., literature review) was conducted between 19 and 22 November 2024 on the vertebrate fauna (reptiles, amphibians, mammals, and birds) and flora (trees and shrubs > 1m in height and grasses) expected to occur in the general Okombahe area (i.e., includes the Uis-Omatjete-Okombahe area incorporating the exploration license area EPL 4818 for the Kokoseb Gold Project). The aim of this study is to determine the vertebrate fauna and flora, especially unique species, and important habitats, located within the EPL 4818 and which may be affected by further exploration/mining development by the Project within the general area (See Figure 1). This was followed by fieldwork conducted over two years rather than one, due to extreme drought conditions experienced during 2024 in the general area, to cover the “dry” and “wet” seasons (i.e., June 2024 & June 2025).

This literature review was to determine the actual as well as potential vertebrate fauna and flora associated with the general Okombahe area and commonly referred to as the Semi-desert Savannah and Transition Zone [Escarpment area] (Giess 1971, van der Merwe 1983) or Western Highlands (Mendelsohn *et al.* 2002, Jarvis *et al.* 2022) (Figure 2). This semi-desert and savannah transition zone, as referred to by Giess (1971), is typified by shrubs (“fodder bushes”) such as *Blepharis pruinosa*, *Leucosphaera bainesii* and *Monechma genistifolia*. Larger woody species such as *Acacia erioloba* are confined to the drainage lines. The general area is characterised by *A. senegal* shrubs while *Cyphostemma currorii* and *C. bainesii* also occur in this region. The trees common in the area are *Commiphora glaucescens*, *C. virgata* and *C. dinteri* as well as *Boscia albitrunca* and *B. foetida*. The grass cover is sparse and consists of the climax grasses *Stipagrostis obtusa* and *S. uniplumis* (Giess 1971).

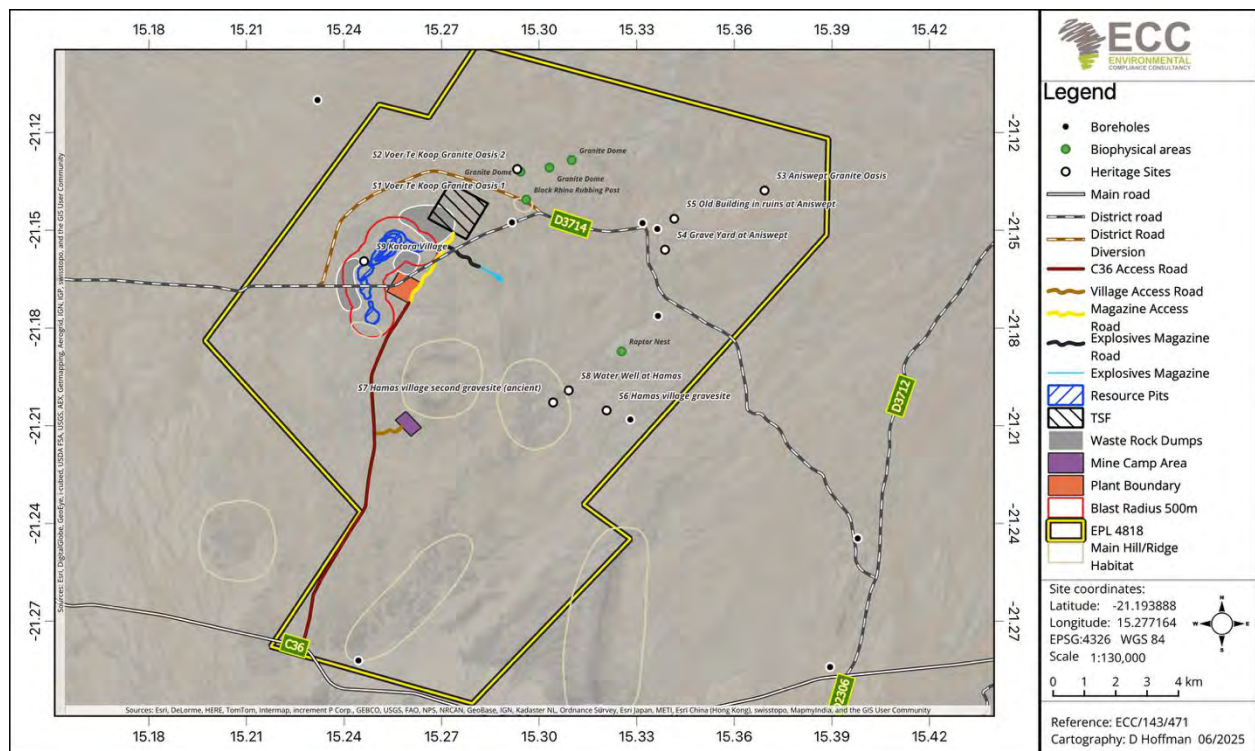


Figure 1. The EPL 4818 is located to the northwest of Okombahe in the Erongo Region. The exploration focus is in the general “resource pits” areas in the central/western parts of the EPL (©ECC).

The Namib Desert biome, located immediately to the west of the Semi-desert Savannah and Transition Zone [Escarpment area] vegetation type, is well protected with parks in this biome making up 69% of the network compared to only 7% of the Savannah biome being formally

protected and the Mountain Savannah area being wholly under protected (Barnard 1998). Sites of special ecological importance in the general area include the Brandberg, located 60-70km to the north/northwest (i.e., high endemism of plants, reptiles, and insects; major rock art sites and area threatened by tourism pressure) and the granite domes (in the Okombahe district, but also in the general Karibib and Omaruru districts) which are high in biotic richness and endemism (Curtis and Barnard 1998).

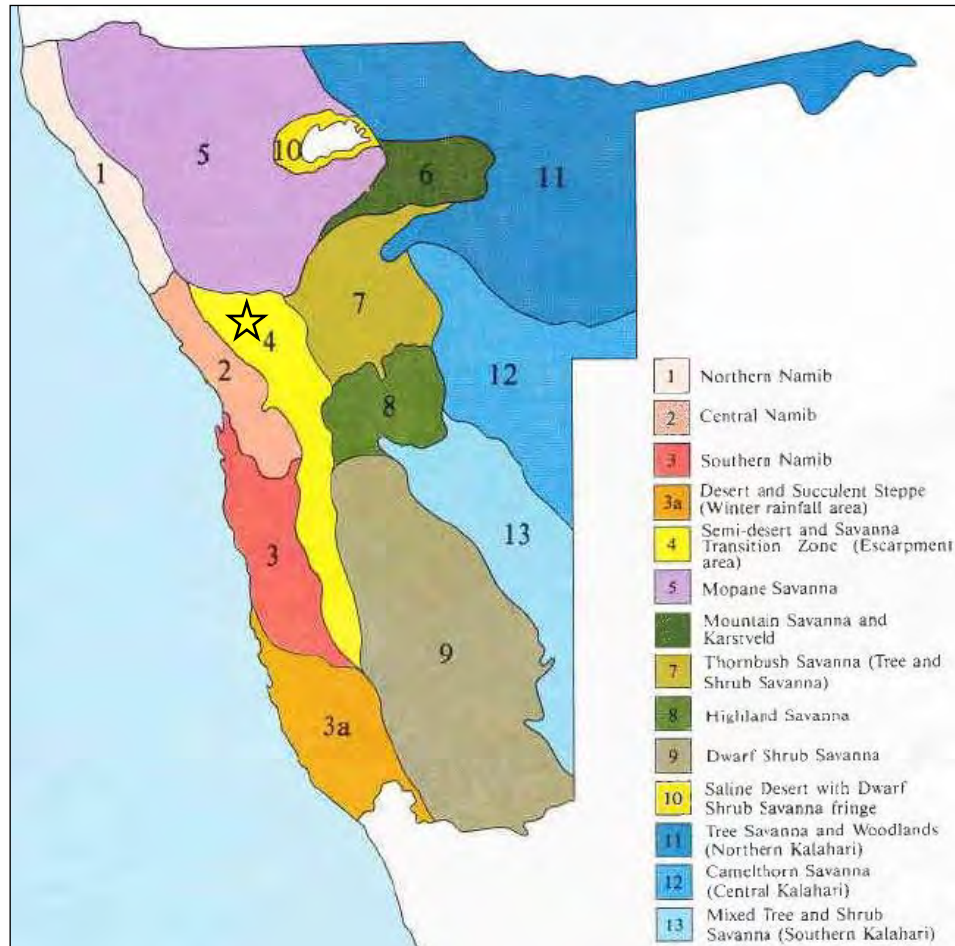


Figure 2. The Okombahe area falls within the Semi-desert Savannah and Transition Zone [Escarpment area] vegetation type (Giess 1971) (black star).

The general area is regarded as “moderate” in overall terrestrial species diversity and overall terrestrial endemism in the area is “high” (Mendelsohn *et al.* 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “moderate” with 3-4 species expected in the area, such as gemsbok, mountain zebra and springbok, while overall diversity and density of large carnivorous mammals (large predators) is viewed as “moderate” with 4 species expected, namely leopard, cheetah, spotted and brown hyena (Mendelsohn *et al.* 2002).

The general area is viewed as an area of importance for local endemic plant species, especially the Brandberg and Erongo Mountains with >35 (Brandberg) and between 26-35 endemic species (Erongo Mountains) (Mendelsohn *et al.* 2002). The overall plant diversity (all species) in the general area is estimated at between 150-299 species and the Brandberg and Erongo Mountain areas between 400-499 species (Mendelsohn *et al.* 2002, Jarvis *et al.* 2022). These estimates are limited to taxonomically “higher” plants as information regarding “lower” plants is sparse. The greatest variants affecting the diversity of plants are habitat and climate with the highest plant diversity generally associated with high rainfall areas. Pockets of high diversity are found throughout Namibia in “unique” habitat – often transition zones such as mountains, inselbergs, etc. Plant endemism, other than the Brandberg and Erongo Mountains, is viewed

as “medium to high” – with between 6-25 species expected from the general area (Mendelsohn *et al.* 2002). Furthermore, Mendelsohn *et al.* (2002) views the overall plant production as low in the general area and high in the Erongo Mountains. The availability of hardwoods is considered low and the grazing and browse species as low to average in the general area. Bush thickening (also known as encroachment) is viewed as problematic further to the east in the Karibib and Omaruru areas with *Acacia reficiens* (red-bark Acacia) the dominant problem species (Bester 1996, Cunningham 1998, Mendelsohn *et al.* 2002).

The carrying capacity (domestic livestock) for the general area is 0-20kg/ha (Mendelsohn *et al.* 2002) or 10-15 Large Animal Unit (LAU)/ha (van der Merwe 1983) and the risk of farming is viewed as high. Goat and sheep farming is the dominant farming activity in the general area with densities of 1-10 small stock/km² (Mendelsohn *et al.* 2002). There are numerous existing tourism ventures in the area with the tourism potential viewed as relatively high (Mendelsohn *et al.* 2002).

The area falls on the eastern boundary of the Tsiseb Communal Conservancy which covers an area of 7,913km² with the major wildlife resources viewed as elephant, black rhino, leopard, cheetah, mountain zebra, kudu, gemsbok, ostrich, springbok, steenbok, black-backed jackal, and klipspringer. However, most of these species are not expected to occur in/around the EPL 4818 area due to anthropogenic influences. The main source of income of the Tsiseb Communal Conservancy is tourism. The closest freehold (i.e., commercial) conservancy is Okawi, east of Karibib (MEFT/NACSO 2021, Mendelsohn *et al.* 2002, NACSO 2010, See: www.nacso.org.na).

2 Methods

2.1 Literature review

A comprehensive and intensive literature review (i.e., desktop study) regarding the reptiles, amphibians, mammals, birds, larger trees, and shrubs (>1m in height) and grasses that could potentially occur in the general Okombahe area (i.e., within the EPL 4818 area) was conducted using as many references as manageable.

A list of the references consulted can be viewed in the Reference section (Page 83).

2.2 Field Surveys

Field surveys were conducted during a “dry” season (June 2024) followed by a “wet” season (June 2025). A drought in the general Okombahe area resulted in the “dry” and “wet” seasons being conducted in consecutive years rather than during the same year.

Vehicle and walking transect of various lengths, times and directions, were conducted throughout the EPL 4818 area with the focus being on unique habitats (i.e., potential habitat for vertebrate fauna) and representative areas (i.e., for tree/shrub; grass and other species).

A map of the vehicle transects as well as the approximate walking transects is shown in Figure 3 below:

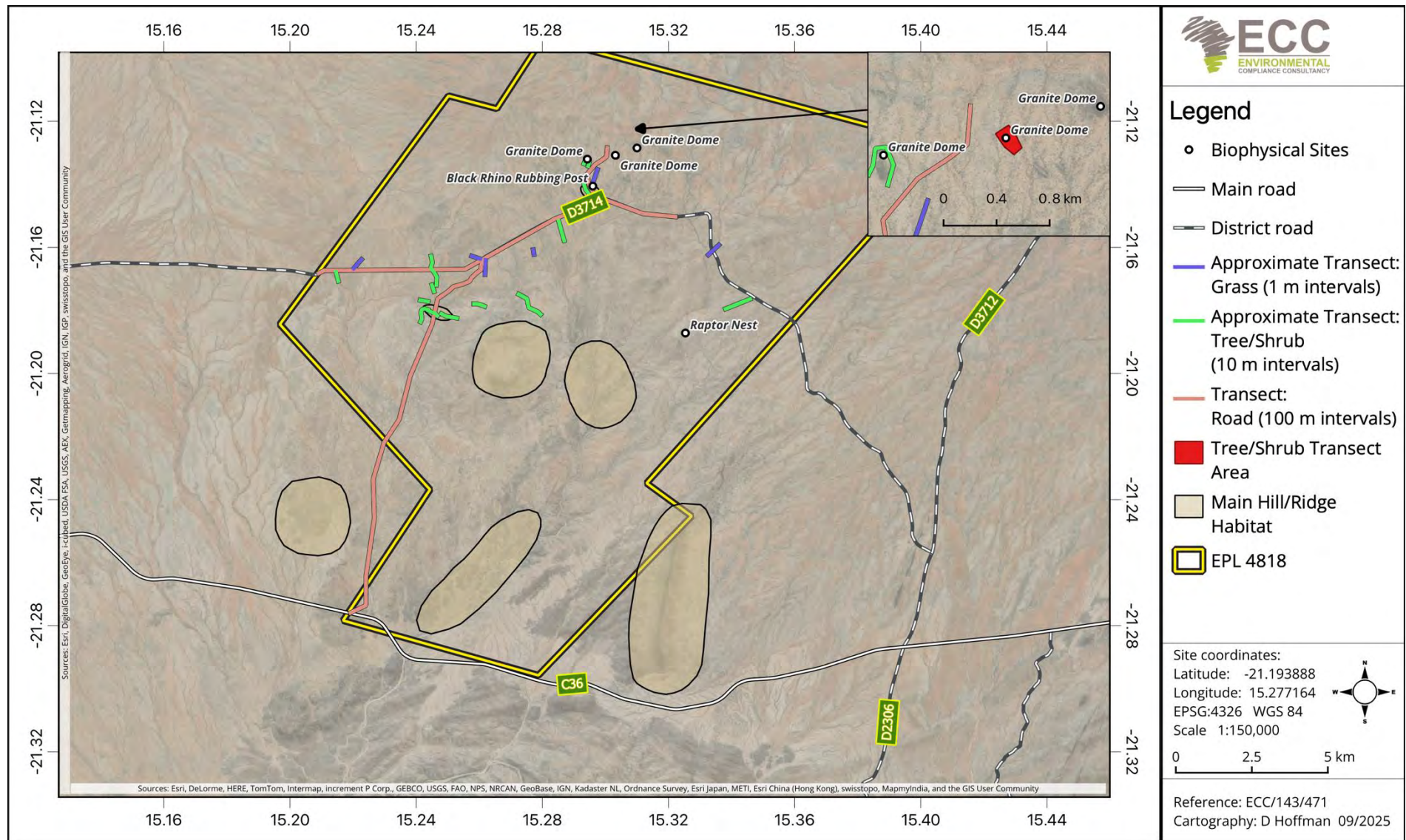


Figure 3. The vehicle and approximate walking transects conducted during the “dry season” and “wet season” field surveys.

The conservation status for the various species were included in the tables throughout the report to highlight the importance of these species locally, regionally and internationally.

Vertebrate fauna

To determine the actual faunal diversity within the EPL 4818 area, the following was conducted during the rapid field assessment:

- Small mammal trapping to determine small mammal diversity in the area;
- Large mammal diversity in the area;
- Reptile and amphibian diversity in the area; and
- Avian diversity in the area.

Reptiles

Diurnal reptile transects were conducted along various transects throughout the proposed development area and were not conducted in rigid straight lines but focused on the habitat viewed as most suitable for reptiles. Reptiles observed were either caught by hand or by using an active capture technique called 'reptile noosing' where an extendable fishing rod was fitted with a soft thread noose, positioned over the unsuspecting head of an individual and pulled tight. This technique does not result in the death or injury of the caught specimen. Species caught were identified *in situ*, photographed, and released unharmed at the point of capture.

Amphibians

Amphibians were searched for in areas deemed suitable habitat – e.g., in drainage lines, rock and pools – with species encountered identified *in situ*.

Mammals

Small mammal trapping was conducted by active trapping using collapsible aluminium Sherman traps baited with peanut butter and oats. Traps were set at 4 sites throughout the area with 20 traps placed 10m apart for 2 nights (i.e., potential maximum of 40 captures) in habitats viewed as potentially suitable for small mammals in the EPL 4818 area.

Assessing larger mammals from the area was conducted by traversing the area on foot and included actual sightings, tracks, scats, and other signs – e.g., burrows, scrapes and carcasses.

Birds

Bird transects (variable lengths, directions, and times) were conducted on foot and by vehicle following permissible tracks throughout the area (when in vehicle) during daylight hours using binoculars to identify and confirm species.

Flora

To determine the actual floral diversity within the EPL 4818 area, the following was conducted during the rapid field assessment:

- Transects to assess tree/shrub species composition;
- Transects to assess grass species composition; and
- All other species such as herbs, etc. were also identified.

Trees and shrubs

All the trees and shrubs encountered in the proposed development areas were identified whilst conducting the fieldwork in the area – i.e., identification was not limited to those occurring in transects only. Trees and shrubs species composition was quantified.

Grasses

All the grasses encountered in the proposed development areas were identified whilst conducting the fieldwork in the area – i.e., identification was not limited to transects only. Grass species composition was quantified.

Other species

Other species – bulbs, herbs, etc. – were also identified whenever encountered.

This report also includes data collected further to the west/southwest in the general Uis area for comparative purposes (See Cunningham 2021, 2023, 2024).

3 Results

It is estimated that at least 57 species of reptile, 8 amphibian, 87 mammal, 190 birds, 105 larger trees and shrubs and up to 80 grass species occur in the general/immediate area of which a high proportion are endemics (e.g., reptiles – 49.1%) (This study).

3.1 Reptile Diversity

Reptile diversity known and/or expected to occur in the general area, including species confirmed during the fieldwork conducted, is presented in Table 1.

Approximately 261 species of reptiles are known or expected to occur in Namibia thus supporting approximately 30% of the continent's species diversity (Griffin 1998a). At least 22% or 55 species of Namibian lizards are classified as endemic. The occurrence of reptiles of "conservation concern" includes about 67% of Namibian reptiles (Griffin 1998a). Emergency grazing and large-scale mineral extraction in critical habitats are some of the biggest problems facing reptiles in Namibia (Griffin 1998a). The overall reptile diversity and endemism in the general area is estimated at between 51-70 species and 25-28 species, respectively (Mendelsohn *et al.* 2002) or 41-60 species and 13-16 species, respectively (Jarvis *et al.* 2022). Griffin (1998a) presents figures of between 41-50 and 9-10 for endemic lizards and snakes, respectively, from the general area, while the closest protected area, the Skeleton Coast Park, has an estimated 77 species.

At least 57 species of reptiles are expected to occur in the general area with 28 species being endemic – i.e., 49.1% endemic. These consist of at least 22 snakes (2 thread snake, 2 python, 1 burrowing snake and 17 typical snakes), 11 of which are endemic (50%) to Namibia, 1 tortoise, 34 lizards (1 worm lizard, 8 skinks, 5 Old World lizards, 1 plated lizard, 1 monitor lizard, 3 agamas, 1 chameleon and 14 geckos), 17 (50%) of which are endemic to Namibia. Skinks (8 species) and geckos (14 species) are the most numerous lizards expected from the general area. Namibia, with approximately 129 species of lizards (Lacertilia), has one of the continent's richest lizard fauna (Griffin 1998a). Geckos have the highest occurrence of endemics in the general area with 13 of the 17 species (71.4%) expected and/or known to occur in the area, being endemic to Namibia.

Table 1. Reptile diversity expected (literature study) and confirmed during the fieldwork ($\sqrt{D}$ = Dry season [2024]; $\sqrt{W}$ = Wet season [2025]), including previous surveys conducted by Cunningham (2021, 2023, 2024) and a published record from Cunningham and van der Waal (2010) ($\sqrt{\#}$), from the general area.

Species: Scientific name	Species: Common name	Species recorded	Cunningham (2024)	Cunningham (2023)	Cunningham (2021)	Namibian conservation and legal status	International conservation status		
							SARDB	IUCN	CITES
TORTOISES AND TERRAPINS									
<i>Stigmochelys pardalis</i>	Leopard Tortoise					Vulnerable; Peripheral; Protected Game		LC	C2
SNAKES									
Thread Snakes									
<i>Namibiana (Leptotyphlops) occidentalis</i>	Western Thread Snake					Endemic; Secure	P	LC	
<i>Namibiana (Leptotyphlops) labialis</i>	Damara Thread Snake					Endemic; Secure		LC	
Pythons									
<i>Python anchietae</i>	Dwarf Python					Endemic; Insufficiently known; Protected Game		LC	C2
<i>Python natalensis</i>	Southern African Python					Vulnerable; Peripheral; Protected Game	V		C2
Burrowing Snakes									
<i>Xenocalamus bicolour bicolor</i>	Bicoloured Quill-snouted Snake					Secure			
Typical Snakes									
<i>Boaedon (Lamprophis) fuliginosus</i>	Brown House Snake								
<i>Lycophidion namibianum</i>	Namibian Wolf Snake					Endemic; Secure		LC	
<i>Pseudaspis cana</i>	Mole Snake					Secure			
<i>Pythonodipsas carinata</i>	Western Keeled Snake					Endemic; Secure		LC	
<i>Prosymna frontalis</i>	South-western Shovel-snout					Endemic; Secure	P	LC	
<i>Dipsina multimaculata</i>	Dwarf Beaked Snake					Endemic; Secure			

Vertebrate Fauna & Flora - Cunningham

<i>Psammophis trigrammus</i>	Western Sand Snake				Endemic; Secure	LC
<i>Psammophis notostictus</i>	Karoo Sand Snake				Secure	
<i>Psammophis leightoni namibensis</i>	Namib Sand Snake	? ^D			Secure	LC
<i>Psammophis brevirostris leopardinus</i>	Leopard Grass Snake				Endemic; Secure	
<i>Dasypeltis scabra</i>	Common/Rhombic Egg Eater				Secure	LC
<i>Aspidelaps lubricus infuscatus</i>	Coral Snake				Secure	
<i>Elapsoidea sunderwallii fitzsimonsi</i>	Sundevall's Garter Snake				Endemic; Secure	
<i>Naja annulifera anchietae</i>	Snouted Cobra				Secure	LC
<i>Naya nigricincta</i>	Black-necked Spitting Cobra		√#		Endemic; Secure	
<i>Bitis arietans</i>	Puff Adder				Secure	
<i>Bitis caudalis</i>	Horned Adder		√#	√	Secure	
WORM LIZARDS						
<i>Zygaspis quadrifrons</i>	Kalahari Round-headed Worm Lizard				Secure	
LIZARDS						
Skinks						
<i>Trachylepis acutilabris</i>	Wedge-snouted Skink	√ ^{D,W}	√	√	Secure	LC
<i>Trachylepis capensis</i>	Cape Skink				Secure	
<i>Trachylepis hoeschi</i>	Hoesch's Skink				Endemic; Secure	LC
<i>Trachylepis occidentalis</i>	Western Three-striped Skink				Secure	
<i>Trachylepis spilogaster</i>	Kalahari Tree Skink	√ ^W		√	Endemic; Secure	
<i>Trachylepis striata wahlbergi</i>	Striped Skink				Secure	
<i>Trachylepis sulcata</i>	Western Rock Skink	√ ^{D,W}		√	Secure	
<i>Trachylepis variegata variegata</i>	Variegated Skink	√ ^D			Secure	
Old World Lizards						
<i>Meroles suborbitalis</i>	Spotted Desert Lizard				Secure	LC
<i>Pedioplanis breviceps</i>	Short-headed Sand Lizard				Endemic; Secure	LC
<i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	√ ^{D,W}		√	Secure	
<i>Pedioplanis undata</i>	Western Sand Lizard	√ ^D	√	√	Endemic; Secure	LC
<i>Pedioplanis gaerdesi</i>	Kaokoveld Sand Lizard				Endemic; Secure	LC
Plated Lizards						
<i>Cordylus subessellatus</i>	Dwarf Plated Lizard	√ ^W			Endemic; Secure	LC

Monitors

<i>Varanus albigularis</i>	Rock or White-throated Monitor				Vulnerable; Peripheral; Protected Game	S to V	C2
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Agamas

<i>Agama achuleata</i>	Ground Agama	√ ^{D;W}	√	√	Secure		
<i>Agama anchietae</i>	Anchietae's Agama	√ ^D			Secure	LC	
<i>Agama planiceps</i>	Namibian Rock Agama	√ ^{D;W}	√		Endemic; Secure	LC	

Chameleons

<i>Chamaeleo namaquensis</i>	Namaqua Chameleon				Secure	LC	C2
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Geckos

<i>Afroedura africana africana</i>	African Flat Gecko				Endemic; Insufficiently known; Rare	LC	
<i>Chondrodactylus angulifer namibensis</i>	Giant Ground Gecko				Endemic; Secure	LC	
<i>Lygodactylus bradfieldi</i>	Bradfield's Dwarf Gecko			√	Endemic; Secure		
<i>Pachydactylus bicolour</i>	Velvety Thick-toed Gecko				Endemic; Secure		
<i>Pachydactylus fasciatus</i>	Banded Thick-toed Gecko				Endemic; Secure	LC	
<i>Pachydactylus kochii</i>	Koch's Thick-toed Gecko				Endemic; Secure	LC	
<i>Pachydactylus turneri</i>	Turner's Thick-toed Gecko	√ ^W	√		Secure		
<i>Pachydactylus mariquensis latirostris</i>	Marico Thick-toed Gecko				Endemic; Secure	LC	
<i>Pachydactylus oreophilus</i>	Kaokoveld Thick-toed Gecko				Endemic; Secure	LC	
<i>Pachydactylus punctatus</i>	Speckled Thick-toed Gecko				Secure		
<i>Pachydactylus rugosus</i>	Rough Thick-toed Gecko				Endemic; Secure	LC	
<i>Pachydactylus weberi</i>	Weber's Thick-toed Gecko				Secure	LC	
<i>Ptenopus garrulus maculatus</i>	Common Barking Gecko	√ ^D	√	√	Secure	LC	
<i>Rhoptropus boultoni</i>	Boulton's Namib Day Gecko	√ ^{D;W}	√	√	Endemic; Secure	LC	

Namibian conservation and legal status according to the Nature Conservation Ordinance No. 4 of 1975

Endemic – includes Southern African Status (Branch 1998)

South African Red Data Book (SARDB 2004): S to V – Safe to Vulnerable; V – Vulnerable; P – Peripheral

International Union for the Conservation of Nature Red List (IUCN 2025): LC – Least Concern [All other species not yet assessed]

Convention in the Trade of Endangered Species of Fauna and Flora (CITES): CITES Appendix 2 species

? – Could not be identified to species level

Source for literature review: Alexander and Marais (2007), Bonin *et al.* (2006), Branch (1998), Branch (2008), Boycott and Bourquin (2000), Broadley (1983), Buys and Buys (1983), Cunningham (2006), Cunningham (2021), Cunningham (2023), Cunningham (2024), Cunningham and van der Waal (2010), Griffin (2003), Hebbard (n.d.), IUCN (2025), Marais (1992), SARDB (2004), Schleicher (2022), Tolley and Burger (2007)

According to the Namibian legislation, 1 species is viewed as rare (*Afroedura africana africana*), 3 species as vulnerable (*Stigmochelys pardalis*, *Python natalensis*, *Varanus albigularis*), 4 species as protected game, 2 species insufficiently known and 3 species as peripheral. The IUCN (2025) classifies 31 species as least concern although not all the reptiles have yet been assessed by the IUCN Red List. The SARDB (2004) classifies 1 species as vulnerable, 1 species as safe to vulnerable and 2 species as peripheral while CITES lists 5 species under Appendix 2 and 1 species under Appendix 3.

The most important species expected to occur in the general area (See Table 1) are viewed as the tortoise *Stigmochelys pardalis*; pythons (*P. anchietae* and *P. natalensis*); Namibian wolf snake (*Lycophidion namibianum*), monitor lizard (*Varanus albigularis*) and some of the endemic and little-known gecko species – e.g., *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Another important species is the “rare” – i.e., *Afroedura africana africana* – although very little is known about this species.

Since reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be in the general area than presented in Table 1.

During the fieldwork, a total of 15 species were recorded (1 snake skin probably *Psammophis* spp. also found but could not be identified to species level) from the EPL 4818 area during “dry” (11 species) and “wet” (10 species) season surveys, respectively. These included 1 terrapin, 1 sand snake, 4 skinks, 1 dwarf plated lizard, 2 Old World lizards, 3 agamas and 3 geckos (Figures 4-13). The marsh/helmeted terrapin (*Pelomedusa subrufa*) was also recorded in a temporary pool albeit not expected and included in Table 1. A total of at least 18 species are confirmed from the general area if one includes Cunningham (2021, 2023, 2024) and Cunningham and van der Waal (2010) – See Table 1.



Figure 4. Snake skin, probably *Psammophis* spp., observed in rocky outcrop.



Figure 5. Wedge-snouted skink (*Trachylepis acutilabris*) was the most commonly seen reptile throughout the area.



Figure 6. Western rock skink (*Trachylepis sulcata*) always shy and difficult to photograph.



Figure 7. Ground agama (*Agama aculeata*) observed on rocky substrate.



Figure 8. Anchietae's agama (*Agama anchietae*) observed in rocky areas.



Figure 9. The endemic Namibian rocky agama (*Agama planiceps*) associated with rocky outcrops in the area.



Figure 10. Namaqua sand lizard (*Pedioplanis namaquensis*) common on sandy/gravel substrate.



Figure 11. Western sand lizard (*Pedioplanis undata*) common on gravel/rocky substrate.



Figure 12. Boulton's Namib day gecko (*Rhoptropus boultoni*) was frequently observed in rocky terrain, usually associated with dark geology.



Figure 13. Marsh/helmeted terrapin (*Pelomedusa subrufa*) – See arrow – were observed in granite pools.

Nocturnal fieldwork was not conducted due to cold ambient temperatures (at temperatures <16°C most reptiles are inactive) although 1 species – common barking gecko (*Ptenopus garrulus*) – was confirmed from clicking sounds emitted just after sunset.

The EPL 4818 area is marginally impacted due to subsistence farming infrastructures and associated anthropogenic influences; current exploration activities and informal mining/prospecting activities; tracks and gravel roads with none of the unique reptiles expected to be exclusively associated with this area.

3.2 Amphibian Diversity

Amphibian diversity known and/or expected to occur in the general area, including species confirmed during the fieldwork conducted, is presented in Table 2.

Globally amphibians are the most threatened class of vertebrate and are declining throughout the world due to various factors of which much has been ascribed to habitat destruction (Du Preez and Carruthers (2009). Basic species lists for various habitats are not always available, with Namibia being no exception in this regard, while the basic ecology of most species is also unknown. Approximately 4,000 species of amphibians are known worldwide with just over 200 species known from southern Africa and at least 57 species expected to occur in Namibia (Du Preez and Carruthers 2009). Griffin (1998b) puts this figure at 50 recorded species and a final species richness of approximately 65 species, 6 of which are endemic to Namibia. This “low” number of amphibians from Namibia is not only because of the generally marginal desert habitat, but also due to Namibia being under studied and under collected. Most amphibians require water to breed and are therefore associated with the permanent water bodies, mainly in northeast Namibia.

According to Mendelsohn *et al.* (2002) and Jarvis *et al.* (2022) the overall frog diversity in the general area is estimated at between 4-7 or 5-8 species, respectively. Two endemic species are expected to occur in the general area (Jarvis *et al.* 2022). Griffin (1998b) puts the species richness in the general area at 5-8 species, while Channing and Griffin (1993) expect at least

5 species from the general area. The closest protected area, the Skeleton Coast Park, has an estimated 10 species (Griffin 1998b).

At least 8 species of amphibians are expected to occur in suitable habitat in the general area. The area is under represented, with 2 pygmy toads, 2 sand frogs, 1 species each for toad, rubber, puddle, and platanna known and/or expected (i.e., potentially could be found in the area) to occur in the area. Of these, 4 species are endemic (*Poyntonophrynus damaranus*, *Poyntonophrynus hoeschi*, *Phrynomantis annectens* and *Tomopterna damarensis*) (Griffin 1998b) of which 2 species are classified as “data deficient” (*Poyntonophrynus damaranus*, *Tomopterna ahli* (*damarensis*)) by the IUCN (2025). The general areas are therefore considered as having a high level (50%) of amphibians of conservation value (including endemism).

Important species include the 4 endemics (*Poyntonophrynus damaranus*, *Poyntonophrynus hoeschi*, *Phrynomantis annectens* and *Tomopterna damarensis*) and especially the 2 species also classified as data deficient (*Poyntonophrynus damaranus*, *Tomopterna ahli* (*damarensis*)) by the IUCN (2025).

During the fieldwork only one amphibian species (*Xenopus laevis*) was recorded from the EPL 4818 area during the “wet” season fieldwork while none were recorded during the “dry” season as the area had experienced a prolonged drought with very little open surface water encountered – See Table 2. However, the ephemeral drainage lines and rock depressions throughout the area, may serve as potential albeit temporary amphibian habitat (Figures 14-17). No amphibians were recorded by Cunningham (2021, 2023, 2024) from the general area either.

Table 2. Amphibian diversity expected (literature study) and confirmed during the fieldwork ($\sqrt{D}$ = Dry season [2024]; $\sqrt{W}$ = Wet season [2025]), including previous surveys conducted by Cunningham (2021, 2023, 2024) from the general area.

Species: Scientific name	Species: Common name	Species recorded	Cunningham (2024)	Cunningham (2023)	Cunningham (2021)	Namibian conservation and legal status	International status: IUCN
Toads							
<i>Sclerophrys (Amietophrynus) poweri</i>	Western Olive Toad						LC
Pygmy Toads							
<i>Poyntonophrynus damaranus</i>	Damaraland Pygmy Toad					Endemic	DD
<i>Poyntonophrynus hoeschi</i>	Hoesch's Pygmy Toad					Endemic	LC
Rubber Frog							
<i>Phrynomantis annectens</i>	Marbled Rubber Frog					Endemic	LC
Puddle Frog							
<i>Phrynobatrachus mababiensis</i>	Dwarf Puddle Frog						LC
Sand Frogs							
<i>Tomopterna ahli (damarensis)</i>	Damaraland Sand Frog					Endemic	DD
<i>Tomopterna tandyi</i>	Tandy's Sand Frog						LC
Platannas							
<i>Xenopus laevis</i>	Common Platanna	$\sqrt{W}$					LC

Endemic – (Griffin 1998b)

International Union for the Conservation of Nature Red List (IUCN 2025): DD – Data Deficient; LC – Least Concern

Source for literature review: Carruthers (2001), Channing (2001), Channing and Griffin (1993), Cunningham (2021), Cunningham (2023), Cunningham (2024), Du Preez and Carruthers (2009), IUCN (2025), Passmore and Carruthers (1995), SARDB (2004)



Figure 14. Granite rock pools could potentially serve as seasonal amphibian habitat.



Figure 15. Subsistence farmers crated artificial rock pools in some areas which may serve as habitat to amphibians after localised rain showers.



Figure 16. Some granite dome areas have large depressions that could hold water and thus act as amphibian habitat.



Figure 17. The same granite dome depression with water as indicated in Figure 15 during the "wet" season survey.

The EPL 4818 area is marginally impacted due to subsistence farming infrastructures and associated anthropogenic influences; current exploration activities and informal mining/prospecting activities; tracks and gravel roads with none of the unique amphibians expected to be exclusively associated with this area.

However, the potential presence of the 2 species classified as data deficient (*Poyntonophrynus damaranus*, *Tomopterna damarensis*) by the IUCN (2025), is viewed as important and

potential habitats should be identified and avoided to protect these little-known species (IUCN 2024).

3.3 Mammal Diversity

Mammal diversity known and/or expected to occur in the general area, including species confirmed during the fieldwork conducted, is presented in Table 3.

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country (Griffin and Coetzee 2005). These include the well-known large mammals as well as a legion of smaller and lesser-known species. Currently, 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores about which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (Dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*.

The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “moderate” with 3-4 species expected – including gemsbok, mountain zebra and springbok – while overall diversity and density of large carnivorous mammals (large predators) is viewed as “moderate” with 4 species expected – i.e., leopard, cheetah, spotted and brown hyena (Mendelsohn *et al.* 2002). The overall mammal diversity in the general area is estimated at between 61-75 species with 7-8 species being endemic to the area (Mendelsohn *et al.* 2002, Jarvis *et al.* 2022). Between 18-20 carnivore species are expected from the general area (Jarvis *et al.* 2022). Griffin (1998c) puts the species richness distribution of endemic mammals between 7-8 species in the general area, while the closest protected areas, the Skeleton Coast Park, at 87 species.

According to the literature reviewed, at least 87 species of mammals are known and/or expected to occur in the general area of which 10 species (11.5%) are classified as endemic. The Namibian legislation classifies 2 species as “rare”, 5 species as “vulnerable”, 3 species as “specially protected game”, 9 species as “protected game”, 5 species as “insufficiently known”, 4 species as “huntable game” and 4 species as “problem animals”. Five species of bat are not listed – i.e., according to Monadjem *et al.* (2010) these bats potentially could occur in the general area according to a habitat modelling programme although not yet confirmed.

At least 31% (27 species) of the mammalian fauna that occur or are expected to occur in the general area are represented by rodents of which 5 species (18.5%) are endemic. This is followed by bats 27.6% (24 species) of which 1 species is classified as “rare”. Twenty-nine species (33.3%) have IUCN, CITES and SARDB international conservation status (some species have more than one conservation status). The IUCN (2025) classifies 4 species each as vulnerable (cheetah, leopard, Hartmann’s mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson’s roundleaf bat, striped leaf-nosed bat, brown hyena). However, the Angolan giraffe (*G. camelopardalis* ssp. *angolensis*) is listed as least concern with population increasing (IUCN 2024). The SARDB (2004) classifies 1 species as rare, 1 species as endangered, 2 species as vulnerable, 12 species as near threatened and 6 species as data deficient while CITES lists 2 species as Appendix 1 and 5 species as Appendix 2. According to the Red List of the terrestrial carnivores of Namibia, 1 species is classified as endangered (cheetah), 2 species as vulnerable (spotted hyaena, leopard) and 1 species as near threatened (brown hyaena) (NCE, LCMAN, MEFT 2022). The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of “plague” and can cause economic losses.

Although elephant and black rhino are included in the species known/expected to occur in the Tsiseb Communal Conservancy (NACSO 2010), they are not expected to occur in the general

Table 3. Mammal diversity expected (literature study) and confirmed during the fieldwork ($\sqrt{D}$ = Dry season [2024]; $\sqrt{W}$ = Wet season [2025]), including previous surveys conducted by Cunningham (2021, 2023, 2024) from the general area.

Species: Scientific name	Species: Common name	Species recorded	Cunningham (2024)	Cunningham (2023)	Cunningham (2021)	Red List – Namibia (carnivores)	Namibian conservation and legal status	International status		
								SARDB	IUCN	CITES
Elephant Shrews										
<i>Macroscelides proboscideus</i>	Round-eared Elephant-shrew				√		Endemic; Secure			
<i>Elephantulus rupestris</i>	Western Rock Elephant-shrew		√	√	√		Secure			
<i>Elephantulus intufi</i>	Bushveld Elephant-shrew	√ ^{D;W}					Secure	DD		
Aardvark										
<i>Orycteropus afer</i>	Aardvark	√ ^{D;W}	√		√		Secure; Protected Game			
Shrews										
<i>Crocidura fuscomurina</i>	Tiny Musk Shrew						Secure	DD		
<i>Crocidura cyanea</i>	Reddish-grey Musk Shrew						Secure	DD		
Hyrax										
<i>Procavia capensis</i>	Rock Hyrax	√ ^{D;W}	√	√	√		Secure; Problem animal			
Bats										
<i>Eidolon helvum</i>	African Straw-coloured Fruit Bat						Secure (Migrant)	NT	NT	
<i>Mops midas</i>	Midas Free-tailed Bat						Secure			
<i>Miniopterus natalensis</i>	Natal Long-fingered Bat						Secure	NT		
<i>Mimetillus thomasi</i>	Thomas's Flat-headed Bat						Not listed			
<i>Sauromys petrophilus</i>	Flat-headed Free-tailed Bat						Secure			
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat						Secure			

Vertebrate Fauna & Flora - Cunningham

<i>Neoromicia capensis</i>	Cape Serotine Bat				Secure		
<i>Neoromicia zuluensis</i>	Zulu Serotine Bat				Secure		
<i>Nycticeinops schlieffeni</i>	Schlieffen's Twilight Bat				Secure		
<i>Pipistrellus rueppellii</i>	Rüppell's Pipistrelle				Insufficiently known; Peripheral		
<i>Pipistrellus rusticus</i>	Rusty Pipistrelle				Not listed		
<i>Cistugo seabrai</i>	Namibian Wing-gland Bat				Endemic; Rare	V	
<i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat				Secure		
<i>Scotophilus dinganii</i>	African Yellow Bat				Secure		
<i>Nycteris thebaica</i>	Egyptian Slit-faced Bat				Secure		
<i>Rhinolophus fumigatus</i>	Rüppell's Horseshoe Bat				Secure	NT	
<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat				Secure	NT	
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat				Secure	NT	
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat				Secure	NT	
<i>Rhinolophus hildebrandtii</i>	Hildebrandt's Horseshoe Bat				Not listed		
<i>Macronycteris (Hipposideros) commersoni</i>	Commerson's Roundleaf Bat				Secure		NT
<i>Hipposideros caffer</i>	Sundevall's Roundleaf Bat				Secure	DD	
<i>Macronycteris (Hipposideros) gigas*</i>	Giant Leaf-nosed Bat				Not listed		
<i>Macronycteris (Hipposideros) vittatus</i>	Striped Leaf-nosed Bat				Not listed		NT
Hares and Rabbits							
<i>Lepus capensis</i>	Cape Hare	√	√	√	Secure		
<i>Lepus saxatilis</i>	Scrub Hare				Secure		
<i>Pronolagus randensis</i>	Jameson's Red Rock Rabbit				Secure		
Rodents							
Porcupine							
<i>Hystrix africaeaustralis</i>	Cape Porcupine	√ ^D	√	√	Secure		
Rats and Mice							
<i>Petromys typicus</i>	Dassie Rat	√ ^{D;W}	√	√	Endemic; Secure	NT	
<i>Pedetes capensis</i>	Springhare				Secure		
<i>Xerus inaurus</i>	South African Ground Squirrel				Secure		

Vertebrate Fauna & Flora - Cunningham

<i>Xerus princeps</i>	Damara Ground Squirrel	√ ^D		√	Endemic	NT	
<i>Graphiurus rupicola/platyops</i>	Western Rock Dormouse				Endemic; Secure	DD	
<i>Graphiurus murinus</i>	Woodland Dormouse				Secure		
<i>Rhabdomys pumilio</i>	Four-striped Grass Mouse				Secure		
<i>Mus indutus</i>	Desert Pygmy Mouse				Secure		
<i>Mastomys natalensis</i>	Natal Multimammate Mouse				Secure		
<i>Mastomys coucha</i>	Southern Multimammate Mouse				Secure		
<i>Thallomys paedulcus</i>	Acacia Rat				Secure		
<i>Thallomys nigricauda</i>	Black-tailed Tree Rat				Secure		
<i>Aethomys chrysophilus</i>	Red Veld Rat				Secure		
<i>Micaelamys namaquensis</i>	Namaqua Rock Mouse			√	Secure		
<i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil				Secure		
<i>Gerbillurus paeba</i>	Hairy-footed Gerbil				Secure		
<i>Gerbillurus setzeri</i>	Setzer's Hairy-footed Gerbil			√	Endemic		
<i>Tatera leucogaster</i>	Bushveld Gerbil	√		√	Secure	DD	
<i>Saccostomus campestris</i>	Pouched Mouse				Secure		
<i>Malacothrix typica</i>	Gerbil Mouse				Secure		
<i>Petromyscus collinus</i>	Pygmy Rock Mouse	√	√	√	Endemic; Secure		
<i>Mus musculus</i>	House Mouse				Invasive alien		
Primates							
<i>Galago moholi</i>	South African Galago				Vulnerable; Protected Game		C2
<i>Papio ursinus</i>	Chacma Baboon				Secure; Problem animal		C2
Hedgehog							
<i>Atelerix frontalis angolae</i>	Southern African Hedgehog				Insufficiently Known; Rare; Protected Game	NT; R	
Carnivores							
<i>Proteles cristatus</i>	Aardwolf				Insufficiently known; (Vulnerable?) Peripheral		

Vertebrate Fauna & Flora - Cunningham

<i>Parahyaena (Hyaena) brunnea</i>	Brown Hyena					NT	Insufficiently known; (Vulnerable?) Peripheral	NT	NT	
<i>Crocuta crocuta</i>	Spotted Hyena					V	Secure?; Peripheral	NT		
<i>Acinonyx jubatus</i>	Cheetah					E	Vulnerable; Protected Game	V	V	C1
<i>Panthera pardus</i>	Leopard	√ ^{D;W}				V	Secure?; Peripheral; Protected Game		V	C1
<i>Caracal caracal</i>	Caracal						Secure; Problem Animal			C2
<i>Felis silvestris</i>	African Wild Cat						Vulnerable			C2
<i>Genetta genetta</i>	Small Spotted Genet						Secure			
<i>Suricata suricatta marjoriae</i>	Suricate						Endemic; Secure			
<i>Cynictis penicillata</i>	Yellow Mongoose		√	√			Secure			
<i>Galerella sanguinea</i>	Slender Mongoose						Secure			
<i>Galerella flavescens (nigrata)</i>	Kaokoland/Black Slender Mongoose						Endemic; Secure			
<i>Otocyon megalotis</i>	Bat-eared Fox						Vulnerable?; Peripheral			
<i>Vulpes chama</i>	Cape Fox						Vulnerable?			
<i>Canis mesomelas</i>	Black-backed Jackal	√ ^{D;W}	√	√	√		Secure; Problem animal			
<i>Mellivora capensis</i>	Honey Badger/Ratel						Secure; Protected Game	NT		
<i>Ictonyx striatus</i>	Striped Polecat						Secure			
Equidae										
<i>Equus zebra hartmannae</i>	Hartmann's Mountain Zebra						Endemic; Secure; Specially Protected Game	E	V	C2
Suidae										
<i>Phacochoerus africanus</i>	Common Warthog						Secure; Huntable Game			
Antelopes										

Vertebrate Fauna & Flora - Cunningham

<i>Giraffa camelopardalis</i>	Giraffe	√	√			Vulnerable; Peripheral; Specially Protected Game	V
<i>Tragelaphus strepsiceros</i>	Greater Kudu	√ ^D	√			Secure; Huntable Game	
<i>Oryx gazella</i>	Gemsbok					Secure; Huntable game	
<i>Sylvicapra grimmia</i>	Common Duiker					Secure	
<i>Antidorcas marsupialis</i>	Springbok	√ ^D	√	√	√	Secure; Huntable game	
<i>Madoqua damarensis</i>	Damara Dik-dik					Insufficiently Known; Protected Game	
<i>Raphicerus campestris</i>	Steenbok	√ ^{D;W}	√	√	√	Secure; Protected Game	
<i>Oreotragus oreotragus</i>	Klipspringer					Secure; Specially Protected Game	

South African Red Data Book (SARDB 2004): R – Rare, E – Endangered, V – Vulnerable, NT – Near Threatened, DD – Data Deficient

International Union for the Conservation of Nature Red List (IUCN 2025): V – Vulnerable, NT – Near Threatened. All other species not listed are viewed as “Least Concern” by IUCN (2023)

Convention in the Trade of Endangered Species of Fauna and Flora (CITES): CITES Appendix 1 or 2 species

*Monadjem *et al.* (2010)

Red List – Namibia (carnivores): E – Endangered, V – Vulnerable, NT – Near Threatened. All other species are classified as LC – Least Concern (NCE, LCMAN, MEFT 2022)

Source for literature review: Cunningham (2021), Cunningham (2023), Cunningham (2024), De Graaff (1981), , Estes (1995), Frost (2014), IUCN (2025), Joubert and Mostert (1975), Monadjem *et al.* (2010), NCE, LCMAN, MEFT (2022), SARDB (2004), Skinner and Smithers (1990), Skinner and Chimimba (2005), Stander and Hanssen (2003) and Taylor (2000)

EPL 4818 area although may occasionally pass through and are consequently not included in Table 3.

Species of greatest concern in the general area are those viewed as rare in Namibia – i.e., Namibian wing-gland bat and Southern African hedgehog – and species classified as vulnerable (cheetah, leopard, Hartmann’s mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson’s roundleaf bat, striped leaf-nosed bat, brown hyena) by the IUCN (2025) or endangered (cheetah), vulnerable (spotted hyaena, leopard) and near threatened (brown hyaena) by the Red List of the terrestrial carnivores of Namibia (NCE, LCMAN, MEFT 2022). Another important and unique species, although not observed, but known to occur in the general area, is the endemic Kaokoland slender or black mongoose (See: Cowley and Cunningham 2004, Warren *et al.* 2009).

During the fieldwork a total of 11 mammal species (11 Versus 7) were confirmed from the EPL 4818 area during “dry” (11 species) and “wet” (7 species) season surveys, respectively. These included bushveld elephant-shrew, aardvark, rock hyrax, porcupine, 2 rats and mice, 2 carnivores and 3 ungulates (Figures 18-23) – See Table 3. A total of at least 20 species are confirmed from the general area if one includes Cunningham (2021, 2023, 2024) – See Table 3.

A total of 40 Sherman small mammal traps (Figure 18) were set for 2 nights at 4 sites during the “dry” season throughout the area (Table 4). This resulted in 7 captures of 1 species – *Elephantulus intufi* – i.e., 17.5% capture success (Table 4) (Figure 18). During the “wet” season a total of 48 Sherman small mammal traps were set for 2 nights at 3 sites resulting in 2 captures of 1 species – *Elephantulus intufi* – i.e., 4.2% capture success (Table 4). This overall paucity in small mammal diversity can be ascribed to the prolonged drought conditions experienced throughout the general area. Rodents are commonly described as boom or bust species showing rapid population increases during favourable conditions and catastrophic declines during dry periods. However, the population dynamics of elephant shrews differ to that typically followed by rodents (Pers. obs.). The lower capture success of *E. intufi* during the “wet” season is probably due to an increase in food availability after the rains.

Table 4. Small mammals trap sites in the EPL 4818 area during “dry” and “wet” seasons.

Number	Traps	Area	Habitat	Coordinates	Captures	Species	Season
1	10	EPL 4818	Rocky ridge/hill	S23°10'39.8"; E15°14'39.3"	0		Dry
2	10	EPL 4818	Gravel plain & Drainage line	S23°10'02.5"; E15°13'27.3"	2	<i>Elephantulus intufi</i>	Dry
3	10	EPL 4818	Granite ridge	S23°08'42.4"; E15°17'14.3"	4	<i>Elephantulus intufi</i>	Dry
4	10	EPL 4818	Granite dome	S23°08'00.8"; E15°17'38.0"	1	<i>Elephantulus intufi</i>	Dry
1	20	EPL 4818	Sandy/Gravel plain	S21°09'28.7"; E15°16'17.8"	0		Wet
2	8	EPL 4818	Sandy/Gravel plain	S21°10'02.8"; E15°14'40.9"	1	<i>Elephantulus intufi</i>	Wet
3	20	EPL 4818	Drainage line	S21°09'37.4"; E15°20'04.7"	1	<i>Elephantulus intufi</i>	Wet



Figure 18. Sherman collapsible small mammal traps were baited with peanut butter and oats mixture and used to trap rodents.



Figure 19. Bushveld elephant-shrew (*Elephantulus intufi*) was the only small mammal captured on site.



Figure 20. Aardvark (*Orycteropus afer*) burrow.

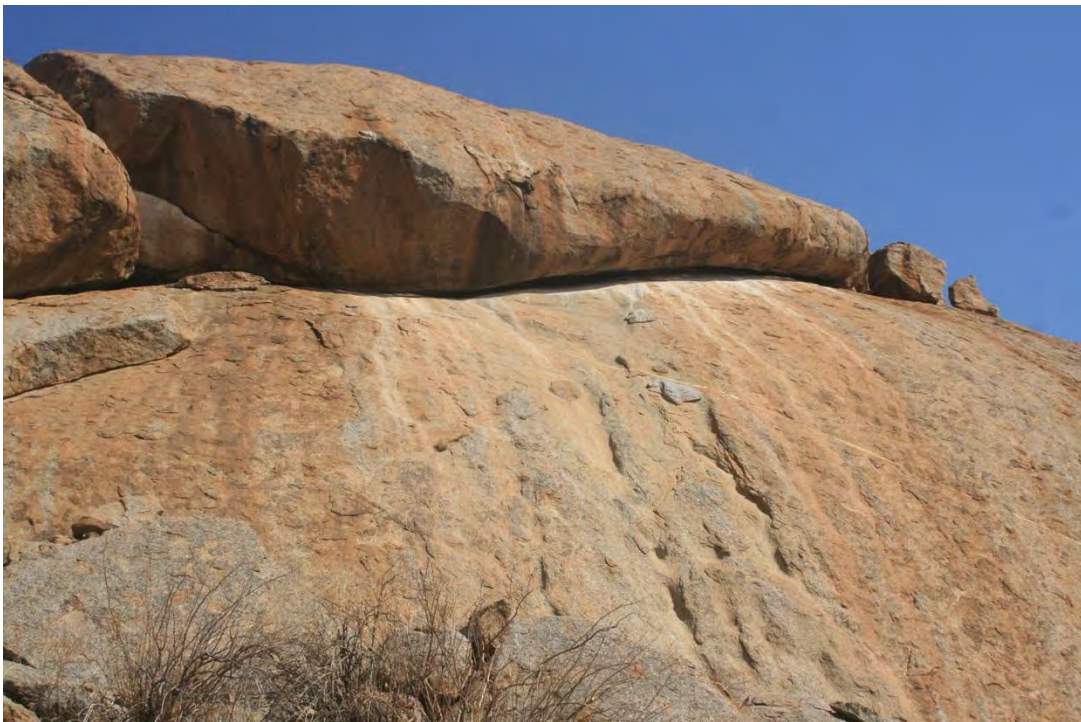


Figure 21. Typical rock hyrax (*Procavia capensis*) latrine stains observed in granite dome areas.



Figure 22. The endemic dassie rat (*Petromys typicus*) associated with rocky outcrops.



Figure 23. Leopard (*Panthera pardus*) – vulnerable (IUCN 2025) – latrine located in granite dome area.

A black rhino (*Diceros bicornis*) rubbing post was located at S21°08'28.0" & E 15°17'21.7" (Figure 24) indicating their past presence in the area.



Figure 24. A historic black rhino (*Diceros bicornis*) rubbing post.

The EPL 4818 area is marginally impacted due to subsistence farming infrastructures and associated anthropogenic influences; current exploration activities and informal mining/prospecting activities; tracks and gravel roads with none of the unique mammals expected to be exclusively associated with this area.

However, the black rhino rubbing post and leopard latrine (See Figures 23-24) are viewed as important sites and should be avoided.

3.4 Avian Diversity

Bird diversity known and/or expected to occur in the general area, including species confirmed during the fieldwork conducted, is presented in Table 5.

Although Namibia's avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse and unique group of arid endemics (Brown *et al.* 1998, Maclean 1985). Fourteen species of birds are endemic or near endemic to Namibia with most Namibian endemics occurring in the savannas (30%) of which ten species occur in a north-south belt of dry savannah in central Namibia (Brown *et al.* 1998).

Bird diversity is viewed as "average" in the general area with 111-140 species, of which 6-10 species being endemic ("high" endemism) (Mendelsohn *et al.* 2002, Jarvis *et al.* 2022). Simmons (1998a) suggests 4-9 endemic species and an "average" ranking for southern African endemics and "low" ranking for red data birds expected from the general area. Although the general area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) the closest such site is located at the Brandberg.

According to the literature reviewed, at least 190 bird species (mainly terrestrial "breeding residents") occur and/or could occur in the general area at any time (Hockey *et al.* 2006, Maclean 1985, Tarboton 2001). Thirteen of the 14 Namibian endemics are expected to occur in the general area (92.9% of all Namibian endemic species or 6.8% of all the species expected to occur in the area). Seven species are classified as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, tawny eagle, booted eagle, martial eagle, black stork),

Table 5. Avian diversity expected (literature study) and confirmed during the fieldwork ($\sqrt{D}$ = Dry season [2024]; $\sqrt{W}$ = Wet season [2025]), including previous surveys conducted by Cunningham (2021, 2023, 2024) from the general area.

Species: Scientific name	Species: Common name	Species recorded	Cunningham (2024)	Cunningham (2023)	Cunningham (2021)	Namibian conservation and legal status	International status	
							Southern African status	IUCN
<i>Struthio camelus</i>	Common Ostrich	$\sqrt{D}$		$\sqrt{}$				
<i>Scleroptila levaillantoides</i>	Orange River Francolin						Near endemic	
<i>Pternistis hartlaubi</i>	Hartlaub's Spurfowl					Endemic	Near endemic	
<i>Pternistis adspersus</i>	Red-billed Spurfowl	$\sqrt{W}$					Near endemic	
<i>Coturnix coturnix</i>	Common Quail	$\sqrt{W}$						
<i>Coturnix delegorguei</i>	Harlequin Quail							
<i>Numida meleagris</i>	Helmeted Guinea fowl							
<i>Turnix sylvaticus</i>	Kurrichane Buttonquail							
<i>Indicator minor</i>	Lesser Honeyguide							
<i>Campethera abingoni</i>	Golden-tailed Woodpecker							
<i>Dendropicos fuscescens</i>	Cardinal Woodpecker							
<i>Dendropicos namaquus</i>	Bearded Woodpecker							
<i>Tricholaema leucomelas</i>	Acacia Pied Barbet	$\sqrt{W}$		$\sqrt{}$			Near endemic	
<i>Tockus monteiri</i>	Monteiro's Hornbill	$\sqrt{D}$				Endemic		
<i>Tockus damarensis</i>	Damara Hornbill	$\sqrt{D}$				Endemic	Near endemic	
<i>Tockus leucomelas</i>	Southern yellow-billed Hornbill	$\sqrt{D;W}$			$\sqrt{}$		Near endemic	
<i>Tockus nasutus</i>	African Grey Hornbill							
<i>Upupa africana</i>	African Hoopoe							
<i>Phoeniculus purpureus</i>	Green Wood-Hoopoe							
<i>Phoeniculus damarensis</i>	Violet Wood-Hoopoe					E; Endemic		
<i>Rhinopomastus cyanomelas</i>	Common Scimitarbill	$\sqrt{W}$			$\sqrt{}$			
<i>Coracias naevius</i>	Purple Roller				$\sqrt{}$			
<i>Merops hirundineus</i>	Swallow-tailed Bee-eater				$\sqrt{}$			
<i>Merops apiaster</i>	European Bee-eater							

<i>Colius colius</i>	White-backed Mousebird	√ ^D	√	√		Endemic	
<i>Urocolius indicus</i>	Red-faced Mousebird			√			
<i>Clamator levaillantii</i>	Levaillant's Cuckoo						
<i>Cuculus gularis</i>	African Cuckoo						
<i>Chrysococcyx klaas</i>	Klaas's Cuckoo						
<i>Chrysococcyz caprius</i>	Diderick Cuckoo						
<i>Poicephalus rueppellii</i>	Rüppell's Parrot				NT; Endemic	Near endemic	
<i>Agapornis roseicollis</i>	Rosy-faced Lovebird				Endemic	Near endemic	
<i>Tachymarptis melba</i>	Alpine Swift	√ ^D					
<i>Apus bradfieldi</i>	Bradfield's Swift					Near endemic	
<i>Apus affinis</i>	Little Swift						
<i>Apus caffer</i>	White-rumped Swift						
<i>Corythaixoides concolor</i>	Grey Go-away Bird	√ ^W		√			
<i>Tyto alba</i>	Barn Owl			√			
<i>Otus senegalensis</i>	African Scops Owl						
<i>Ptilopsis granti</i>	Southern White-faced Scops Owl						
<i>Bubo capensis</i>	Cape Eagle Owl				NT		
<i>Bubo africanus</i>	Spotted Eagle Owl	√ ^D		√			
<i>Bubo lacteus</i>	Verreaux's Eagle-Owl						
<i>Glaucidium perlatum</i>	Pearl-spotted Owlet						
<i>Asio capensis</i>	Marsh Owl						
<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar						
<i>Columba livia</i>	Rock Dove						
<i>Columba guinea</i>	Speckled Pigeon						
<i>Streptopelia capicola</i>	Cape Turtle Dove	√ ^{D;W}	√				
<i>Streptopelia senegalensis</i>	Laughing Dove		√	√			
<i>Oena capensis</i>	Namaqua Dove	√ ^W					
<i>Neotis ludwigii</i>	Ludwig's Bustard						
<i>Ardeotis kori</i>	Kori Bustard				E	Near endemic	E
<i>Lophotis ruficrista</i>	Red-crested Korhaan	√ ^W			NT		NT
<i>Afrotis afraoides</i>	Northern Black Korhaan	√ ^{D;W}		√		Near endemic	
<i>Eupodotis rueppellii</i>	Rüppell's Korhaan	√ ^W	√	√		Endemic	
<i>Pterocles namaqua</i>	Namaqua Sandgrouse	√ ^W		√		Near endemic	
<i>Pterocles bicinctus</i>	Double-banded Sandgrouse	√ ^W		√		Near endemic	
<i>Burhinus capensis</i>	Spotted Thick-knee						
<i>Charadrius tricollaris</i>	Three-banded Plover						

<i>Vanellus armatus</i>	Blacksmith Lapwing				√		
<i>Vanellus coronatus</i>	Crowned Lapwing	√ ^{D;W}	√	√	√		
<i>Rhinoptilus africanus</i>	Double-banded Courser						
<i>Cursorius rufus</i>	Burchell's Courser						Near endemic
<i>Cursorius temminckii</i>	Temminck's Courser						
<i>Elanus caeruleus</i>	Black-shouldered Kite						
<i>Milvus migrans</i>	Black Kite						
<i>Gyps africanus</i>	White-backed Vulture					E	CE
<i>Aegypius tracheliotos</i>	Lappet-faced Vulture			√		V	E
<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle	√ ^D			√		
<i>Circaetus cinereus</i>	Brown Snake-Eagle						
<i>Melierax canorus</i>	Southern Pale Chanting Goshawk	√ ^{D;W}			√		Near endemic
<i>Melierax gabar</i>	Gabar Goshawk						
<i>Accipiter badius</i>	Shikra						
<i>Accipiter minullus</i>	Little Sparrowhawk						
<i>Accipiter ovampensis</i>	Owambo Sparrowhawk						
<i>Buteo vulpinus</i>	Steppe Buzzard						
<i>Buteo augur</i>	Augur Buzzard						
<i>Buteo rufofuscus</i>	Jackal Buzzard						
<i>Aquila nipalensis</i>	Steppe Eagle						
<i>Aquila rapax</i>	Tawny Eagle					E	V
<i>Aquila verreauxii</i>	Verreaux's Eagle					NT	
<i>Aquila spilogaster</i>	African Hawk-Eagle						
<i>Aquila pennatus</i>	Booted Eagle					E	
<i>Polemaetus bellicosus</i>	Martial Eagle					E	E
<i>Sagittarius serpentarius</i>	Secretarybird					V	E
<i>Polihierax semitorquatus</i>	Pygmy Falcon						
<i>Falco rupicolus</i>	Rock Kestrel	√ ^D		√			
<i>Falco rupicoloides</i>	Greater Kestrel						
<i>Falco chicquera</i>	Red-necked Falcon						
<i>Falco biarmicus</i>	Lanner Falcon			√			
<i>Falco peregrinus</i>	Peregrine Falcon					NT	
<i>Egretta garzetta</i>	Little Egret						
<i>Ardea cinerea</i>	Grey Heron						
<i>Ardea melanocephala</i>	Black-headed Heron						
<i>Ciconia nigra</i>	Black Stork					E	

<i>Ciconia abdimii</i>	Abdim's Stork						
<i>Dicrurus adsimilis</i>	Fork-tailed Drongo	√ ^D					
<i>Nilaus afer</i>	Brubru						
<i>Dryoscopus cubla</i>	Black-backed Puffback						
<i>Tchagra australis</i>	Brown-crowned Tchagra						
<i>Laniarius atrococcineus</i>	Crimson-breasted Shrike	√ ^D					Near endemic
<i>Telophorus zeylonus</i>	Bokmakierie			√			Near endemic
<i>Prionops plumatus</i>	White-crested Helmet-Shrike						
<i>Lanioturdus torquatus</i>	White-tailed Shrike	√ ^{D;W}				Endemic	Near endemic
<i>Batis pririt</i>	Pirit Batis			√			Near endemic
<i>Corvus capensis</i>	Cape Crow						
<i>Corvus albus</i>	Pied Crow						
<i>Lanius minor</i>	Lesser Grey Shrike						
<i>Lanius collaris</i>	Common Fiscal	√ ^{D;W}	√	√	√		
<i>Eurocephalus anguitimens</i>	Southern White-crowned Shrike						Near endemic
<i>Anthoscopus minutes</i>	Cape Penduline Tit						Near endemic
<i>Parus carpi</i>	Carp's Tit					Endemic	Near endemic
<i>Parus cinerascens</i>	Ashy Tit						Endemic
<i>Hirundo rustica</i>	Barn Swallow						
<i>Hirundo fuligula</i>	Rock Martin	√ ^D		√	√		
<i>Delichon urbicum</i>	Common House Martin						
<i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	√ ^W					Near endemic
<i>Achaetps pycnopygius</i>	Rockrunner					Endemic	Near endemic
<i>Sylvietta rufescens</i>	Long-billed Crombec		√				
<i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela						
<i>Acrocephalus baeticatus</i>	African Reed Warbler						
<i>Turdoides bicolor</i>	Southern Pied Babbler						Endemic
<i>Turdoides gymnogenys</i>	Bare-cheeked Babbler					Endemic	
<i>Parisoma layardi</i>	Layard's Tit-Babbler						Endemic
<i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler	√ ^D			√		Near endemic
<i>Cisticola subruficapilla</i>	Grey-backed Cisticola						Near endemic
<i>Cisticola jaridulus</i>	Desert Cisticola	√ ^W					
<i>Prinia flavicans</i>	Black-chested Prinia	√ ^D	√	√	√		
<i>Camaroptera brevicaudata</i>	Grey-backed Camaroptera						
<i>Mirafr passerina</i>	Monotonous Lark						
<i>Mirafr fasciolata</i>	Eastern Clapper Lark						Near endemic

<i>Mirafraba sabota</i>	Sabota Lark	√ ^{D;W}		√	√	Endemic	
<i>Ammomanopsis grayi</i>	Gray's Lark		√	√			
<i>Chersomanes albofasciata</i>	Spike-heeled Lark	√ ^D		√	√		Near endemic
<i>Certhilauda benguelensis</i>	Benguela Long-billed Lark		√	√			Near endemic
<i>Eremopterix leucotis</i>	Chestnut-backed Sparrowlark						
<i>Eremopterix verticalis</i>	Grey-backed Sparrowlark	√ ^W					Near endemic
<i>Calandrella cinerea</i>	Red-capped Lark						
<i>Alauda starki</i>	Stark's Lark						Near endemic
<i>Monticola brevipes</i>	Short-toed Rock Thrush						
<i>Psophocichla litsitsirupa</i>	Groundscraper Thrush						
<i>Bradornis infuscatus</i>	Chat Flycatcher		√				Near endemic
<i>Melaenornis mariquensis</i>	Marico Flycatcher	√ ^{D;W}			√		Near endemic
<i>Muscicapa striata</i>	Spotted Flycatcher						
<i>Cercotrichas leucophrys</i>	White-browed Scrub-Robin						
<i>Cercotrichas paena</i>	Kalahari Scrub-Robin	√ ^D					
<i>Namibornis herero</i>	Herero Chat	√ ^{D;W}				Endemic	Near endemic
<i>Oenanthe monticola</i>	Mountain Wheatear	√ ^{D;W}	√	√	√		Near endemic
<i>Oenanthe pileata</i>	Capped Wheatear						
<i>Cercomela schlegelii</i>	Karoo Chat						Near endemic
<i>Cercomela tractrac</i>	Tractrac Chat	√ ^{D;W}	√	√	√		Near endemic
<i>Cercomela familiaris</i>	Familiar Chat	√ ^W		√			
<i>Myrmecocichla formicivora</i>	Ant-eating Chat						Endemic
<i>Onychognathus nabouroup</i>	Pale-winged Starling	√ ^{D;W}			√		Near endemic
<i>Lamprotornis nitens</i>	Cape Glossy Starling	√ ^W			√		
<i>Cinnyricinclus leucogaster</i>	Violet-backed Starling						
<i>Creatophora cinerea</i>	Wattled Starling	√ ^W					
<i>Chalcomitra senegalensis</i>	Scarlet-chested Sunbird						
<i>Nectarinia fusca</i>	Dusky Sunbird	√ ^D		√	√		Near endemic
<i>Cinnyris mariquensis</i>	Marico Sunbird						
<i>Bualornis niger</i>	Red-billed Buffalo-Weaver						
<i>Sporopipes squamifrons</i>	Scaly-feathered Finch			√			Near endemic
<i>Plocepasser mahali</i>	White-browed Sparrow-Weaver	√ ^{D;W}		√			
<i>Philetairus socius</i>	Sociable Weaver						Endemic
<i>Ploceus intermedius</i>	Lesser Masked-Weaver						
<i>Ploceus velatus</i>	Southern Masked-Weaver	√ ^{D;W}	√				
<i>Ploceus rubiginosus</i>	Chestnut Weaver	√ ^W					

<i>Quelea quelea</i>	Red-billed Quelea					
<i>Amadina erythrocephala</i>	Red-headed Finch					Near endemic
<i>Estrilda erythronotos</i>	Black-faced Waxbill					
<i>Estrilda astrild</i>	Common Waxbill					
<i>Granatina granatina</i>	Violet-eared Waxbill	√ ^W				
<i>Pytilia melba</i>	Green-winged Pytilia					
<i>Vidua regia</i>	Shaft-tailed Whydah					
<i>Passer domesticus</i>	House Sparrow					
<i>Passer motitensis</i>	Great Sparrow					Near endemic
<i>Passer melanurus</i>	Cape Sparrow	√ ^D	√	√	√	Near endemic
<i>Passer griseus</i>	Southern Grey-headed Sparrow					
<i>Motacilla capensis</i>	Cape Wagtail					
<i>Anthus cinnamomeus</i>	African Pipit					
<i>Anthus vaalensis</i>	Buffy Pipit					
<i>Anthus similis</i>	Long-billed Pipit					
<i>Serinus alario</i>	Black-headed Canary					Endemic
<i>Crithagra atrogularis</i>	Black-throated Canary					
<i>Serinus flaviventris</i>	Yellow Canary	√ ^W			√	Near endemic
<i>Serinus albogularis</i>	White-throated Canary		√			Near endemic
<i>Emberiza impetuani</i>	Lark-like Bunting		√ ^W		√	Near endemic
<i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting					
<i>Emberiza capensis</i>	Cape Bunting					Near endemic
<i>Emberiza flaviventris</i>	Golden-breasted Bunting					

This table excludes migratory birds (e.g., Petrel, Albatross, Skua, etc.), aquatic species (e.g., ducks, etc.) and species breeding extralimital (e.g., stints, sandpipers, etc.) and rather focuses on birds that are breeding residents or can be found in the area during any time of the year. This would imply that many more birds (e.g., Palearctic migrants) could occur in the area depending on “favourable” environmental conditions.

Namibian status: E – Endangered, V – Vulnerable, NT – Near Threatened (Simmons *et al.* 2015)

Southern African status: Hockey *et al.* (2006)

International Union for the Conservation of Nature Red List (IUCN 2025): CE – Critically Endangered, E – Endangered, V- Vulnerable, NT – Near Threatened. All other species not listed are viewed as “Least Concern” by IUCN (2025)

Source for literature review: Brown *et al.* (1998), Cunningham (2021), Cunningham (2023), Cunningham (2024), Hockey *et al.* (2006), IUCN (2025), Komen (n.d.), Little and Crowe (2011), Maclean (1985), Peacock (2015), Simmons *et al.* (2015), Tarboton (2001)

2 species as vulnerable (lappet-faced vulture, secretarybird) and 5 species as near threatened (Rüppel's parrot, kori bustard, Cape eagle owl, Verreaux's eagle, peregrine falcon) (Simmons *et al.* 2015). Fifty-six species have a southern African conservation rating with 8 species classified as endemic (14.3% of southern African endemics or 4.2% of all the birds expected) and 48 species classified as near endemic (85.7% of southern African endemics or 25.3% of all the birds expected) (Hockey *et al.* 2006). The IUCN (2025) classifies 1 species as critically endangered (white-backed vulture), 4 species as endangered (Ludwig's bustard, lappet-faced vulture, martial eagle, secretarybird), 1 species as vulnerable (tawny eagle) and 1 species as near threatened (kori bustard).

The most important bird species from the general area are those classified as endemic to Namibia include the Damara hornbill, bare-cheeked babbler and Herero chat. These are viewed as the most important due to the overall lack of knowledge of these species. Although also viewed as important, Rüppel's korhaan is migratory throughout its range while the rockrunner inhabits inaccessible terrain and is widespread throughout mountainous areas in Namibia. Other species of concern are those classified as endangered (violet wood-hoopoe, Ludwig's bustard, tawny eagle, booted eagle, martial eagle, black stork) and near threatened (Rüppel's parrot, Cape eagle owl, Verreaux's eagle, peregrine falcon) (Simmons *et al.* 2015) and those species classified by the IUCN (2025) as critically endangered (white-backed vulture), endangered (Ludwig's bustard, lappet-faced vulture, martial eagle, secretarybird), vulnerable (tawny eagle) and near threatened (kori bustard). Although it is not known if vultures (e.g., white-backed vulture) breed in the area, such nesting sites (including all large raptor nesting sites), should these be established and/or located in future, should be viewed as extremely important avoided.

During the fieldwork a total of 51 bird species (32 Versus 35) were confirmed from the EPL 4818 area during "dry" (32 species) and "wet" (35 species) season surveys, respectively (e.g., Figures 25-30) – See Table 5. The difference in bird assemblages between the "dry" and "wet" seasons can be ascribed to some guilds, especially seed eaters (e.g., sandgrouse, sparrow-lark, quail) attracted to the good grass cover, having moved into the area after above average rainfall experienced during April 2025.

A large raptor nest was in an *Acacia tortilis* (umbrella thorn) tree in an ephemeral drainage line (S21°11'02.2" & E15°17'24.2", m.a.s.l. 1,051m; Figure 25). Although the nest could not be identified, black-chested snake eagle was observed in the general area. All larger raptors face persecution by farmers with their numbers declining throughout Namibia. Such nesting sites should be protected and avoided, especially during the breeding season.

A total of at least 70 species are confirmed from the general area if one includes Cunningham (2021, 2023, 2024) – See Table 5.



Figure 25. Unidentified large raptor nest – probably black-chested snake eagle – observed in area.



Figure 26. Numerous owl pellets – probably spotted eagle owl – observed in granite dome area.



Figure 27. Typical tractrac chat (*Cercomela tractrac*) nest construction.



Figure 28. The endemic Herero chat (*Namibornis herero*) confirmed from the area.



Figure 29. Southern yellow-billed hornbill (*Tockus leucomelas*) associated with the larger well vegetated drainage lines in the area.



Figure 30. Southern pale chanting goshawk (*Melierax canorus*) observed in area.

The EPL 4818 area is marginally impacted due to subsistence farming infrastructures and associated anthropogenic influences; current exploration activities and informal mining/prospecting activities; tracks and gravel roads with none of the unique birds expected to be exclusively associated with this area.

However, the raptor nesting site (See Figure 25) is viewed as an important site and should be avoided.

3.5 Tree and Shrub Diversity

It is estimated that at least 105 species of larger trees and shrubs (>1m in height) occur in the general area (Mannheimer and Curtis 2018).

The trees and shrubs known, and/or expected to occur in the general area (derived from Mannheimer and Curtis 2018) is presented in Table 6. Species indicated are known from the quarter-degree square distribution principle used and don't necessarily occur throughout the entire area.

Twelve species of trees and shrubs (11.4%) expected to occur in the general area are classified as endemic, 7 species as near endemic (6.7%), 25 species (23.8%) are protected by the Forest Act No. 12. of 2001, 4 species (3.8%) are protected under the Nature Conservation Ordinance No. 4 of 1975 while 6 species (5.7%) are classified as CITES Appendix 2 species. All the trees with some kind of conservation and/or protected status are viewed as important in the general area. The most important species are viewed as *Acacia montis-usti*, *Adenia pechuelii*, *Aloe dichotoma*, *Caesalpinia pearsonii*, *Commiphora dinteri*, *Commiphora kaokoensis*, *Commiphora kraeuseliana*, *Commiphora saxicola*, *Commiphora virgata*, *Commiphora wildii*, *Cyphostemma currorii*, *Erythrina decora*, *Manuleopsis dinteri*, *Moringa ovalifolia*, *Sesamothamnus guerichii*, *Sterculia africana*, *Sterculia quinqueloba* and *Welwitschia mirabilis* (See Table 6). The IUCN (2025) classifies *Aliodendron (Aloe) dichotoma* as vulnerable; *Acacia montis-usti* and *Gossypium anomalum* as near threatened and *Gossypium triphyllum* as data deficient while all the other species are classified as least concern or have not yet been assessed by the IUCN Red Data Book. However, not all these species are expected to occur in the EPL 4818 area, but rather the larger general area (e.g., *Acacia montis-usti* – Brandberg; *Welwitschia mirabilis* – west/north of Brandberg, etc.).

Although at least 105 larger species of trees and shrubs are known and/or expected to occur in the general area a total of 39 species of larger trees/shrubs were identified throughout the EPL 4818 (See Table 6).

A total of at least 56 species are confirmed from the general area if one includes Cunningham (2021, 2023, 2024) – See Table 6.

During the fieldwork 12 species of larger tree and shrubs species were confirmed along various transects in the rocky areas – i.e., hills/ridges, etc. (Figure 31); 13 species confirmed in undulating gravel plain areas (Figure 36) and 13 species confirmed in ephemeral drainage lines (Figure 40).

[Although African species of Acacia have undergone a name change and grouped into two distinct genera – i.e., Vachellia and Senegalia – which are clearly separated based on several morphological, anatomical & biochemical attributes (e.g., Vachellia has capitate inflorescences (round, head-like flowers) and spinescent stipules (thorns) while Senegalia has spicate inflorescences (flowers in spikes) and the stipules are non-spinescent), the International Code of Nomenclature for algae, fungi, and plants is not prescriptive and Acacia has been used throughout this report]

Table 6. Tree and shrub diversity expected (literature study) and confirmed during the fieldwork (✓), including previous surveys conducted by Cunningham (2021, 2023, 2024) from the general area. The trees and shrubs known, and/or expected to occur in the general area are derived from Mannheimer and Curtis (2018).

Species Expected: Scientific name	Species recorded	Cunningham (2024)	Cunningham (2023)	Cunningham (2021)	Namibian conservation and legal status	International status (IUCN 2024)
<i>Acacia erioloba</i>	✓	✓	✓	✓	Protected (F#)	
<i>Acacia erubescens</i>	✓					
<i>Acacia hebeclada</i>						
<i>Acacia hereroensis</i>						
<i>Acacia karroo</i>						
<i>Acacia mellifera</i>	✓		✓	✓		
<i>Acacia montis-usti</i>		✓	✓		End	NT
<i>Acacia reficiens</i>	✓			✓		
<i>Acacia senegal</i>	✓					
<i>Acacia tortilis</i>	✓			✓		
<i>Adenia pechuelii</i>					Protected (F#), End	
<i>Adenolobus garipensis</i>	✓		✓	✓		
<i>Adenolobus pechuelii</i>				✓		
<i>Albizia anthelmintica</i>	✓				Protected (F#)	
<i>Aloidendron (Aloe) dichotoma</i>					Protected (F#), NC, C2, N-end	V
<i>Aloe litoralis</i>					NC, C2	
<i>Azima tetracantha</i>						
<i>Boscia albitrunca</i>	✓			✓	Protected (F#)	
<i>Boscia foetida</i>	✓	✓	✓	✓		
<i>Cadaba aphylla</i>						
<i>Cadaba schroeppelii</i>	✓				N-end	
<i>Caesalpinia pearsonii</i>					End	
<i>Caesalpinia rubra</i>				✓		
<i>Catophractes alexandri</i>	✓					
<i>Combretum hereoensis</i>	✓					
<i>Combretum imberbe</i>					Protected (F#)	
<i>Commiphora dinteri</i>		✓	✓		Protected (F#), End	
<i>Commiphora glandulosa</i>	✓			✓		
<i>Commiphora glaucescens</i>	✓			✓	N-end	
<i>Commiphora kaokoensis</i>					End	

Vertebrate Fauna & Flora - Cunningham

<i>Commiphora kraeuseliana</i>					Protected (F#), End	
<i>Commiphora pyracanthoides</i>				√		
<i>Commiphora saxicola</i>		√	√	√	Protected (F#), End	
<i>Commiphora tenuipetiolata</i>		√		√		
<i>Commiphora virgata</i>	√	√	√	√	Protected (F#), End	
<i>Commiphora wildii</i>				√	Protected (F#), N-end	
<i>Cordia sinensis</i>	√		√	√		
<i>Croton gratissimus</i>						
<i>Cyphostemma currorii</i>					Protected (F#), NC	
<i>Dichrostachys cinerea</i>	√					
<i>Diospyros acocksii</i>						
<i>Diospyros lycioides</i>						
<i>Dombeya rotundifolia</i>						
<i>Ehretia alba</i>						
<i>Erythrina decora</i>					Protected (F#), End	
<i>Elephantorrhiza suffruticosa</i>		√	√			
<i>Euclea pseudebenus</i>	√	√	√	√	Protected (F#)	
<i>Euclea undulata</i>						
<i>Euphorbia damarana</i>				√	End, C2	
<i>Euphorbia guerichiana</i>					C2	
<i>Euphorbia virosa</i>	√			√	C2	
<i>Faidherbia albida</i>				√	Protected (F#)	
<i>Ficus cordata</i>	√				Protected (F#)	
<i>Ficus ilicina</i>						
<i>Ficus sycomorus</i>					Protected (F#)	
<i>Gossypium anomalum</i>				√		NT
<i>Gossypium triphyllum</i>						DD
<i>Grewia bicolor</i>						
<i>Grewia flava</i>	√					
<i>Grewia flavescens</i>	√					
<i>Grewia tenax</i>				√		
<i>Grewia villosa</i>				√		
<i>Gymnosporia senegalensis</i>	√	√		√		
<i>Ipomoea adeniodes</i>						
<i>Laggera decurrens</i>						
<i>Lycium bosciifolium</i>						
<i>Lycium eenii</i>						
<i>Maerua juncea</i>	√	√	√	√		
<i>Maerua parvifolia</i>						

Vertebrate Fauna & Flora - Cunningham

<i>Maerua schinzii</i>	√		√	√	Protected (F#)
<i>Melianthus comosus</i>					
<i>Manuleopsis dinteri</i>					End
<i>Montinia caryophyllacea</i>	√				
<i>Moringa ovalifolia</i>	√			√	Protected (F#), NC, N-end
<i>Mundulea sericea</i>	√				
<i>Olea europaea</i>					
<i>Osyris lanceolata</i>					
<i>Ozoroa crassinervia</i>					
<i>Parkinsonia africana</i>	√		√		
<i>Pechuel-Loeschea leubnitziae</i>				√	
<i>Phaeoptilum spinosum</i>	√	√	√	√	
<i>Rothea myricoides</i>					
<i>Rhigozum brevispinosum</i>					
<i>Salsola</i> spp.	√		√		
<i>Salvadora persica</i>	√	√		√	
<i>Searsia burchellii</i>			√		Protected (F#)
<i>Searsia ciliata</i>					
<i>Searsia marlothii</i>	√				
<i>Searsia pyroides</i>					
<i>Sesamothamnus guerichii</i>	√				N-end
<i>Steganotaenia araliacea</i>					
<i>Sterculia africana</i>				√	Protected (F#)
<i>Sterculia quinqueloba</i>					Protected (F#)
<i>Tamarix usneoides</i>					Protected (F#)
<i>Terminalia prunioides</i>	√			√	
<i>Tetradenia riparia</i>					
<i>Tinnea rhodesiana</i>					
<i>Terminalia prunioides</i>					
<i>Vangueria cyanescens</i>					
<i>Vangueria infausta</i>	√				
<i>Vernonia cinerascens</i>					
<i>Welwitschia mirabilis</i>					Protected (F#); N-end; C2
<i>Ximenia americana</i>	√				
<i>Ziziphus mucronata</i>	√				Protected (F#)
<i>Zygophyllum stapfii</i>					End

Endemic and Near-endemic – (Mannheimer and Curtis 2018)

F# – Forest Act No. 12 of 2001

NC – Nature Conservation Ordinance No. 4 of 1975

International Union for the Conservation of Nature Red List (IUCN 2025): V – Vulnerable; NT – Near Threatened; DD – Data Deficient; All other species are listed as Least Concern (LC) or not yet been assessed by the IUCN Red List.

Convention in the Trade of Endangered Species of Fauna and Flora (CITES): C2 – Appendix 2 species

Source for literature review: Burke (2005), Cunningham (2021), Cunningham (2023), Cunningham (2024), IUCN (2025), Loots (2005), Mannheimer and Curtis (2018), Rothmann (2004), Steyn (2003)

Rocky habitats (Hills/Ridges)

Twelve species of larger trees and shrubs were encountered along various transects totalling 1,000m in various hill/ridge habitats, respectively. *Commiphora virgata* (27%), *Adenolobus pechuelii* (21%) and *Commiphora glauscens* (16%) were the most dominant species observed (Figure 31). Endemic species (*Commiphora virgata*) account for 27% of the larger tree and shrubs in these habitats while protected species (*Commiphora virgata*, *Ficus cordata*, *Maerua schinzii*) account for 30% and near endemic species (*Cadaba schroepelii*, *Commiphora glauscens*, *Sesamothamnus guerichii*) account for 18% (Figures 31-35). The protected species are widespread throughout Namibia and not exclusively associated with the EPL 4818 area. However, as many unique species (i.e., protected, endemic & near endemics, etc.) are associated with the rocky habitats, all unnecessary activities should be avoided in this habitat as far as possible and/or remove and relocate suitable species. Permits would also be required to remove these plant species.

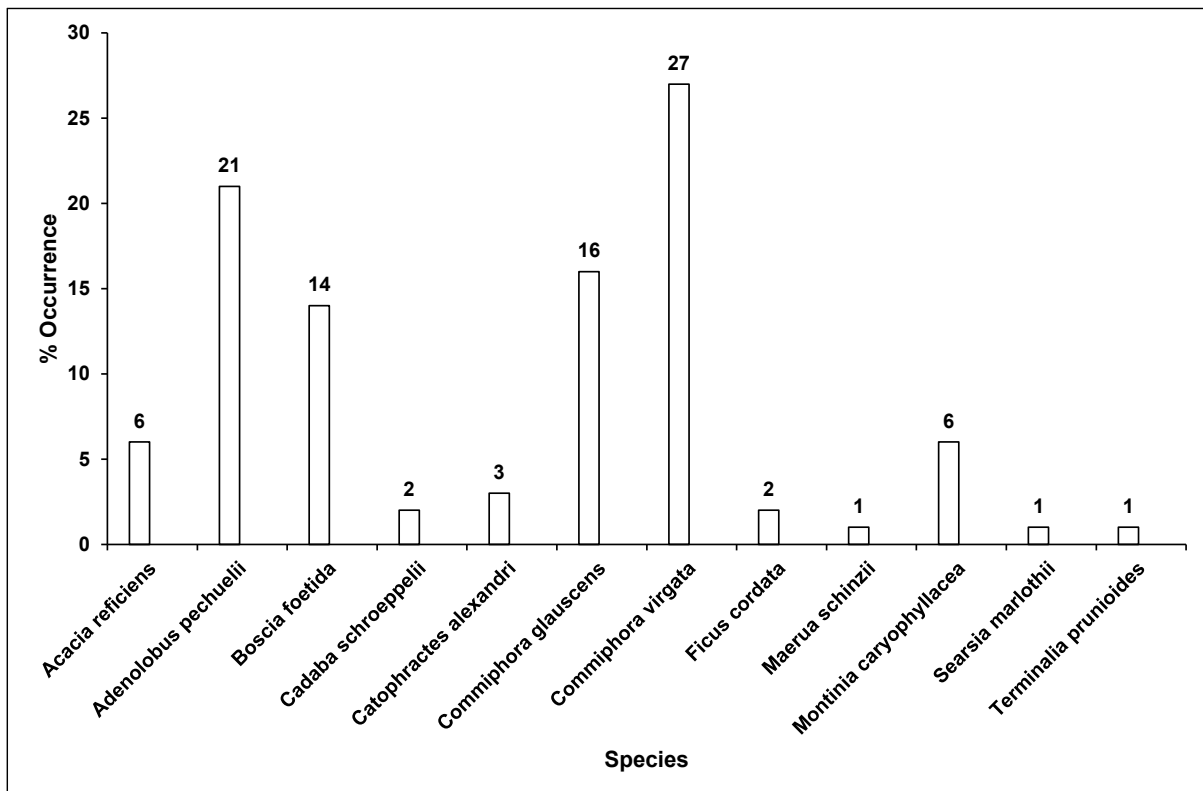


Figure 31. Tree and shrub species composition along various transects (1,000m @ 10m intervals) in the rocky habitat (N=100 points).



Figure 32. *Cadaba schroepelii* (silver-leaved wormbush) – near endemic – only observed in rocky habitats.



Figure 33. *Commiphora glauca* (blue-leaved corkwood) – near endemic – are common on calcrete/limestone ridges.



Figure 34. *Commiphora virgata* (slender corkwood) – protected F; endemic – are dominant on rocky ridges.



Figure 35. *Ficus cordata* (Namaqua rock fig) – protected F – observed on calcrete/limestone ridges and granite dome areas.

Undulating gravel plains

Thirteen species of larger trees and shrubs were encountered along various transects totalling 2,000m in various undulating gravel plain habitats. *Acacia reficiens* (48.5%), *Boscia foetida* (21%) and *Acacia tortilis* (7%) were the most dominant species observed (Figure 36). Protected species (*Albizia anthelmintica*, *Boscia albitrunca*, *Maerua schinzii*) account for 2.5% of the larger tree and shrubs in these habitats while near endemic species (*Commiphora glandulosa*) account for 0.5% (Figures 36-39). The protected species are widespread throughout Namibia and not exclusively associated with the EPL 4818 area. These habitats are dominated by *Acacia* species (64.5%) and not viewed as sensitive. However, permits would be required to remove the protected plant species.

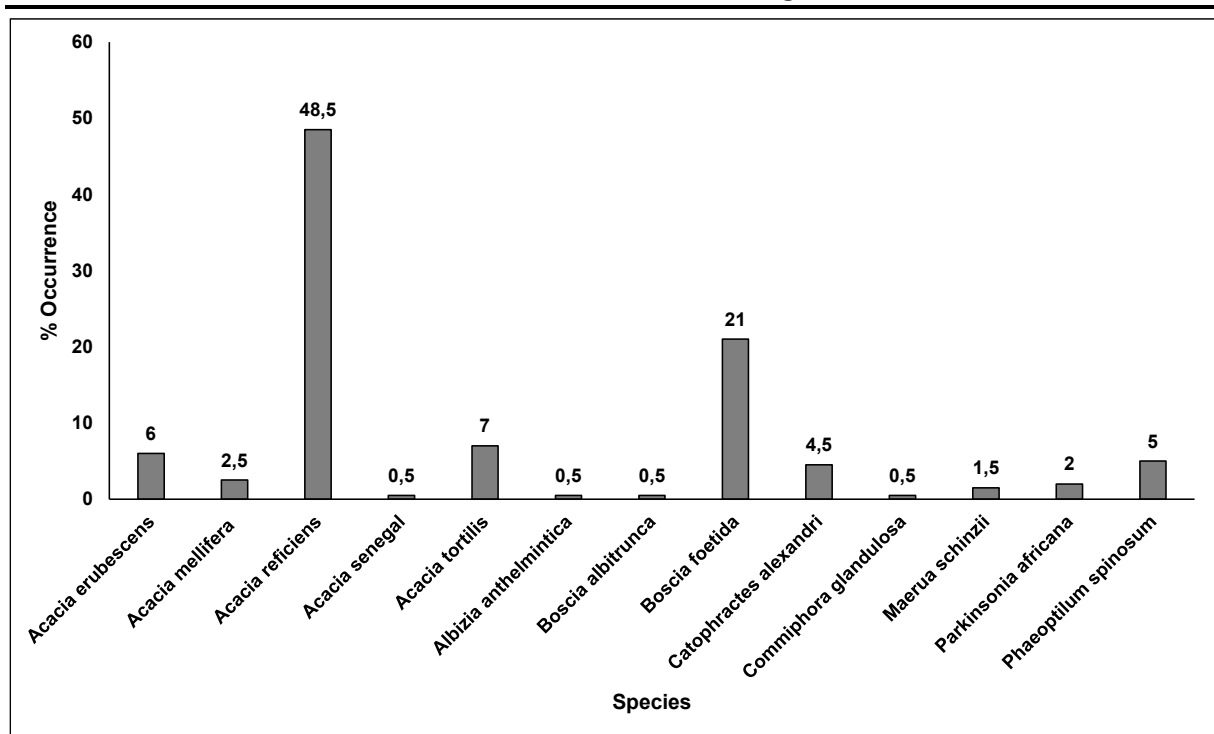


Figure 36. Tree and shrub species composition along various transects (2,000m @ 10m intervals) in the undulating gravel plains habitat (N=200 points).



Figure 37. The undulating gravel plain habitats are dominated by *Acacia reficiens* (red-bark Acacia) trees and shrubs.



Figure 38. *Boscia albitrunca* (shepherds tree) – protected F – individuals are scattered throughout the area.



Figure 39. *Maerua schinzii* (ringwood tree) – protected F – individuals were observed throughout the area.

Drainage lines

Thirteen species of larger trees and shrubs were encountered along various transects totalling 1,000m in various ephemeral drainage line habitats. *Acacia reficiens* (49%), *Acacia tortilis* (13%) and *Ziziphus mucronate* (7%) were the most dominant species observed (Figure 40). Protected species (*Acacia erioloba*, *Albizia anthelmintica*, *Boscia albitrunca*, *Ziziphus mucronata*) account for 15% of the larger tree and shrubs in these habitats (Figures 40-44). The protected species are widespread throughout Namibia and not exclusively associated with

the EPL 4818 area. However, the trees in these drainage lines are large and serve as habitat to a variety of vertebrate fauna, and all unnecessary activities should be avoided in these areas as far as possible. Cognisance of the importance of these habitats is imperative and developments should be limited in drainage lines in such an arid environment. Permits would also be required to remove protected species.

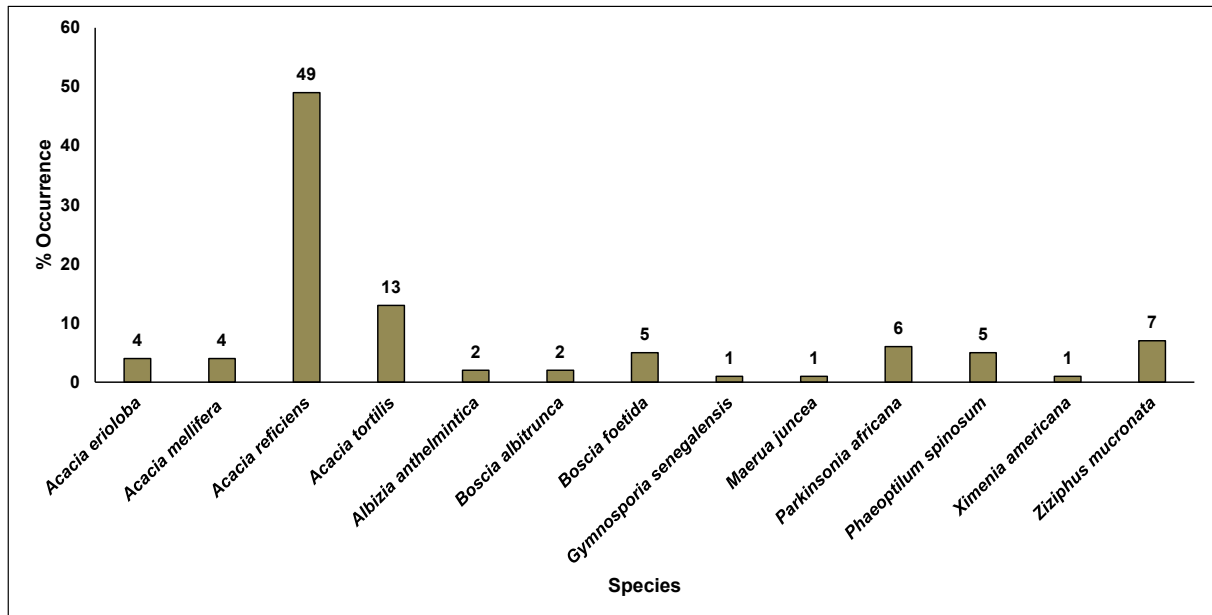


Figure 40. Tree and shrub species composition along various transects (1,000m @ 10m intervals) in the ephemeral drainage line habitat (N=100 points).



Figure 41. The larger ephemeral drainage lines are well vegetated and include a variety of species, especially larger specimens.



Figure 42. Large *Acacia erioloba* (camel thorn) – protected F – are associated with the larger ephemeral drainage lines in the area.



Figure 43. *Euclea pseudebenus* (false ebony) – protected F – associated with drainage lines in the area.



Figure 44. *Ziziphus mucronata* (buffalo thorn) – protected F – associated with ephemeral drainage lines in area.

The EPL 4818 area is marginally impacted due to subsistence farming infrastructures and associated anthropogenic influences; current exploration activities and informal mining/prospecting activities; tracks and gravel roads with none of the unique larger trees and shrubs expected to be exclusively associated with this area.

However, unique habitats such as ephemeral drainage lines have larger specimens which often serve as habitat for a variety of species – e.g., raptor breeding sites (See Figure 25), and bark and cavity dwelling species (bats, birds, and reptiles) – and stabilise river banks while rocky areas, especially granite dome areas, have a higher diversity of species including unique species – e.g., *Commiphora* spp., *Ficus cordata*, etc. However, many species (e.g., *Commiphora* spp., *Euphorbia* spp., etc.) are relatively easily to transplant/relocate and could be relocated to other similar habitat should mining/prospecting activities be necessary in the areas they occur in.

3.6 Grass Diversity

It is estimated that at least 6-72 grasses (Müller 2007 [72 spp.], Burke 2005 [6 spp.], Van Oudshoorn 2012 [52 spp.]) – approximate total of 80 species – occur in the general area. The grasses known and/or expected to occur in the general area (¹Müller 2007, ²Van Oudtshoorn 2012 and ³Burke 2005) is presented in Table 7 below. Of the approximately 80 grasses that are expected in the general area, 2 species is viewed as endemic (*Eragrostis omahekensis*, *Stipagrostis damarensis*), with *S. damarensis* only occurring in the central and northern Namib in dry river courses (Burke 2005, Müller 2007) (Table 7).

During the “dry” season fieldwork only 7 grass species were identified throughout the area and due to the overall dry conditions grass species composition was not quantified (Table 7; Figures 45-46). However, during the “wet” season survey 20 grass species were recorded throughout the area (Table 7). A total of at least 28 species were recorded from the general area if one includes Cunningham (2021, 2023, 2024) – See Table 7.

Table 7. Grass diversity expected (literature study) and confirmed during the fieldwork ($\sqrt{D}$ = Dry season [2024]; $\sqrt{W}$ = Wet season [2025]), including previous surveys conducted by Cunningham (2021, 2023, 2024) from the general area. The grasses known, and/or expected to occur in the general area are derived ¹Müller (2007), ²Van Oudtshoorn (2012), ³Burke (2005).

Species: Scientific name	Species confirmed	Cunningham (2024)	Cunningham (2023)	Cunningham (2021)	Ecological Status *	Grazing Value *
^{1,2} <i>Andropogon chinensis</i>					Increaser 1	Average
² <i>Andropogon eucomus</i>					Increaser 2	Low
¹ <i>Antheophora argentea</i>					Decreaser	High
^{1,2} <i>Antheophora pubescens</i>	$\sqrt{D}$				Decreaser	High
¹ <i>Antheophora schinzii</i>					Increaser 2	Low
^{1,2} <i>Aristida adscensionis</i>	$\sqrt{W}$			$\sqrt{}$	Increaser 2	Low
^{1,2} <i>Aristida congesta</i>					Increaser 2	Low
¹ <i>Aristida effusa</i>					Increaser 2	Low
^{1,2} <i>Aristida meridionalis</i>					Increaser 2	Low
¹ <i>Aristida rhiniochloa</i>					Increaser 2	Low
^{1,2} <i>Bachiaria deflexa</i>					Increaser 2	Average
¹ <i>Brachiaria malacodes</i>					?	Low
¹ <i>Brachiaria glomerata</i>					Decreaser	Average
^{1,2} <i>Brachiaria nigropedata</i>					Decreaser	High
^{1,2} <i>Cenchrus ciliaris</i>	$\sqrt{W}$				Decreaser	High
^{1,2} <i>Centropodia glauca</i>					Decreaser	High
^{1,2} <i>Chloris virgata</i>					Increaser 2	Average
² <i>Cladoraphis spinosa</i>					Increaser 1	Low
^{1,2} <i>Cynodon dactylon</i>					Increaser 2	High
^{1,2} <i>Dactyloctenium aegyptium</i>					Increaser 2	Low
¹ <i>Danthoniopsis ramosa</i>					?	High
^{1,2} <i>Dichanthium annulatum</i>					Decreaser	High
² <i>Diplachne fusca</i>					Decreaser	High
¹ <i>Echinochloa colona</i>					?	Low
² <i>Elionurus muticus</i>					Increaser 2	Low
^{1,2} <i>Enneapogon cenchroides</i>	$\sqrt{D:W}$			$\sqrt{}$	Increaser 2	Low
^{1,2} <i>Enneapogon desvauxii</i>	$\sqrt{D:W}$		$\sqrt{}$	$\sqrt{}$	Intermediate	Average
^{1,2} <i>Enneapogon scaber</i>	$\sqrt{W}$				?	Low
^{1,2,3} <i>Enneapogon scoparius</i>					Increaser 2	Low
¹ <i>Entoplocamia aristulata</i>					Intermediate	Low

^{1,2} <i>Eragrostis annulata</i>	√ ^W				Increaser 2	Low
¹ <i>Eragrostis cylindriflora</i>	√ ^W			√	?	Low
² <i>Eragrostis biflora</i>	√ ^W				Increaser 2	Low
² <i>Eragrostis cilianensis</i>					Increaser 2	Low
^{1,2} <i>Eragrostis echinochloidea</i>					Increaser 2	Average
¹ <i>Eragrostis homomalla</i>					?	Low
² <i>Eragrostis lehmanniana</i>					Increaser 2	Average
^{1,2} <i>Eragrostis nindensis</i>	√ ^W	√	√	√	Increaser 2	Average
¹ <i>Eragrostis omahekensis</i> [E]					?	Low
¹ <i>Eragrostis porosa</i>	√ ^W			√	Intermediate	Low
¹ <i>Eragrostis rigidior</i>					Increaser 2	Average
^{1,2} <i>Eragrostis rotifer</i>					Intermediate	Low
¹ <i>Eragrostis scopelophila</i>					?	High
^{1,2} <i>Eragrostis superba</i>					Increaser 2	Average
^{1,2} <i>Eragrostis trichophora</i>					Increaser 2	Average
^{1,2} <i>Eragrostis viscosa</i>					Increaser 2	Low
^{1,2,3} <i>Fingerhuthia africana</i>	√ ^W				Decreaser	Average
^{1,2} <i>Heteropogon contortus</i>	√ ^D				Increaser 2	Average
^{1,2} <i>Hyparrhenia hirta</i>					Increaser 1	Average
¹ <i>Leptochloa fusca</i>					?	Average
^{1,2} <i>Microchloa caffra</i>					Increaser 2	Low
¹ <i>Monelytrum luederitzianum</i>					?	Average
^{1,2} <i>Melinis repens</i>	√ ^W				Increaser 2	Low
¹ <i>Odyssea paucinervis</i>					?	Average
^{1,2} <i>Oropetium capense</i>					?	Low
^{1,2} <i>Panicum coloratum</i>	√ ^W				Decreaser	High
^{1,2} <i>Panicum maximum</i>					Decreaser	High
² <i>Panicum repens</i>					Decreaser	High
¹ <i>Pogonarthria fleckii</i>	√ ^W				Increaser 2	Low
² <i>Polypogon monspeliensis</i>					?	Average
^{1,2,3} <i>Schmidtia kalahariensis</i>	√ ^W			√	Increaser 2	Low
^{1,2} <i>Schmidtia pappophoroides</i>					Decreaser	High
¹ <i>Setaria appendiculata</i>					?	Average
^{1,2} <i>Setaria verticillata</i>	√ ^W			√	Increaser 2	Average
¹ <i>Sorghum bicolor</i>			√		?	Average
^{1,2} <i>Sporobolus festivus</i>					Increaser 2	Low
^{1,2} <i>Stipagrostis ciliata</i>		√	√		Decreaser	High
³ <i>Stipagrostis damarensis</i> [E]	√ ^{D;W}	√	√			
¹ <i>Stipagrostis giessii</i>					?	Average

Vertebrate Fauna & Flora - Cunningham

^{1,2} <i>Stipagrostis hirtigluma</i>		√	√		Increaser 2	Low
^{1,3} <i>Stipagrostis hochstetteriana</i>	√ ^W			√	Decreaser	Average
^{1,2} <i>Stipagrostis namaquensis</i>			√	√	?	Average
^{1,2} <i>Stipagrostis obtusa</i>		√		√	Decreaser	High
^{1,2,3} <i>Stipagrostis uniplumis</i>	√ ^{D;W}	√	√	√	Increaser 2	Average
^{1,2} <i>Tricholaena monachne</i>					Increaser 2	Average
¹ <i>Triraphis purpurea</i>					?	Low
¹ <i>Triraphis ramosissima</i>	√ ^{D;W}		√	√	?	Average
^{1,2} <i>Tragus berteronianus</i>					Increaser 2	Low
¹ <i>Tragus racemosus</i>					Increaser 2	Low
¹ <i>Urochloa brachyura</i>					?	Average
¹ <i>Urochloa panicoides</i>				√	?	Low

Endemic – (Burke 2005, Müller 2007)

? – not classified in literature, but often similar to other species within the genus

Source for literature review: Burke (2005), Müller (2007), Van Oudtshoorn (2012)

During the “dry” season survey the area was virtually bare of grass (Figure 45) with only a few dry tufts observed in some hills and ephemeral drainage lines (Figure 46). Drought and continuous grazing system have resulted in the absence of perennial tuft forming grasses throughout the general area. Due to the overall lack of grass, no attempt was made to quantify species composition in the various habitats.



Figure 45. The general area is devoid of grasses due to drought and continuous grazing system.



Figure 46. Grass was only observed in a few patches in some ephemeral drainage lines.

During the “wet” season survey the conditions had changed remarkably after good rains had fallen in the area during April 2025. Ten grass species, with *Stipagrostis uniplumis* being

dominant (39%), were recorded along various transects in the rocky areas (Figures 47-48); 6 grass species, with *Stipagrostis uniplumis* being dominant (83.8%), recorded in the undulating gravel plain areas (Figure 49-50) and 9 grass species, with *Stipagrostis uniplumis* (36.5%), *Enneapogon cenchroides* (23.5%) and *Eragrostis cylindriflora* (17.2%) being dominant, recorded in ephemeral drainage line areas (Figure 51-52).

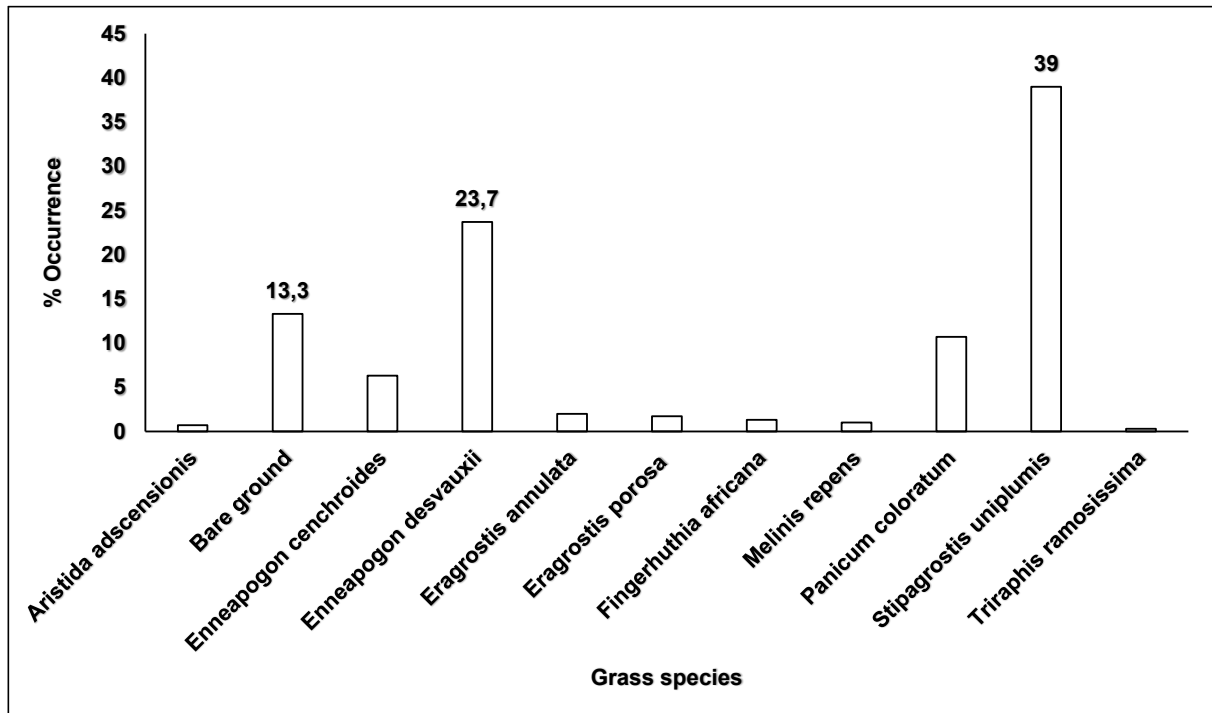


Figure 47. Grass species composition along various transects (300m @ 1m intervals) in the rocky areas habitat (N=300 points).



Figure 48. *Stipagrostis uniplumis* and *Enneapogon desvauxii* grasses were dominant on the rocky areas during the “wet” season survey.

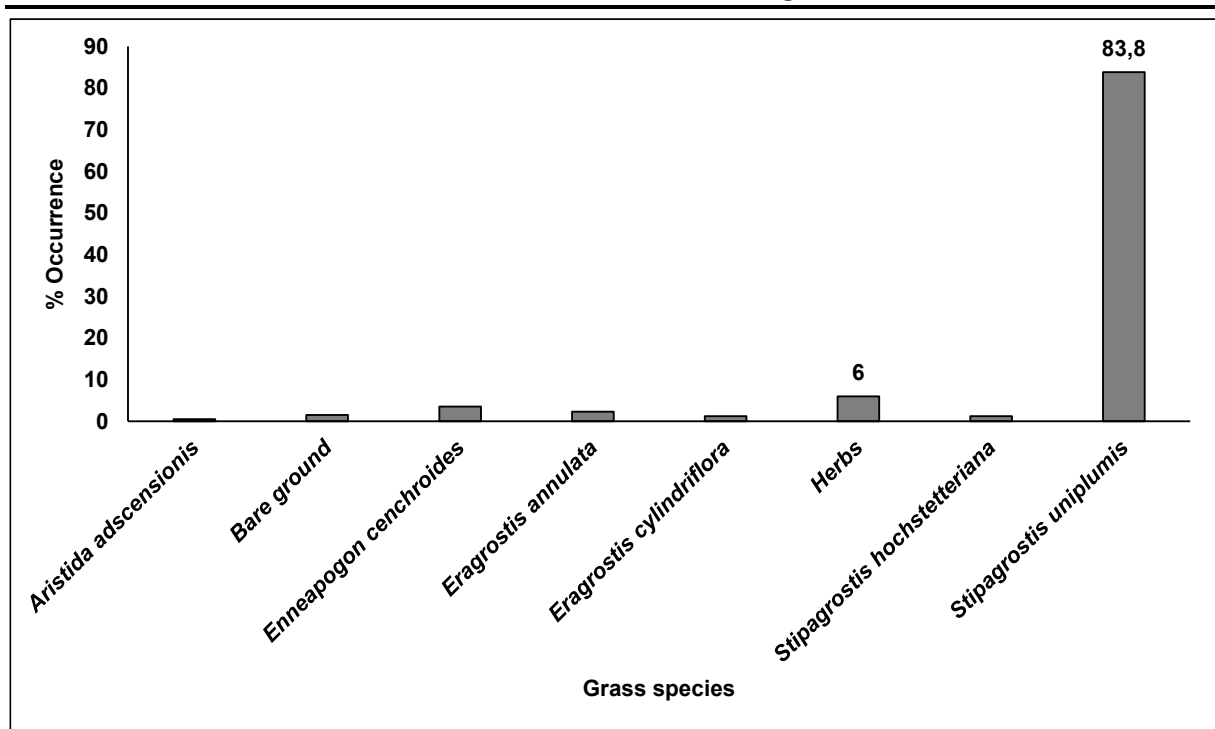


Figure 49. Grass species composition along various transects (400m @ 1m intervals) in the undulating gravel plains habitat (N=400 points).



Figure 50. *Stipagrostis uniplumis* grass were dominant on the undulating gravel plains during the “wet” season survey.

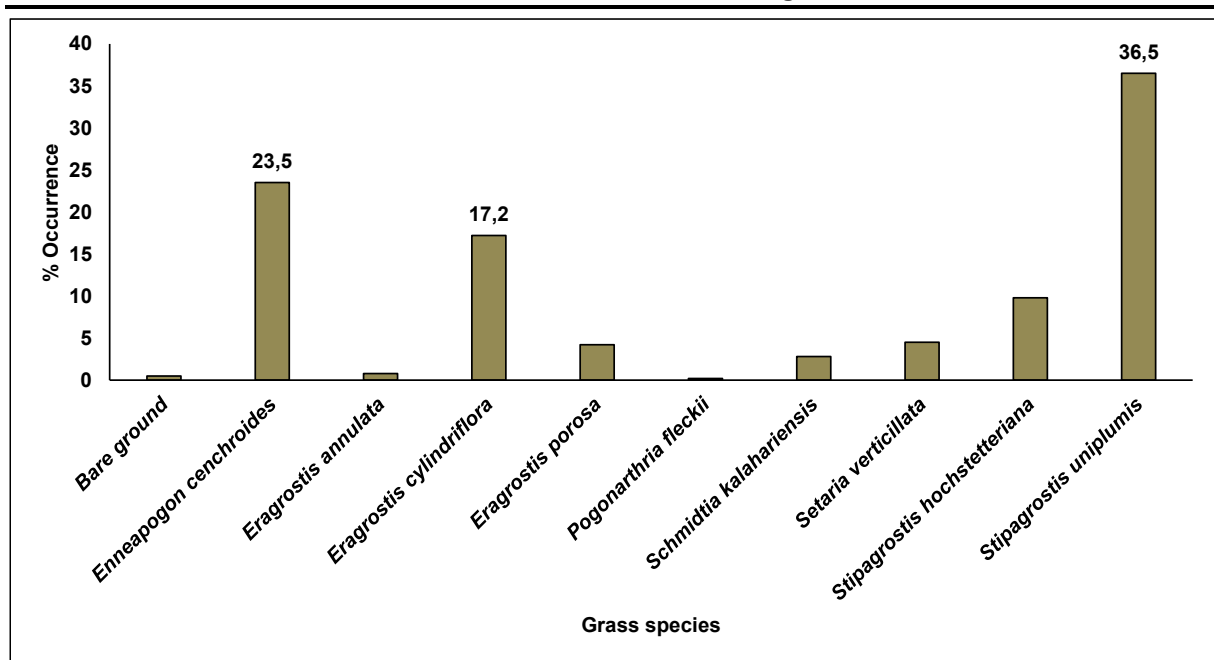


Figure 51. Grass species composition along various transects (400m @ 1m intervals) in the ephemeral drainage line habitat (N=400 points).



Figure 52. *Stipagrostis uniplumis*, *Enneapogon cenchroides* and *Eragrostis cylindriflora* grasses were dominant in the ephemeral drainage lines during the “wet” season survey.

The EPL 4818 area is marginally impacted due to subsistence farming infrastructures and associated anthropogenic influences; current exploration activities and informal mining/prospecting activities; tracks and gravel roads with none of the unique grasses expected to be exclusively associated with this area.

3.7 Other Species

Other species observed throughout the proposed development area included the herbs listed in Table 8.

This list is not comprehensive – i.e., many more species are known and/or expected to occur throughout the general area.

A total of 10 and 49 “other” species (herbs, etc.) were identified during the “dry” and “wet” seasons, respectively, in the various habitats throughout the area (Table 8). The most important “other” species recorded during the field surveys are viewed as the endemics, especially *Rogeria biggibosa* and *Solanum rigescentoides* and *Gosypium anomalum* (NT – IUCN 2025) all associated with rocky habitat (Table 8; Figures 53-54). Cunningham (2021) confirmed a total of 63 “other” species in the general area although after better rainfall conditions while only 21 species (Cunningham 2023) and 12 species (Cunningham 2024) were confirmed under more adverse conditions.



Figure 53. The endemic *Rogeria biggibosa* recorded in rocky habitats.



Figure 54. The endemic *Solanum rigescentoides* recorded in rocky habitats.

Table 8. Other species – bulbs, herbs, etc. – confirmed in various habitats throughout the general area.

Species	Conservation status	Season recorded	
		Dry	Wet
<i>Abutilon fruticosum</i>			√ ^w
<i>Acrotome fleckii</i>			√ ^w
<i>Asparagus</i> spp.		√ ^D	
<i>Barleria lancifolia</i>			√ ^w
<i>Blepharis grossa</i>		√ ^D	
<i>Blepharis obmitrata</i>			√ ^w
<i>Calicorema capitata</i>		√ ^D	
<i>Citrullus lanatus</i>			√ ^w
<i>Cleome angustifolia</i>			√ ^w
<i>Cleome elegantissima</i>			√ ^w
<i>Cleome rubella</i>			√ ^w
<i>Cleome oxyphylla</i>			√ ^w
<i>Crotalaria damarensis</i>			√ ^w
<i>Cucumis africanus</i>			√ ^w
<i>Cucumis meeusei</i>			√ ^w
<i>Dactyliandra welwitschii</i>	N-end		√ ^w
<i>Dicoma tomentosa</i>			√ ^w
<i>Dipcadi glaucum</i>			
<i>Euphorbia glanduligera</i>			√ ^w
<i>Forsskaolea hereroensis</i>	N-end		√ ^w
<i>Geigeria ornativa</i>			√ ^w

<i>Geigeria pectidea</i>			√W
<i>Gossypium anomalum</i>	NT		√W
<i>Helichrysum pumilio</i>			√W
<i>Heliotropium lineare</i>			√W
<i>Hermestaedtia lineare</i>			√W
<i>Indogophera alternans</i>			√W
<i>Indogophera heterotricha</i>	End		√W
<i>Indogophera pechuelii</i>			√W
<i>Jammesbrittenia tenella</i>	N-end		√W
<i>Jammesbrittenia</i> spp.			√W
<i>Kyphocarpa angustifolia</i>			√W
<i>Launaea intybacea</i>			√W
<i>Leucas pechuelii</i>			√W
<i>Limeum argute-carinatum</i>			√W
<i>Mimulus</i> spp.			√W
<i>Momordica humilis</i>			√W
<i>Monechma cleomoides</i>		√D	
<i>Monechma divaricatum</i>			√W
<i>Monechma genistifolium</i>			√W
<i>Monsonia senegalensis</i>			√W
<i>Monsonia umbellata</i>			√W
<i>Nelsia quadrangula</i>			√W
<i>Peliostomum leucorrhizum</i>			√W
<i>Pergularia daemia</i>		√D	√W
<i>Petalidium variabile</i>		√D	
<i>Petalidium</i> spp.			√W
<i>Rogeria bigibbosa</i>	End		√W
<i>Sarcostemma viminalis</i>		√D	
<i>Senna italica</i>			√W
<i>Sesamum capense</i>			√W
<i>Sesuvium sesuvioides</i>			√W
<i>Solanum rigescentoides</i>	End	√D	√W
<i>Tapinanthus oleifolius</i>		√D	√W
<i>Tephrosia dregeana</i>		√D	√W
<i>Tribulus terrestris</i>			√W
<i>Zygophyllum clavatum</i>		√D	

End & N-end = Endemic & Near endemic (Mannheimer 2012)

International Union for the Conservation of Nature Red List (IUCN 2025): NT = Near Threatened. Most herb species have not yet been assessed by the IUCN Red List.

Invasive alien species

No invasive alien species were observed throughout the EPL 4818 area although *Prosopis* spp. (mesquite spp.) individuals were seen in adjacent areas.

3.8 Important Species

Reptiles

The most important species expected to occur in the general area are viewed as the tortoise *Stigmochelys pardalis*; pythons (*P. anchietae* and *P. natalensis*); Namibian wolf snake (*Lycophidion namibianum*), monitor lizard (*Varanus albigularis*) and some of the endemic and little-known gecko species – e.g., *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Another important species is the “rare” *Afroedura africana africana* – although very little is known about this species (See Table 1).

Amphibians

The most important species expected to occur in the general area are those viewed as endemics (*Poyntonophrynus damaranus*, *Poyntonophrynus hoeschi*, *Phrynomantis annectens* and *Tomopterna damarensis*) and especially the 2 species also classified as data deficient (*Poyntonophrynus damaranus*, *Tomopterna ahli* (*damarensis*)) by the IUCN (2025) (See Table 2).

Mammals

The most important species expected to occur in the general area those viewed as rare in Namibia (Namibian wing-gland bat and Southern African hedgehog) and species classified as vulnerable (cheetah, leopard, Hartmann’s mountain zebra, giraffe) and near threatened (African straw-coloured fruit bat, Commerson’s roundleaf bat, striped leaf-nosed bat, brown hyena) by the IUCN (2025) or endangered (cheetah), vulnerable (spotted hyaena, leopard) and near threatened (brown hyaena) by the Red List of the terrestrial carnivores of Namibia (NCE, LCMAN, MEFT 2022). Another important and unique species, although not observed, but known to occur in the general area, is the endemic Kaokoland slender or black mongoose (See: Cowley and Cunningham 2004, Warren *et al.* 2009) (See Table 3).

Birds

The most important species expected to occur in the general area those classified as endemic to Namibia of which the Damara hornbill, bare-cheeked babbler and Herero chat are viewed as the most important due to the overall lack of knowledge of these species. Although also viewed as important, Rüppel’s korhaan is migratory throughout its range while the rockrunner inhabits inaccessible terrain and is widespread throughout mountainous areas in Namibia. Other species of concern are those classified as endangered (violet wood-hoopoe, Ludwig’s bustard, tawny eagle, booted eagle, martial eagle, black stork) and near threatened (Rüppel’s parrot, Cape eagle owl, Verreaux’s eagle, peregrine falcon) (Simmons *et al.* 2015) and those species classified by the IUCN (2025) as critically endangered (white-backed vulture), endangered (Ludwig’s bustard, lappet-faced vulture, martial eagle, secretarybird), vulnerable (tawny eagle) and near threatened (kori bustard). Although it is not known if vultures (e.g., white-backed vulture) breed in the area, such nesting sites (including all large raptor nesting sites), should these be established and/or located in future, are viewed as extremely important and should be avoided at all costs (See Table 5).

Flora

Trees/shrubs and Grasses

The most important species are viewed as *Acacia montis-usti*, *Adenia pechuelii*, *Aloe dichotoma*, *Caesalpinia pearsonii*, *Commiphora dinteri*, *Commiphora kaokoensis*, *Commiphora kraeuseliana*, *Commiphora saxicola*, *Commiphora virgata*, *Commiphora wildii*, *Cyphostemma currorii*, *Erythrina decora*, *Manuleopsis dinteri*, *Moringa ovalifolia*, *Sesamothamnus guerichii*, *Sterculia africana*, *Sterculia quinqueloba* and *Welwitschia mirabilis*. The IUCN (2025) classifies *Aliodendron* (*Aloe*) *dichotoma* as vulnerable; *Acacia montis-usti* and *Gossypium anomalum* as near threatened and *Gossypium triphyllum* as data deficient while all the other species are classified as least concern or have not yet been assessed by the IUCN Red Data Book. However, not all these species are expected to occur in the EPL

4818 area, but rather the larger general area (e.g., *Acacia montis-usti* – Brandberg; *Welwitschia mirabilis* – west/north of Brandberg) (See Tables 6 & 8).

The most important grass species from the general area are viewed as the 2 endemics (*Eragrostis omahekensis*, *Stipagrostis damarensis*), with *S. damarensis* only occurring in the central and northern Namib in dry river courses (See Table 7).

Important plant species known and/or expected from the general area and included in the Red Data Book for Namibia include at least 16 species of which 4 species is listed as rare (*Diclis tenuissima*, *Felicia gunillae*, *Nidorella nordenstamii*, *Pentzia tomentosa*) and 2 species as near threatened (*Adenia pechuelii*, *Lithops gracilidelineata* subsp. *brandbergensis*) (Table 9) (Loots 2005). All the species included in Table 9 are viewed as important.

Table 9. Important species – i.e., Red Data spp. – known to occur in the general area according to Loots (2004).

Species: Scientific name	Conservation status
<i>Adenia pechuelii</i>	Endemic, NT
<i>Aloe dinteri</i>	Endemic, NC, C2, LC
<i>Aloe viridiflora</i>	Endemic, NC, C2, LC
<i>Diclis tenuissima</i>	Endemic, Rare
<i>Dombeya rotundifolia</i> var. <i>velutina</i>	Endemic, LC
<i>Euphorbia montei</i> subsp. <i>brandbergensis</i>	Endemic, C2, LC
<i>Felicia gunillae</i>	Endemic, Rare
<i>Lithops gracilidelineata</i> subsp. <i>gracilidelineata</i>	NC, LC
<i>Lithops gracilidelineata</i> subsp. <i>brandbergensis</i>	Endemic, NC, NT
<i>Lithops ruschiorum</i>	Endemic, NC, LC
<i>Namacodon schinzianum</i>	Endemic, LC
<i>Nicotiana africana</i>	Endemic, LC
<i>Nidorella nordenstamii</i>	Endemic, Rare
<i>Pentzia tomentosa</i>	Endemic, Rare
<i>Selago lepida</i>	Endemic, LC
<i>Trema orientalis</i>	LC

Endemic (Loots 2005)

NC – Nature Conservation Ordinance No. 4 of 1975

Rare; NT – Near Threatened; LC – Least Concern (Loots 2005)

Convention in the Trade of Endangered Species of Fauna and Flora (CITES): C2 = Appendix 2 spp.

Other

Aloes

Aloes are protected throughout Namibia with 2 other aloe species not included in Table 6, but which potentially occur in the general area, and viewed as important are *Aloe asperifolia* and *A. hereroensis* (Rothmann 2004). No *Aloe* spp. was observed during the field surveys.

Amaryllis

There are an estimated 260 members of the Amaryllidaceae family in southern Africa with several taxa in urgent need of conservation (especially associated habitats). In the Desert Biome in Namibia there are an estimated 13 species of which 2 species potentially occur in the general area, albeit towards the southwest in the inland area east from Swakopmund (*Ammocharis deserticola*, *Crinum giessii*) while in the Nama Karroo Biome there are an estimated 4 species, none of which potentially occur in the general area (Duncan *et al.* 2020). No *Amaryllis* spp. was observed during the field surveys.

Commiphora

Many endemic *Commiphora* species are found throughout Namibia with Steyn (2003) indicating that *Commiphora anacardiifolia*, *C. mollis*, *C. crenato-serrata*, *C. multijuga*, *C. oblanceolata* (not included in the Table 6) potentially also occurring in the general area.

Commiphora species have economic potential (i.e., resin properties used in the perfume industry – e.g., *C. wildii*) making them an important species (Nott and Curtis 2006). Three *Commiphora* species were confirmed during the field surveys (*Commiphora glandulosa*, *C. glauscens* and *C. virgata*).

Euphorbias

At least 47 species of *Euphorbia* occur throughout Namibia of which 4 species are listed as rare, 1 endangered, 1 vulnerable and 1 near threatened (Möller and Becker 2019). *Euphorbia* species known/expected to occur in the general area include at least 7 species (*Euphorbia damarana*, *E. gariepina*, *E. guerichiana*, *E. lignosa*, *E. mauritanica*, *E. monteiroi*, *E. virosa*). One *Euphorbia* species was confirmed during the field surveys (*Euphorbia virosa*).

Ferns

At least 64 species of ferns, of which 13 species being endemic, occur throughout Namibia. Ferns in the general area include at least 2 endemic species (*Cheilanthes nielsii*, *Isoetes giessii*) and 13 indigenous species (*Actiniopteris radiata*, *Cheilanthes dinteri*, *C. hirta*, *C. marlothii*, *C. parviloba*, *Doryopteris concolor*, *Isoetes aequinoctialis*, *Marselia aegyptiaca*, *M. ephippiocarpa*, *M. vera*, *Ophioglossum polyphyllum*, *Pteris vittata* and *Pellaea calomelanos*) (Crouch et al. 2011). The general area is undercollected with more species probably occurring in the general area than presented above. No Fern spp. was observed during the field surveys.

Hoodia

Hoodia species are protected throughout Namibia with the following expected to occur in the general area: *Hoodia currorii*, *H. gordonii* and *H. pedicillata* (Anon n.d.). No *Hoodia* spp. was observed during the field surveys.

Lichens

The overall diversity of lichens is poorly known from Namibia, especially the coastal areas and statistics on endemism is even sparser (Craven 1998). More than 100 species are expected to occur in the Namib Desert with the majority being uniquely related to the coastal fog belt (Wirth 2010). Lichen diversity is related to air humidity and generally decreases inland from the Namibian coast (Schultz and Rambold 2007). Off road driving is the biggest threat to these lichens which are often rare and unique to Namibia. To indicate how poorly known lichens are from Namibia, the recent publication by Schultz et al. (2009) indicating that 37 of the 39 lichen species collected during BIOTA surveys in the early/mid 2000's was new to science (i.e., new species), is a case in point. Lichens are known to occur on rocky mountainous terrain in the general area although none were observed during the field surveys.

Lithops

Lithops species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – are also known to occur in the general area and often difficult to observe, especially during the dry season when their aboveground structures wither. The species known to occur in the general area are *Lithops gracilidelineata* var. *gracilidelineata* and *Lithops gracilidelineata* var. *gracilidelineata* subsp. *brandbergensis* (Cole and Cole 2005, Earle and Round n.d.). No *Lithops* spp. was observed during the field surveys.

Other species with commercial potential that could occur in the general area include *Harpagophytum procumbens* (Devil's claw) – harvested for medicinal purposes and often over-exploited – *Citrullus lanatus* (Tsamma melon) which potentially has a huge economic benefit (Mendelsohn et al. 2002) *Commiphora* [*C. wildii*] oil (omumbiri) – cosmetic potential – and *Ximenia americana* (sour plum) – oil (Jarvis et al. 2022).

3.9 Important Areas

The most important areas in the EPL 4818 area are:

1. Granite domes

Granite domes are viewed as sites of ecological importance due being typically high in biotic richness and endemism (Curtis and Barnard 1998). One such granite dome had a leopard (vulnerable, IUCN 2024) latrine which is viewed as an important territorial site for this species (See Section 3.3 & Figure 23). These domes are often habitat to a variety of unique species (e.g., endemic dwarf python; *Python anchietae*) not found in the surrounding gravel plain areas (See Figure 55-57).



Figure 55. Granite dome areas are important habitats to a variety of unique species.

2. Hills/Ridges

Rocky areas generally have high biodiversity and consequently viewed as important habitat for all vertebrate fauna and flora in the general area. Important tree species include various *Commiphora* species (e.g., *C. glauca*, *C. virgata*), wild fig (e.g., *Ficus cordata*), *Moringa ovalifolia* (phantom tree), *Sterculia africana* (African star chestnut), etc. (See Table 6, Figures 33-35, 54-55, 57).



Figure 56. Protected *Moringa ovalifolia* (phantom tree) and *Sterculia africana* (African star chestnut) on granite ridges on the southern boundary of the EPL 4818.

3. Ephemeral drainage lines

The various larger well vegetated ephemeral drainage lines (tributaries of the Omaruru River) are important habitat usually with larger tree species which serve as habitat to a variety of vertebrate fauna – e.g., bark and cavity dwelling bats, birds, rodents, etc. (See Figures 41-44, 56).

4. Raptor nest

The large unidentified nest located in an *Acacia tortilis* (umbrella thorn) tree (S21°11'02.2" & E15°17'24.2). is viewed as an important area as raptors often reuse such nesting sites with their numbers (all species) dramatically decreasing (See Figure 25 & 57). Such nesting sites should be protected and avoided, especially during the breeding season.

5. Black rhino rubbing post

A black rhino (*Diceros bicornis*) rubbing post was located at S21°08'28.0" & E 15°17'21.7" (See Figures 24 & 57) indicating their presence in the area over millennia. Such a site would have been reused over time and serve an important social function as well as of historical importance.

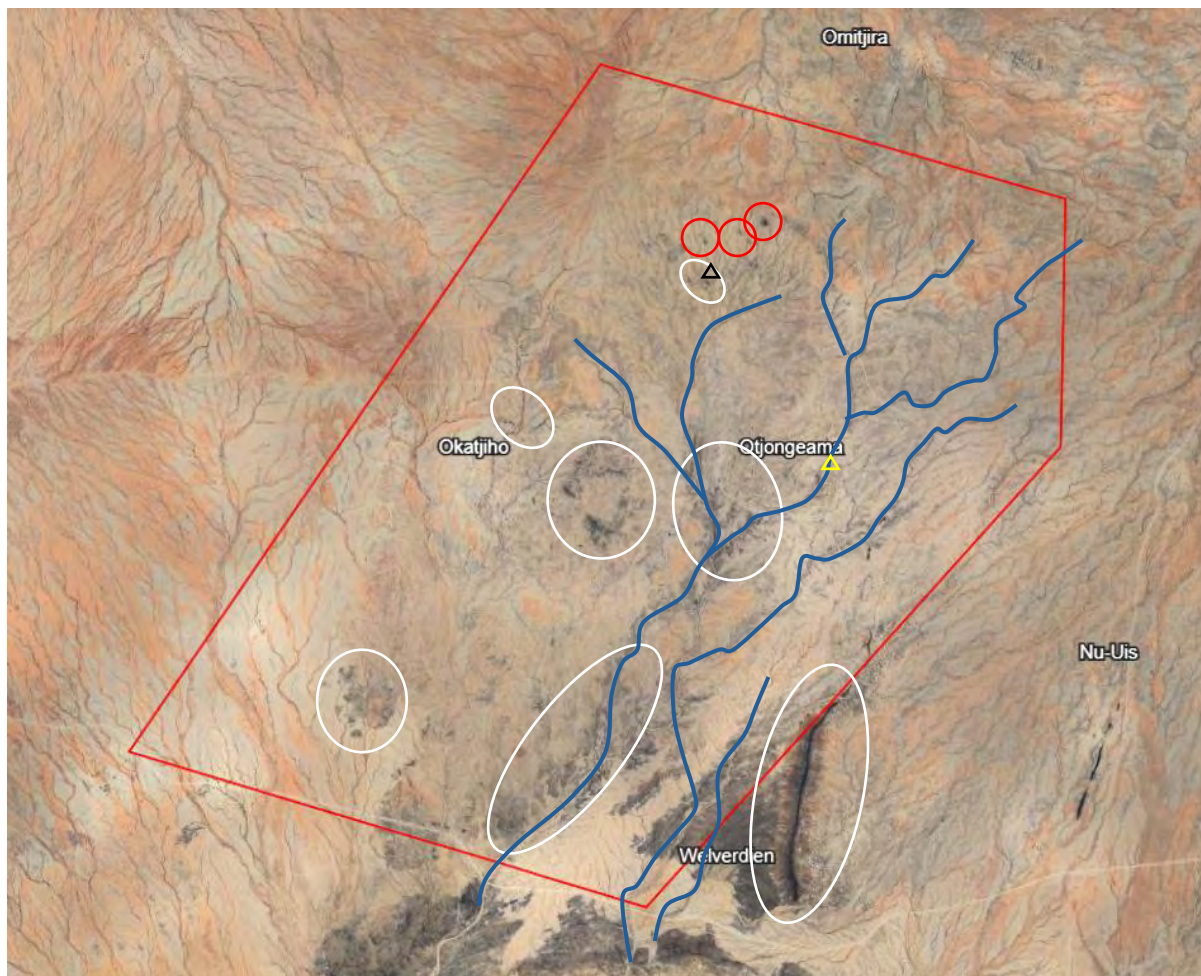


Figure 57. The most important habitats in the EPL 4818 area are the granite domes (red circles); main hills/ridges (white circles/oblongs); main ephemeral drainage lines (blue lines); raptor nesting site (yellow triangle) and black rhino rubbing post (black triangle). However, the ephemeral drainage lines are not as diverse as elsewhere throughout the western escarpment making them slightly less important overall (i.e., compared to drainage lines with large stands of protected tree species, etc.).

IFC Performance Management Issues

Although this biophysical impact assessment was not required to be conducted at the prescribed IFC Performance Management Standard level according to the ToR, the following biodiversity related IFC Standards (highlighted in bold) are expected to be relevant and actions addressed included (*italics*):

Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts Performance

Risks identified: Important species (Section 3.8); Important habitats (Section 3.9) and Envisaged impacts (Section 4) were identified during this study.

Standard 2: Labor and Working Conditions Performance

N/A

Standard 3: Resource Efficiency and Pollution Prevention Performance

N/A

Standard 4: Community Health, Safety, and Security Performance

Hazardous materials management: Addressed in Section 4 – i.e., removal of waste to applicable waste management sites in neighbouring towns/settlements.

Ecosystem services: Not addressed as not part of the ToR for this study but potentially important especially if important habitats such as ephemeral drainage lines are negatively affected.

Standard 5: Land Acquisition and Involuntary Resettlement Performance

N/A

Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources Performance

Modified Vs Natural habitat: Although the area is not viewed as pristine habitat due to various anthropogenic activities throughout the area, it falls between Modified and Natural habitat. This report deals with the various biodiversity related issues relevant to the proposed development area, highlighting important species and habitats potentially affected.

Critical habitat: Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

Points i, ii & iv are relevant in the proposed development area. All these issues have been incorporated within this study – e.g., vertebrate fauna and flora species potentially occurring throughout the area, including species recorded during the fieldwork, with applicable local & international conservation status identified (Section 3); important habitats identified (Section 3.9) and mitigations proposed (Section 4). Granite domes, hills/ridges and larger well vegetated ephemeral drainage lines are viewed as the most critical habitats in the area.

Standard 7: Indigenous Peoples Performance

N/A

Standard 8: Cultural Heritage

N/A

4 Envisaged impacts**4.1 Introduction**

All developments change or are destructive to the local fauna and flora to some or other degree. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope of the development – i.e., development, once initiated, may have a different effect on the fauna and flora as originally predicted. Thus, continuing monitoring of such impacts during the development phase(s) is imperative.

4.2 Faunal impacts

Faunal disturbance with the proposed mining/exploration activities would be localised. The following table indicates the potential/envisaged impacts expected regarding faunal disturbance (which is obviously closely linked to habitat destruction):

Description	Faunal disturbance will vary depending on the scale/intensity of the development operation and associated and inevitable infrastructure.
Extent	1. Mining/exploration site(s) - Localised disruption/destruction of the habitat and thus consequently vertebrate fauna associated directly with the actual sites. This, however, would be relatively small areas – depending on scale/intensity of operations – with localised implications. 2. Mine infrastructure(s) - Localised disruption/destruction of the habitat and thus consequently vertebrate fauna associated directly with the actual sites. This, however, would be relatively small areas – depending on scale/intensity of operations – with localised implications.
Duration	1. Mining site(s) - The duration of the impact is expected to be permanent at the site(s). This, however, would be relatively small area(s) with localised implications. 2. Infrastructure(s) - The duration of the impact is expected to be permanent at the site(s). This, however, would be relatively small area(s) with localised implications.
Intensity	1. Mining site(s) - The actual mining site(s) would be permanently altered. This, however, would be relatively small area(s) with localised implications. 2. Infrastructure(s) - The actual construction sites associated with the various mining infrastructures would be permanently altered. This, however, would be relatively small area(s) with localised implications. The areas adjacent the mining site(s) and other associated infrastructure should not be significantly affected. This, however, would depend on control over the contractors during the road building, construction phase(s) and prospecting/mining phase(s), but should be limited to localised implications. Areas not directly affected by the prospecting/mining and associated infrastructure although within the immediate area would be affected minimally. This would include dust, noise, light and other associated disturbances in the area, but be limited to the prospecting/mining and construction periods.
Mitigation	General 1. Limit the development to actual sites to be mined and avoid affecting adjacent areas, especially granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines, raptor nesting sites, throughout the entire area (See Figure 57 & Section 3.9). 2. Avoid development and associated infrastructure in sensitive areas – e.g., granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines, in the immediate area (See Figure 57 & Section 3.9). This would minimise the negative effect on the local environment especially unique features serving as habitat to various vertebrate fauna species. 3. Remove (e.g., capture) unique fauna and sensitive fauna before commencing with the development activities and/or species serendipitously located during this period and relocate to a less sensitive/disturbed sites in the immediate area. 4. Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods (e.g., tortoises, etc.), indiscriminate killing of perceived dangerous species (e.g., snakes, etc.) and collecting of wood as this would diminish and negatively affect the local fauna – especially during the development phase(s).

	5. Attempt to avoid the removal of bigger trees during the development phase(s) – especially with the development of access routes – as these serve as habitat for a myriad of fauna. 6. Prevent and discourage fires – especially during the development phase(s) – as this could easily cause runaway veld fires affecting the local fauna, but also causing problems (e.g., loss of grazing and domestic stock mortalities, etc.) for the neighbouring communal farmers. 7. Rehabilitation of the disturbed areas – i.e., initial development access route “scars” and associated tracks as well as associated mining infrastructures. Preferably workers should be transported in/out to the construction sites daily to avoid excess damage to the local environment (e.g., fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity but also show true local commitment to the environment. 8. Prevent domestic pets – e.g., cats and dogs – accompanying the workers during the construction phase as cats decimate the local fauna and interbreed and transmit diseases to the indigenous African wildcat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna. The indiscriminate and wanton killing of the local fauna by such pets should be avoided at all costs. 9. Initiate a suitable waste removal system (i.e., remove to Omaruru/Okombahe/Uis and not store on site) as this often attracts wildlife – e.g., black-backed jackal, crows, etc. – which may result in human-wildlife conflict issues. 10. Educate/inform contractors and staff on protected species (See Tables 1 to 7) to avoid and the consequences of illegal collection of such species. 11. Employ an Environmental Officer during the construction phase(s) to ensure compliance and minimise the overall impact on the fauna and the environment. Tracks 12. Avoid placing access routes (roads and tracks) through sensitive areas – e.g., granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines (Figure 57). This would minimise the effect on localised potentially sensitive habitats in the area. 13. Avoid driving randomly through the area (i.e., “track discipline”), but rather stick to permanently placed roads/tracks – especially during the construction phase. This would minimise the effect on localised potentially sensitive habitats in the area. 14. Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Speed humps could also be used to ensure the speed limit. Lower speeds would also minimise dust pollution. 15. Implement erosion control. – i.e., avoid constructing tracks up steep gradients; incorporate erosion furrows (runoff sites) and humps along tracks to channel water off the tracks to minimise erosion problems; cross drainage lines at right angles, etc. The area(s) towards and adjacent the drainage line(s) are easily eroded, and further development may exacerbate this problem. Avoid construction within 100m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated flora and fauna.
Frequency of occurrence	Expected to be a “once off” issue affecting the selected site(s). Further prospecting and associated road construction (should this become necessary and/or evident during the mining operations) including power line and water

Vertebrate Fauna & Flora - Cunningham

	pipeline construction activities throughout the area would however increase the frequency of occurrence.
Probability	Definite (100%) negative impact on fauna is expected in the actual mining areas (open pits) as well as along the access route(s) and infrastructure development sites. This, however, would be much localised and cover only a small area(s) and should avoid sensitive areas. Highly Probable (75%) negative impact on fauna is expected in the general areas especially during the construction and mining phase(s) because of noise, increased activities, etc. Probable (50%) negative impact on fauna is expected from the infrastructure (roads/tracks/buildings, etc.). Precautionary principle (e.g., avoid unique habitat features as well as adhering to the proposed mitigating measures would minimise this) would decrease the significance of these potential impacts.
Significance	Before mitigation: High After mitigation: Medium to Low
Status of the impact	Negative Localised unique habitats (e.g., granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines) with associated fauna would bear the brunt of this proposed development but be limited in extent and only permanent at the actual mining site(s) and access routes and infrastructure sites.
Legal requirements	Fauna related: Nature Conservation Ordinance No. 4 of 1975, CITES, IUCN and SARDB Habitat – Flora related: Forest Act No. 12 of 2001, Nature Conservation Ordinance No. 4 of 1975, CITES
Degree of confidence in predictions	As an ecologist I am sure of the above-mentioned predictions made and would suggest that the mitigation measures be implemented to minimise potentially negative aspects regarding the local fauna in the area.

4.3 Floral impacts

Floral disturbance with the proposed mining/exploration activities would be localised. The following table indicates the potential/envisaged impacts expected regarding floral disturbance (which is obviously closely linked to habitat destruction):

Description	Floral disturbance will vary depending on the scale/intensity of the development operation and associated and inevitable infrastructure.
Extent	1. Mining/exploration site(s) - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This, however, would be relatively small areas – depending on scale/intensity of operations – with localised implications. 2. Mine infrastructure(s) - Localised disruption/destruction of the habitat and thus consequently flora associated directly with the actual sites. This, however,

	would be relatively small areas – depending on scale/intensity of operations – with localised implications.
Duration	1. Mining site(s) - The duration of the impact is expected to be permanent at the site(s). This, however, would be relatively small area(s) with localised implications. 2. Infrastructure(s) - The duration of the impact is expected to be permanent at the site(s). This, however, would be relatively small area(s) with localised implications.
Intensity	1. Mining site(s) - The actual mining site(s) would be permanently altered. This, however, would be relatively small area(s) with localised implications. 2. Infrastructure(s) - The actual construction sites associated with the various mining infrastructures would be permanently altered. This, however, would be relatively small area(s) with localised implications. The areas adjacent the mining site(s) and other associated infrastructure should not be significantly affected. This, however, would depend on control over the contractors during the road building, construction phase(s) and prospecting/mining phase(s), but should be limited to localised implications. Areas not directly affected by the prospecting/mining and associated infrastructure although within the immediate area would be affected minimally. This would include dust and other associated disturbances in the area but is limited to the prospecting/mining and construction periods.
Mitigation	General 1. Limit the development to actual sites to be mined and avoid affecting adjacent areas, especially granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines, throughout the entire area (See Figure 57 & Section 3.9). 2. Avoid development and associated infrastructure in sensitive areas – e.g., granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines in the immediate area (See Figure 57 & Section 3.9). This would minimise the negative effect on the local environment especially unique features serving as habitat to various vertebrate fauna/flora species. 3. Remove unique and sensitive flora (e.g., <i>Aloe</i> spp., <i>Commiphora</i> spp., <i>Hoodia</i> spp., <i>Lithops</i> spp., etc. – See Table 6) before commencing with the development activities and relocate to a less sensitive/disturbed sites in the immediate area. 4. Prevent and discourage the collecting of firewood as dead wood has an important ecological role – especially during the development phase(s). Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g., chopping down of live and/or protected tree species such as <i>Acacia erioloba</i>, etc. which are good quality wood. 5. Attempt to avoid the removal of bigger trees during the development phase(s) – especially with the development of access routes – as these serve as habitat for a myriad of fauna. Avoid the destruction of larger trees associated with the ephemeral drainage lines. 6. Prevent and discourage fires – especially during the development phase(s) – as this could easily cause runaway veld fires causing problems (e.g., loss of grazing and domestic stock mortalities, etc.) for the neighbouring communal farmers.

	7. Rehabilitation of the disturbed areas – i.e., initial development access route “scars” and associated tracks as well as associated mining/prospecting infrastructures. Preferably workers should be transported in/out to the construction sites daily to avoid excess damage to the local environment (e.g., fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity but also show true local commitment to the environment. 8. Prevent the planting of potentially invasive alien plant species (e.g., <i>Prosopis</i> spp., etc.) for ornamental purposes as part of the landscaping – e.g., office buildings, plant site, access gate, etc. Alien species often “escape” and become invasive causing further ecological damage. 9. Eradicate – destroy – all invasive alien plants encountered on site – e.g., <i>Prosopis</i> spp. (mesquite), etc. – should these be found on site. This would ensure that the spread is limited and show environmental commitment. 10. Incorporate indigenous vegetation – especially the protected species e.g., <i>Aloe</i> spp., <i>Commiphora</i> spp., <i>Hoodia</i> spp., etc. – into the overall landscaping. Indigenous species require less water and overall maintenance. 11. Educate/inform contractors and staff on protected species (See Tables 6-9 and Section 3.8) to avoid and the consequences of illegal collection of such species. 12. Employ an Environmental Officer during the construction phase(s) to ensure compliance and minimise the overall impact on the flora and the environment. Tracks 13. Avoid placing access routes (roads and tracks) through sensitive areas – e.g., granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines. This would minimise the effect on localised potentially sensitive flora and habitats in the area. 14. Avoid driving randomly through the area (i.e., “track discipline”), but rather stick to permanently placed roads/tracks – especially during the construction phase. This would minimise the effect on localised potentially sensitive flora and habitats in the area. 15. Stick to speed limits of maximum 30km/h as this would result in less dust pollution. Speed humps could also be used to ensure the speed limit 16. Implement erosion control. – i.e., avoid constructing tracks up steep gradients; incorporate erosion furrows (runoff sites) and humps along tracks to channel water off the tracks to minimise erosion problems; cross drainage lines at right angles, etc. The area(s) towards and adjacent the drainage line(s) are easily eroded, and further development may exacerbate this problem. Avoid construction within 100m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated flora and fauna.
Frequency of occurrence	Expected to be a “once off” issue affecting the selected site(s). Further prospecting and associated road construction (should this become necessary and/or evident during the mining operations) including power line and water pipeline construction activities throughout the area would however increase the frequency of occurrence.
Probability	Definite (100%) negative impact on flora is expected in the actual mining areas (open pits) as well as along the access route(s) and infrastructure development sites. This, however, would be much localised and cover only a small area(s) and should avoid sensitive areas.

	Highly Probable (75%) negative impact on flora is expected in the general areas especially during the construction and mining phase(s) because of dust, increased activities, etc. Probable (50%) negative impact on flora is expected from the infrastructure (roads/tracks/buildings, etc.). Precautionary principle (e.g., avoid unique habitat features as well as adhering to the proposed mitigating measures would minimise this) would decrease the significance of these potential impacts.
Significance	Before mitigation: High After mitigation: Medium to Low
Status of the impact	Negative Localised unique habitats (e.g., granite domes, rocky outcrops/ridges, larger well vegetated ephemeral drainage lines) with associated flora would bear the brunt of this proposed development but be limited in extent and only permanent at the actual mining site(s) and access routes and infrastructure sites.
Legal requirements	Flora & Habitat related: Forest Act No. 12 of 2001, Nature Conservation Ordinance No. 4 of 1975, CITES, IUCN, Red Data Book (Namibian plants)
Degree of confidence in predictions	As an ecologist I am sure of the above-mentioned predictions made and would suggest that the mitigation measures be implemented to minimise potentially negative aspects regarding the local flora in the area.

4.4 Impacts – Assessment Framework

The exploration and mining activities would result in various impacts on the vertebrate fauna and flora and can be placed into three categories:

Direct Impacts: These are directly as a result of the exploration activities and associated developments and include general habitat destruction and the destruction of species of conservation concern.

Indirect Impacts: These are not directly associated with the proposed developments but potentially affect species of conservation concern recorded within the general area and include impacts as a result of changes in the hydrology, etc. and affect species rather on a population level.

Cumulative Impacts: These are impacts that the proposed developments will have from a broad area perspective by considering land-use and transformation of natural habitat in areas surrounding the site (i.e., considering past, present and anticipated changes to biodiversity).

Mitigation measures are not always straightforward and/or easy to implement, but should be based on the following steps as mitigation hierarchy:

Step 1: Avoid/prevent loss to biodiversity and ecosystem services: The project location, layout and phasing should avoid negative impacts on biodiversity. Areas of high biodiversity should be identified prior to development activities to avoid negative impacts;

Step 2: Minimise impacts on biodiversity and ecosystem services: The project location, layout, and phasing should minimise the negative impacts on biodiversity;

Step 3: Rehabilitation – concurrently, progressively and on cessation of the activity: Rehabilitation should attempt to return the affected area(s) to pre-development natural state; and

Step 4: Offset significant residual negative impacts on biodiversity or ecosystem services: This refers to the compensation for the remaining and unavoidable negative impacts on biodiversity.

Assessment Criteria

The environmental impacts are assessed with and without mitigation measures and the results are presented in impact tables summarising the assessment. Mitigation and management actions are recommended to enhance positive impacts and minimising negative impacts.

The following risk assessment was used to determine the significance of impacts.

Significance = (Magnitude + Duration + Scale) x Probability

The maximum potential value for significance of an impact is 100 points. Environmental impacts are rated as high, medium, or low significance on the following basis:

High environmental significance = 60-100 points

Medium environmental significance = 30-59 points

Low environmental significance = 0-29 points

Magnitude (M)

[Description & Numerical value]

Very high = 10

High = 8

Moderate = 6

Low = 4

Minor = 2

Duration (D)

[Description & Numerical value]

Permanent = 5

Long-term (ceases at end of operation) = 4

Medium-term = 3

Short-term = 2

Immediate = 1

Scale (S)

[Description & Numerical value]

International = 5

National = 4

Regional = 3

Local = 2

Site = 1

None = 0

Probability (P)

[Description & Numerical value]

Definite (or unknown) = 5

High = 4

Medium = 3

Low = 2
 Improbable = 1
 None = 0

The following criteria against which these activities are assessed are presented below.

Nature of the Impact

This is an appraisal of the type of effect the project would have on the environment. This description includes what would be affected and how and whether the impact is expected to be positive or negative.

Scale of the Impact

A description of whether the impact will be local, limited to the study area and its immediate surroundings, regional, national or international scale.

Duration of the Impact

This provides an indication of whether the lifespan of the impact would be immediate, short term (0-5 years), medium term (6-15 years), long term (cesses at end of operational phase) or permanent.

Probability of Occurrence

This describes the probability of the impact occurring. This is rated as none, improbable (low likelihood), low, medium, high and definite.

Significance

This describes the degree of significance for the predicted impact based on the available information and level of knowledge and expertise – i.e., High, Medium and Low.

4.5 Assessment: Construction, Operational and Decommissioning Phases

The exploration and mining activities would include the following:

- Exploration/drill sites;
- Access routes (tracks); and
- Associated mining infrastructures.

The impacts that the construction and operation of the proposed exploration/mining activities may have on the vertebrate fauna and flora recorded throughout the general area were based on a comprehensive literature review and rapid site assessment.

Possible impacts and their sources that this development is likely to have on the biodiversity and ecology (vertebrate fauna and flora) are provided for the construction phase (Table 9), operational phase (Table 10) and decommissioning phase (Table 11).

Table 9. Impacts expected to occur during the Construction Phase.

Impact - Description	Impact - Source	Affected Area
Destruction of vertebrate fauna, especially protected spp.	Exploration & drill sites and access route(s) & vehicle movement	Granite domes & rocky areas & drainage lines

Destruction of vegetation, especially protected tree/shrub spp.	Exploration & drill sites and access route(s)	Ephemeral drainage lines
Destruction of sensitive habitats	Exploration & drill sites and access route(s)	Granite domes & rocky areas & drainage lines
Soil erosion issues	Mechanised activities especially adjacent drainage lines	Exploration & drill sites
Introduction & spread of invasive alien plant spp.	Ground clearing activities & habitat change	Exploration & drill sites

Table 10. Impacts expected to occur during the Operational Phase.

Impact - Description	Impact - Source	Affected Area
Destruction of vertebrate fauna, especially protected spp.	Development sites and access route(s) & vehicle movement	Development sites
Soil erosion issues	Access/maintenance route(s)	Development sites
Introduction & spread of invasive alien plant spp.	Access/maintenance route(s)	Development sites

Table 11. Impacts expected to occur during the Decommissioning Phase.

Impact - Description	Impact - Source	Affected Area
Destruction of vertebrate fauna, especially protected spp.	Vehicle movement	Project area
Soil erosion issues	Vehicle movement	Project area
Introduction & spread of invasive alien plant spp.	Vehicle movement	Project area

4.6 Impacts: Construction, Operational and Decommissioning Phases

The following impact tables describe the impacts that are expected to occur during the Construction, Operational and Decommissioning Phases:

CONSTRUCTION PHASE:

1. Destruction of vertebrate fauna, especially protected species

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Local (2)	Permanent (5)	High (8)	Definite (5)	High (75)	High
With Mitigations	Site (1)	Long term (4)	Low (4)	High (4)	Medium (36)	High

Description of Impact: The land clearing activities (exploration & drill sites; access routes; infrastructures) by mechanical methods, at the various development areas would result in numerous protected species, being eradicated and/or dispersed (See Tables 1-4). Vertebrate fauna (e.g., especially sedentary, slow moving and ground nesting species; various cavity dwellers such as bats, various reptiles, etc.; various avifauna using vegetation in affected areas for perching/roosting/breeding, etc.) associated with the area, especially the old/large tree specimens associated with the various ephemeral drainage lines, would be killed and/or displaced.

Mitigation Measures:

- Remove important slow-moving species such as tortoises, chameleons, etc. prior to construction activities as well as when serendipitously encountered throughout the proposed development areas;
- Avoid granite domes & rocky outcrops/ridges as these support localised populations of various unique species;
- Avoid trees with raptor nests; and
- See Figure 57 for areas to avoid and/or limit activities.

2. Destruction of vegetation, especially protected tree/shrub species

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Local (2)	Permanent (5)	High (8)	Definite (5)	High (75)	Definite
With Mitigations	Site (1)	Long term (4)	Low (4)	High (4)	Medium (36)	High

Description of Impact: The land clearing activities (exploration & drill sites; access routes; infrastructures) by mechanical methods, at the various development areas would result in numerous protected tree species, being eradicated (See Table 6). Vertebrate fauna (e.g., cavity dwellers such as bats, gallago, hornbills, parrots, various reptiles, etc. including various raptors e.g. eagles, vultures using such trees as perching/roosting/breeding) associated with these trees, especially the old/large specimens, would be killed and/or displaced.

Mitigation Measures:

- Remove and relocate important species – e.g., Aloe spp., Commiphora spp., Lithops spp., etc.;
- Avoid granite domes; rocky outcrops/ridges & larger well vegetated ephemeral drainage lines as these support localised populations of various unique species;
- Avoid trees with raptor nests; and
- See Figure 57 for areas to avoid and/or limit activities.

3. Destruction of sensitive habitats

Vertebrate Fauna & Flora - Cunningham

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Local (2)	Permanent (5)	Very high (10)	Definite (5)	High (85)	Definite
With Mitigations	Site (1)	Long term (4)	Low (4)	High (4)	Low (36)	High

Description of Impact: The land clearing activities (exploration & drill sites; access routes; infrastructures) by mechanical methods, at the various development areas would result in some sensitive habitats being destroyed and/or detrimentally affected (See Section 5). Vertebrate fauna & flora associated with these sensitive habitats, would be killed and/or displaced.

Mitigation Measures:

- Avoid granite domes; rocky outcrops/ridges & larger well vegetated ephemeral drainage lines as these support localised populations of various unique species; and
- See Figure 57 for areas to avoid and/or limit activities.

4. Soil erosion issues

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Long term (4)	Moderate (6)	High (4)	Medium (44)	High
With Mitigations	Site (1)	Short term (2)	Minor (2)	Low (2)	Low (10)	High

Description of Impact: The land clearing activities (exploration & drill sites; access routes; infrastructures) by mechanical methods especially adjacent the ephemeral drainage lines could result in erosion issues.

Mitigation Measures:

- Avoid mechanical activities adjacent/through the various larger ephemeral drainage lines;
- Where new tracks must be made off the main routes, the routes should be selected causing minimal damage to the environment – e.g., use the same tracks; cross drainage lines at right angles; avoid placing tracks within drainage lines; avoid collateral damage (i.e. select routes that do not require the unnecessary removal of trees/shrubs, especially protected species);
- Rehabilitate all new tracks created; and
- Monitor & implement erosion control measures after each rainy season.

5. Invasion and spread of invasive alien plant species

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Long term (4)	Moderate (6)	High (4)	Medium (44)	High
With Mitigations	No (0)	Immediate (1)	Minor (2)	Low (2)	Low (6)	High

Description of Impact: Soil disturbances by mechanical methods, at the various development areas could result in invasive alien plant species becoming established.

Mitigation Measures:

- Limit land clearing activities to the actual development sites and infrastructures areas to prevent random soil disturbances favouring invasive alien plant species;
- Remove and destroy all invasive alien plants encountered in the project area;
- Ensure that vehicles accessing the route are free of vegetation, especially if contractors are used which also use their vehicles in urban areas; and
- Monitor & implement invasive alien plant control measures annually.

OPERATIONAL PHASE:**6. Destruction of vertebrate fauna, especially protected species**

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Long term (4)	Moderate (6)	High (4)	Medium (44)	High
With Mitigations	Site (1)	Short term (2)	Low (4)	High (4)	Low (28)	High

Description of Impact: Ongoing exploration/drilling & actual mining operations, at the various development areas would result in certain species being affected negatively (See Tables 1-4). Maintain track discipline throughout while offroad and nocturnal driving would increase mortalities of nocturnal species (e.g., owls, certain carnivores, etc.); species attracted to the area for food, water & artificial habitats (e.g., geckos, snakes, various carnivore, ungulates) and artificial lighting would also attract nocturnal species (e.g., bats, owls).

Mitigation Measures:

- Remove important slow-moving species such as tortoises, chameleons, etc. when serendipitously encountered throughout the proposed development areas;
- Maintain track discipline and limit/prevent nocturnal & offroad driving;
- Ensure adequate waste control – i.e., remove waste to Municipal landfill sites (e.g., Omaruru/Okombahe/Uis);
- Prevent water from accumulating in ponds, etc. (would attract amphibians, various birds; carnivores & ungulates); and
- Use focused lighting (lights expected to attract nocturnal species such as bats, owls, certain carnivores, etc.).

7. Soil erosion issues

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Long term (4)	Moderate (6)	High (4)	Medium (44)	High
With Mitigations	Site (1)	Short term (2)	Low (4)	Low (2)	Low (14)	High

Description of Impact: Typical exploration/mining operations, would result in continued erosion issues if not continuously maintained. The focus areas should be adjacent the various ephemeral drainage lines.

Mitigation Measures:

- Implement and maintain erosion control measures where applicable along the access routes – i.e., use the same tracks; cross drainage lines at right angles;
- Rehabilitate eroded areas annually – i.e., after the rainy season and/or flooding events (during winter months); and
- Maintain track discipline – i.e., no offroad driving; speed control; use the same tracks, etc.

8. Introduction & spread of invasive alien plant spp.

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Short term (2)	Low (4)	High (4)	Low (28)	High
With Mitigations	None (0)	Immediate (1)	Minor (2)	Low (2)	Low (6)	High

Description of Impact: Invasive alien plant species would become established on disturbed areas and could also inadvertently continuously be transported into the area as seed on the various vehicles accessing the area.

Mitigation Measures:

- Remove and destroy all invasive alien plants encountered throughout the area; and
- Ensure that vehicles accessing the project area are free of vegetation, especially if contractors are used which also use their vehicles in urban areas.

DECOMMISSIONING PHASE:**9. Destruction of vertebrate fauna, especially protected spp.**

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Short term (2)	Low (4)	High (4)	Low (28)	High
With Mitigations	Site (1)	Immediate (1)	Minor (2)	High (4)	Low (16)	High

Description of Impact: Typical rehabilitation operations, including heavy vehicle movement along the various access routes to remove infrastructures, would result in some destruction of vertebrate fauna (i.e., especially slow-moving species).

Mitigation Measures:

- Avoid sensitive areas;
- Avoid nocturnal vehicle movement; and
- Maintain and enforce track discipline – i.e., no offroad driving; speed control; use the same tracks, etc.

10. Soil erosion issues

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Short term (2)	Moderate (6)	High (4)	Medium (36)	High
With Mitigations	Site (1)	Immediate (1)	Low (4)	Low (2)	Low (12)	High

Description of Impact: Typical rehabilitation operations, including heavy vehicle movement along the various access routes to remove infrastructures, would result in some erosion issues if not continuously maintained.

Mitigation Measures:

- Rehabilitate eroded areas annually – i.e., after the rainy season & flooding events (during winter months); and
- Maintain and enforce track discipline – i.e., no offroad driving; speed control; use the same track, etc.

11. Introduction & spread of invasive alien plant spp.

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
Without Mitigations	Site (1)	Short term (2)	Low (4)	High (4)	Low (28)	High
With Mitigations	Site (1)	Immediate (1)	Minor (2)	Low (2)	Low (8)	High

Description of Impact: Invasive alien plant species would become established on disturbed areas and could also inadvertently continuously be transported into the area as seed on the various vehicles accessing the area.

Mitigation Measures:

- Remove and destroy all invasive alien plants encountered throughout the area; and
- Ensure that vehicles accessing the project area are free of vegetation, especially if contractors are used which also use their vehicles in urban areas.

5 Conclusion

As all development have potential negative environmental consequences, identifying the most important faunal species including high risk habitats beforehand, coupled with environmentally acceptable mitigating factors, lessens the overall impact of such development.

Vertebrate fauna species most likely to be adversely affected by the exploration/mining in the EPL 4818 area would be sedentary species (i.e., species with limited mobility) such as unique reptiles tortoise *Stigmochelys pardalis*; pythons (*P. anchietae* and *P. natalensis*); Namibian wolf snake (*Lycophidion namibianum*), monitor lizard (*Varanus albigularis*) and some of the endemic and little-known gecko species – e.g., *Pachydactylus* species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Another important species is the “rare” – i.e., *Afroedura africana africana* – although very little is known about this species. Due to the lack of open surface water, amphibians are not viewed as important in the area although the endemics (*Poyntonophrynus damaranus*, *Poyntonophrynus hoeschi*, *Phrynomantis annectens* and *Tomopterna damarensis*) and especially the species classified as data deficient (*Poyntonophrynus damaranus*, *Tomopterna ahli (damarensis)*) by the IUCN (2025) are important. Mammals are more mobile and although important species are known to occur and/or pass through the area (see elsewhere in this report) none are expected to be specifically associated and/or expected to be negatively affected by mining developments. Although general disturbances could affect bird species of concern – i.e., those classified as endangered (violet wood-hoopoe, Ludwig’s bustard, tawny eagle, booted eagle, martial eagle, black stork) and near threatened (Rüppel’s parrot, Cape eagle owl, Verreaux’s eagle, peregrine falcon) (Simmons *et al.* 2015) and those species classified by the IUCN (2025) as critically endangered (white-backed vulture), endangered (Ludwig’s bustard, lappet-faced vulture, martial eagle, secretarybird), vulnerable (tawny eagle) and near threatened (kori bustard) – birds are also mobile and not limited to the area. The raptor nest (See Figures 25 & 57) should be avoided, especially during the breeding season, and protected.

Flora species most likely to be adversely affected by exploration/mining would be the various protected species – See Tables 6 and 9; Section 3.9 – although these species are not specifically associated with the EPL 4818 area.

Important areas in the general vicinity are viewed as the granite domes; rocky hills/ridges and main ephemeral drainage lines – See Section 3.9 and Figure 57.

It is not expected that further exploration/mining developments will adversely affect any unique vertebrate fauna and flora in the EPL 4818 area, especially if the proposed recommendations (mitigation measures) are incorporated – See Sections 3.8, 3.9, 4.2, 4.3 & 4.6 + Figure 57.

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