mora
ecological services
(Pty)LTD

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT:

MINING PERMIT APPLICATION ON PORTION OF THE FARM STEINKOPF NO 22, WITHIN NAMA KHOI MUNICIPALITY IN NORTHERN CAPE PROVINCE

DOCUMENT CONTROL

Report Name	MOLEPO, M., MOTHWA, R. & MAKHUBELA, D., 2022. TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT FOR THE PROPOSED MINING PERMIT APPLICATION ON PORTION OF THE FARM STEINKOPF NO 22, WITHIN NAMA KHOI MUNICIPALITY IN NORTHERN CAPE PROVINCE.
Reference	GM/TBIA0522
Submitted to	GREENMINED ENVIRONMENTAL
Authors	Mokgatla Molepo *Pr. Sci.Nat*: 009509 Ramokone Mothwa Makhubela Dineo

BACKGROUND AND EXECUTIVE SUMMARY

MORA Ecological Services (Pty) Ltd was appointed by Greenmined Environmental on behalf of Namli Exploration and Mining (Pty) Ltd to conduct a terrestrial biodiversity impact assessment for the proposed mining permit application on portion of the Farm Steinkopf No 22 within Nama Khoi Metropolitan Municipality in Northern Cape Province.

The study site was investigated to determine potential impacts on the immediate natural environment. Survey methodology included a comprehensive desktop review, utilising available provincial ecological data, relevant literature, SANBI BGIS databases, topographical maps, and aerial photography. This was then supplemented through a ground-truthing phase, where the site was visited during a field survey in April 2022. This allowed for the assessment of the habitat integrity and status of the vegetation that was identified during the desktop review.

Floral features:

The study site falls within the Desert biome, and the vegetation type found on site is Eastern Gariep Rocky Desert. The study site consists mainly of low shrubs. Species of Conservation Concern which were observed on site are *Aloidendron dichotomum* (Quiver tree), *Boscia foetida* (Stink Shepherd's tree) and *Euphorbia gregaria* (Aggenysmelkbos).

Faunal features:

The mammals and reptiles were surveyed through direct and indirect methods, while birds were surveyed through direct methods. Although no mammals were observed during the survey, several bird and reptile species were recorded, and these were generalist species. From the survey conducted, no Species of Conservation Concern were observed.

Conclusions and Recommendations:

The project area has a low-medium ecological function due to current land use and previous disturbances. Although the site was previously disturbed, there are provincially protected plants that should be conserved and protected against damage. These plants should be resued and relocated. Relevant permits should be obtained before disturbance of any protected plant species.

The site falls within the Kamiesberg Bushmanland Augrabies Focus Area which represents the largest remaining natural area for the expansion of the protected area network. Therefore, it is advisable to keep all activities within the current disturbed site and to avoid encroaching into other undisturbed areas. The site must be rehabilitated post mining activities. This should be done in consultation with local experts.

TABLE OF CONTENTS

List of tables

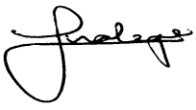
DECLARATION OF INDEPENDENCE

I, Mokgatla Molepo, in my capacity as a lead specialist consultant, hereby declare that I:

- Act/acted as an independent specialist to Greenmined Environmental for this project.
- Do not have any personal, business or financial interest in the project expect for financial remuneration for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2017.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed developments but aim to present facts and my best scientific and professional opinion regarding the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2017.

INDEMNITY

- This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using available information and data related to the site to be affected, *in situ* fieldwork, surveys and assessments and the specialists best scientific and professional knowledge.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions and recommendations given in this report are based on the specialist's best scientific and professional knowledge as well as information available at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information and recommendations in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgement of these terms and liabilities.



Mokgatla Molepo *Pr. Nat. Sci* (009509)

20 May 2022

1. INTRODUCTION

Humans alter their environment to suit their needs, to improve their quality of life, and to encourage economic growth. Generally, it is now accepted that development should be planned to make the best possible use of natural resources and to avoid degradation of the environment. Hence the need to pay explicit attention to environmental factors in the decision-making process. This should entail an accurate prediction and assessment of the impact of any development on the environment. It is essential for such assessment procedures to be developed alongside development planning, with the necessary mitigation that could inform development projects to conserve the natural environment.

MORA Ecological Services (Pty) Ltd has been appointed by Greenmined Environmental on behalf of Namli Exploration and Mining (Pty) Ltd to undertake terrestrial biodiversity impact assessment for the proposed mining permit application on portion of the Farm Steinkopf No 22 within Nama Khoi Metropolitan Municipality in Northern Cape Province. (Fig. 1). The study site/proposed area lies approximately 43.4 km North of Steinkopf Town.

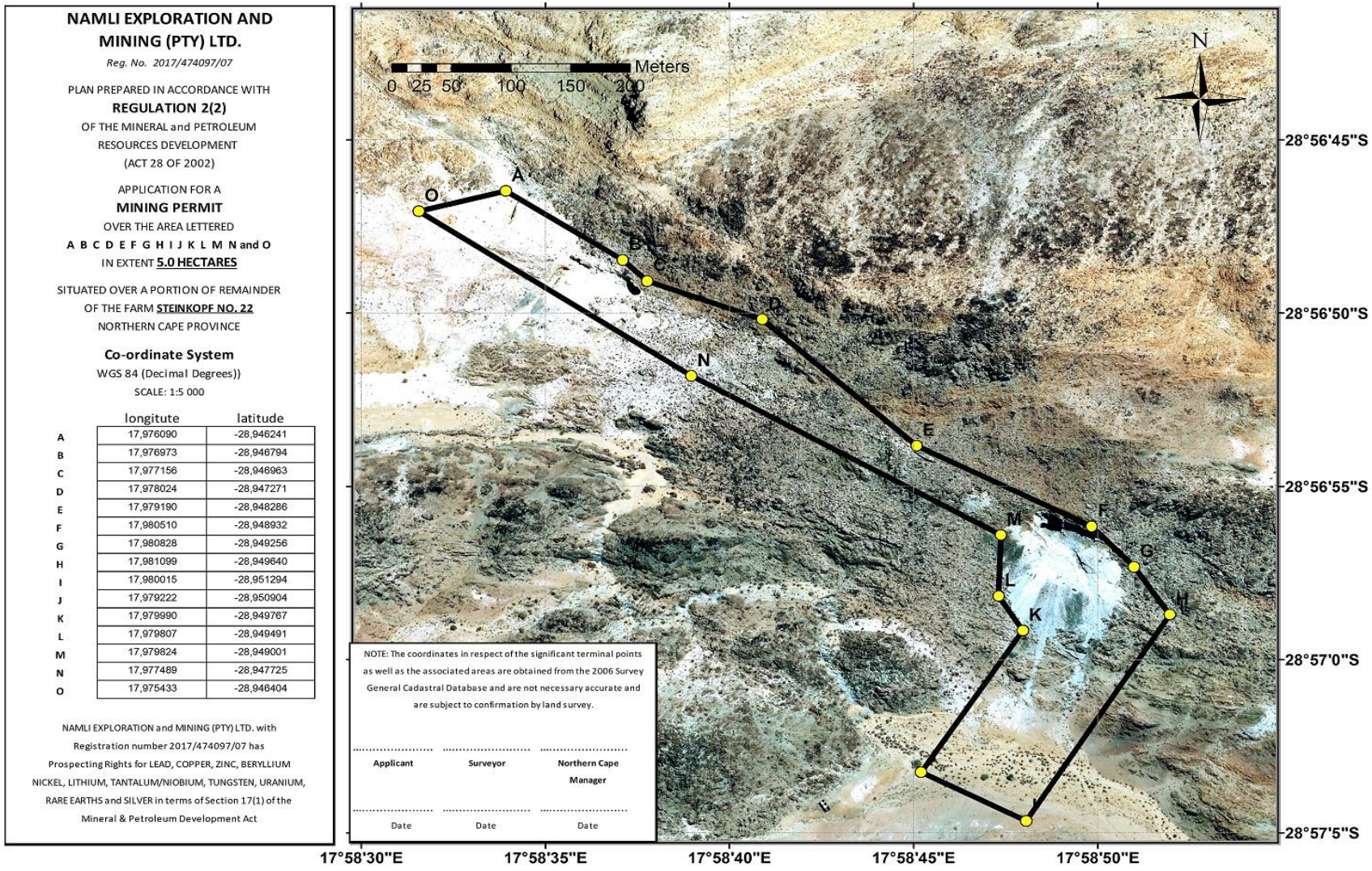


Figure 1: Location of the study site. ©Greenmined Environmental.

2. TERMS OF REFERENCES

- The study included the following activities:
- Provide a broad-scale map of the vegetation of the proposed site.
- A description of the dominant and characteristic species within the broad-scale plant communities.
- Provide a list of red data plant and animal species previously recorded within the study site, and information obtained from the relevant authorities and literature reviews.
- Identification of sensitive habitats and plant communities.
- Preliminary investigation of the impacts of the project and the provision of recommended mitigation measures; and
- Recommend practical mitigation measures to minimize or eliminate negative impacts and or enhance potential project benefits.

2.1. Objectives of this study

- To provide a description of the flora and fauna occurring around the proposed project area.
- To provide description of any threatened species occurring or likely to occur within the study area in terms of the National Red List Status (SANBI, 2012) and Red Data List (IUCN, 2018) specifying species that are either: rare, threatened, endangered, or critically endangered.
- Determine conservation priory areas according to authorised Critical Biodiversity Areas (CBAs).
- To describe the available habitats on the study site including areas of important conservation value.
- Identify and assess the potential impacts associated with a proposed development.

2.2. Assumptions, Limitations, Uncertainties, and Gap analysis

- The findings, results, observations, conclusions, and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as available information regarding the perceived impacts on terrestrial environment.
- A description of vegetation was based on the physical field surveys and site walkthrough and investigations as performed on site.
- Results presented in this report are based on a snapshot investigation of the study site and not on detailed and long-term investigations of all environmental attributes and the varying degrees of biological diversity that may be present in the study site.
- The assessment of impacts and recommendation of mitigation measures were informed by the site-specific ecological issues arising from the field survey and based on the assessor's working knowledge and experience with similar projects**.**

3. SURVEY METHODS AND REPORTING

Climate

Steinkopf has a desert climate. In Steinkopf, there is virtually no rainfall during the year. According to Köppen and Geiger, this climate is classified as BWk. The average annual temperature is 17.8 °C in Steinkopf. About 132 mm of precipitation falls annually.

Biophysical Environment

Vegetation of the study site

Floral diversity was determined by walkthroughs around the project area. The vegetation units of Mucina and Rutherford (2006) were used as references but where necessary communities are named according to the recommendations of a standardised South African Syntaxonomic nomenclature system. By combining the available literature with the survey results, stratification of vegetation communities was possible.

The study site is covered, predominantly by shrubs and small trees species, with few graminoinds and herbs. This type of vegetation has the potential to support a variety of faunal species including birds, but due to human settlements, very few animals can remain.

The site falls within Desert Biome and the vegetation type is Eastern Gariep Rocky Desert (Fig. 2). The vegetation type is explained below.

Distribution

This vegetation type is found in all the rocky desert areas along the Orange River, including Groot Pellaberge, Dabenorisberge, Abbasasberge and many smaller mountains between Pella and Vioolsdrif. Also some mountains mapped further south well away from the Orange River such as the Haramoebberge and Witberg. Altitude about 250–1 205 m at the highest peak of the Groot Pella.

Vegetation & Landscape Features :

Hills and mountains (up to 650 m of relative altitude from their base), mostly with bare rock outcrops and covered with very sparse shrubby vegetation in crevices. Separated by broad sheet-wash plains (Dg 9 Eastern Gariep Plains Desert). Habitats are mainly controlled by topography, aspect, local climate and lithology. On the Groot Pellaberg, for example, there is a sparse shrubland on the southern foothills (with, for example, *Aloe dichotoma*, *Rhigozum trichotomum* and *Petalidium setosum*) and a higher cover of plants in the southern ravines and rocky drainage lines (e.g. *Abutilon pycnodon*, *Asparagus suaveolens*, *Ficus cordata*, *Rhus populifolia* and *R. viminalis*). On the higher southern slopes *Justicia orchioides* is often dominant, with localised grassland directly below steep cliffs (*Enneapogon scaber, Triraphis ramosissima* and *Danthoniopsis ramosa*). The south-facing quartzite cliffs and steep slopes support chasmophytes (cremnophytes) such as *Ficus*

ilicina, Aloe dabenorisana and *Bowiea gariepensis*. On the summits and higher northern slopes there is a much higher preponderance of succulent plants including *Euphorbia avasmontana, Aloe dichotoma, A. microstigma subsp. microstigma, Pelargonium aridum* and *Kleinia longiflora*. Succulent plants are also important on the northern foothills and also include *Aloe dichotoma, Euphorbia avasmontana, Sarcostemma viminale* and the diminutive *Lapidaria margarethae* (Van Jaarsveld 1985).

Geology & Soils:

In the east mainly leucocratic biotite gneiss and quartz-feldspar gneiss of the Stalhoek Complex and lesser amounts of leucocratic biotite gneiss occur, with intercalations of calc-silicate rocks, mafic gneiss, and a quartzite-schist association of the Hom Subgroup, Bushmanland Group. In the west the area consists of granodiorite, adamellite, leucogranite, tonalite and diorite of the Vioolsdrif Suite and intermediate and acid volcanics of the Haib Subgroup of the Orange River Group (all of the above of Mokolian age). Very rocky substrate, with little or no soils. Land type Ic.

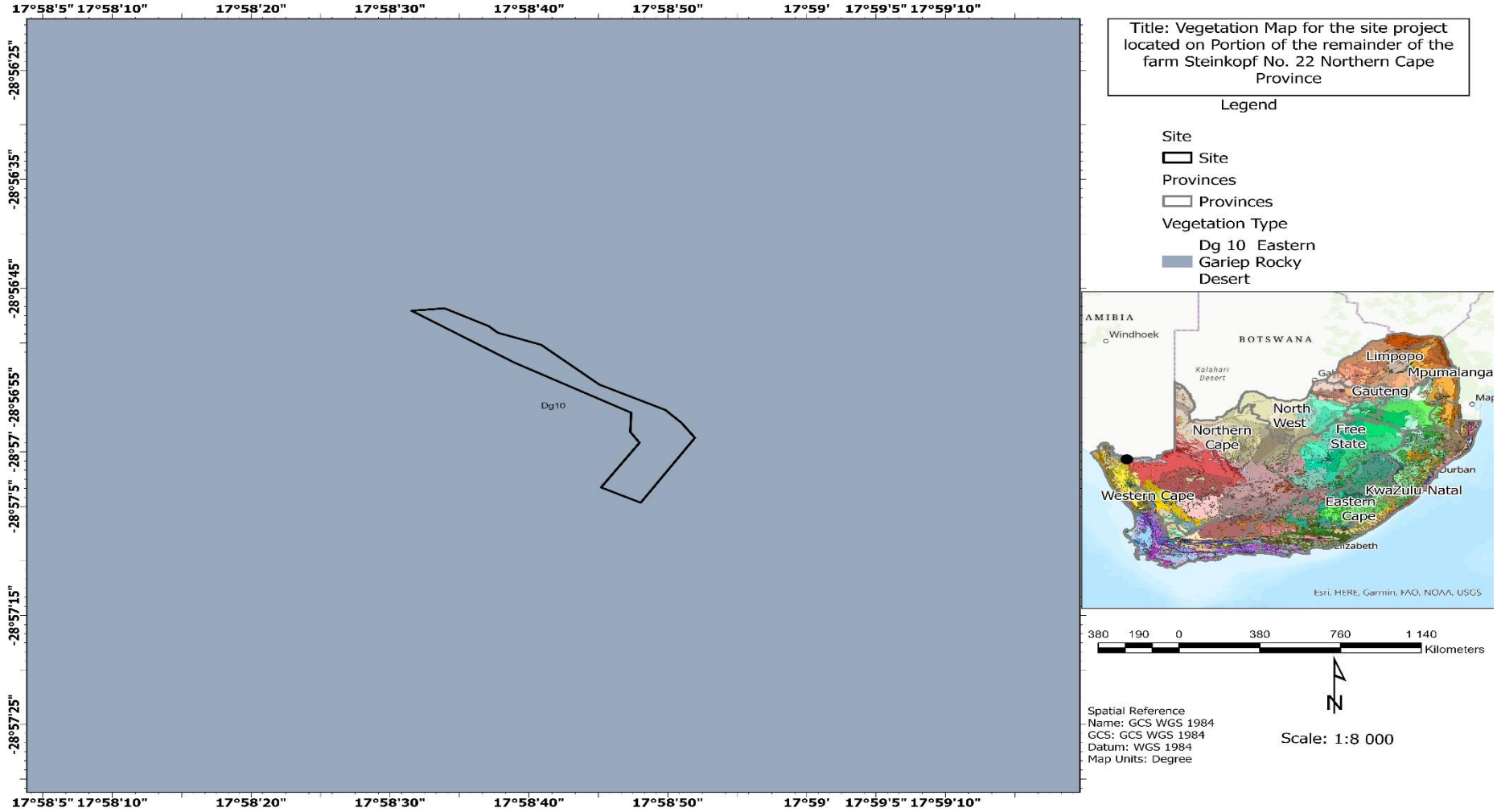


Figure 2: Vegetation map of the study site.

4. LEGAL REQUIREMENTS

4.1. RELEVANT LEGISLATION

The Constitution of the Republic of South Africa Act (Act No. 108 of 1996) – Section 24.

The Constitution is South Africa's overarching law. It prescribes minimum standards with which existing and new laws must comply. Chapter 2 of the Constitution contains the Bill of Rights in which basic human rights are enshrined. Government's commitment to give effect to the environmental rights enshrined in the Constitution is evident from the enactment of various pieces of environmental legislation since 1996, including the National Water Act, the National Environmental Management Act, etc.

The Constitution deals with the environment in Section 24 and proclaims the right of everyone—

(a) To an environment that is not harmful to their health or well-being; and

(b) To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that—

(i) Prevent pollution and ecological degradation.

(ii) Promote conservation; and

(iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended.

NEMA replaces a number of the provisions of the Environment Conservation Act, 1989 (Act No. 73 of 1989). The Act provides for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions. The principles enshrined in NEMA guide the interpretation, administration and implementation of the Act with regards to the protection and / or management of the environment. These principles serve as a framework within which environmental management must be formulated. Section 2(4) specifies that "sustainable development requires the consideration of all relevant factors including aspects specifically relevant to biodiversity":

National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA).

NEMBA provides for the management and conservation of biological diversity and components thereof; the use of indigenous biological resources in a sustainable manner; the fair and equitable sharing of benefits rising from bioprospecting of biological resources; and cooperative governance in biodiversity management and conservation within the framework of NEMA.

National Water Act (Act No. 36 of 1998) (NWA).

The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a

sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

The National Water Act, requires any development to secure Water Use Licences with the following activities:

Section 21 (a), abstractive use of water for construction (if possible and required).

Section 21 (c) and (i) use, i.e., river or wetland crossings, which includes any drainage lines by any infrastructure.

In terms of the definitions provided, activities included under Sections 21(c) and 21(i) are (amongst others) the construction of roads, bridges, pipelines, culverts and structures for slope stabilisation and erosion protection. DWS will however need to be approached to provide guidance on whether approval for Section 21 (c) and (i) water uses would be required.

GENERAL AUTHORISATION IN TERMS OF SECTION 39 OF THE NWA

According to the preamble to Part 6 of the NWA, “This Part established a procedure to enable a responsible authority, after public consultation, to permit the use of water by publishing general authorisations in the Gazette…” “The use of water under a general authorisation does not require a licence until the general authorisation is revoked, in which case licensing will be necessary…”

The General Authorisations for Section 21 (c) and (i) water uses (impeding or diverting flow or changing the bed, banks or characteristics of a watercourse) as defined under the NWA have recently been revised (Government Notice R509 of 2016). Determining if a water use licence is required for these water uses is now associated with the risk of degrading the ecological status of a watercourse. A low risk of impact could be authorised in terms of a General Authorisations (GA).

Provincial legislation

In addition to national legislation such as Protected Areas Act No. 57 of 2003, National Environmental Management: Biodiversity Act No. of 2004 and Conservation of Agricultural Resources Act No. 43 of 1983, some of South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996).

The Northern Cape Nature Conservation Act (NCNCA, Act No 9 of 2009)

The purpose of this Act is to provide for the sustainable utilisation of wild animals, aquatic biota and plants; to provide for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; to provide for offences and penalties for contravention of the Act; to provide for the appointment of nature conservators to implement the provisions of the Act; to provide for the issuing of permits and other authorisations; and to provide for matters connected therewith.

Restricted activities involving protected plants and specially protected plants:

49(1) No person may, without a permit –

- Pick
- Import
- Export
- Transport
- Possess
- Cultivate; or
- Trade in,
- A specimen of a specially protected plant

50 (1) Subject to the provision of section 52, no person may, without a permit –

- Pick
- Import
- Export
- Transport
- Cultivate; or
- Trade in,
- A specimen of a protected plant

Northern Cape Critical Biodiversity Areas

The Northern Cape CBA Map identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

According to the plan, the entire site falls within Critical Biodiversity Area 2 (Figure 3). Furthermore, the site also falls within National Protected Areas Expansion Strategy (NPAES) which is called Kamiesberg Bushmanland Augrabies (Figure 4). Kamiesberg Bushmanland Augrabies Focus Area represents the largest remaining natural area for the expansion of the protected area network.

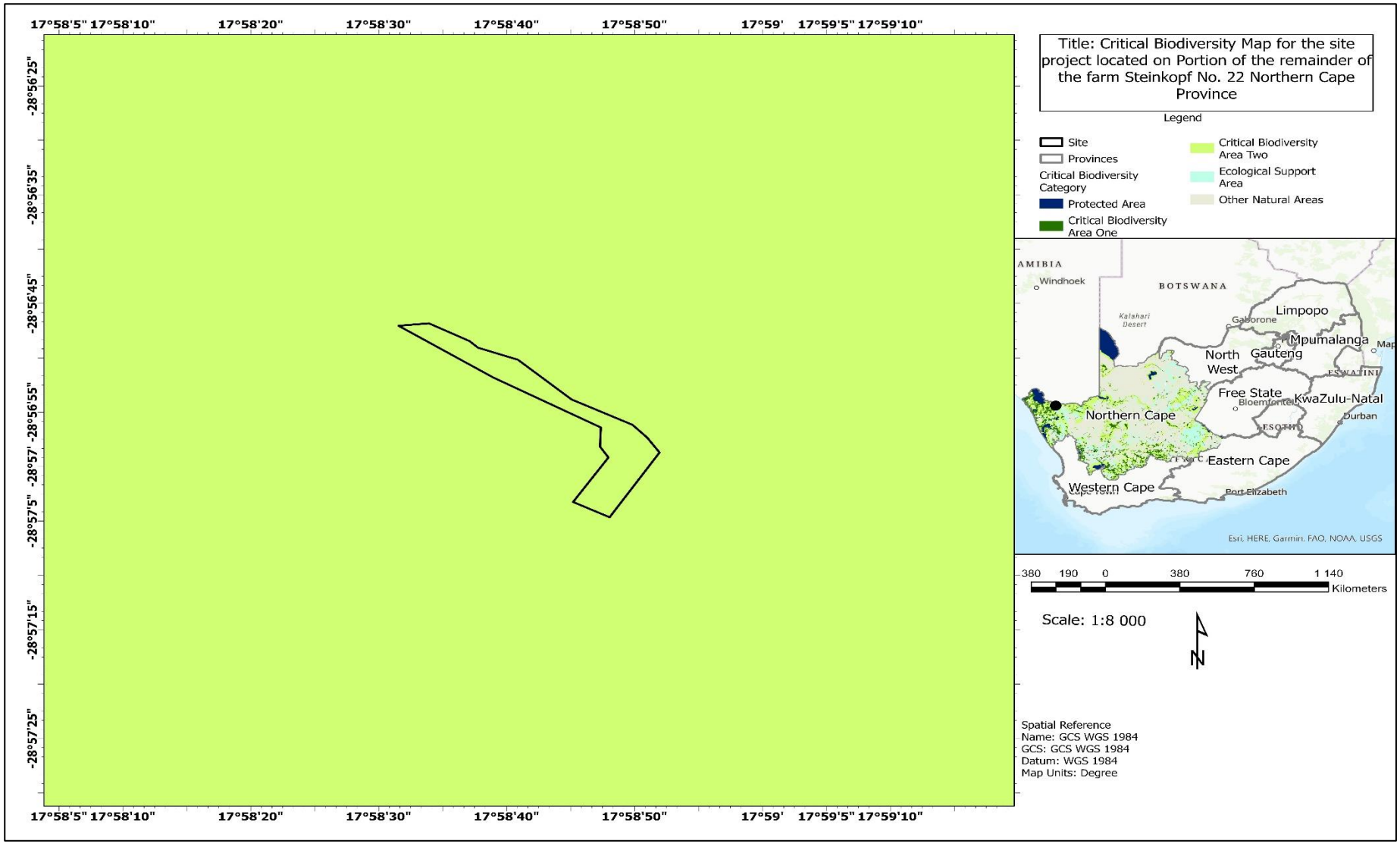


Figure 3: Northern Cape Biodiversity Conservation Plan Map.

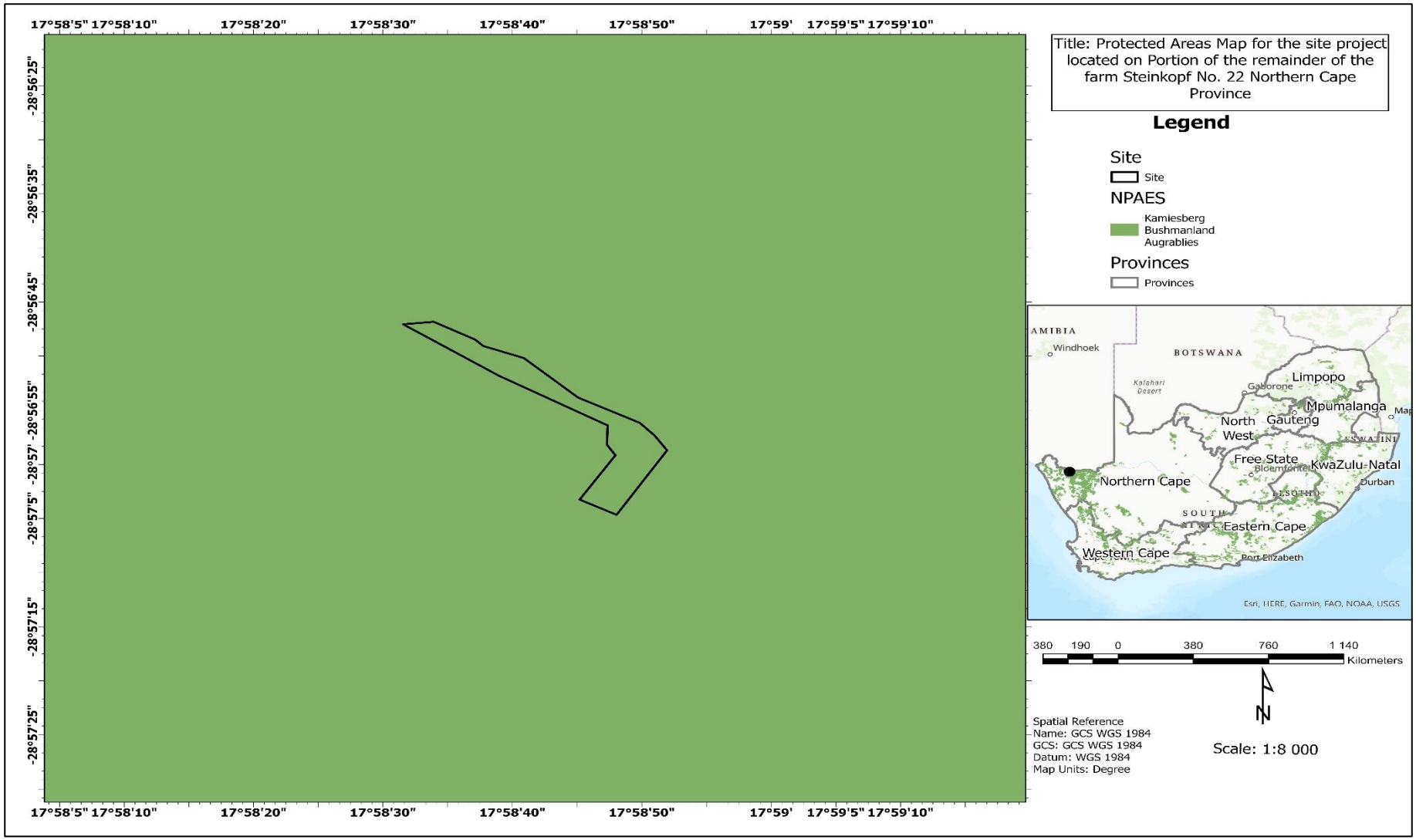


Figure 4: National Protected Areas Expansion Strategy Map.

5. METHODOLOGY

Our methodology included both background information search (Desktop) and field survey. Below is the method used in our study for each of the subfields of biodiversity and the limitations encountered:

5.1. Flora Study

Random walkthrough method was used to identify the plants and vegetation structure occurring on the study site. Plants that could not be identified on site were photographed for later identification.

5.2. Fauna Study

Visual observations stand counts and indirect counts method were used to assess the animals occurring on the study site.

Red Data Analysis and Floral Assessment

SANBI NEW POSA was compared to relevant literature detailing Protected and Red Data plant species lists in order to compile a list of Red Data plant species that may potentially occur within the study area. There are no historical floral records around the study area. The status is determined in table 1 below.

Table 1: Red Data Status definitions (SANBI, 2010).

p- protected Species **M- Medicinal species**		
EX	**Extinct**	A taxon is Extinct when there is no reasonable doubt that the last individual has died. Taxa should be listed as extinct only once exhaustive surveys throughout the historic range have failed to record an individual.
EW	**Extinct in the Wild**	A taxon is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
CR PE	**Critically Endangered (Possibly Extinct**	Critically Endangered (Possibly Extinct) taxa are those that are, on the balance of evidence, likely to be extinct, but for which there is a small chance that they may be extant. Hence, they should not be listed as Extinct until adequate surveys have failed to record the taxon.
CR	**Critically Endangered**	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five IUCN criteria for Critically Endangered and is therefore facing an extremely high risk of extinction in the wild.
EN	**Endangered**	A taxon is Endangered when the best available evidence indicates that it meets any of the five IUCN criteria for Endangered and is therefore facing a very high risk of extinction in the wild.

VU	**Vulnerable**	A taxon is Vulnerable when the best available evidence indicates that it meets any of the five IUCN criteria for Vulnerable and is therefore facing a high risk of extinction in the wild.
NT	**Near Threatened**	A taxon is Near Threatened when available evidence indicates that it nearly meets any of the five IUCN criteria for Vulnerable and is therefore likely to qualify for a threatened category in the near future.
CRITICALLY RARE		A taxon is Critically Rare when it is known to occur only at a single site but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to the five IUCN criteria.
RARE		A taxon is Rare when it meets any of the four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to the five IUCN criteria.
DECLINING		A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.
DDD	**Data Deficient—Insufficient Information**	A taxon is DDD when there is inadequate information to make an assessment of its risk of extinction, but the taxon is well defined. Data Deficient is not a category of threat. However, listing of taxa in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
LC	**Least Concern**	A taxon is Least Concern when it has been evaluated against the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, and it is not rare, and the population is not declining.

6. Ecological function

Ecological function relates to the degree of ecological connectivity between systems within a landscape matrix. Therefore, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive and will be those contributing to ecosystem service (for example wetlands for water and food) or overall preservation of biodiversity. Conservation importance relates to species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation.

Weeds and Invasive Plants

Alien invasive species

Alien invasive species were recorded during the field surveys. Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that all these aliens be eradicated and controlled by means of an eradication and monitoring programme. Invader plants degrade ecosystems through superior competitive capabilities to exclude indigenous plant species. Below is a discussion of the four categories of Invasive Alien Plants as per the National Environmental Management Biodiversity Act (NEMBA).

Category 1a: invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled on your property, and officials from the Department of Environmental Affairs must be allowed access to monitor or assist with control.

Category 1b: invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All Category 1b species must be contained, and in many cases, they already fall under a government sponsored management programme.

Category 2: These are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.

Category 3: These are invasive species that can remain in your garden. However, you cannot propagate or sell these species and must control them in your garden. In riparian zones or wetlands all Category 3 plants become Category 1b plants.

Sensitivity scale

- ***High ecological function***: Sensitive ecosystems with either low inherent resistance or resilience towards disturbance factors or highly dynamic systems considered to be stable and important for the maintenance of ecosystems integrity for example pristine grasslands, pristine wetlands and pristine ridges.
- ***Medium ecological function***: Relatively important ecosystems at gradients of intermediate disturbances. An area may be considered of medium ecological function if it is directly adjacent to sensitive/pristine ecosystem.
- ***Low ecological function***: Degraded and highly disturbed systems with little or no ecological function.
- ***No Go Areas***: Areas that have irreplaceable biodiversity or important ecosystem function values which may be lost permanently if these ecosystems are transformed, with a high potential of also affecting adjacent and/or downstream ecosystems negatively.

Conservation status of the vegetation

- ***High conservation importance***: Ecosystems with high species richness which usually provide suitable habitat for several threatened species. Usually termed ‘no-go’ areas and unsuitable for development and should be conserved.
- ***Medium conservation importance***: Ecosystems with intermediate levels of species diversity without any threatened species. Low-density development may be accommodated, provided the current species diversity is conserved.
- ***Low conservation importance***: Areas with little or no conservation potential and usually species poor (most species are usually exotic).

Therefore, the site was observed to be of **Low-Medium Ecological Function with Medium Conservation importance** when looking at the sensitivity scale and the conservation status of the vegetation of the area.

7. RESULTS

Biological diversity everywhere is at great risk as a direct result of an ever-expanding human population and its associated needs for energy, water, food and minerals. Landscape transformation that is needed to accommodate these activities inevitably leads to habitat loss and habitat fragmentation, resulting in the mosaical appearance of undisturbed habitat within a matrix of transformed areas. These remaining areas of natural habitat are frequently too small to support the biodiversity that previously occupied the area, and the region loses its ecological integrity (Kamffer 2004). Conservation of the remaining ecosystem is vital and beneficial in the long run.

The assessment results revealed that the site still has important plant species that warrant conservation. No faunal species were observed on site. Historical records of faunal species previously recorded around the study area is listed in the appendices.

Plants

The vegetation has been exposed to some level of disturbance. Of the species recorded on site, three of them are protected under Northern Cape Nature Conservation Act No.9 of 2009. The protection levels are stated in the table below.

Table 2: List of plant species recorded at the study site.

Species	Common Name	Growth Form	Protection Level	IUCN Conservation Status
Euphorbia gregaria	Aggenysmelkbos	Succulent	Schedule 2	Least Concern
Aloe gariepensis	Orange River aloe	Succulent		Least Concern
Aloidendron dichotomum	Quiver tree		Schedule 1	Vulnerable
Boscia foetida	Stink Shepherds-tree	Tree	Schedule 2	Least Concern
Brownanthus pseudoschlichtianus	Groot Skerpioenbos	Succulent		Least Concern
Forsskaolea tenacissima	N/A	Herb		Least Concern
Maerua gilgii	River bush cherry	Tree		Least Concern
Monechma mollissimum	Skaapbossie	Shrub		Least Concern
Sisyndite spartea	N/A	Shrub		Least Concern
Stipagrostis anomala	N/A	Grass		Least Concern
S. obtusa	Kortbeenboesmangras	Grass		Least Concern

Birds

Birds are regarded as one of the most useful bioindicators, and they have been used extensively as models to determine ecosystem function (see review Koskimies 1989; Potts

et al. 2014; Bregman et al. 2016). High levels of human disturbance as well as habitat transformation and degradation on the study site and adjacent areas would result in the disappearance of the more elusive bird species. Very few birds were recorded around the study site (Table 3).

Table 3: List of bird species recorded at the study site.

Species	Common Name	IUCN Conservation Status
Emberiza impetuani	Lark-like Bunting	Least Concern
Corvus albus	Pied Crow	Least Concern
Philetairus socius	Sociable Weaver	Least Concern
Myrmecocichla formicivora	Ant-eating Chat	Least Concern
Oenanthe familiaris	Familiar Chat	Least Concern

SENSITIVITY ANALYSIS

Vegetation has been used as a common biological indicator to identify the Present Ecological State (PES) or ecological health of ecosystems, given their overall ability to respond rapidly to disturbance. Conservative plant species are the most affected species given their high conservatism status, high sensitivity, narrow distribution ranges and low tolerance to disturbance, these species are the first to be eradicated in disturbed conditions (Rocchio, 2007).

The sensitivity within the study area was predominantly low to medium. Some sections within the site have been extensively excavated and no rehabilitation was done. There are also Quiver trees on site, which is a Vulnerable species and is protected provincially. The abovementioned, makes the site to be of low-medium sensitivity.

Figure 5 below is a sensitivity map which shows habitat sensitivity within the study site.

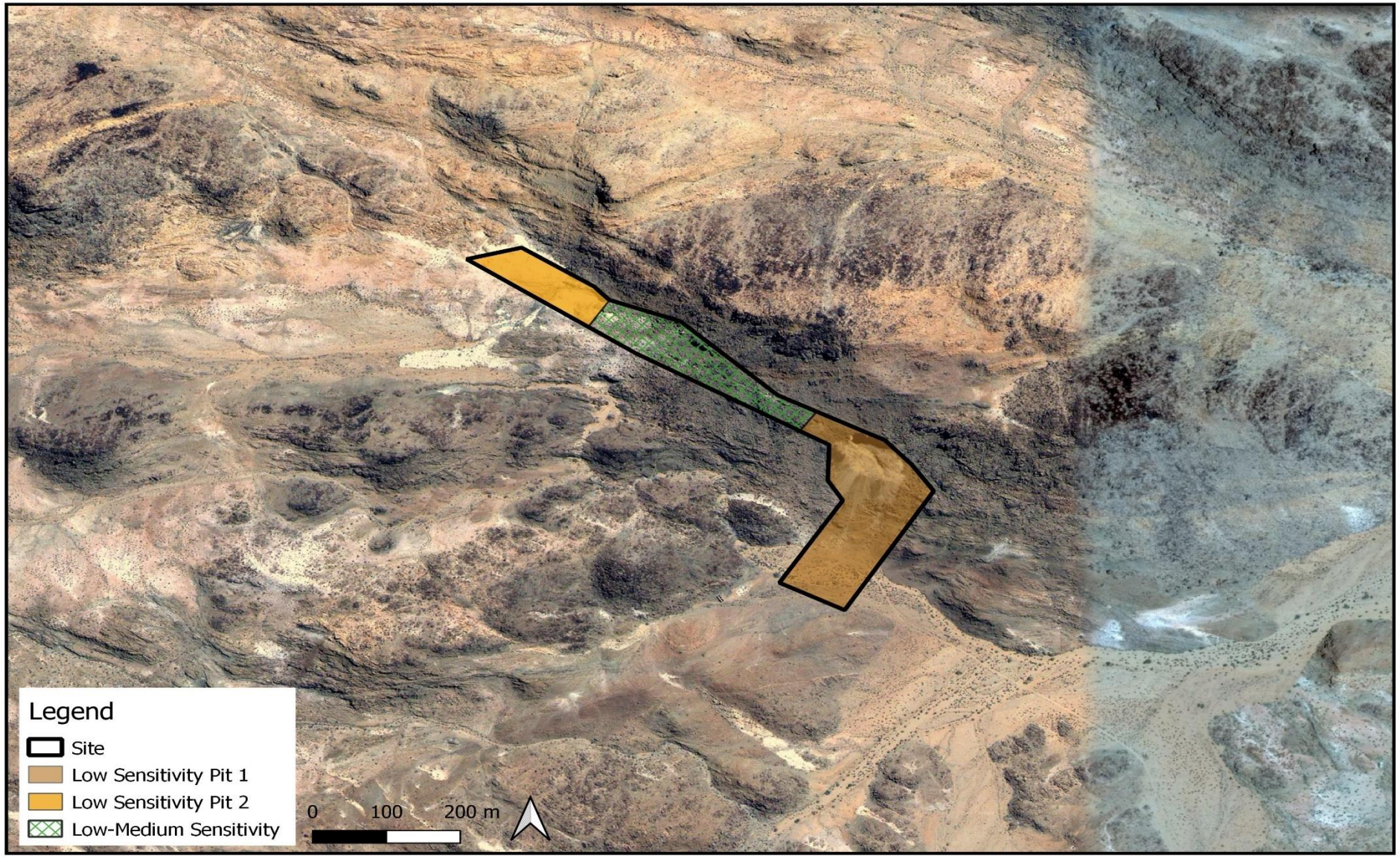


Figure 5: Site sensitivity of the study site.

Photographic Records

Existing excavation on Pit 1.

Existing excavation on Pit 2.

Stink Shepherd’s tree.

Quiver tree with a Sociable Weaver nest.

Aggeneysmelkbos.

THE MAIN IMPACTS

- Permanent loss of vegetation on disturbed sites; and
- Introduction and spread of declared weeds and alien invasive plants: This may occur in disturbed areas and/or where propagules of these plants are readily available

Impact Phase: Mining							
Potential impact description: Direct and indirect avifauna and faunal Impacts The mining phase will result in habitat loss, noise, and disturbance on site. This will lead to direct and indirect disturbance of fauna. Slow-moving species such as the tortoises are likely to be killed by machinery.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	Yes, this impact can be prevented through appropriate mitigation measures.						
Will impact cause irreplaceable loss or resources?	Yes.						
Can impact be avoided, managed, or mitigated?	Yes. Contractors should be informed about slow moving species that are likely to be crushed by construction vehicles.						
Mitigation measures: • No animal may be hunted, trapped, snared or captured for any purpose whatsoever. • Speed of vehicles should be limited to allow for sufficient safety margins.							

Impact Phase: Mining							
Potential impact description: Introduction of alien invasive plants Cleared areas which are not rehabilitated are likely to be invaded by aliens and pioneer plants.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	This impact can be prevented through appropriate mitigation measures such as eradication.						
Will impact cause irreplaceable loss or resources?	No. If this impact is correctly addressed, then no loss of resources will occur.						
Can impact be avoided, managed or mitigated?	Yes. This impact can be avoided if appropriate mitigation measures are followed.						
Mitigation measures: • Any cleared areas that are no longer or not required for drilling activities should be re-seeded with locally sourced seed of suitable species. Bare areas can also be packed with brush removed from other parts of the site to encourage natural vegetation regeneration and limit erosion.							

Impact Phase: Mining							
Potential impact description: Impacts on vegetation The major impact during this phase will result from vegetation clearance for drilling purposes							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	H	Negative	M	H	H
With Mitigation	L	L	M	Negative	L	M	H
Can the impact be reversed?	No, once vegetation is cleared, it would be possible to return it to its previous state.						
Will impact cause irreplaceable loss or resources?	Yes. Although the site has already been exposed to severe modifications, there are still protected plant species within the site.						
Can impact be avoided, managed or mitigated?	Yes. Protected plants should be rescued prior to site establishment.						
Mitigation measures: • All natural vegetation not required to be removed should be protected against damage. • Species of Conservation Concern should be relocation prior to site establishment. • The site should be rehabilitated post mining.							

MITIGATION MEASURES

All natural vegetation not required to be removed should be protected against damage.

Any cleared areas that are no longer or not required for drilling activities should be re-seeded with locally sourced seed of suitable species. Bare areas can also be packed with brush removed from other parts of the site to encourage natural vegetation regeneration and limit erosion.

Maintenance vehicles must not veer from dedicated access roads and activities should be

restricted to the previously disturbed footprint.

No animal may be hunted, trapped, snared or captured for any purpose whatsoever.

Speed of vehicles should be limited to allow for sufficient safety margins.

Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the mining area.

Workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority.

Where topsoils need to be removed, store such in a separate area where such soils can be protected until they can be re-used for post-mining rehabilitation (never mix topsoils with subsoils or other spoil materials).

8. REHABILITATION

The traditional definition of rehabilitation aims at returning the land in a given area to some degree of its former state after a particular process has resulted in its damage.

Rehabilitation requires that there is an attempt to imitate natural processes and reinstate natural ecological driving forces in such a way that it aids the recovery (or maintenance) of dynamic systems so that, although they are unlikely to be identical to their natural counterparts, they will be comparable in critical ways so as to function similarly (Jordan et al.1987). Rehabilitation should be based on an understanding of both the ecological starting point and on a defined goal endpoint and should accept that it is not possible to predict exactly how the disturbed vegetation is likely to respond to the rehabilitation interventions.

The site is already disturbed, and it is advisable that the applicant prepares a rehabilitation plan in consultation with local experts.

9. CONCLUSION AND RECOMMENDATIONS

The proposed mining will be located on a previously mined site, which was not rehabilitated. There are several habitats within the proposed site that have been exposed to high levels of disturbance resulting from excavations. There are also areas that still have provincially protected plant species. As a result, conservation of the said plant species should be prioritised.

10. REFERENCES

Bregman T. P., Lees, A. C., MacGregor, H. E. A., Darski, B., de Moura, N. G., Aleixo, A., Barlow, J. & Tobias, J. A. 2016 Using avian functional traits to assess the impact of land-cover change on ecosystem processes linked to resilience in tropical forests. *Proceedings of the Royal Society B* 283: 1-10.

Branch, B. 1998. Field guide to snakes and other reptiles of southern Africa. Struik Nature, Cape Town.

Bredenkamp, G., Granger, J.E. & van Rooyen, N. 1996. Moist Sandy Highveld Grassland. In: Low, A.B. &Robelo, A.G. (eds) *Vegetation of South Africa, Lesotho and Swaziland*. Department of Environmental Affairs and Tourism, Pretoria.

Gelderblom, C.M. & Bronner, G.N. 1995. Patterns of distribution and protection status of the endemic mammals in South Africa, *South African Journal of Zoology*, 30:3, 127-135.

Koskimies, P. Birds as a tool in environmental monitoring. *Annales Zoologici Fennici*, 26: 153-166.

Kottek, M., Grieser, J., Beck, C., Rudolf, B. & Rubel, F. 2006. World Map of Köppe Geiger Climate Classification updated. *Meteorology. Z*. **15**. 259-263.

Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.S. & Collins, N.B. 2007. Wet EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands, WRC Report No. TT 339/09, Water Research Commission, Pretoria.

Manning, J. 2009. Field guide to the wild flowers of South Africa. Struik, Cape Town.

Mucina, L., Hoare, D.B., Lötter, M.C., Du Preez, P.J., Rutherford, M.C., Scott Shaw,C.R., Bredenkamp, G.J., Powrie, L.W., Scott, L., Camp, K.G.T., Cilliers, S.S.Bezuidenhout, H., Mostert, T.H., Siebert, S.J., Winter, P.J.D., Burrows, J.E. ,

Dobson, L., Ward, R.A., Stalmans, M., Oliver, E.G.H., Siebert, F., Schmidt, E.,Kobisi, K., Kose, L. 2006. Grassland Biome. In: Mucina, L. & Rutherford, M.C. (eds.). Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Nieto, M., Hortal, J., Martínez-Maza, C., Morales, J., Ortiz-Jaureguizar, E., Pelaez Campomanes, P., Pickford, M., Prado, J.L., Rodríguez, J., Senut, B., Soria, D. & Varela, S. 2005. Historical Determinants of Mammal Diversity in Africa: Evolution of Mammalian Body Mass Distribution in Africa and South America During Neogene and Quarternary Times. *African Biodiversity*.

Ollis, D., Snaddon, K., Job, N., & Mbona, N. 2013. Classification Systems for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. Pretoria: South African National Biodiversity Institute.

Potts, J. R., Mokross, K., Stouffer, P. C. & Lewis, M. A. 2014. Step selection techniques uncover the environmental predictors of space use patterns in flocks of Amazonian birds. *Ecology and Evolution*,4(24): 4578-4588.

Raimondo, D., von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. and Manyama, P.A. 2009. Red List of South African Plants. Strelitzia 25. South African National Biodiversity Institute, Pretoria

Sinclair, I., Hockey, P., Tarboton, W. & Ryan, R. 2011. Birds of Southern Africa. Struik Nature, Cape Town.

APPENDICES

Appendix 1: Historical Faunal and Floral Records

A, Mammal Records. Animal Demographic Unit.

NO.	Family	*Scientific name*	Common name	Red list category	Number of records	Last recorded
1	Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern (2016)	1	2011-12-01

B, Reptile Records. Animal Demographic Unit.

NO.	Family	*Scientific name*	Common name	Red list category	Number of records	Last recorded
1	Gekkonidae	*Lygodactylus bradfieldi*	Bradfield's Dwarf Gecko	Least Concern (SARCA 2014)	1	2007-06-15
2	Gekkonidae	*Pachydactylus carinatus*	Richtersveld Gecko	Least Concern (SARCA 2014)	6	1900-06-15
3	Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	Least Concern (SARCA 2014)	1	1900-06-15

C, Frog Records, Animal Demographic Unit.

NO,	Family	*Scientific name*	Common name	Red list category	Number of records	Last recorded
1	Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern	1	2002-03-31
2	Bufonidae	*Vandijkophrynus gariepensis gariepensis*	Karoo Toad (subsp. gariepensis)		1	1964-08-21
3	Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)	2	2002-03-31

E, Avifaunal Records. SABAP2, Animal Demographic Unit.

NO.	Common group	Common species	Genus	Species
1	Bulbul	African Red-eyed	*Pycnonotus*	*nigricans*
2	Bunting	Cape	*Emberiza*	*capensis*
3	Bunting	Lark-like	*Emberiza*	*impetuani*
4	Chat	Ant-eating	*Myrmecocichla*	*formicivora*

5	Chat	Familiar	*Oenanthe*	*familiaris*
6	Crow	Pied	*Corvus*	*albus*
7	Fiscal	Southern	*Lanius*	*collaris*
8	Goshawk	Pale Chanting	*Melierax*	*canorus*
9	Kestrel	Greater	*Falco*	*rupicoloides*
10	Lark	Karoo Long-billed	*Certhilauda*	*subcoronata*
11	Lark	Stark's	*Spizocorys*	*starki*
12	Mousebird	Red-faced	*Urocolius*	*indicus*
13	Mousebird	White-backed	*Colius*	*colius*
14	Sparrow	Cape	*Passer*	*melanurus*
15	Weaver	Scaly-feathered	*Sporopipes*	*squamifrons*
16	Weaver	Sociable	*Philetairus*	*socius*
17	Wheatear	Capped	*Oenanthe*	*pileata*
18	Wheatear	Mountain	*Myrmecocichla*	*monticola*