



ECOLOGICAL ASSESSMENT REPORT

ALET MARITZ MYNBOU (Pty) Ltd

Gamahuli, Malley & La Rochelle Kieselguhr Prospecting Operation



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ALET MARITZ MYNBOU (Pty) Ltd

The Farm Gamahuli 495

Remaining Extent of the Farm Malley 498

The Farm La Rochelle 359

Districts of Postmasburg and Kuruman

Northern Cape Province

**Ecological Assessment Report in application for Environmental
Authorisation related to a Prospecting Right Application (NC 30/5/1/
1/2/12782 PR) that was lodged with the Department of Mineral
Resources**

January 2022

EXECUTIVE SUMMARY

Alet Maritz Mynbou is proposing the prospecting of kieselguhr on the Farm Gamahuli 495, the Remaining Extent of the Farm Malley 498 and the Farm La Rochelle 359. The prospecting right area is located within the Postmasburg and Kuruman District Municipalities of the Northern Cape Province. Alet Maritz Mynbou has submitted a Prospecting Right application, which triggers the requirement to apply for Environmental Authorisation. An ecological assessment is required in order to consider the impacts that the proposed activities might have on the ecological integrity of the property. This terrestrial ecological assessment report describes the ecological characteristics and biodiversity of the proposed prospecting area, identifies the source of impacts from the operation, and assesses these impacts, as well as the residual impacts after closure.

A desktop study and field investigation were performed to obtain ecological and biodiversity information for the proposed study area and to identify the ecological characteristics and sensitivity of the site. Five plant communities were identified on site and are all considered to be of high sensitivity, primarily because of the high occurrences of plant species of conservation concern that occur widespread across the entire site as well as the important habitat associations for animal species of conservation concern. All drainage lines are of very high sensitivity due to their important hydrological function. Significant impacts associated with the proposed operation are expected to be the erosion of the sandy substrate, loss of plant species of conservation concern as well as the disruption of ecological corridors. These impacts are however expected to have moderate effects.

Species of conservation concern that are found in the areas earmarked for prospecting activities include *Ruschia griquensis* and *Vachellia erioloba*. The prospecting operation will also result in the large-scale clearance of indigenous vegetation. Permit applications regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation three months prior to any clearance of vegetation. Similarly, if any of the *Vachellia erioloba* trees is to be affected, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries three months prior to any potential disturbances to these trees.

The destruction of the natural plant species and habitats within the study area is inevitable, but the significance of the impacts will be affected by the success of the mitigation and rehabilitation measures implemented. Authorisation can be granted if the applicant commits to the adherence of the proposed avoidance, management, mitigation, and rehabilitation measures.

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1. INTRODUCTION

1.1. Background information

Alet Maritz Mynbou is proposing the prospecting of kieselguhr on the Farm Gamahuli 495, the Remaining Extent of the Farm Malley 498 and the Farm La Rochelle 359 (from hereon referred to as the study/prospecting area). The prospecting right area is located within the Postmasburg and Kuruman District Municipalities of the Northern Cape Province. It is split into two separate portions, with neighbouring farms Gamahuli and Malley lying approximately 41 km north-west of the town Olifantshoek on a gravel road that turns off from the N14 and leads to Van Zylsrus (Figure 1). The isolated farm, La Rochelle, is located further north-east and lies approximately 65 km north-west of the town Kathu on a private road that turns off from the gravel road which connects Kathu and Deben with Hotazel (Figure 1). The combined extent of the prospecting right area is $\pm 7\,094$ ha.

Alet Maritz Mynbou has submitted a Prospecting Right application, which triggers the requirement to apply for Environmental Authorisation. An ecological assessment is required to consider the impacts that the proposed activities might have on the ecological integrity of the property and therefore Boscia Ecological Consulting has been appointed by the applicant to conduct an assessment and provide an ecological assessment report.

This assessment report describes the characteristics of habitats in the proposed prospecting area, identifies the biodiversity and species of conservation concern, identifies invasive and encroaching species and their distribution, indicates the source of impacts from the prospecting operation and assesses these impacts as well as the residual impacts after closure.

A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the operation. Ecological responsibilities pertaining to relevant conservation legislation are also indicated. These should all be included in the EMPR.

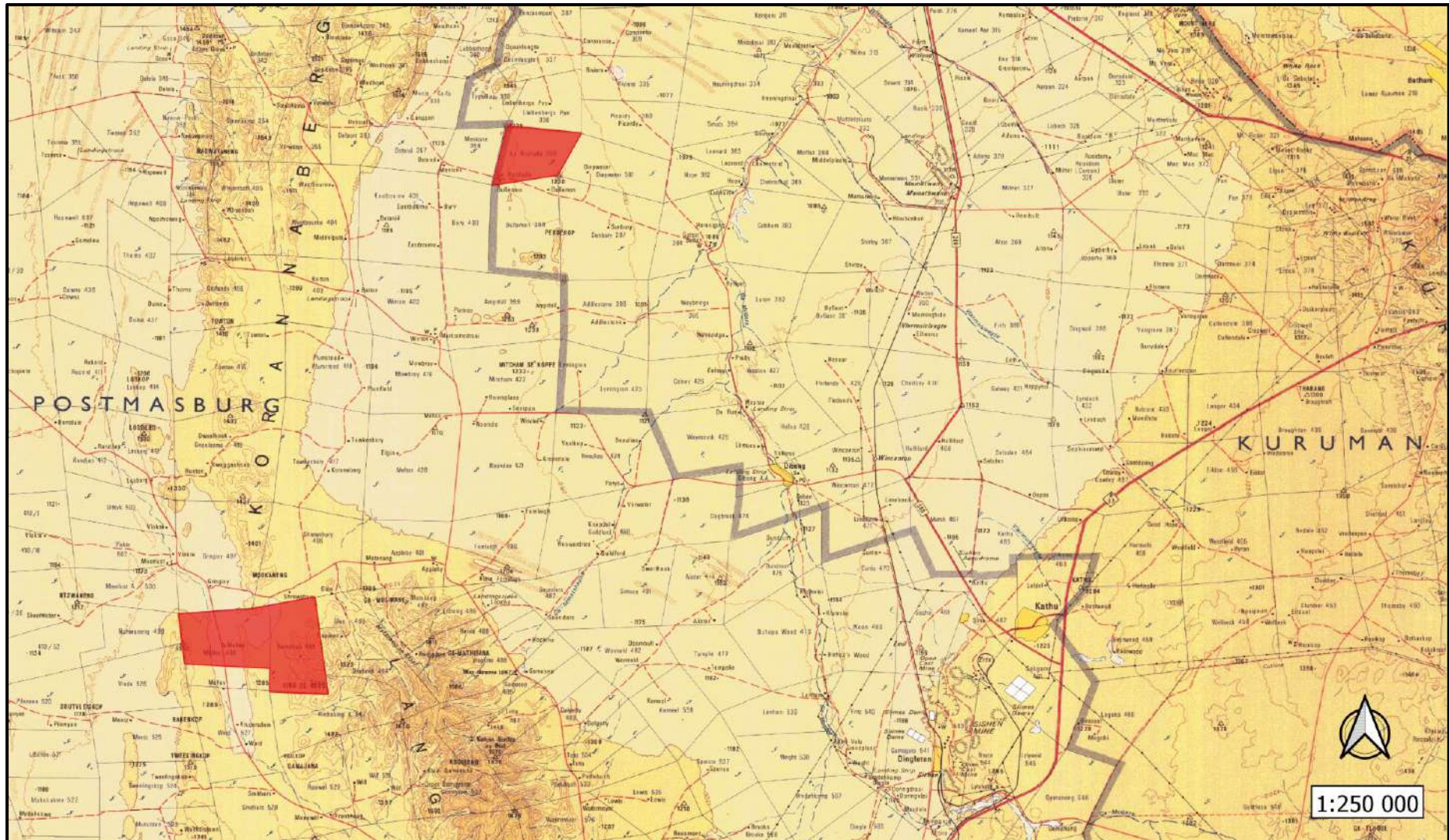


Figure 1. The location of the prospecting area is indicated in red, with neighbouring Gamahuli and Malley in the south-west (Postmasburg District) and La Rochelle in the north-east (Kuruman District).

1.2. Scope of study

The specific terms of reference for the study include the following:

- conduct a desktop study and field investigation in order to identify and describe different ecological habitats and provide an inventory of biodiversity, i.e., communities/species/taxa and associated species of conservation concern within the environment that may be affected by the proposed activity;
- identify the relative ecological sensitivity of the project area;
- produce an assessment report that:
 - indicates identified habitats and fauna and flora species,
 - indicates the ecological sensitivity of habitats and conservation values of species,
 - determines the potential impacts of the project on the ecological integrity,
 - provides mitigation measures and recommendations to limit project impacts,
 - indicate ecological responsibilities pertaining to relevant conservation legislation.

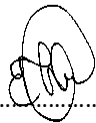
1.3. Details of the specialist consultant

Company Name	Boscia Ecological Consulting cc	Registration no:	2011/048041/23
Address	PostNet Suite 0216 Private Bag X37 Lynnwood Ridge 0040		
Contact Person	Dr Elizabeth (Betsie) Milne (Pr. Sci. Nat)		
Contact Details	Cell: 082 992 1261	Email: BosciaEcology@gmail.com	
Qualifications	Professional Natural Scientist - Ecological Science (Registration No: 131395) PhD Botany (Nelson Mandela Metropolitan University), Masters Environmental Management (University of the Free State), BTech Nature Conservation (Tshwane University of Technology)		

Declaration of independence

I, Elizabeth (Betsie) Milne, owner of Boscia Ecological Consulting, declare that I:

- act as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct;
- do not have, and will not have any financial interest in the undertaking of the activity; other than the remuneration of work performed in terms of the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have any vested interest in the activity proceedings;
- have no, and will not engage in conflicting interest in the undertaking of the activities;
- undertake to disclose to the component authority any material information that have or may have the potential to influence the decision of the competent authority, or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- will provide the competent authority with access to all information at my disposal regarding the study.



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1.4. Description of the proposed activity

The prospecting operation is based on kieselguhr deposits associated with the Kalahari Basin. These are diatomaceous earth composed mainly of the fossilised skeletons of diatoms and spicules of sponges and grass skeletons found below the unconsolidated sands of the Gordonia Formation.

The deposits will be sampled by means of pitting and trenching. Prospecting pits will be positional along a grid (100m x 100m) and approximately 300 pits (2m x 3m x 0.5 - 5m each) are planned to verify feasibility of deposits. Thereafter, bulk sampling will be performed in feasible areas, during which 50 trenches (100m x 50 m x 0.5 - 5m each) will be created. This will be performed by means of an opencast method using heavy earthmoving machinery. Vegetated soil or overburden will be stripped, and the underlying deposits will be excavated and stockpiled before being hauled off-site to a processing facility. An estimated total ore volume of 1 050 m³ and 125 000 m³ for pitting and trenching will be processed, respectively over 4 years.

Prospecting activities will primarily make use of existing roads where possible, but new haul roads will be created to access new prospecting trenches and to transport the ore off site. The proposed infrastructure and prospecting related footprint include access roads, temporary office and workshop complex, ablution facilities, storm water control berms, water tank, fuel storage facility, wash bay, salvage yard, waste disposal site, open pits and trenches, overburden stockpiles and ore stockpiles.

2. METHODOLOGY

2.1. Data collection

The study comprised a combination of field and desktop surveys for data collection on fauna and flora to obtain the most comprehensive data set for the assessment. The fieldwork component was conducted on 13 and 14 October 2021 and most data for the desktop component was obtained from the quarter degree squares that includes the study area (2722DA, 2722CB and 2722BC).



Figure 2. The proposed core footprint of prospecting activities in the study area is indicated in white.

2.2. Flora

2.2.1. Field survey

For the field work component, satellite images were used to identify homogenous vegetation units within the proposed prospecting area. Representative sampling plots were allocated in these units and sampled with the aid of a GPS to characterise the species composition. The following quantitative data was collected:

- Species composition
- Species percentage cover
- Amount of bare soil and rock cover
- Presence of biotic and anthropogenic disturbances

Additional checklists of plant species were compiled during the surveys by traversing a linear route and recording species as they were encountered in each unit.

2.2.2. Desktop survey

For the desktop component, the South African National Vegetation Map (Mucina and Rutherford 2006) was used to obtain data on broad scale vegetation types and their conservation status. The South African National Biodiversity Institute's (SANBI) BGIS database was also consulted to obtain information on biodiversity information for the Tsantsabane Local Municipality (NC085) - Z F Mgcawu (previously known as Siyanda) District Municipality and the Joe Morolong Local Municipality (NC451) - John Taolo Gaetsewe District Municipality, in which the study area falls. The Environmental Management Frameworks for these municipalities was also consulted to understand their conservation strategies.

Further searches were undertaken specifically for Red List plant species within the current study area. Historical occurrences of Red List plant species were obtained from the SANBI: POSA database for the quarter degree squares that include the study area (Figure 3). The IUCN conservation status of plants in the species list was also extracted from the SANBI database and is based on the Threatened Species Programme (SANBI 2020).

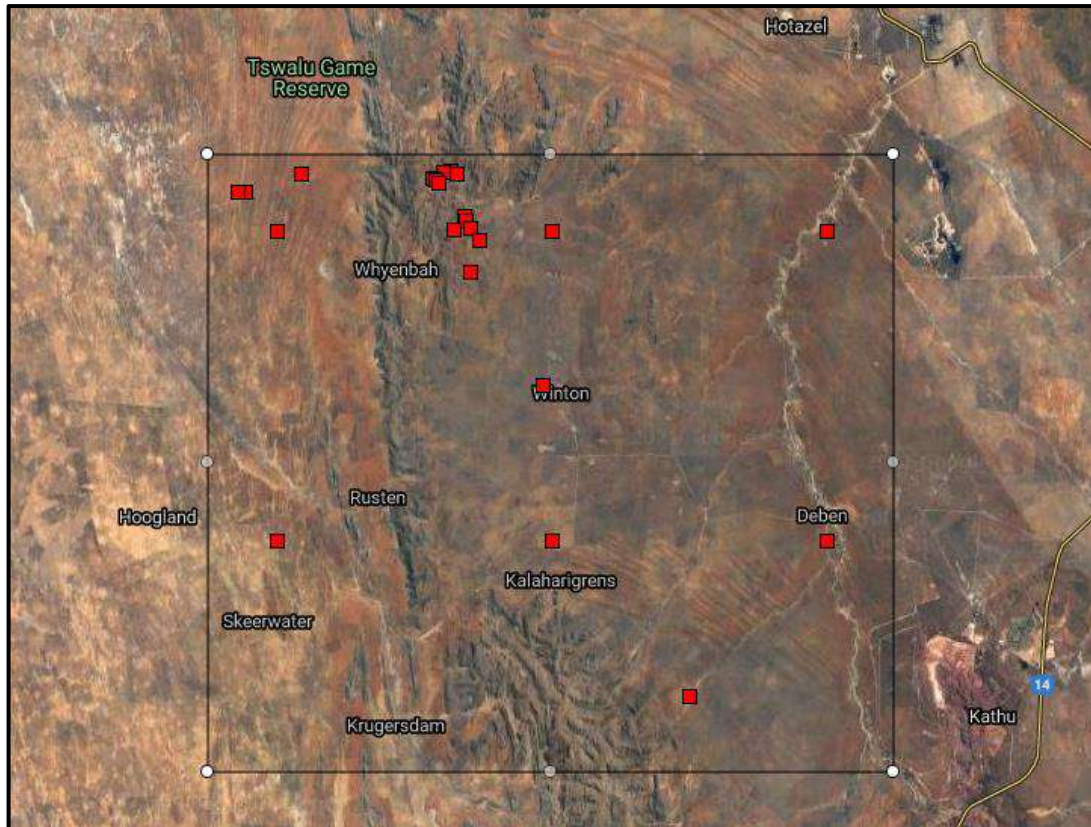


Figure 3. The extent of the map filter applied on the POSA website to extract species information is shown by the large black square. The small red squares indicate historical data points.

2.3. Fauna

2.3.1. Desktop survey

A desktop survey was undertaken to obtain lists of mammals, reptiles, amphibians, birds, and arthropods which are likely to occur in the study area. These were derived based on distribution records from the literature, including Friedmann and Daly (2004) and Stuart and Stuart (2015) for mammals, Alexander and Marais (2007) and Bates et al. (2014) for reptiles, Du Preez and Carruthers (2009) for amphibians, Gibbon (2006) for birds, and Thirion (2007) and Picker et al. (2004) for invertebrates. A map of important bird areas (BirdLifeSA 2015) was also consulted.

Additional information on faunal distribution was extracted from the various databases hosted by the ADU web portal, <http://adu.org.za>, as well as from the Baboon Spider Atlas <https://www.baboonspideratlas.co.za/>, and iNaturalist <https://www.inaturalist.org/>.

The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.

The likelihood of Red Data species occurring on site has been determined using the distribution maps in the Red Data reference books (Friedmann and Daly 2004; Minter et al. 2004; Bates et al. 2014; Taylor et al. 2015; ADU 2016) and comparing their habitat preferences with the habitat described from the field survey. The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria (IUCN 2019) and/or the various red data books for the respective taxa.

2.3.2. Field survey

The faunal field survey was conducted concurrent with the vegetation survey. Habitats on site were assessed to compare with the habitat requirements of Red Data species. The presence of faunal species was determined using the following methods:

- Identification by visual observation,
- Identification of bird and mammal calls,
- Identification of signs (spoor, faeces, burrows, and nests).

2.4. Assumptions and limitations

Due to the brief duration of the survey and the lack of seasonal coverage, the species list obtained during the site visit cannot be regarded as comprehensive. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant species present is captured. However, this is rarely possible due to time and cost constraints related to the mining and prospecting right application processes. The survey was nevertheless conducted in such a manner to ensure all representative communities are traversed and therefore is likely to have included most of the dominant and common species present.

Furthermore, the study took place during spring, which is not the most optimal time of the year. The best time to evaluate vegetation in the study area is in summer after the first rain, when the vegetation has had a chance to respond and is in an actively growing state. Grasses were still dormant, but some shrubs and forbs started flowering. Therefore, the results presented here can only reflect the condition of the vegetation at the time of the field visit.

2.5. Sensitivity mapping and assessment

An ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases. The sensitivity mapping entails delineating different habitat units identified on the satellite images and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern, as well as their probability of being affected by proposed activities. The sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- Low:** Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and biodiversity. Most types of activities can proceed within these areas with little ecological impact.
- Medium:** Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Activities within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- High:** Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Activities within these areas are undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- Very High:** Critical and unique habitats that serve as habitat for species of conservation concern or perform critical ecological roles. These areas are essentially no-go areas for activities and should be avoided as much as possible.

2.6. Impact assessment and mitigation

The criteria used to assess the significance of the impacts are shown in Table 1. The different project activities and associated infrastructure were identified and considered in order to identify and analyse the various possible impacts. The limits were defined in relation to project characteristics. Those for severity, extent, duration and probability are subjective, based on rule-of-thumb and experience. Natural and existing mitigation measures were considered. These natural mitigation measures were defined as natural conditions, conditions inherent in the project design and existing management measures, which alleviate impacts. The Consequence value of the impacts was calculated by using the following formula:

$$\frac{\text{CONSEQUENCE}}{(\text{Severity} + \text{Spatial Scope} + \text{Duration})} \times \frac{\text{PROBABILITY}}{(\text{Frequency of activity} + \text{Frequency of impact})}$$

Consequence of impacts is defined as follows:

Very Low: Impact would be negligible. Almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple.

Low: Impact would have little real effect. Mitigation and/or remedial activity would be either easily achieved or little would be required or both.

Low – Medium: Impact would be real but not substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be both feasible and fairly easily possible.

Medium – High: Impact would be real and rather substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be feasible, but not necessarily possible without difficulty.

High: Impacts of substantial order. Mitigation and/or remedial activity would be feasible but difficult, expensive, time consuming or some combination of these.

Very High: Of the highest order possible within the bounds of impacts which could occur. There would be no possible mitigation and/or remedial activity to offset the impact at the spatial or time scale for which was predicted.

Table 1. Criteria used to assess the significance of the impacts.

Weight	Severity	Spatial scope (Extent)		Duration											
5	Disastrous	Trans boundary effects		Permanent											
4	Catastrophic / major	National / Severe environmental damage		Residual											
3	High/ Critical / Serious	Regional effect		Decommissioning											
2	Medium / slightly harmful	Immediate surroundings / local / outside mine fence		Life of operation											
1	Minimal/potentially harmful	Slight permit deviation / on-site		Short term / construction (6 months – 1 yrs)											
0	Insignificant / non-harmful	Activity specific / No effect / Controlled		Immediate (0 – 6 months)											
Weight number		1	2	3	4	5									
Frequency															
Probability	Frequency of impact	Highly unlikely	Rare	Low likelihood	Probable / possible	Certain									
		Practically impossible	Conceivable but very unlikely	Only remotely possible	Unusual but possible	Definite									
	Frequency of activity	Annually or less	6 monthly / temporarily	Infrequent	Frequently	Life of operation									
CONSEQUENCE (Severity + Spatial Scope + Duration)															
PROBABILITY (Frequency of activity + Frequency of impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Colour code	Significance rating	Value	Negative impact Management strategy		Positive Impact Management strategy										
	VERY HIGH	126 – 150	Improve current management		Maintain current management										
	HIGH	101 – 125	Improve current management		Maintain current management										
	MEDIUM – HIGH	76 – 100	Improve current management		Maintain current management										
	LOW – MEDIUM	51 – 75	Improve current management		Maintain current management										
	LOW	26 – 50	Improve current management		Maintain current management										
	VERY LOW	1 – 25	Improve current management		Maintain current management										

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1. Current and historic land use

The major land uses in the region include activities related to agriculture and hunting. The land capability for most of the study area is non-arable, with moderately low potential for grazing and wildlife, while the hills are classified as wilderness with very low land use potential. The agricultural region is demarcated for cattle farming, with the grazing capacity estimated at 13 Ha/LSU (on La Rochelle) and 15 Ha/LSU (on Gamahuli and Malley). The study area is not suitable for crop irrigation. Currently, the farms are primarily utilised as natural pastures for domestic livestock. Some areas have been subject to small-scale historic diggings and irrigation. Existing infrastructure include roads, homesteads, farm buildings and dams (Figure 4).

3.2. Geology, soils and topography

According to Coetsee (1979) the geological features of the study area primarily comprise Quaternary deposits, intermixed with Mokolian deposits and a very small proportion of Vaalian deposits (Figure 5). Most of the study area comprises red to flesh-coloured wind-blown sand, with various quartzite formations belonging to the Volop Group (Griqualand West Sequence) protruding throughout the properties. A very small area in the south-east of La Rochelle comprises Lucknow Quartzite with subordinate limestone and shale of the Olifantshoek Group (Griqualand West Sequence) (Figure 5). The kieselguhr deposits on both properties are primarily associated with alluvials that have not been formally mapped.

The topography of the study area is characterised by plains with some high gradient hills. Altitude ranges from 1 120 m above sea level on the plains, to 1 500 m on the hill tops. The terrain across the plains is indicated by a very gentle slope of 1 % but increases to 13 % along the hill slopes.

Land types found on the property include Ae5, Ae6, Ae13 and Ic2 (Figure 6). The plains (Ae types) are associated with red-yellow apedal, freely drained soils, red with a high base status and is more than 300 mm deep, with no dunes present. The hills are associated with Ic types and are usually very rocky with little or no soil.

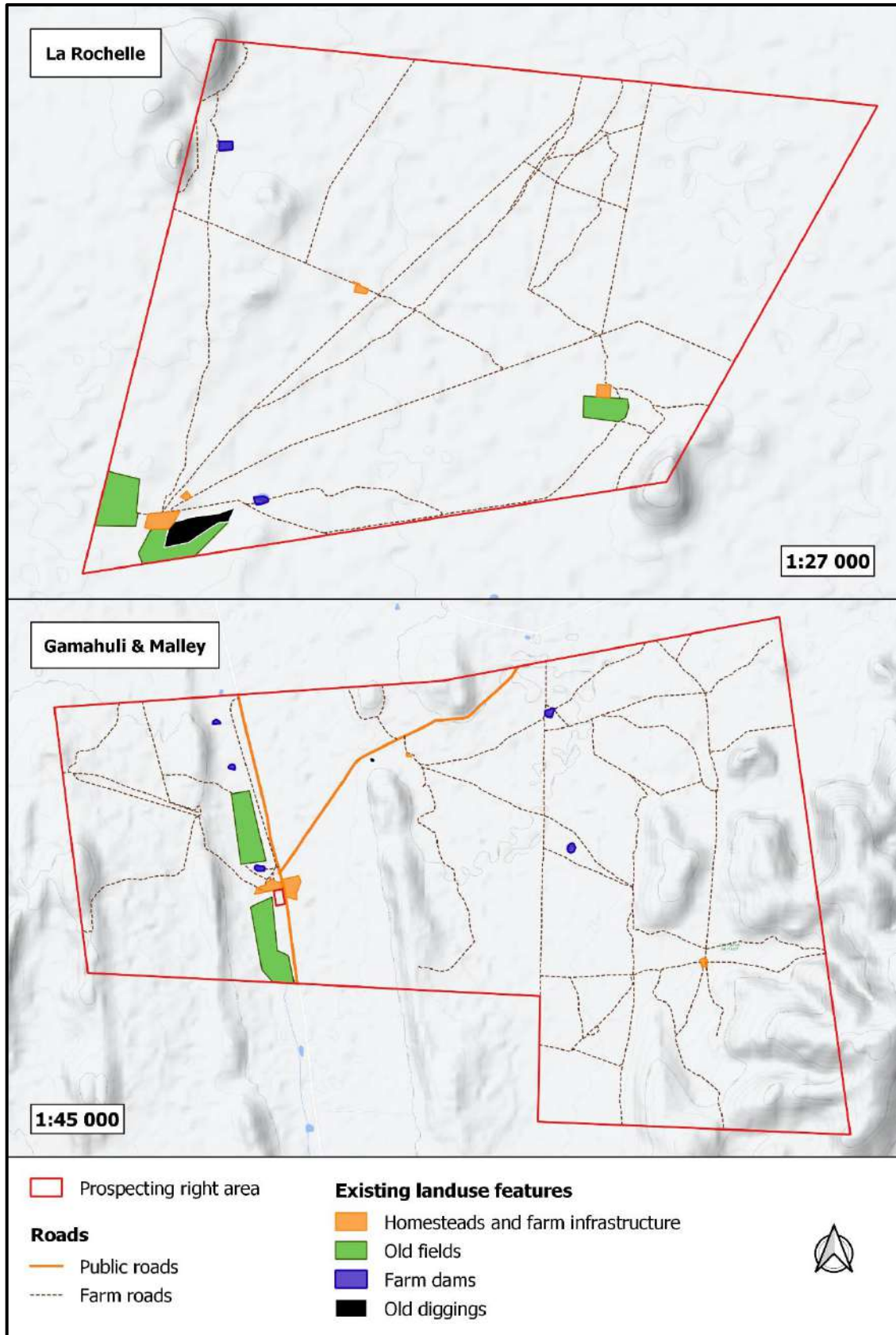


Figure 4. The existing land use features on the prospecting right area.



Figure 5. The distribution of geological features in the study area.

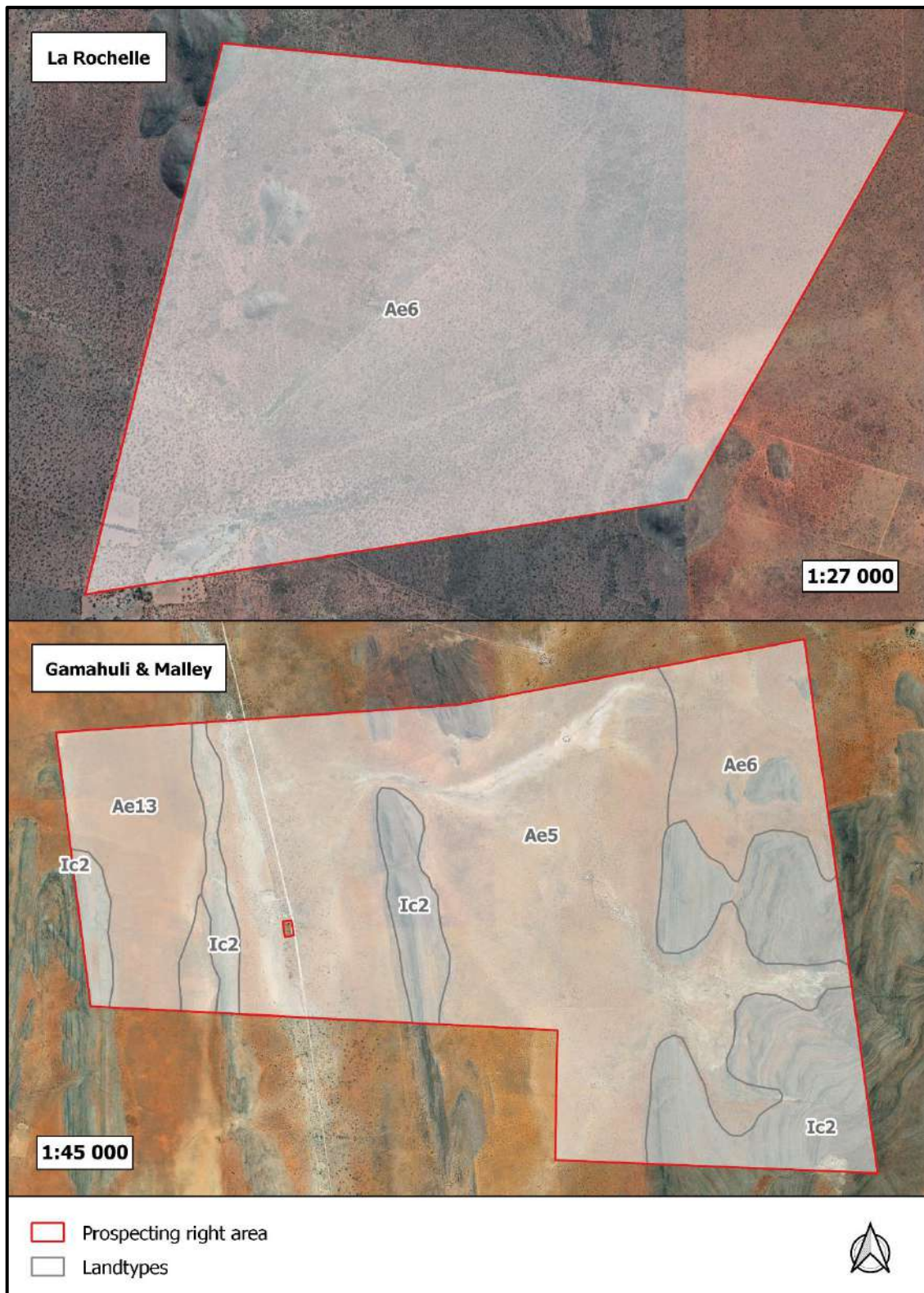


Figure 6. The distribution of land types in the study area.

The generally level to gently sloping land of the plains produces low water erosion risk, but because the soils primarily consist of pure sand, the wind erosion risk is increased significantly here. Conversely, the hill slopes are much steeper to increase water erosion risks, but with very little soil present here, wind and water erosion potential is substantially reduced. Nevertheless, if badly eroded, the soils of the study area have a low potential to regenerate.

3.3. Water resources

The National Water Act (36 of 1998) (NWA) provides a framework to protect water resources. According to this Act, a water resource includes a watercourse, surface water, estuary, or aquifer; whereas a water course includes:

- a) a river or spring,
- b) a natural channel in which water flows regularly or intermittently,
- c) a wetland, lake or dam into which, or from which, water flows, and
- d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse.

Any reference to a watercourse includes its bed and banks and a water resource does not only include the water within the system, but also the entire water cycle; i.e., evaporation, precipitation, the habitats and processes.

The purpose of this Act (Section 2) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors - (g) protecting aquatic and associated ecosystems and their biological diversity and (h) reducing and preventing pollution and degradation of water resources. No activity may take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from DWS in terms of Section 21 (c) and (i).

The study area falls within the Molopo quaternary catchments D41K and D42C of the Lower Vaal Water Management Area (Figure 7). Both quaternary catchments have been allocated a Present Ecological State (PES) of 'largely natural' (B) by Delport and Mallory (2002) and information regarding mean annual rainfall, evaporation potential and runoff for these quaternary catchments are provided in Table 2.

Table 2. Catchment characteristics for the Molopo quaternary catchments in which the study area fall, as presented by Delpont and Mallory (2002).

Quaternary catchment	Catchment Area (km ²)	Mean Annual Rainfall (mm)	Mean Annual Evaporation (mm)	Mean Annual Runoff (10 ⁶ m ³)
D41K	4 216	344	2 350	4.43
D42C	18 110	216	2 700	7.78

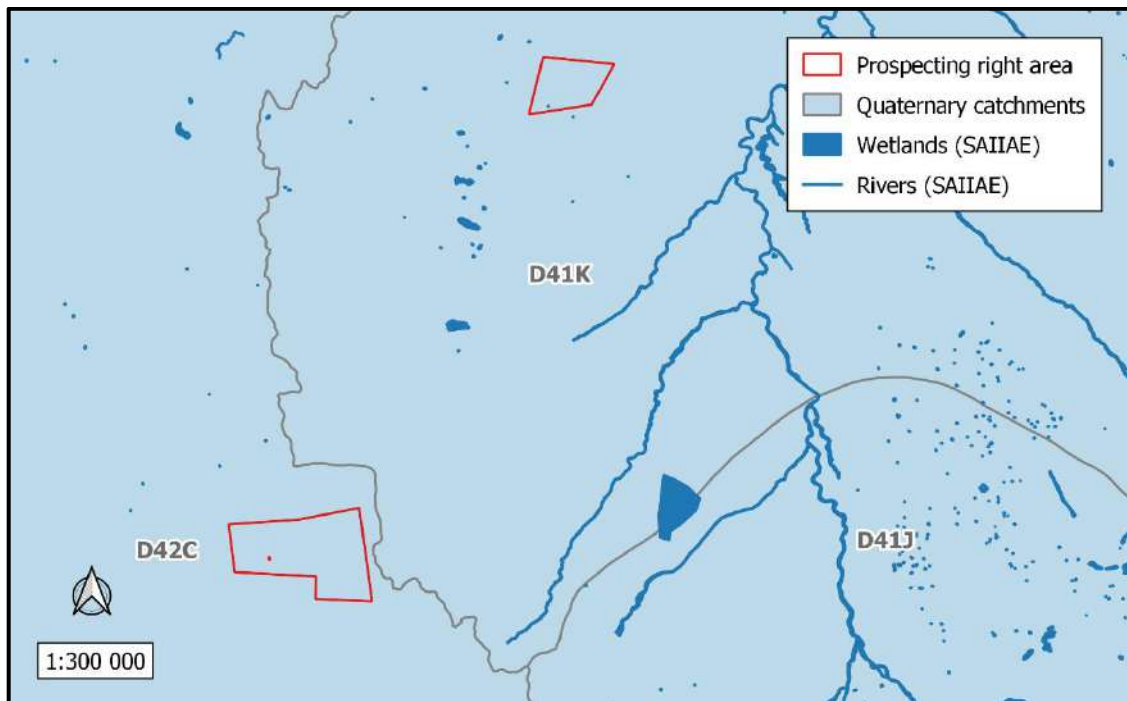


Figure 7. The locality of the proposed prospecting area in relation to the quaternary catchments of the Lower Vaal Water Management Area.

According to the South African Inventory of Inland Aquatic Ecosystems (SAIIAE), the study area falls within the Eastern Kalahari Bushveld Bioregion, where 1.3 % of the land area is covered by inland wetlands, including depressions, floodplains, seeps and valley-bottom wetland types (Van Deventer et al. 2019). The spatial extent according to the SAIIAE present ecological status per wetland type is depicted in Table 3. Depressions are most abundant in the bioregion, with the majority in natural or near-natural condition. The remaining wetland types have been moderately to severely modified.

The study area does not comprise any natural wetlands, but several drainage channels flow through it (Figure 8).

Table 3. Percentage of inland wetland spatial extent according to the present ecological status per wetland type of the Eastern Kalahari Bushveld Bioregion.

Wetland type	Total Extent (%)	% Natural or near-natural (A/B)	% Moderately modified (C)	% Heavily to severely/critically modified (D/E/F)
Depression	57.1	70.5	5.7	23.8
Floodplain	2.2	0.6	48.8	50.5
Seep	17.2	10	15.1	75
Valley-bottom	23.5	0.9	29.6	69.5

3.4. Vegetation

3.4.1. Broad-scale vegetation patterns

The study area falls within the Savanna Biome (Mucina and Rutherford 2006). According to the vegetation map of Mucina and Rutherford (2012), the site is represented by three broad-scale vegetation units, i.e. Kathu Bushveld, Koranna-Langeberg Mountain Bushveld, and Olifantshoek Plains Thornveld (Figure 9).

Kathu Bushveld is found in the Northern Cape on plains from Kathu and Dibeng (south), through Hotazel, to the Botswana border between Van Zylsrus and McCarthysrus (north). It occurs at altitudes between 960 and 1 300 m, with the vegetation presented as open savanna. *Vachellia erioloba* and *Boscia albitrunca* are dominant trees, while *Senegalia mellifera*, *Diospyros lycioides* and *Lycium hirsutum* are important shrubs. The geology comprises aeolian red sand and surface calcrete, with deep sandy soils of Hutton and Clovelly forms. The unit is considered least threatened, with none being statutorily conserved. More than 1% of this unit has been transformed mainly through mining, but erosion is very low.

Koranna-Langeberg Mountain Bushveld occurs in the Northern Cape at altitudes between 1 000 and 1 836 m. It is found from the Tswalu Kalahari Reserve, at the northern tip of the Korannaberg, in the form of multiple ridges, to the Langeberg west of Olifantshoek. The topography comprises mountains with steep slopes which supports open shrubland with moderately open grass cover. The geology comprises quartzite, greywacke and lenses of hematite of the Olifantshoek Supergroup. Soils consist of very rocky, shallow sand. The unit is considered least threatened, with none being statutorily conserved, but it is partly conserved in private reserves, such as Tswalu. Virtually none of this unit has been transformed and erosion is very low.

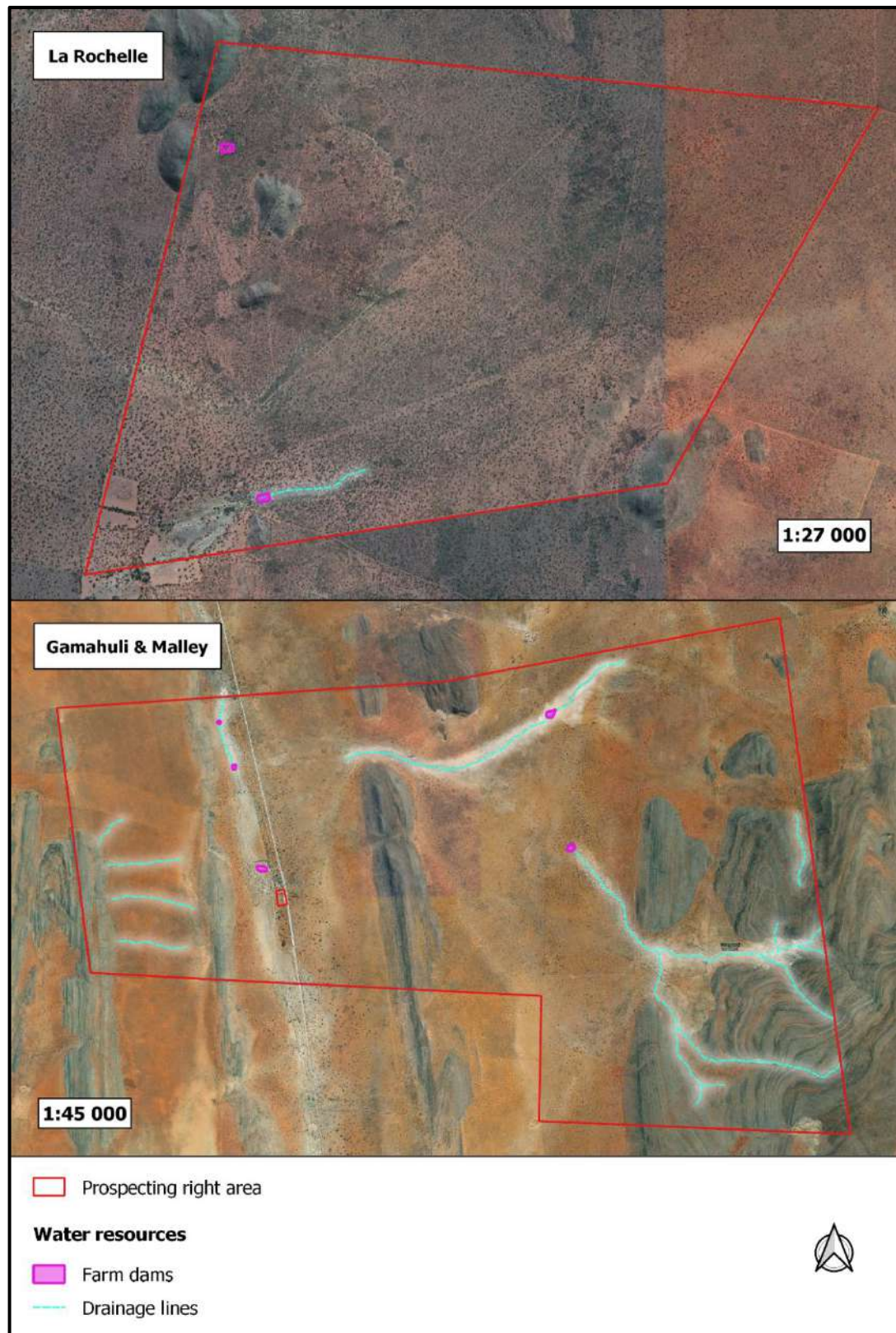


Figure 8. The location of water resources on the proposed prospecting right area.



Figure 9. The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

Olifantshoek Plains Thornveld is found in the Northern Cape at altitudes between 1 000 and 1 500 m. It is restricted to the pediments of the Korannaberg, Langeberg and Asbestos Mountains. The plains are presented by an open tree and shrub layer, with a sparse grass layer. The unit occurs on red aeolian sand of the Kalahari Groups with silcrete and calcrete and some andesitic and basaltic lava of the Griqualand West Supergroup. Soils are deep. Only 1 % of the unit has been transformed and erosion is very low. It is considered least threatened, and a small proportion is being conserved in the Witsand Nature Reserve. The shrub *Amphiglossa tecta* is the only endemic plant species known from this unit.

3.4.2. Fine-scale vegetation patterns

Plant communities in the study area are delineated according to plant species correspondences and changes in soil structure. They can be divided into five distinct units (Figure 10), which are described below. These descriptions include unique characteristics and the dominant species found in each unit. A complete plant species list, including those species likely to occur here is presented in Appendix 1.

i) *Vachellia erioloba* - *Stipagrostis uniplumis* open woodland on red sand

This community covers most of the study area and is found on aeolian deposits (Figure 10), where red sand constitutes about 10 % of the ground cover. The vegetation is presented as woodland where *Vachellia erioloba* dominates the tall tree layer, while the grassy matrix is dominated by *Stipagrostis uniplumis* (Figure 11). The woodland on La Rochelle comprises a much taller, denser tree canopy, while the woodland on Gamahuli and Malley includes a combination of tall shrubs and trees, with more open canopies.

Apart from the dominant species, other common trees scattered in this community include *Vachellia haematoxylon*, *Boscia albitrunca*, *Senegalia mellifera*, *Ziziphos mucronata* and *Tarchonanthus camphoratus*. Tall shrubs include *Grewia flava* and *Lycium hirsutum*, with *Viscum rotundifolium* parasitising many of these larger woody species. Lower shrubs such as *Rhigozum trichotomum*, *Lycium cinereum*, *Justicia incana*, *Eriocephalus ericoides*, *Chrysocoma ciliata*, *Pteronia mucronata*, *Lasiosiphon polycephalus*, *Asparagus exuvialis*, *Aptosimum albomarginatum*, *A. marlothii*, *A. elongatum*, *Pollichia campestris*, *Elephantorrhiza elephantina* and *Geigeria brevifolia* occurred in the grassy matrix.



Figure 10. The distribution of fine-scale plant communities in the study area.

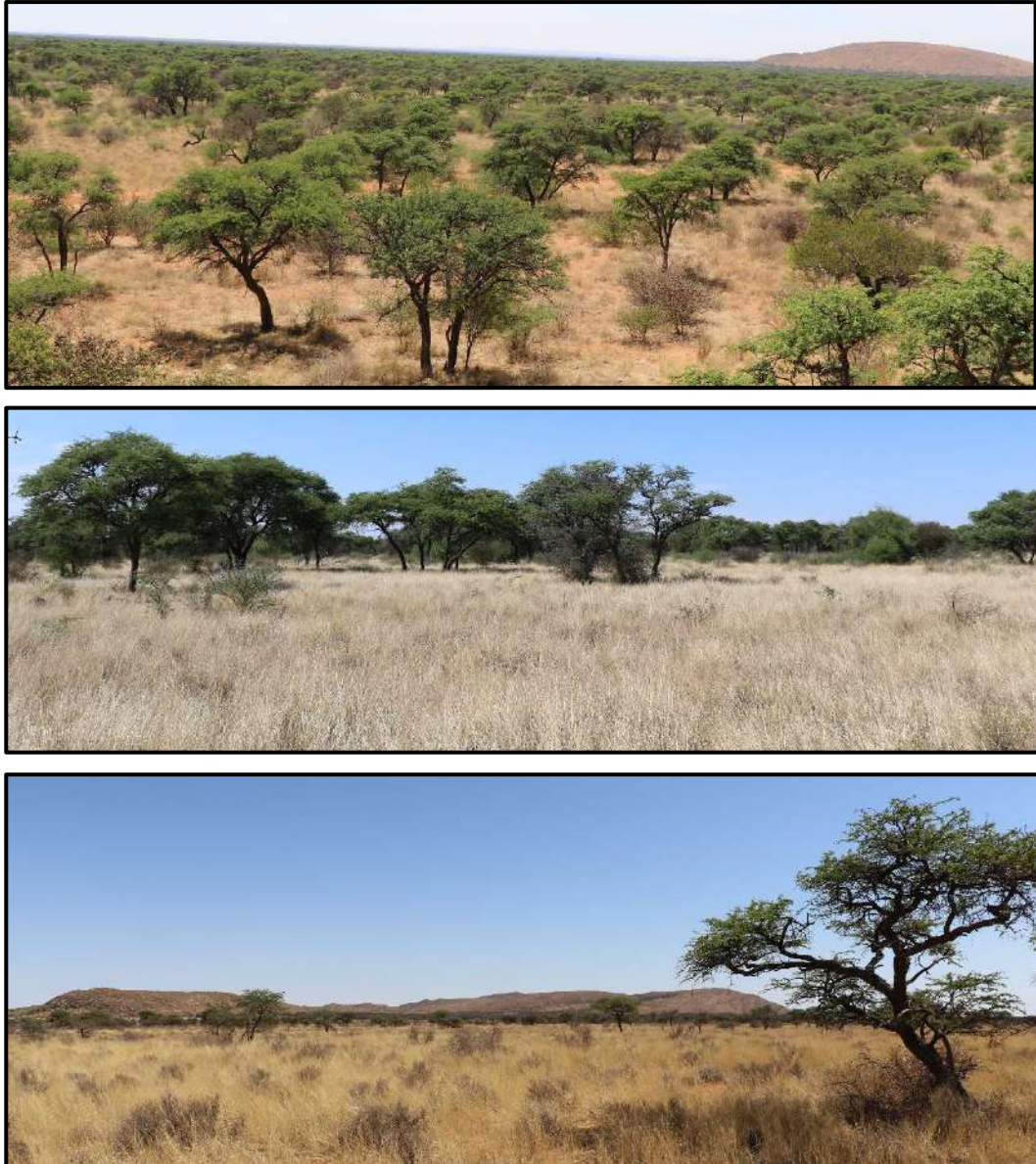


Figure 11. The woodland on red sand is presented by a tall tree layer dominated by *Vachellia erioloba*, scattered in a grassy matrix dominated by *Stipagrostis uniplumis*. The woodland on La Rochelle comprises a taller, denser tree canopy (top and centre), while the woodland on Gamahuli and Malley includes a combination of tall shrubs and trees, with more open canopies (bottom).

The grass layer is well developed and apart from the dominant species, *Eragrostis rigidior*, *Aristida congesta* subsp. *congesta* and *Eragrostis lehmanniana* are also very common. Other species include *Schmidtia pappophoroides*, *Pogonarthria squarrosa*, *Aristida engleri* var. *ramosissima* and *A. meridionalis*.

Common herbs include *Senna italica*, *Indigofera daleoides*, *Hermannia abrotanoides* and *Dicoma capensis*.

ii) *Croton gratissimus* - *Digitaria eriantha* open shrubland on quartz hills

This community has a patchy distribution across the study area and is restricted to the hills (Figure 10). Here, shallow soil and Quartzitic rock constitutes about 30 % of the ground cover (Figure 12). It is presented as an open shrubland with the dominant shrub *Croton gratissimus* scattered in a grassy matrix, dominated by *Digitaria eriantha* (Figure 12).

The shrub layer is further occupied by other common trees and shrubs, including *Senegalia mellifera*, *Searsia burchellii*, *Boscia albitrunca*, *Vachellia erioloba*, *Diospyros lycioides*, *Tarchonanthus camphoratus* and *Leonotis pentadentata*.

Apart from *D. eriantha*, *Cenchrus ciliaris*, *Aristida congesta* subsp. *congesta* and *Eragrostis rigidior* is also very common. Other grasses found here include *Aristida meridionalis*, *Heteropogon contortus* and *Urochloa nigropedata*.



Figure 12. The plant community on the hills is presented as open shrubland, where tall shrubs scattered in a grassy matrix occur on shallow soil among Quartzitic rocks.

iii) *Aristida congesta* - *Eriosephalus ericoides* shrubby grassland on alluvium

This community is associated with alluvium deposits, which occur in the centre of Gamahuli and Malley (Figure 10). It is found on light-coloured calcareous and sandy soil, where bare ground constitutes about 10 % of the ground cover. It is presented as a grassland dominated by *Aristida congesta* subsp. *barbicollis*, intermixed with a low shrub layer dominated by *Eriosephalus ericoides* (Figure 13).

The grass layer is not particularly well developed but forms very dense stands. Apart from the dominant grass species already mentioned, other abundant grasses include *Chloris virgata*, *Eragrostis rotifer* and *E. rigidior*. *Pogonarthria squarrosa* and *Aristida congesta* subsp. *congesta* also occurred here, but at low densities.

The low shrub layer is diverse and in addition to the dominant species, other species include *Oedera humilis*, *Plinthus karooicus*, *Justicia incana*, *Ruschia griquensis*, *Tetraena microcarpa*, *Melolobium candicans*, *Pentzia calcarea*, *Pteronia mucronata*, *Barleria rigida*, *Thesium hystrix* and *Salsola* sp. Taller shrubs and trees, i.e., *Vachellia erioloba*, *V. hebeclada*, *Grewia flava*, *Lycium cinereum* and *Rhigozum trichotomum* also occur scattered across the grassland matrix, but at low densities.

Herbs include *Convolvulus sagittatus*, *Senna italica*, *Kewa salsoloides* and *Chascanum pinnatifidum*.



Figure 13. The plant community on alluvium is presented as a grassland, intermixed with a low shrub layer.

iv) *Eragrostis rotifer* - *Chloris virgata* grassland on artificial pan

This community is located on what appears to be an artificial pan, where an earth wall intercepts the natural drainage line in the north of Gamahuli (Figure 10). Here, it is surrounded by the shrubland community on alluvium.

The centre of the pan is primarily bare, from where it transitions outwards into a monotonous grassland dominated by *Eragrostis rotifer*, but *Chloris virgata* is also present (Figure 14). Trees line the periphery of the pan, which includes *Vachellia erioloba*, *V. hebeclada*, *Ziziphus mucronata*, *Grewia flava*, *Lycium hirsutum* and *L. cinereum*. The grass *Setaria verticillata* occurs under the tree canopy and the low shrub *Oedera humilis* occurs near the transition zone with the shrubland on alluvium.



Figure 14. The artificial pan comprises a bare centre, which transitions into a monotonous grassland, while the perimeter is lined with trees.

v) *Prosopis glandulosa* - *Vachellia erioloba* closed woodland on transformed land

This community is restricted to a small area in the south-west of La Rochelle (Figure 10), where historic land use activities have transformed the natural vegetation. The vegetation resembles the woodland on red sand, but it has been severely infested by *Prosopis glandulosa* to form impenetrable stands of trees in some places (Figure 15). Red sand constitutes 10 - 20 % of the ground cover.

Apart from the dominant *Prosopis* stands, *Vachellia erioloba* trees are also common. Tall shrubs include *Senegalia mellifera*, *Ziziphus mucronata* and *Vachellia hebeclada*. Lower shrubs include *Rhigozum trichotomum*, *Lycium cinereum*, *Lasiosiphon polycephalus*, *Chrysocoma ciliata*, *Aptosimum marlothii*, *Pentzia incana* and *Asparagus exuvialis*.

The grass layer is dominated by *Aristida congesta* subsp. *congesta*, but *Stipagrostis uniplumis* is also abundant. Other grasses include *Pogonarthria squarrosa*, *Schmidtia pappophoroides*, *Eragrostis rigidior*, *E. trichophora*, *Chloris virgata*, *Aristida meridionalis*, *A. adscensionis* and *Cenchrus ciliaris*.

Senna italica was the only herb recorded here during the survey.



Figure 15. The woodland on transformed land resembles the woodland on red sand, but it has been severely infested by *Prosopis glandulosa* to form impenetrable stands of trees in some places.

3.4.3. Population of sensitive, threatened, and protected plant species

The SANBI Red List provides information on the national conservation status of South Africa's indigenous plants, while the National Forests Act (No. 84 of 1998) (NFA) and the Northern Cape Nature Conservation Act (Act No. 9 of 2009) (NCNCA) restricts activities regarding sensitive plant species. Section 15 of the NFA prevents any person to cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister. Section 49 (1) and 50 (1) of the NCNCA states that no person may, without a permit pick, transport, possess, or trade in a specimen of a specially protected (Schedule 1) or protected (Schedule 2) plants. Furthermore, Section 51(2) states that no person may, without a permit, pick an indigenous plant (Schedule 3) in such manner that it constitutes large-scale harvesting.

Most species recorded in the area are classified as least concern; a category which includes widespread and abundant taxa (Table 4). However, one species, i.e., *Tragia physocarpa*, is listed as “Data Deficient – Taxonomically Problematic”. This species was originally described from material collected in 1912 in northern Namibia, but since then only a few scattered records from Gauteng and the Kalahari Region of the Northern Cape have been matched to the description. The genus *Tragia* needs revision, and many species are poorly known. Due to the uncertainty around the identity of this taxon, its risk of extinction has not yet been assessed. It was not recorded during the survey, but it is known to prefer rocky places in grassland, bushveld and thornveld. Therefore, it is most likely to be restricted to the hills on site.

Species protected in terms of the National Forests (NFA) Act No 84 of 1998 include *Vachellia erioloba*, *V. haematoxylon* and *Boscia albitrunca* (Table 4). The latter species is also protected according to the NCNCA (Schedule 2) and occurs widespread across the hills and woodland on red sand (Figure 16). In the latter community they are found at low densities of less than 1 individual per hectare, as large adult trees with canopies of 5 - 12 m in diameter and up to 5 m tall. On the hills they occur at slightly higher densities (3 - 4 individuals per hectare), as adult trees with canopies of \pm 3 - 5 m in diameter and up to 3 m tall.

Vachellia erioloba occurs across the entire study area (Figure 17), with its densities being very high in the woodland on red sand (8 - 20 individuals per hectare) as well as the infested woodland (10 individuals per hectare).

Table 4. Plant species found in the region that are of conservation concern.

FAMILY	Scientific name	Status	NFA	NCNCA
AIZOACEAE	<i>Ruschia griquensis</i>	LC		S2
AMARYLLIDACEAE	<i>Haemanthus humilis</i> subsp. <i>humilis</i>	LC		S2
	<i>Nerine laticoma</i>	LC		S2
APOCYNACEAE	<i>Fockea angustifolia</i>	LC		S2
	<i>Gomphocarpus fruticosus</i>	LC		S2
	<i>Gomphocarpus tomentosus</i> subsp. <i>tomentosus</i>	LC		S2
	<i>Orthanthera jasminiflora</i>	LC		S2
BRASSICACEAE	<i>Boscia albitrunca</i>	LC	X	S2
EUPHORBIACEAE	<i>Euphorbia spartaria</i>	LC		S2
	<i>Tragia physocarpa</i>	DDT		
FABACEAE	<i>Lessertia frutescens</i> subsp. <i>frutescens</i>	LC		S1
	<i>Vachellia erioloba</i>	LC	X	
	<i>Vachellia haematoxylon</i>	LC	X	
IRIDACEAE	<i>Moraea polystachya</i>	LC		S2
OXALIDACEAE	<i>Oxalis haedulipes</i>	LC		S2
SCROPHULARIACEAE	<i>Jamesbrittenia integerrima</i>	LC		S2

Vachellia erioloba also formed dense stands around the artificial pan, but in the grassland and hills their densities were very low (< 1 individual per ha). Here, they also primarily occurred as adult trees (2 – 5 m (w) x 3 – 6 m (h)), but in the woodlands they are found across the entire size and age range, i.e., from saplings (20 - 60 cm (w) x 20 - 80 cm (h)), young individuals (1 m (w) x 1.5 - 2 m (h)) to tall adult trees (3 - 10 m (w) x 6 - 12 m (h)).

Vachellia haematoxylon are restricted to the woodlands on red sand of Gamahuli and Malley, where they are found at moderate densities of 2 - 4 individuals per hectare as young shrubs (1 – 2 m (w) x 2 m (h)) to adult trees of up to 5 m tall, with canopies of 2 - 6 m wide (Figure 18).

To damage or remove any of these protected trees (seedlings to adults) an application must be submitted to the Northern Cape Department of Agriculture, Forestry and Fisheries (DAFF) and a licence obtained from DAFF at least three months prior to such activities.

Protected species in terms of Schedule 1 and 2 of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009 is listed in Table 4. Species already discussed above, i.e., *B. albitrunca* is protected according to Schedule 2. *Ruschia griquensis*, also protected according to Schedule 2 of the NCNCA occurs in the grassland on alluvium, at very low densities. The remaining species were not encountered during the field survey.

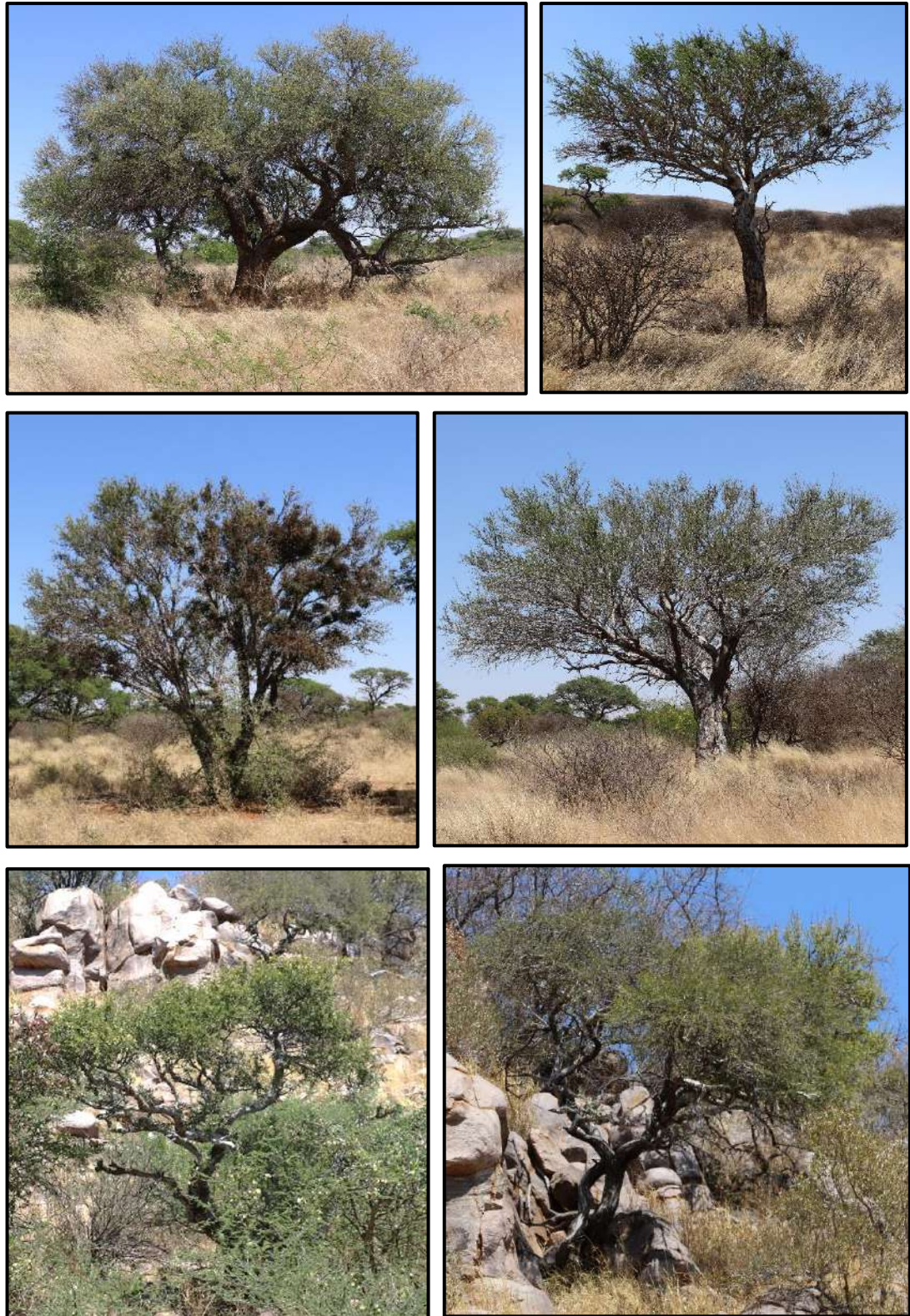


Figure 16. The protected tree *Boscia albitrunca* is widespread across the woodland on red sand (top and centre) as well as on the hills (bottom).

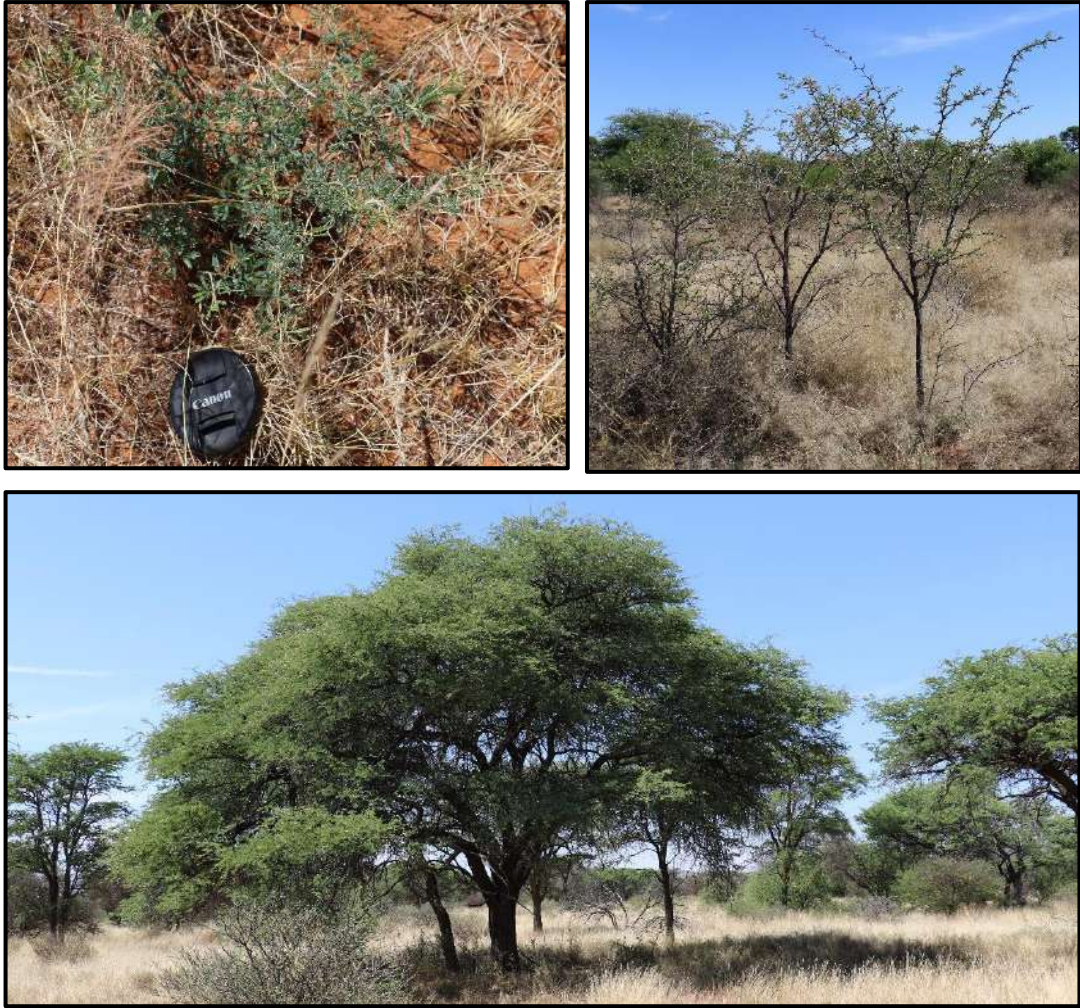


Figure 17. The protected tree *Vachellia erioloba* occur as samplings (top left), young individuals (top right) and large adult trees (bottom) at high densities in the woodland on red sand.



Figure 18. The protected tree *Vachellia haematoxylon* is restricted to the woodland of Gamahuli and Malley, where they occur as young individuals (left) and large trees (right).

In addition to those protected species listed above; according to Section 51(2) of NCNCA, a permit is required from the Northern Cape, Department of Environment and Nature Conservation (DENC) for any large-scale clearance of all indigenous (Schedule 3) vegetation, at least three months before such activities commence.

3.4.4. Weeds and invader plant species

Weeds and invasive species are controlled in terms of the National Environmental Management: Biodiversity (NEMBA) Act 10 of 2004, the Conservation of Agricultural Resources (CARA) Act 43 of 1993, as well as the NCNCA (Schedule 6). These are species that do not naturally occur in a given area and exhibit tendencies to invade that area, and others; at the cost of locally indigenous species. To govern the control of such species, NEMBA and CARA have divided weeds and invader species into categories (see Table 5). All declared weeds and invasive species recorded in and around the study area are listed in Table 6, along with their categories according to CARA, NEMBA and NCNCA.

Table 5. The categorisation of weeds and invader plant species, according to NEMBA and CARA.

NEMBA	CARA
<p>1a Listed invasive species that must be combatted or eradicated.</p>	<p>1 Plant species that must be removed and destroyed immediately. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals and the environment.</p>
<p>1b Listed invasive species that must be controlled.</p>	<p>2 Plant species that may be grown under controlled conditions. These plants have certain useful qualities and are allowed in demarcated areas. In other areas they must be eradicated and controlled.</p>
<p>2 Listed invasive species that require a permit to carry out a restricted activity within an area.</p>	<p>3 Plant species that may no longer be planted. These are alien plants that have escaped from or are growing in gardens and are proven to be invaders. No further planting is allowed. Existing plants may remain (except those within the flood line, 30 m from a watercourse, or in a wetland) and must be prevented from spreading.</p>
<p>3 Listed invasive species that are subject to exemptions and prohibitions</p>	

Table 6. A list of declared weeds and invasive species recorded in the study area.

Scientific name	Common name	CARA	NEMBA	NCNCA
<i>Prosopis glandulosa</i> var. <i>glandulosa</i>	Honey mesquite	2	3	S6

3.4.5. Indicators of bush encroachment

Bush encroacher species are controlled in terms of Regulation 16 of CARA; where land users of an area in which natural vegetation occurs and that contains communities of encroacher indicator plants are required to follow sound practices to prevent the deterioration of natural resources and to combat bush encroachment where it occurs. Declared indicators of bush encroachment in the Northern Cape, which were recorded in and around the study area, are listed in Table 7.

Table 7. A list of declared indicators of bush encroachment in the Northern Cape recorded in the study area.

Scientific name	Common name
<i>Grewia flava</i>	Velvet Raisin
<i>Rhigozum trichotomum</i>	Three-thorn rhigozum
<i>Senegalia mellifera</i>	Black thorn
<i>Tarchonanthus camphoratus</i>	Camphor Bush

3.5. Faunal communities

According to Section 3(a) and 4(a) of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009, no person may, without a permit by any means hunt, kill, poison, capture, disturb, or injure any protected or specially protected animals. Furthermore, Section 12 (1) of NCNCA states that no person may, on a land of which he or she is not the owner, hunt a wild animal without the written permission from the landowner.

The landscape features in the study area provides diverse habitat opportunities to faunal communities and the rocky and sandy substrates also provide many micro habitats. Animals likely to be found in the study area are discussed in their respective faunal groups below.

3.5.1. Mammals

As many as 54 terrestrial mammals and seven bat species have been recorded in the region (see Appendix 2). Of these, six terrestrial mammal species and two bat species are listed either according to the IUCN or South African Mammal Red List (Table 8). The two listed bat species, Ground Pangolin, African Striped Weasel, South African Hedgehog and Black-footed Cat have a high chance of occurring across the site, given their wide habitat tolerances or preference for savanna habitats. Leopard and Brown Hyaena have a low potential to be found on site mainly since farm fences are restricting their occurrences across their natural distribution range, and they are also persecuted by livestock farmers. It is however possible that leopard could occasionally roam the larger hills on Gamahuli and Malley.

Table 8. Mammal species of conservation concern that are likely to occur in the region. Conservation values are indicated in terms of the international (IUCN) Red List, the South African Mammal Red List (SA MRL) and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	IUCN	SA MRL	NCNCA
<i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT		
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat		NT	
<i>Atelerix frontalis</i>	South African Hedgehog		NT	X
<i>Smutsia temminckii</i>	Ground Pangolin	VU	VU	X
<i>Orycteropus afer</i>	Aardvark			X
<i>Vulpes chama</i>	Cape Fox			X
<i>Otocyon megalotis</i>	Bat-eared Fox			X
<i>Mellivora capensis</i>	Honey Badger			X
<i>Poecilogale albinucha</i>	African Striped Weasel		NT	X
<i>Ictonyx striatus</i>	Striped Polecat			X
<i>Hyaena brunnea</i>	Brown Hyena	NT		X
<i>Proteles cristata</i>	Aardwolf			X
<i>Felis silvestris</i>	African Wild Cat			X
<i>Felis nigripes</i>	Black-footed Cat	VU	VU	X
<i>Panthera pardus</i>	Leopard	VU	VU	X

Furthermore, virtually all mammals of the study area are protected; either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Apart from the red listed species already discussed above, those that are specially protected (Schedule 1) include Aardvark, Cape Fox, Bat-eared Fox, Honey Badger, Striped Polecat, Aardwolf, and African Wild Cat. These all have an affinity for open woodland or savanna and therefore a high likelihood to occur on site.

Brants' Whistling Rat, South African Ground Squirrel, Yellow Mongoose, Duiker, Steenbok, and Greater Kudu, all protected under Schedule 2, were recorded on site. The presence of fossorial mammals was also signified through many different burrows, observed during the field survey (Figure 19). Chacma Baboon (Schedule 4 – Problem animal) was also recorded during the field survey. Other problem animals with a high likelihood to occur here include Black-backed Jackal and Caracal.

3.5.2. Reptiles

The proposed prospecting area lies within the distribution range of at least 46 reptile species (see Appendix 2), of which none are red listed. However, most are protected either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Specially protected species (Schedule 1) include *Chamaeleo dilepis dilepis* (Common Flap-neck Chameleon), *Karusasaurus polyzonus* (Southern Karusa Lizard) and *Python natalensis* (Southern African Python). The Southern Karusa Lizard has a low likelihood to be found on site due to their preference for dolerite rock outcrops. The Southern African Python is associated with a variety of habitats but prefers riverine or rocky areas and therefore might be found in the hills. The Namaqua Chameleon, however, has a high chance of occurring on site. They occur in a variety of habitats and is expected to be found high up in shrubs or trees.

The only South African endemic known from the region is *Acontias gracilicauda* (Thin-tailed Legless Skink). It is fossorial and usually found in moderately mesic soils in open or partly wooded habitats up to 1 600 m.a.s.l. Images of these reptile species of special importance are shown in Figure 20.

3.5.3. Amphibians

Ten amphibian species are known from the region (Appendix 2), of which none are red listed. However, all amphibians of the study area are protected according to Schedule 2 of NCNCA (see Appendix 2). One South African endemic, i.e., *Vandijkophrynus garipeensis* (Karoo Toad) is known from the region. It is adapted to a wide variety of terrestrial habitats and breeds in different types of permanent and temporary waterbodies. It could therefore potentially occur on site, especially in the pans and artificial farm dams after good rainfall events. Similarly, any pool or stream formed after large rainfall events are expected to attract most of the remaining frog species for breeding.



Figure 19. Burrows occur across the sandy substrate of the study area signifying the presence of Brants' Whistling Rat (top), and other fossorial mammals (centre and bottom).

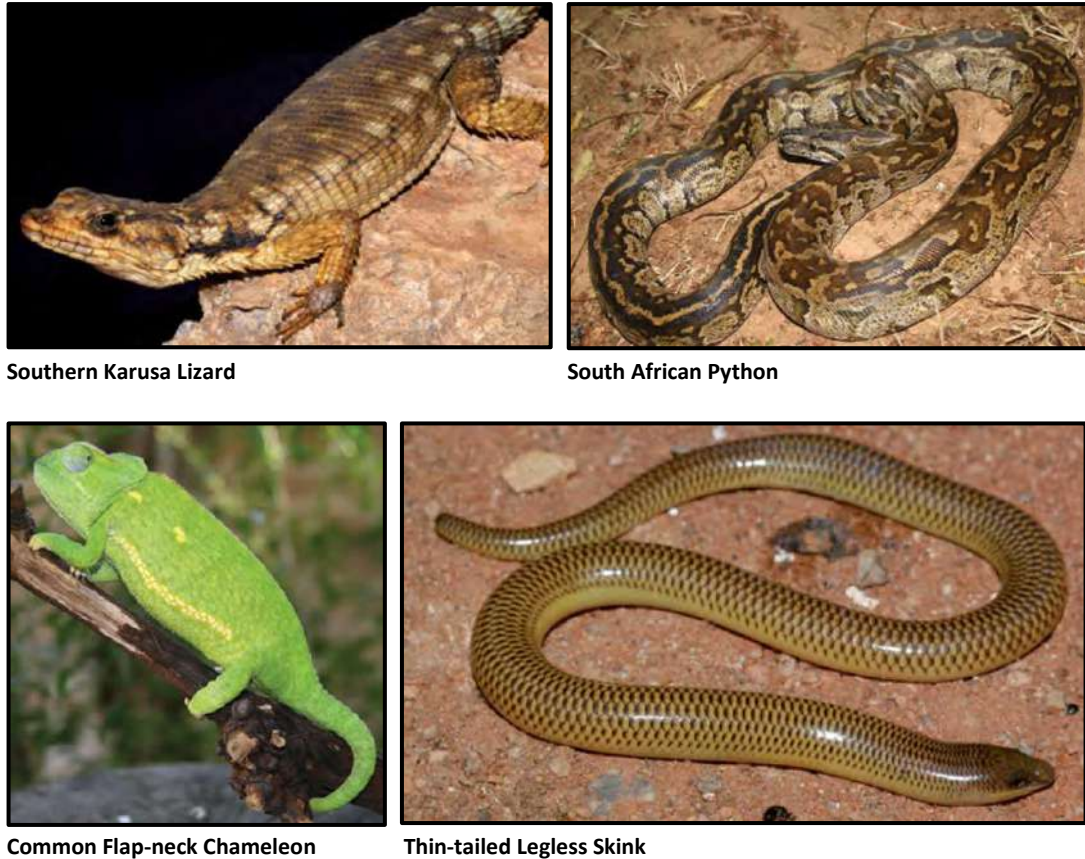


Figure 20. Reptile species of special importance that are expected to occur in the study area.

However, the Bushveld Rain Frog is independent of water and is expected to be found across the study area. Those species that are dependent on perennial waters, i.e., Common Platanna and Common River Frog are not expected to occur on site.

3.5.4. Avifauna

The study site does not fall within or near (< 150 km) any of the Important Bird Areas (IBA) defined by Birdlife South Africa. A total number of 267 bird species have been recorded from the region (see Appendix 2), of which 28 are listed either in the IUCN or South African Red Data Book of Birds (Table 9). Of these, Ludwig's Bustard was recorded in the grassland community during the field survey. Furthermore, all birds are protected either according to Schedule 1, 2 or 3 of NCNCA (Appendix 2). Those that are specially protected (Schedule 1) are also listed in Table 9.

Table 9. Bird species of conservation concern recorded from the study region.

Scientific name	Common name	IUCN	SA RDB	NCNCA (S1)
<i>Accipiter badius</i>	Shikra	LC	LC	X
<i>Anthropoides paradisea</i>	Blue Crane	VU	NT	
<i>Anthus crenatus</i>	African Rock Pipit	NT	NT	
<i>Aquila rapax</i>	Tawny Eagle	VU	EN	X
<i>Aquila verreauxii</i>	Verreaux's Eagle	LC	VU	X
<i>Ardeotis kori</i>	Kori Bustard	NT	NT	
<i>Bubo africanus</i>	Spotted Eagle-Owl	LC	LC	X
<i>Bubo lacteus</i>	Verreaux's Eagle-Owl	LC	LC	X
<i>Buteo rufofuscus</i>	Jackal Buzzard	LC	LC	X
<i>Buteo vulpinus</i>	Steppe Buzzard	LC	LC	X
<i>Caprimulgus europaeus</i>	European Nightjar	LC	LC	X
<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar	LC	LC	X
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT	X
<i>Ciconia abdimii</i>	Abdim's Stork	LC	NT	
<i>Ciconia nigra</i>	Black Stork	LC	VU	X
<i>Circaetus cinereus</i>	Brown Snake-Eagle	LC	LC	
<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle	LC	LC	X
<i>Circus maurus</i>	Black Harrier	EN	EN	X
<i>Circus pygargus</i>	Montagu's Harrier	LC	LC	X
<i>Coracias garrulus</i>	European Roller	LC	NT	
<i>Cursorius rufus</i>	Burchell's Courser	LC	VU	
<i>Elanus caeruleus</i>	Black-shouldered Kite	LC	LC	X
<i>Falco biarmicus</i>	Lanner Falcon	LC	VU	X
<i>Falco chicquera</i>	Red-necked Falcon	NT	LC	X
<i>Falco naumanni</i>	Lesser Kestrel	LC	LC	X
<i>Falco peregrinus</i>	Peregrine Falcon	LC	LC	X
<i>Falco rupicolis</i>	Rock Kestrel	LC	LC	X
<i>Falco rupicoloides</i>	Greater Kestrel	LC	LC	X
<i>Falco vespertinus</i>	Red-footed Falcon	VU	NT	X
<i>Glareola nordmanni</i>	Black-winged Pratincole	NT	NT	X
<i>Glaucidium perlatum</i>	Pearl-spotted Owlet	LC	LC	X
<i>Gyps africanus</i>	White-backed Vulture	CR	CR	X
<i>Gyps coprotheres</i>	Cape Vulture	EN	EN	X
<i>Haliaeetus vocifer</i>	African Fish-Eagle	LC	LC	X
<i>Hieraaetus pennatus</i>	Booted Eagle			X
<i>Leptoptilos crumeniferus</i>	Marabou Stork	LC	NT	X
<i>Melierax canorus</i>	Southern Pale Chanting Goshawk	LC	LC	X
<i>Melierax gabar</i>	Gabar Goshawk	LC	LC	X
<i>Milvus migrans</i>	Black Kite	LC	LC	X
<i>Mycteria ibis</i>	Yellow-billed Stork	LC	EN	X
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN	VU	X
<i>Otus senegalensis</i>	African Scops-Owl			X
<i>Oxyura maccoa</i>	Maccoa Duck	VU	NT	
<i>Phoenicopterus minor</i>	Lesser Flamingo	NT	NT	X
<i>Phoenicopterus ruber</i>	Greater Flamingo	LC	NT	X
<i>Polemaetus bellicosus</i>	Martial Eagle	EN	EN	X
<i>Polihierax semitorquatus</i>	Pygmy Falcon	LC	LC	X
<i>Polyboroides typus</i>	African Harrier-Hawk	LC	LC	X
<i>Ptilopus granti</i>	Southern White-faced Scops-Owl	LC	LC	X
<i>Sagittarius serpentarius</i>	Secretarybird	EN	VU	X
<i>Terathopius ecaudatus</i>	Bateleur	EN	EN	X
<i>Torgos tracheliotus</i>	Lappet-faced Vulture	EN	EN	X
<i>Tyto alba</i>	Barn Owl	LC	LC	X

Among these, birds with a high affinity for woodland and grassland habitat, i.e. Martial Eagle, Tawny Eagle, Bateleur, Lanner Falcon, Red-necked Falcon, Red-footed Falcon, White-backed Vulture, Secretarybird, Lappet-faced Vulture, Kori Bustard, Roller- and Owl species, have the highest likelihood to occur on site and are expected to forage, nest or pass through the woodland and grassland communities (Figure 21). The protected water birds (i.e., Chestnut-banded Plover, Storks, Black-winged Pratincole, Maccoa Duck, Lesser Flamingo and Greater Flamingo) may potentially occur in the artificial pan, but only seldomly when it is inundated. High altitude rock associated species (Verreaux's Eagle, African Rock Pipit and Cape Vulture) may occur on the hills. Sociable Weaver's nests (Schedule 2) were observed in many of the larger *Vachellia erioloba* trees (Figure 21).

3.5.5. Fish

In addition to those regulations in the NCNCA pertaining to wild animals, Section 32 and 33 of the NCNCA states that no person may, without a permit and not immediately release, catch, import, export, transport, keep, possess, breed, or trade in a specimen of a specially protected (Schedule 1) or protected (Schedule 2) fish. However, no suitable habitat for fish occurs on site and therefore no fish species are expected to occur in the study area.

3.5.6. Invertebrates

Invertebrates dominate inland habitats and play a significant role in the overall function of the ecosystem (Kremen et al. 1993; Weisser and Siemann 2004). In general, they are widely distributed and extremely diverse, which makes it almost impossible to list all species that may possibly occur on site without a dedicated monitoring programme. Invertebrates have also not been surveyed as comprehensively as plants and mammals and therefore current available data on their distribution is much scarcer. Nevertheless, key morphospecies and species of conservation concern are discussed here, as well as the major habitats which delimit possible invertebrate communities on site.

Seventeen invertebrate species of the Northern Cape appear on the IUCN Red Data list of threatened species and are listed in Table 10. Among the listed invertebrates, one species, i.e., *Anthene lindae*, Linda's Hairtail (**Near Threatened**) (Figure 22) is known from the study region and could potentially occur on site. The adult butterflies are usually found on scattered *Vachellia erioloba* trees, which is believed to be the larval host plant.

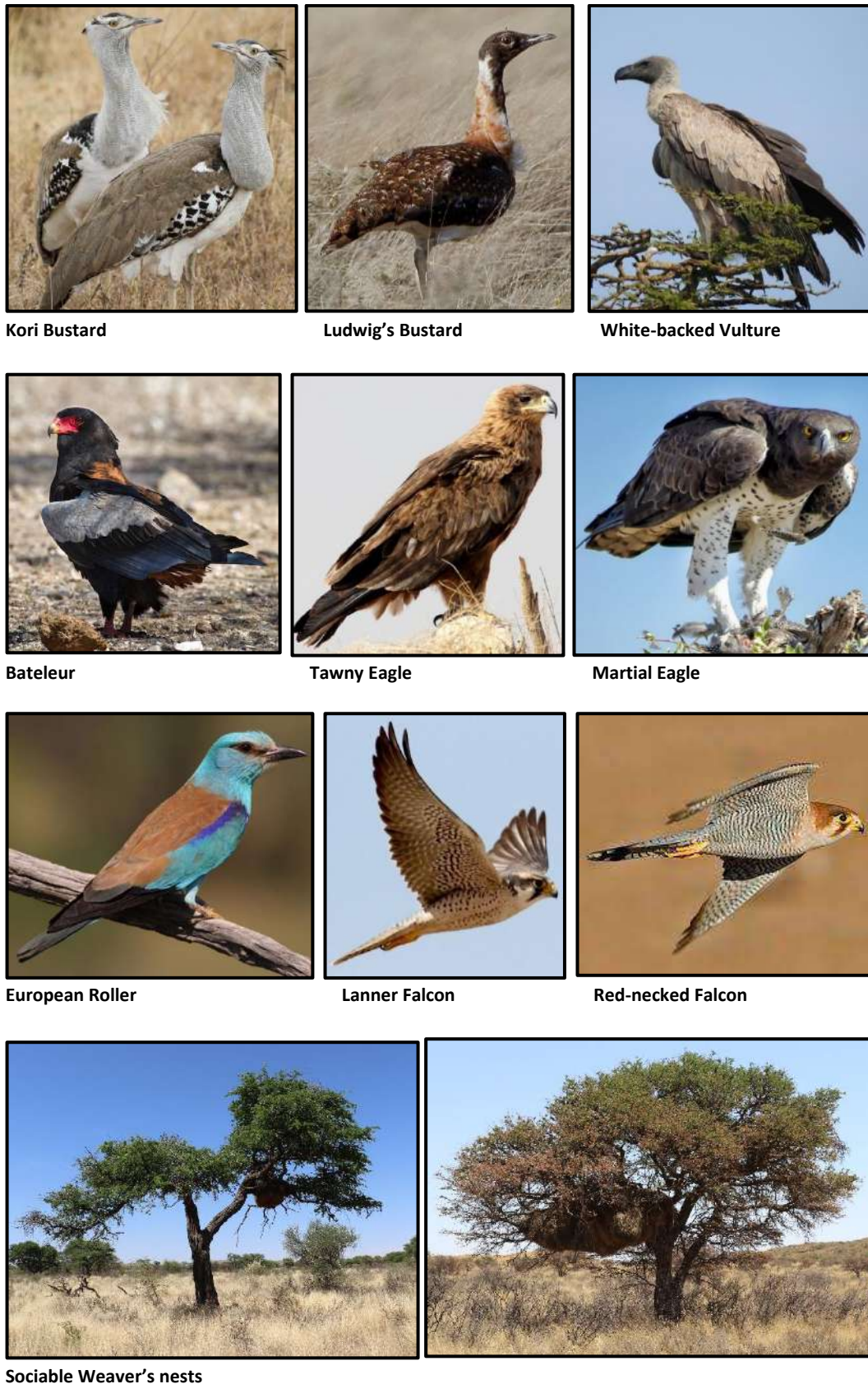


Figure 21. The most common bird species of conservation concern from the study area.

Table 10. Invertebrate species found in the Northern Cape that are of conservation concern.

CLASS	ORDER	Scientific Name	Common name	Status	
ARACHNIDA	MYGALOMORPHAE	<i>Ceratogyrus</i> spp.	Horned Baboon Spiders	S1	
		<i>Harpactira</i> spp.	Common Baboon Spiders	S1	
		<i>Pterinochilus</i> spp.	Goldenbrown Baboon Spiders	S1	
	SCORPIONES	<i>Hadogenes</i> spp.	All Rock Scorpions	S2	
		<i>Opisthacanthus</i> spp.	All Creeping Scorpions	S2	
		<i>Opisththalmus</i> spp.	All Burrowing Scorpions	S2	
DIPLOPODA	SPIROSTREPTIDA	<i>Harpagophora monodus</i>	Millipede	NT	
INSECTA	COLEOPTERA	<i>Circellium bacchus</i>	Flightless Dung Beetle	S1	
		<i>Colophon</i> spp.	All Stag Beetles	S1	
		<i>Dromica</i> spp.	Tiger Beetles (all species)	S2	
		<i>Graphipterus assimilis</i>	Velvet Ground Beetle	S2	
		<i>Ichnestoma</i> spp.	All Fruit Chafer Beetles	S2	
		<i>Manticora</i> spp.	All Monster Tiger Beetles	S2	
		<i>Megacephala asperata</i>	Tiger Beetle	S2	
		<i>Megacephala regalis</i>	Tiger Beetle	S2	
		<i>Nigidius auriculatus</i>	Stag Beetle	S2	
		<i>Oonotus adspersus</i>	Stag Beetle	S2	
		<i>Oonotus interioris</i>	Stag Beetle	S2	
		<i>Oonotus rex</i>	Stag Beetle	S2	
		<i>Oonotus sericeus</i>	Stag Beetle	S2	
		<i>Platychile pallida</i>	Tiger Beetle	S2	
		<i>Prosopocoilus petitclerci</i>	Stag Beetle	S2	
		<i>Prothyma guttipennis</i>	Tiger Beetle	S2	
		<i>Scarabaeus canaliculatus</i>	Dung Beetle	DD	
		LEPIDOPTERA	<i>Anthene lindae</i>	Linda's Hairtail	NT
			<i>Chrysothrix trimeni</i>	Trimen's Opal	VU
			<i>Lepidochrysops penningtoni</i>	Pennington's Blue	DD
	Lycaenidae		All Gossamer-winged Butterflies	S2	
	Hepialidae		All Swift Moths	S2	
	Hesperiidae		All Skippers	S2	
	Nymphalidae		All Brush-footed Butterflies	S2	
	ORTHOPTERA	Satyridae	All Satyrs	S2	
		<i>Africariola longicauda</i>	Richtersveld Katydid	VU	
		<i>Afrotettix fursti</i>	Bokkeveld Earless Grasshopper	VU	
<i>Alfredectes browni</i>		Brown's Shieldback	DD		
<i>Brinckiella aptera</i>		Mute Winter Katydid	VU		
<i>Brinckiella arboricola</i>		Tree Winter Katydid	EN		
<i>Brinckiella karoensis</i>		Karoo Winter Katydid	VU		
<i>Brinckiella mauerbergerorum</i>		Mauerberger's Winter Katydid	VU		
<i>Brinckiella serricauda</i>		Serrated Winter Katydid	DD		
<i>Bullacris boschimana</i>		Bladder grasshopper	DD		
<i>Bullacris obliqua</i>		Bladder grasshopper	VU		
<i>Pachyphymus samwaysi</i>		Samways's Agile Grasshopper	DD		
<i>Peringueyacris namaqua</i>		Bladder grasshopper	VU		
ONYCHOPHORA		All Velvet worms	S1		

In addition, those species that are specially protected according to Schedule 1 of the NCNCA include all Velvet worms as well as some baboon spider species, Stag Beetles and the Flightless Dung Beetle (Table 10). Of these, Common Baboon Spiders (*Harpactira baviana*) have been recorded in the region and could potentially also be found on site (Figure 22). It prefers arid and semi-arid grassland and is found under stones, generally in shallow excavations but sometimes in short burrows a few centimetres deep.

All Rock- Creeping- and Burrowing Scorpions are protected according to Schedule 2 of the NCNCA, along with several beetles, butterflies and moths (Table 10). Of these, several burrowing scorpions (*Opisthophthalmus fitzsimonsi*, *O. carinatus*, *O. wahlbergii*, and *O. pluridens*), Monster Tiger Beetles (*Manticora* sp.), Gossamer-winged Butterflies, Skippers, Brush-footed Butterflies and Satyrs have been recorded in the region and have a high likelihood to be found on site.

Three major habitats delimit possible invertebrate communities in the study area:

i. Terrestrial vegetation classified as bushveld for insect preference (Picker et al. 2004)

All the terrestrial vegetation communities on site fall within this bushveld habitat. Invertebrate communities associated with this habitat are expected to be widespread and diverse. Those protected species discussed above with a likelihood to occur in the study area, are expected to be associated with this habitat. Insect activity during the field survey was limited by the dormant state of the vegetation, but grasshoppers were common. Furthermore, termitaria, most likely belonging to *Trinervitermes trinervoides*, are abundant in the woodland and grassland communities (Figure 22).

ii. Artificial pan

The artificial pan on site resembles an ephemeral wetland, which is known to host crustaceans that are specifically adapted to ephemerality. Their eggs lie dormant in the soil until the pans are inundated. They then hatch and mature rapidly to produce eggs that accumulate in the top few centimetres of the sediment. These eggs are heat and drought resistant and ensure the continued existence of species in a habitat. Not much is known about the species distribution or conservation status of species in the Northern Cape, but taxa (Figure 23) that could potentially occur in the artificial pan on site include Notostraca (Tadpole shrimp), Anostraca (Fairy shrimp), Spinicaudata (Clam shrimp), Cladocera (water fleas), Ostracoda (Seed shrimp) and Copepoda (Copepods). Within a few days after the pan is inundated several wetland bird species will arrive to forage on the crustaceans as their main food source. If the pan remains wet enough the water birds will stay longer to start nesting and breeding. Therefore, the crustaceans are essential components in the food web.



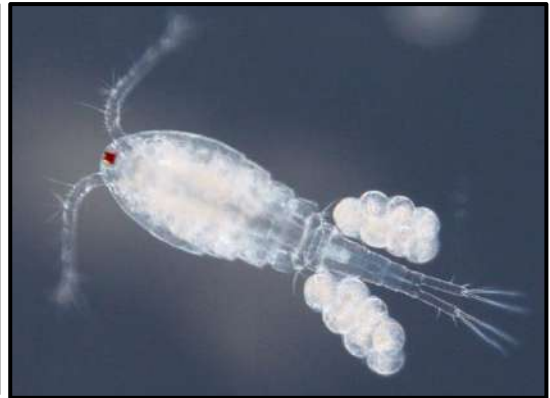
Figure 22. Invertebrates from the study region include the protected Linda’s hairtail butterfly (top left) and Common Baboon Spiders (top right). Those recorded during the survey include termitaria (bottom left) and grasshoppers (bottom right).

iii. Ephemeral drainage ways

Invertebrates expected to be associated with the ephemeral drainage ways when flooded include generalist species like biting midges, non-biting midges and house flies. Various dragonfly species are also expected to occur here. When desiccated however, those species associated with the terrestrial habitats are also expected to occur here.



Tadpole shrimp



Copepod



Fairy shrimp



Clam shrimp



Water flea



Seed shrimp



Egg bank

Figure 23. Crustacean taxa that could potentially occur in the artificial pan. The first few centimetres of the soil are where the egg bank occurs and any disturbances to this layer will expose the eggs to erosion and crushing, which might lead to major species losses.

3.6. Critical biodiversity areas and broad-scale processes

The proposed prospecting site falls within a critical biodiversity area, as defined by the Northern Cape Critical Biodiversity Areas Map (Holness and Oosthuysen 2016). This 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. Although most of the site comprises *Other Natural Areas*, the hills are classified as *Ecological Support Areas* (Figure 24). No *Critical Biodiversity Area One-, Two-, or Protected Areas* occur within the study area, but the Tswalu Kalahari Reserve, which lies north and west of the study area, is classified as a *Protected Area*, with its surrounding buffer as *Critical Biodiversity Area Two*.

The Mining and Biodiversity Guidelines (DENC et al. 2013) does not classify any section on Gamahuli and Malley to have biodiversity importance, and therefore does not constitute a high risk for mining, but it does classify the north-eastern half of La Rochelle to have *Moderate Biodiversity Importance*, which constitutes a moderate risk for mining (Figure 25). These guidelines were developed to identify and categorize biodiversity priority areas sensitive to the impacts of mining to support mainstreaming of biodiversity issues in decision making in the mining sector.

None of the habitats in the study area have been identified as threatened ecosystems and no habitats on La Rochelle have been identified as ecological corridors within the John Taolo Gaetsewe District Municipality. However, the hills on Gamahuli and Malley have been classified to have *High Conservation Priority*, while the plains on these farms have *Medium Conservation Priority* within the Z F Mgcawu District Municipality.

The National Web based Environmental Screening Tool considers some parts of the study area to be sensitive (Figure 26). This tool is a geographically based web-enabled application which allows a proponent intending to apply for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (as amended), to screen their proposed site for any environmental sensitivity. According to this the entire study area is of low sensitivity based on the *Plant Species-* and *Aquatic Biodiversity Themes*. In terms of the *Animal Species Theme*, La Rochelle is of low sensitivity, while the central parts of Gamahuli and Malley is of medium sensitivity. This sensitivity is based on the associated habitat for the rare butterfly *Anthene lindae*. This butterfly is only known from a few localities in the region.

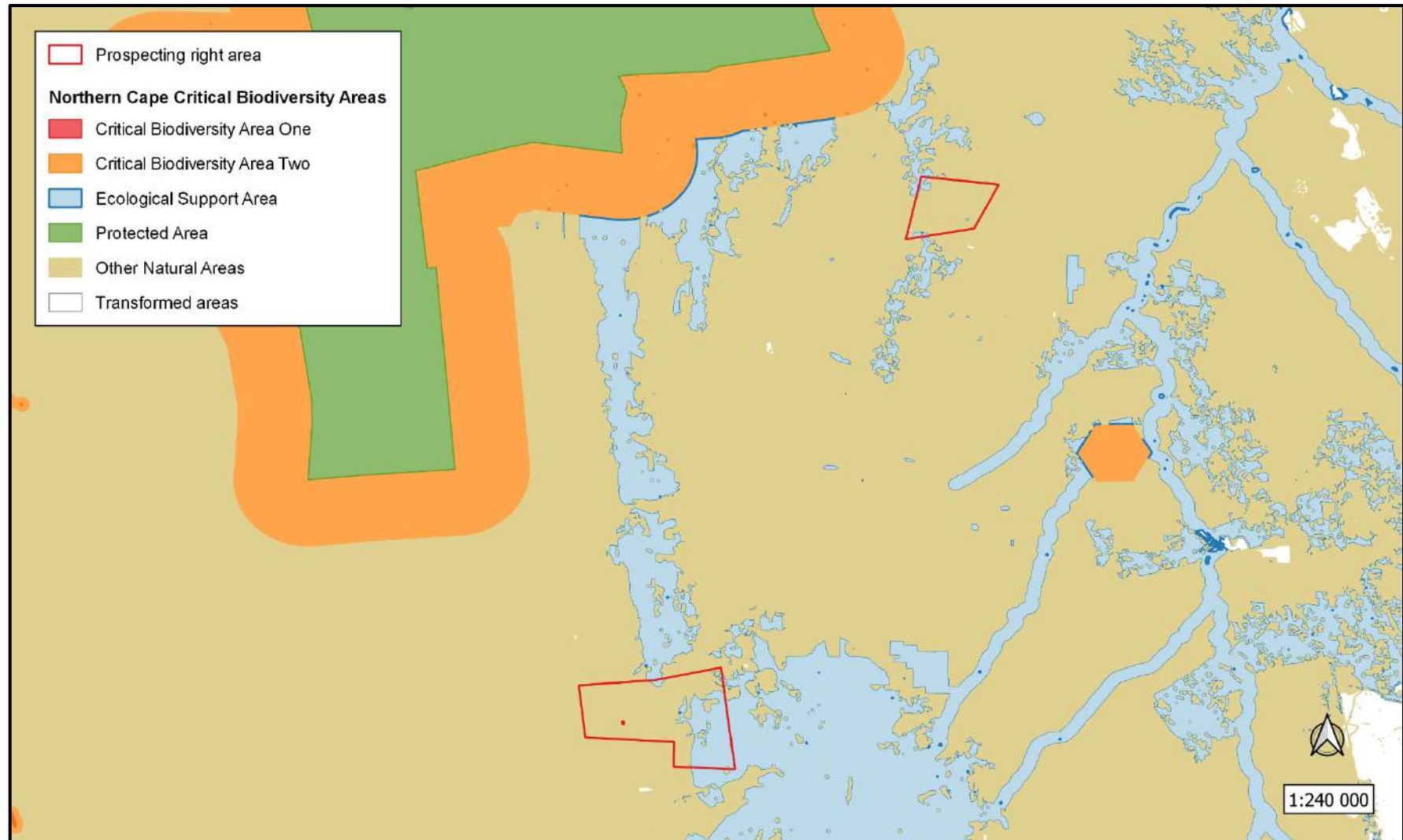


Figure 24. The study area in relation to the Northern Cape Critical Biodiversity Areas.

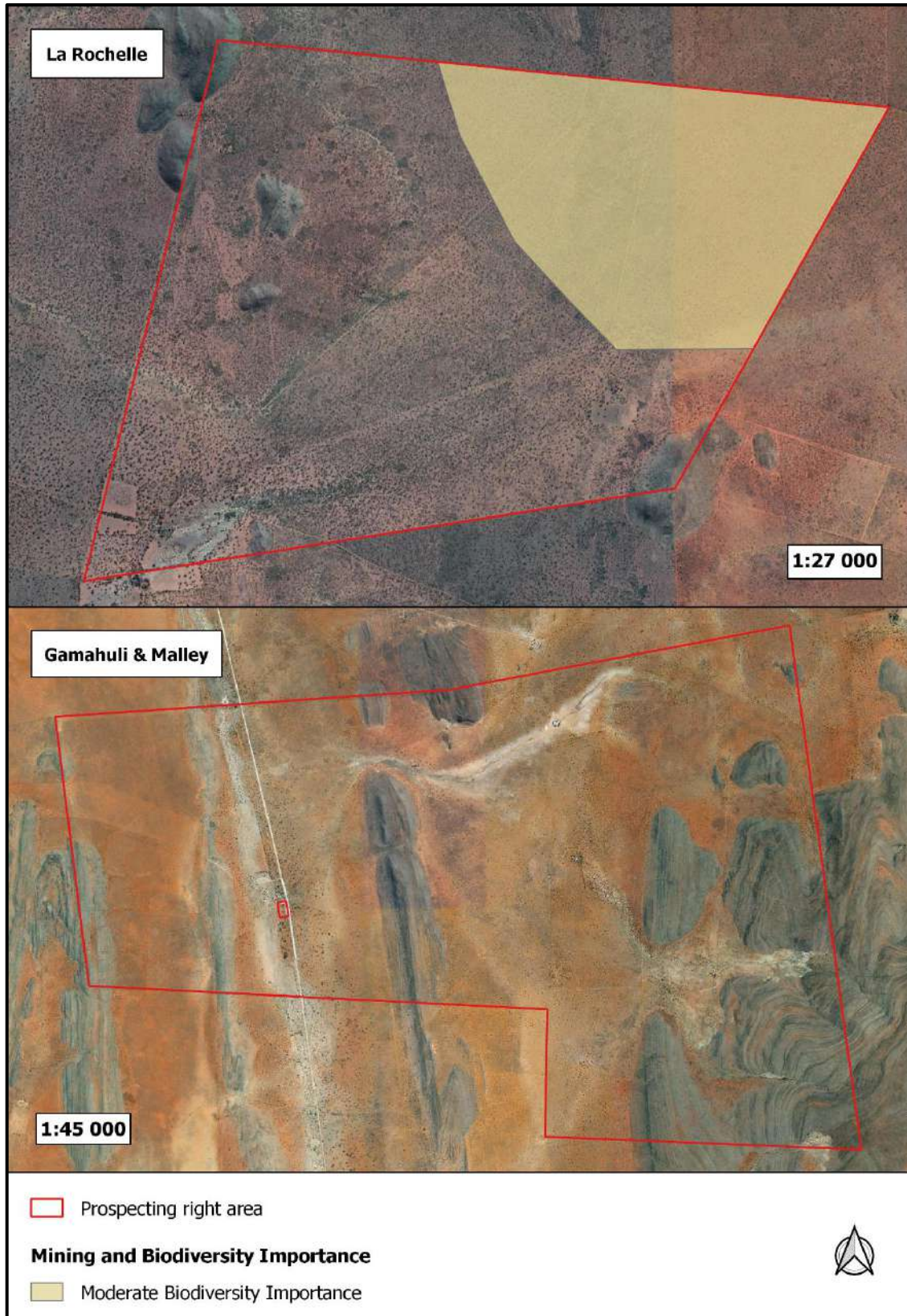


Figure 25. The study area in relation to the Mining and Biodiversity Guidelines.

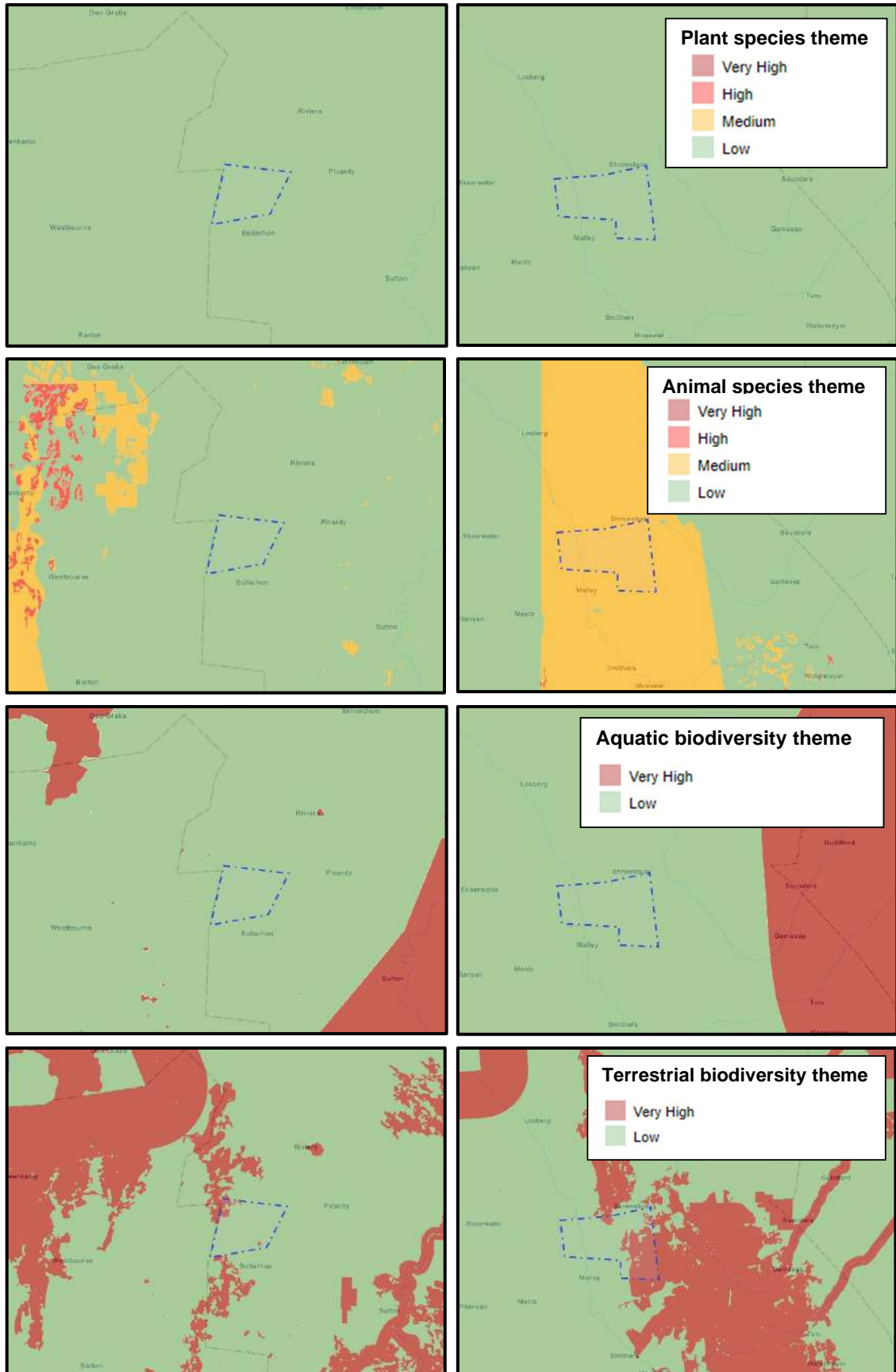


Figure 26. Environmental sensitivities associated with the study area, according to the National Web based Environmental Screening Tool, with La Rochelle on the left and Gamahuli and Malley on the right.

In terms of the *Terrestrial Biodiversity Theme*, the hills of the entire study area are of High Sensitivity. This sensitivity is ascribed to their classification as *Ecological Support Areas* in the province's CBAs.

The study area also falls within the core area of the Griqualand West Centre (GWC) of Endemism as defined by Frisby et al. (2019) (Figure 27). A centre of plant endemism is an area with high concentrations of plant species with very restricted distributions, known as endemics (Van Wyk and Smith 2001). Relatively small disturbances in a centre of endemism may easily pose a serious threat to its many range-restricted species. Endemics are specifically vulnerable due to their restricted distribution ranges.



Figure 27. The study area in relation to the GWC core, according to Frisby et al. (2019).

With regards to the broad-scale vegetation units of the study area, according to Mucina and Rutherford (2012) the Kathu Bushveld, Koranna-Langeberg Mountain Bushveld, and Olifantshoek Plains Thornveld vegetation is least threatened, with little transformation. However, mining has contributed significantly to habitat transformation in the region (Figure 28), and this prospecting operation will further contribute to the cumulative impacts thereof.

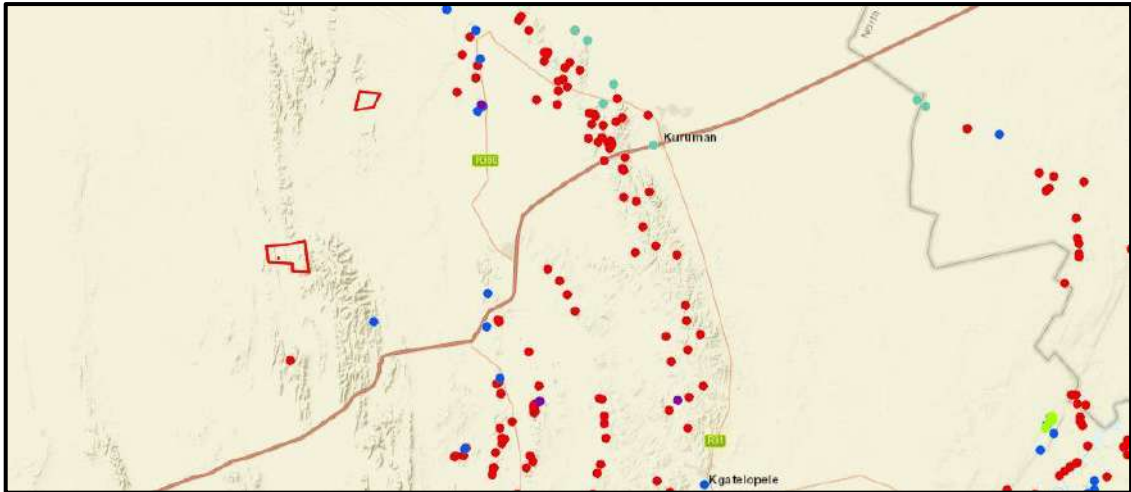


Figure 28. Past and present mining operations near the study area, which increases the cumulative impacts on habitat transformation in the region.

3.7. Site sensitivity

The sensitivity map for the prospecting operation is illustrated in Figure 29. The ephemeral drainage ways are of **very high** sensitivity due to their vital ecological and hydrological functionality and significance. These natural channels, in which water flows intermittently, are also protected in terms of the National Water Act (Act No 36 of 1998). These units are essentially no-go areas.

The remainder of the study area is of **high** sensitivity, primarily because of the high occurrences of plant species of conservation concern that occur widespread across the entire site as well as the important habitat associations for animal species of conservation concern. The sandy substrates of the plains are also particularly prone to wind erosion after disturbances. Although these units are not regarded as no-go areas, activities should only proceed with caution as it may not be possible to mitigate all impacts appropriately.

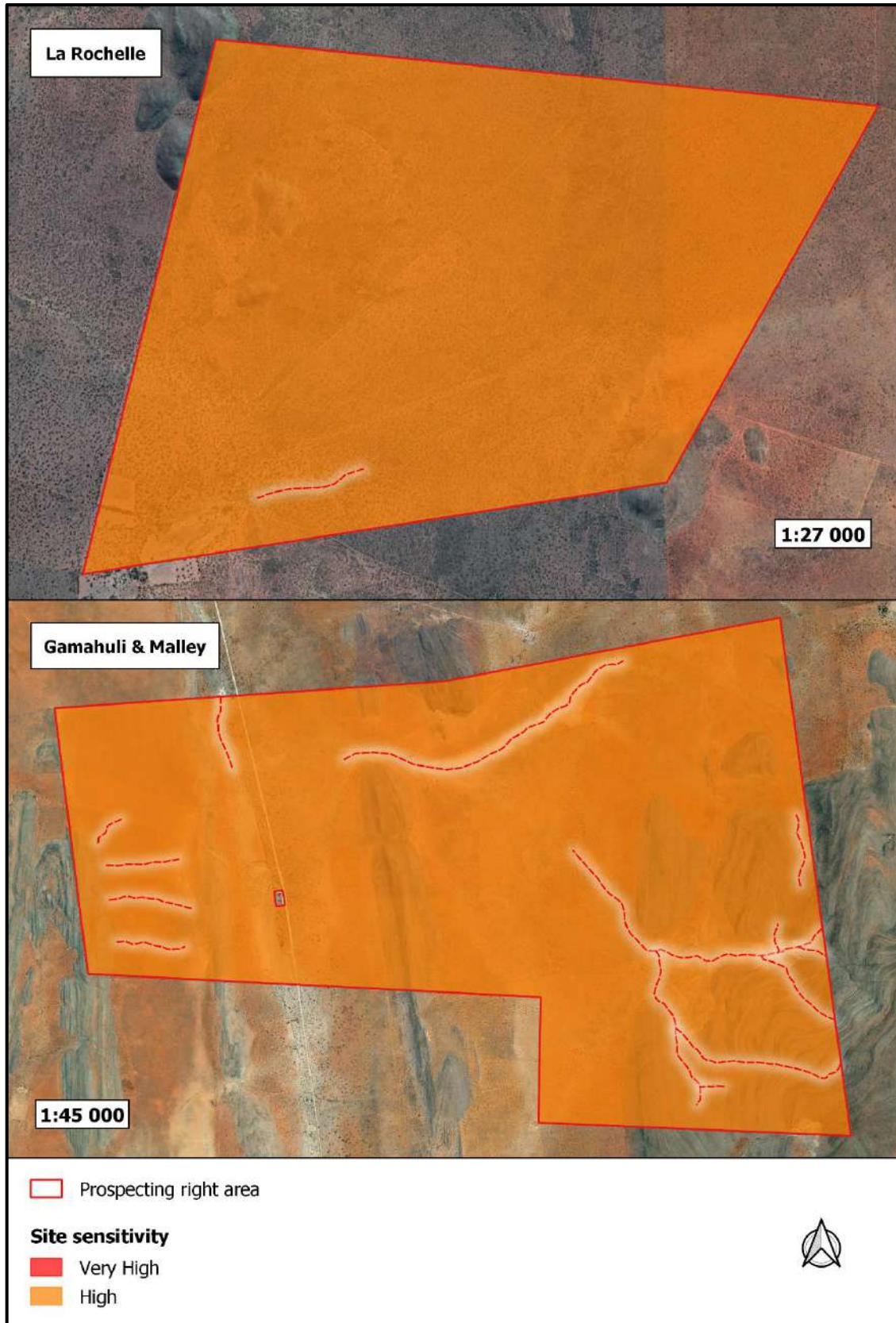


Figure 29. A sensitivity map for the prospecting right area.

4. ECOLOGICAL IMPACT ASSESSMENT

In this section, the potential impacts and associated risk factors that may be generated by the prospecting operation are identified and described. A detailed analysis of each impact is provided in Table 11. The impacts are assessed in terms of the relevant ecological aspects and each impact is associated with an outline of specific mitigation measures, which with proper implementation, monitoring and auditing, will serve to reduce the significance of the impact. To ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the prospecting activities are listed.

4.1. Topography, soil erosion and associated degradation of landscapes

4.1.1. Loss of soil fertility

Source of the impact

During clearing of an area for excavations, roads and infrastructure, the removal of topsoil, stockpiling.

Description of the impact

Topsoil contains living organisms that naturally regulates the ecological functioning of a habitat. Any disturbances to the intact soil profile can result in soil sterilisation. This includes excavations, improper stockpiling, soil erosion and soil compaction. Rainwater can also cause leaching and erosion of stockpiles, resulting in the loss of nutrients.

Mitigation and monitoring

- Topsoil must be removed and stockpiled before the overburden is excavated.
- Topsoil should preferably be protected with tarps to regulate air flow and prevent erosion and leaching.
- Topsoil stockpiles must be kept as small as possible to prevent compaction and the formation of anaerobic conditions.
- Topsoil must be stockpiled for the shortest possible timeframes (ideally no longer than two months) to ensure that the quality of the topsoil is not impaired.
- Topsoil must not be handled when the moisture content exceeds 12 %.
- Topsoil stockpiles must be kept separate from sub-soil overburden.
- The topsoil should be replaced as soon as possible on to the backfilled areas, thereby allowing for the re-growth of the seed bank contained within the topsoil.

Table 11. A detailed analysis of ecological impacts identified for the proposed prospecting operation.

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Landscape	Loss of soil fertility	✓	✓	✓	On-site (1)	Residual (4)	High (3)	Possible for life of operation (9)	Low-Medium (72)	Low-Medium
	Increase in soil erosion	✓	✓	✓	On-site (1)	Permanent (5)	High (3)	Certain, frequently (9)	Medium - High (81)	Low-Medium
Flora	Loss of indigenous vegetation	✓	✓	✓	On-site (1)	Residual (4)	Medium (2)	Certain for life of operation (10)	Low - Medium (70)	Low
	Loss of Red data and/or protected floral species	✓	✓		On-site (1)	Residual (4)	High (3)	Possible for life of operation (9)	Low - Medium (72)	Low
	Introduction or spread of alien species	✓	✓	✓	Local (2)	Residual (4)	Medium (2)	Possible, infrequently (7)	Low-Medium (56)	Low
	Bush encroachment			✓	On-site (1)	Residual (4)	Medium (2)	Possible, temporarily (6)	Low (42)	Very low

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Fauna	Habitat fragmentation	✓	✓	✓	Regional (3)	Residual (4)	High (3)	Certain for life of operation (10)	Medium - High (100)	Medium - High
	Disturbance, displacement and killing of fauna	✓	✓		On-site (1)	Decommissioning (3)	Medium (2)	Certain, for life of operation (10)	Low-Medium (60)	Low-Medium
Ecological Processes	Compromise of ecological processes	✓	✓		Regional (3)	Residual (4)	High (3)	Certain for life of operation (10)	Medium - High (100)	Medium - High

4.1.2. Soil erosion

Source of the impact

During clearing of an area for excavations, roads, and infrastructure.

Description of the impact

Vegetation will be stripped in preparation for placement of infrastructure and excavations, and therefore the areas will be bare and susceptible to erosion. The sandy substrate of the study area is particularly prone to wind erosion. Topsoil and overburden that is stripped and piled on surrounding areas can be eroded by wind, rain, and flooding. The soil/sediments will be carried away during runoff. The affected areas will be rehabilitated, but full restoration might only occur over several years, after the re-establishment of vegetation.

Mitigation and monitoring

- Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in each area have ceased.
- Bare ground exposure should be minimised in terms of the surface area and duration.
- The operation must co-ordinate different activities to optimise the excavated pits and trenches and thereby prevent repeated and unnecessary excavations and disturbances to the vegetation and soil.
- Construction/excavations during the rainy season (November to March) should be monitored and controlled.
- Run-off from exposed ground should be controlled with flow retarding barriers.
- All stockpiles must be kept as small as possible, with gentle slopes (18 degrees) to avoid excessive erosional induced losses.
- Excavated and stockpiled soil material are to be stored on the higher lying areas of the footprint area and not in any natural storm water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate.
- Regular audits carried out to identify areas where erosion is occurring (incl. linear activities such as roads and pipelines); followed by appropriate remedial actions.

4.2. Vegetation and floristics

4.2.1. Loss of indigenous vegetation

Source of the impact

During the construction of roads and other necessary infrastructure; the placement of stockpiles; and the clearing of vegetation for excavations, materials storage, and topsoil stockpiles; vehicular movement.

Description of the impact

Construction and prospecting activities on site will destroy large areas of indigenous vegetation, which in turn will disrupt natural ecological process. It is not expected that the areas of high ecological function and biodiversity will fully rehabilitate following disturbance events. Vehicle traffic and prospecting activities also generates lots of dust which can reduce the growth success and seed dispersal of many small plant species.

Mitigation and monitoring

- Implement best practise principles to minimise the footprint of transformation.
- Encourage proper rehabilitation of excavated areas, by effective backfilling and returning the stockpiled topsoil.
- Encourage the growth of natural plant species by sowing indigenous seeds or by planting seedlings. Seeds can be acquired from renukaroo@gmail.com, or harvested from adjacent natural areas.
- Ensure measures for the adherence to the speed limit to minimise dust plumes.
- Apply for permits to authorise the large-scale clearance of indigenous vegetation from DENC at least three months before such activities will commence.

4.2.2. Loss of Red data and/or protected floral species

Source of the impact

During clearing of an area for excavations, roads, infrastructure, and placement of stockpiles. Intentional removal of listed or protected plant species for non-mine related purposes, e.g., illegal medicinal trade, cultural beliefs, or firewood collection.

Description of the impact

Species of conservation concern present in the area earmarked for prospecting include *Ruschia griquensis* and *Vachellia erioloba*. Many individuals belonging to these species will most certainly be damaged or removed during the operation. Furthermore, any illegal firewood collection or harvesting of succulents by staff, contractors or secondary land users could potentially have a negative impact on the population of these species.

Mitigation and monitoring

- The footprint areas of the prospecting activities must be scanned for Red Listed and protected plant species prior to excavations.
- It is recommended that these plants are identified and marked prior to intended activity.
- These plants should ideally be incorporated into the design layout and left in situ.
- However, if threatened by destruction, these plants should be removed (with the relevant permits from DAFF and/or DENC) and relocated if possible.
- A management plan should be implemented to ensure proper establishment of ex situ individuals and should include a monitoring programme for at least two years after re-establishment to ensure successful translocation.
- The designation of a full-time ECO is vital to render guidance to the staff and contractors with respect to suitable areas for all related disturbance and must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site. The environmental induction should occur in the appropriate languages for the workers who may require translation.
- All those working on site must be educated about the conservation importance of the flora occurring on site.

4.2.3. Introduction or spread of alien species

Source of the impact

During the clearing of vegetation, and general disturbances caused by prospecting activities.

Description of the impact

The extent of alien invasive species in the area shows some level of past disturbance interference in the natural ecosystem and primarily include *Prosopis glandulosa*. While general clearing of the area and excavation activities destroy natural vegetation, invasive plants can increase due to their opportunistic nature in disturbed areas. If invasive plants establish in disturbed areas, it may cause an impact beyond the boundaries of the prospecting site. These alien invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity as well as the ecological and agricultural value of the area. Therefore, if alien invasive species are not controlled and managed, their propagation into new areas could have a high impact on the surrounding natural vegetation in the long term. With proper mitigation, the impacts can be substantially reduced. In fact, if the prospecting activities involve the removal of entire shrubs and trees to gain access to underlying minerals it could help with the control of existing infestations in the earmarked areas.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of excavated areas.
- Encourage the growth of natural plant species.
- Mechanical methods of control to be implemented extensively.
- Annual follow-up operations to be implemented.

4.2.4. Encouraging bush encroachment

Source of the impact

During the clearing of vegetation, and general disturbances cause through prospecting activities.

Description of the impact

The extent of bush encroaching species on site shows fairly high levels of past disturbance interference in the natural ecosystem, presumably through grazing practises. Bush encroachment is a natural phenomenon characterised by the excessive expansion of certain shrub species at the expense of other plant species, especially grasses. In the area earmarked for prospecting, these include *Rhigozum trichotomum* and *Grewia flava*. While general clearing of the area and prospecting activities destroy natural vegetation, bush encroaching plants may increase due to their aggressive nature in disturbed areas. If encroaching plants establish in disturbed areas, it may lower the potential for future land use and decrease biodiversity. With proper mitigation, the impacts can be substantially reduced. In fact, the proposed prospecting activities could potentially reduce the extent of these shrubs. By clearing large stands of these species and effectively rehabilitating the cleared areas, it can have a positive effect on the biodiversity.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of disturbed areas.
- Encourage the growth of a diverse selection of natural plant species.
- Mechanical methods of control to be implemented selectively.
- Annual follow-up monitoring to be implemented.

4.3. Fauna

4.3.1. Habitat fragmentation

Source of the impact

During the clearing of vegetation, and general disturbances cause through prospecting activities.

Description of the impact

Prospecting activities and associated infrastructure will result in the loss of connectivity and fragmentation of natural habitats. Fragmentation of habitats will lead to the loss of migration corridors, in turn resulting in degeneration of the affected population's genetic make-up. This results in a subsequent loss of genetic variability between meta-populations occurring within the study site. Pockets of fragmented natural habitats hinder the growth and development of populations.

Mitigation and monitoring

- All activities associated with the prospecting operation must be planned, where possible to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type.
- The extent of the area earmarked for prospecting should be demarcated on site layout plans. No staff, contractors or vehicles may leave the demarcated area except those authorised to do so.
- Those pristine areas surrounding the earmarked area that are not part of the demarcated area should be considered as a no-go zone for employees, machinery and even visitors.
- Employ sound rehabilitation measures to restore the characteristics of any affected habitats as far as possible.

4.3.2. Disturbance, displacement and killing of fauna

Source of the impact

Vegetation clearing; excavations; increase in noise and vibration; human and vehicular movement on site resulting from prospecting activities.

Description of the impact

The transformation of natural habitats will result in the loss of habitat, affecting individual species and ecological processes. This will result in the displacement of faunal species that depend on such habitats. Protected species are specifically vulnerable to such destruction. For example, when breeding sites or eggs of the ground-nesting Ludwig's Bustard are destroyed through prospecting activities. Increased noise and vibration will also disturb and possibly displace birds and other wildlife. Fast moving vehicles cause road kills of small mammals, birds, reptiles, amphibians, and many invertebrates. Intentional killing of snakes, reptiles, vultures, and owls will negatively affect the local populations.

Mitigation and monitoring

- Careful planning of the operation is needed to avoid the destruction of pristine habitats and minimise the overall disturbance footprint.
- The extent of the prospecting activities should be demarcated on site layout plans, and no personnel or vehicles may leave the demarcated area except if authorised to do so. Areas surrounding the earmarked site that are not part of the demarcated area should be considered as a no-go zone.
- However, if any of the protected species are threatened by destruction, the relevant permits from DENC should be obtained followed by the relevant mitigation procedures stipulated in the permits.
- The designation of a full-time ECO is vital to render guidance to the staff and contractors with respect to suitable areas for all related disturbances.
- Everyone on site must undergo environmental induction for awareness on not harming or collecting species that are often persecuted out of superstition and to be educated about the conservation importance of the fauna occurring on site.
- Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert.
- Employ measures that ensure adherence to the speed limit to lower the risk of animals being killed on the roads.

4.4. Broad-scale ecological processes

Source of the impact

During the clearing of vegetation for excavations and the construction of roads and infrastructure.

Description of the impact

The prospecting operation itself is expected to cause habitat transformation through the excavation of open pits and will thereby contribute moderately to cumulative habitat loss and the disruption of the broad-scale landscape connectivity in the region. Transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. A high amount of habitat transformation, specifically through mining, exist in the region, but the proposed site is still largely surrounded by indigenous pastures and the footprint area of the proposed activity is fairly small. Therefore, the cumulative impact for the proposed prospecting operation is moderate.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of affected areas.
- Encourage the growth of natural plant species.
- Encourage the preservation of ecological corridors.
- Employ sound rehabilitation measures to restore the characteristics of affected habitats.

5. CONCLUSION, RECOMMENDATIONS AND OPINION REGARDING AUTHORISATION

Five distinct plant communities were identified on site which were all considered to be of high sensitivity, primarily because of the high occurrences of plant species of conservation concern that occur widespread across the entire site as well as the important habitat associations for animal species of conservation concern. Although not unique plant communities, all drainage lines are of very high sensitivity due to their important hydrological function. The most profound impacts associated with the proposed operation are expected to be related to risks associated to potential erosion of the sandy substrate, the loss of plant species of conservation concern as well as the disruption of ecological corridors. Nevertheless, these impacts are all considered to have moderate and local effects.

Species of conservation concern that are found in the areas earmarked for prospecting activities include *Ruschia griquensis* and *Vachellia erioloba*. The prospecting operation will also result in the large-scale clearance of indigenous vegetation. Permit applications regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation three months prior to any clearance of vegetation. Similarly, if any of the *Vachellia erioloba* trees is to be affected, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries three months prior to any potential disturbances to these trees.

To conclude, the destruction of the natural plant species and habitats within the study area is inevitable, but the significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the prospecting area. In my opinion, authorisation can be granted if the applicant commits to the adherence of effective avoidance, management, mitigation, and rehabilitation measures.

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APPENDICES

APPENDIX 1

Plant species list

FAMILY	SPECIES	STATUS	NFA	NCNCA
ACANTHACEAE	<i>Barleria rigida</i>	LC		
	<i>Justicia divaricata</i>	LC		
	<i>Justicia incana</i>	LC		
	<i>Justicia puberula</i>	LC		
AIZOACEAE	<i>Plinthus karoocicus</i>	LC		
	<i>Ruschia griquensis</i>	LC		S2
AMARANTHACEAE	<i>Dysphania carinata</i>	Nat. Exot.		
	<i>Salsola</i> sp.	-		
AMARYLLIDACEAE	<i>Haemanthus humilis</i> subsp. <i>humilis</i>	LC		S2
	<i>Nerine laticoma</i>	LC		S2
ANACARDIACEAE	<i>Searsia burchellii</i>	LC		
	<i>Searsia tenuinervis</i>	LC		
APOCYNACEAE	<i>Fockea angustifolia</i>	LC		S2
	<i>Gomphocarpus fruticosus</i>	LC		S2
	<i>Gomphocarpus tomentosus</i> subsp. <i>tomentosus</i>	LC		S2
	<i>Orthanthera jasminiflora</i>	LC		S2
ASTERACEAE	<i>Asparagus exuvialis</i>	LC		
	<i>Arctotis leiocarpa</i>	LC		
	<i>Chrysocoma ciliata</i>	LC		
	<i>Dicoma capensis</i>	LC		
	<i>Eriocephalus ericoides</i> subsp. <i>griquensis</i>	LC		
	<i>Erlangea misera</i>	LC		
	<i>Euryops subcarnosus</i> subsp. <i>vulgaris</i>	LC		
	<i>Felicia fascicularis</i>	LC		
	<i>Geigeria brevifolia</i>	LC		
	<i>Helichrysum zeyheri</i>	LC		
	<i>Leysera tenella</i>	LC		
	<i>Oedera humilis</i>	LC		
	<i>Pentzia calcarea</i>	LC		
	<i>Pentzia incana</i>	LC		
	<i>Pteronia mucronata</i>	LC		
	<i>Senecio inaequidens</i>	LC		
		<i>Tarchonanthus camphoratus</i>	Decl. Encr.	
	<i>Tarchonanthus obovatus</i>	LC		
	<i>Verbesina encelioides</i>	Nat. Exot.		
BIGNONIACEAE	<i>Rhigozum trichotomum</i>	Decl. Encr.		
BORAGINACEAE	<i>Ehretia alba</i>	LC		
BRASSICACEAE	<i>Boscia albitrunca</i>	LC	X	S2
CAPPARACEAE	<i>Cadaba aphylla</i>	LC		
CLEOMACEAE	<i>Cleome angustifolia</i>	LC		
	<i>Cleome gynandra</i>	LC		
	<i>Cleome monophylla</i>	LC		
	<i>Cleome rubella</i>	LC		
CONVOLVULACEAE	<i>Convolvulus sagittatus</i>	LC		
	<i>Evolvulus alsinoides</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
CONVOLVULACEAE	<i>Ipomoea bolusiana</i>	LC		
	<i>Ipomoea obscura</i>	LC		
CUCURBITACEAE	<i>Cucumis africanus</i>	LC		
CYPERACEAE	<i>Bulbostylis hispidula</i> subsp. <i>pyriformis</i>	LC		
	<i>Cyperus difformis</i>	LC		
	<i>Cyperus squarrosus</i>	LC		
	<i>Fuirena pubescens</i> var. <i>pubescens</i>	LC		
	<i>Isolepis setacea</i>	LC		
	<i>Kyllinga alba</i>	LC		
	<i>Lipocarpa rehmannii</i>	LC		
EBENACEAE	<i>Diospyros lycioides</i>	LC		
EUPHORBIACEAE	<i>Croton gratissimus</i> var. <i>gratissimus</i>	LC		
	<i>Euphorbia spartaria</i>	LC		S2
	<i>Tragia physocarpa</i>	DDT		
FABACEAE	<i>Calobota linearifolia</i>	LC		
	<i>Crotalaria podocarpa</i>	LC		
	<i>Crotalaria virgultalis</i>	LC		
	<i>Elephantorrhiza elephantina</i>	LC		
	<i>Indigofera daleoides</i> var. <i>daleoides</i>	LC		
	<i>Lessertia frutescens</i> subsp. <i>frutescens</i>	LC		S1
	<i>Listia heterophylla</i>	LC		
	<i>Lotononis crumanina</i>	LC		
	<i>Melolobium candicans</i>	LC		
	<i>Pomaria burchellii</i>	LC		
	<i>Prosopis glandulosa</i>	Decl. Inv.		
	<i>Rhynchosia totta</i> var. <i>totta</i>	LC		
	<i>Senegalia mellifera</i>	Decl. Encr.		
	<i>Senna italica</i> subsp. <i>arachoides</i>	LC		
	<i>Tephrosia purpurea</i> subsp. <i>leptostachya</i>	LC		
	<i>Vachellia erioloba</i>	LC	X	
	<i>Vachellia haematoxylon</i>	LC	X	
<i>Vachellia hebeclada</i>	LC			
HYACINTHACEAE	<i>Albuca seineri</i>	LC		
IRIDACEAE	<i>Moraea polystachya</i>	LC		S2
KEWACEAE	<i>Kewa salsoloides</i>	LC		
LAMIACEAE	<i>Acrotome inflata</i>	LC		
	<i>Leonotis pentadentata</i>	LC		
	<i>Salvia verbenaca</i>	Nat. Exot.		
	<i>Stachys burchelliana</i>	LC		
LOBELIACEAE	<i>Pollichia campestris</i>	LC		
LOPHIOPARPACEAE	<i>Lophiocarpus polystachyus</i>	LC		
MALVACEAE	<i>Grewia flava</i>	Decl. Encr.		
	<i>Hermannia abrotanoides</i>	LC		
	<i>Hermannia burchellii</i>	LC		
	<i>Hermannia comosa</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA	
MALVACEAE	<i>Hibiscus engleri</i>	LC			
	<i>Pavonia senegalensis</i>	LC			
	<i>Sida cordifolia</i> subsp. <i>cordifolia</i>	LC			
MORACEAE	<i>Ficus cordata</i> subsp. <i>cordata</i>	LC			
OXALIDACEAE	<i>Oxalis haedulipes</i>	LC		S2	
POACEAE	<i>Andropogon chinensis</i>	LC			
	<i>Aristida adscensionis</i>	LC			
	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	LC			
	<i>Aristida congesta</i> subsp. <i>congesta</i>	LC			
	<i>Aristida engleri</i> var. <i>ramosissima</i>	LC			
	<i>Aristida meridionalis</i>	LC			
	<i>Cenchrus ciliaris</i>	LC			
	<i>Chloris virgata</i>	LC			
	<i>Cymbopogon caesius</i>	LC			
	<i>Digitaria eriantha</i>	LC			
	<i>Digitaria polyphylla</i>	LC			
	<i>Digitaria seriata</i>	LC			
	<i>Eragrostis curvula</i>	LC			
	<i>Eragrostis gummiflua</i>	LC			
	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i>	LC			
	<i>Eragrostis porosa</i>	LC			
	<i>Eragrostis rigidior</i>	LC			
	<i>Eragrostis rotifer</i>	LC			
	<i>Eragrostis trichophora</i>	LC			
	<i>Eragrostis viscosa</i>	LC			
	<i>Heteropogon contortus</i>	LC			
	<i>Hyparrhenia hirta</i>	LC			
	<i>Melinis repens</i> subsp. <i>repens</i>	LC			
	<i>Panicum gilvum</i>	LC			
	<i>Panicum maximum</i>	LC			
	<i>Pogonarthria squarrosa</i>	LC			
	<i>Schmidtia pappophoroides</i>	LC			
	<i>Setaria verticillata</i>	LC			
	<i>Sporobolus fimbriatus</i>	LC			
	<i>Stipagrostis uniplumis</i>	LC			
	<i>Urochloa nigropedata</i>	LC			
	PORTULACACEAE	<i>Portulaca kermesina</i>	LC		
	PTERIDACEAE	<i>Cheilanthes hirta</i> var. <i>brevipilosa</i>	LC		
<i>Pellaea calomelanos</i> var. <i>calomelanos</i>		LC			
RHAMNACEAE	<i>Ziziphus mucronata</i>	LC			
RUBIACEAE	<i>Cordylostigma virgatum</i>	LC			
	<i>Kohautia caespitosa</i> subsp. <i>brachyloba</i>	LC			
SANTALACEAE	<i>Thesium hystrix</i>	LC			
	<i>Viscum rotundifolium</i>	LC			
SCROPHULARIACEAE	<i>Aptosimum albomarginatum</i>	LC			

FAMILY	SPECIES	STATUS	NFA	NCNCA
SCROPHULARIACEAE	<i>Aptosimum elongatum</i>	LC		
	<i>Aptosimum marlothii</i>	LC		
	<i>Buddleja saligna</i>	LC		
	<i>Jamesbrittenia integerrima</i>	LC		S2
	<i>Peliosotomum leucorrhizum</i>	LC		
	<i>Selago mixta</i>	LC		
	<i>Selago paniculata</i>	LC		
	<i>Sutera griquensis</i>	LC		
SOLANACEAE	<i>Lycium hirsutum</i>	LC		
	<i>Solanum lichtensteinii</i>	LC		
THYMELAEACEAE	<i>Lasiosiphon polycephalus</i>	LC		
VAHLIACEAE	<i>Vahlia capensis</i>	LC		
VERBENACEAE	<i>Chascanum pinnatifidum</i> var. <i>pinnatifidum</i>	LC		
	<i>Lantana rugosa</i>	LC		
ZYGOPHYLLACEAE	<i>Tetraena microcarpa</i>	LC		
	<i>Tribulus terrestris</i>	LC		

APPENDIX 2

Fauna species list

LIST OF MAMMALS

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript.

	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
CHIROPTERA	² <i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT	LC	Wide habitat tolerance.	High
	² <i>Neoromicia capensis</i>	Cape Bat	LC	LC	Wide habitat tolerance, but often found in arid areas, grassland, bushveld and <i>Acacia</i> woodland. Animals roost under the bark of trees and similar vegetation.	High
	³ <i>Miniopterus natalensis</i>	Natal Long-fingered Bat	LC	<i>Not listed</i>	Mainly roosts in caves or mine shafts, but also in crevices and holes in trees.	Moderate
	² <i>Nycteris thebaica</i>	Common Slit-faced Bat	LC	LC	Savanna species with wide habitat tolerance. Roosts in caves, mine adits, aardvark holes, rock crevices and hollow trees in open savanna woodland.	High
	² <i>Rhinolophus denti</i>	Dent's Horseshoe Bat	LC	NT	Savanna habitats.	High
	² <i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	LC	Savanna habitats.	High
	² <i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC	Wide habitat tolerance.	High

LIST OF MAMMALS (cont.)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript.

	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
MACROSCELIDIDAE	² <i>Elephantulus intufi</i>	Bushveld Sengi	LC	LC	Arid terrain, including dry savannah woodlands, bushveld, steppe, and semi-deserts. Cover is an essential habitat requirement and is provided by low bushes in open grasslands.	High
	² <i>Macroscelides proboscideus</i>	Karoo Round-eared Sengi	LC	LC	Open country with a preference for shrubs and areas with sparse grass cover on gravel plains associated with alluvial plains and relatively flat areas between higher elevation areas such as outcrops, scarps, hills, and mountains.	Moderate
LAGOMORPHA	² <i>Lepus capensis</i>	Cape Hare	LC	LC	Lives in a wide variety of grassland and open habitat, avoiding only bushy or closed habitats. Preferring dry, open habitats.	High
	² <i>Lepus saxatilis</i>	Scrub Hare	LC	LC	Typically absent from forest, desert and open grassland regions and prefers savanna woodland and scrub. Adapts well to modified agricultural areas, occurring commonly in croplands and fallow or dilapidated lands, where some degree of bush encroachment has taken place.	High

LIST OF MAMMALS (cont.)

Mammals protected according to NCNCA are indicated with their respective Schedule no. in superscript.

	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
RODENTIA	² <i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC	Catholic in habitat requirements.	High
	² <i>Xerus inauris</i>	South African Ground Squirrel	LC	LC	Open terrain with a sparse bush cover and hard substrate.	Confirmed
	² <i>Pedetes capensis</i>	Springhare	LC	LC	Wide distribution but absent in deserts and forests. Prefers flat, arid and semi-arid areas with short grass.	High
	² <i>Fukomys damarensis</i>	Damara Mole-rat	LC	LC	Semi-arid regions consisting of red Kalahari sands and sandy soils; habitats include grassland, savannah, thornveld and woodland.	High
	² <i>Graphiurus microtis</i>	Small-eared Dormouse	LC	LC	Widespread across a range of savannah and woodland habitats, as well as within rocky areas, caves and disturbed areas.	High
	² <i>Zelotomys woosnami</i>	Woosnam's Desert Mouse	LC	LC	Associated with riverbeds and pans in sparsely vegetated Acacia woodlands, savannahs and open shrublands with <i>Vachellia</i> , <i>Grewia</i> , <i>Terminalia</i> , and <i>Rhigozum</i> . Prefers sandy to fine, consolidated Kalahari-type soils and lime-clay silty soils.	High
	² <i>Saccostomus campestris</i>	Pouched Mouse	LC	LC	Wide habitat tolerance; prefers soft, sandy soils; open and dense vegetation; rocky areas.	High

LIST OF MAMMALS (cont.)

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	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
RODENTIA	² <i>Steatomys krebsii</i>	Krebs's Fat Mouse	LC	LC	A variety of habitat types but prefers open grasslands and savannas. Absent from forests and montane grasslands.	High
	² <i>Dendromus melanotis</i>	Grey Climbing Mouse	LC	LC	Grassland and savanna, where it prefers tall, rank grassland. Can also inhabit riparian-, Afromontane-, and sand forests, wetlands, drainage lines and thickets.	High
	² <i>Malacothrix typica</i>	Large-eared (Gerbil) Mouse	LC	LC	Short grass habitats over hard soil.	Low
	² <i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	LC	LC	Hard ground, unlike other gerbil species, with some cover of grass or karroid bush.	Low
	² <i>Gerbilliscus paeba</i>	Hairy-footed Gerbil	LC	LC	Open habitat specialist, prefers sandy soils, or sandy alluvium associated with grass, scrub, or thin woodland cover.	High
	² <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	LC	Associated with a wide variety of habitats, including bushveld and grasslands and highly transformed habitats.	High
	² <i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC	Open areas or plains with grass, scrub or open woodland. Avoids heavy consolidated sands or very loose sandy soils.	High

LIST OF MAMMALS (cont.)

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	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
RODENTIA	² <i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	LC	LC	Catholic habitat requirements, but prefer rocky hills, outcrops, or boulder-strewn hillsides.	High
	² <i>Aethomys chrysophilus</i>	Red Veld Rat	LC	LC	Habitat generalist occupying a variety of savannah woodlands.	High
	² <i>Rhabdomys pumilio</i>	Four-striped Grass Mouse	LC	LC	Essentially a grassland species; occurs in wide variety of habitats where there is good grass cover.	High
	³ <i>Mus musculus</i>	House Mouse	LC	<i>Not listed</i>	Wide habitat tolerance.	High
	² <i>Thallomys nigricauda</i>	Black-tailed Tree Rat	LC	LC	Arid savannas, especially Acacia bushland habitats and Kalahari thornveld with <i>Vachellia erioloba</i> , <i>V. luederitzii</i> , <i>Boscia albitrunca</i> and <i>Terminalia sericea</i> trees.	High
	² <i>Mastomys coucha</i>	Southern Multimammate Mouse	LC	LC	Wide habitat tolerance.	High
	² <i>Parotomys brantsii</i>	Brants' Whistling Rat	LC	LC	It is restricted to areas with consolidated sands in semi-desert landscapes, with a low percentage plant cover of 34 - 40%.	Confirmed

LIST OF MAMMALS (cont.)

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	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
EULIPTYPHLA	¹ <i>Atelerix frontalis</i>	South African Hedgehog	LC	NT	Generally found in semi-arid savanna and grassland habitats.	High
PRIMATES	⁴ <i>Papio ursinus</i>	Chacma Baboon	LC	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	Confirmed
PHOLIDOTA	¹ <i>Smutsia temminckii</i>	Ground Pangolin	VU	VU	Various woodland and savannah habitats, preferring arid and mesic savannah and semi-arid environments at lower altitudes, often with thick undergrowth. Also found on rocky hills but absent in forest and true desert.	High
TUBULENTATA	¹ <i>Orycteropus afer</i>	Aardvark	LC	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil.	High

LIST OF MAMMALS (cont.)

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	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
CARNIVORA	¹ <i>Vulpes chama</i>	Cape Fox	LC	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub.	High
	¹ <i>Otocyon megalotis</i>	Bat-eared Fox	LC	LC	Mainly short-grass plains, but also in arid, semi-arid or winter rainfall shrublands, and open arid savannah.	High
	⁴ <i>Canis mesomelas</i>	Black-backed Jackal	LC	LC	Wide habitat tolerance.	High
	¹ <i>Mellivora capensis</i>	Honey Badger	LC	LC	Wide habitat tolerance.	High
	¹ <i>Poecilogale albinucha</i>	African Striped Weasel	LC	NT	Wide habitat tolerance, but most common in grassland areas.	High
	¹ <i>Ictonyx striatus</i>	Striped Polecat	LC	LC	Widely distributed throughout the sub-region.	High
	² <i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC	Wide habitat tolerance, but areas with adequate cover.	High
	² <i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC	Semi-arid country on a sandy substrate.	Confirmed
	² <i>Suricata suricatta</i>	Suricate	LC	LC	Open arid country with hard and stony substrate. Occur in Nama- and Succulent Karoo but also fynbos.	Moderate

LIST OF MAMMALS (cont.)

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	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
CARNIVORA	² <i>Genetta genetta</i>	Common (Small-spotted) Genet	LC	LC	Occur in open arid habitats.	High
	¹ <i>Hyaena brunnea</i>	Brown Hyena	NT	NT	Found in dry areas, generally with annual rainfall of 100 - 700 mm, particularly along the coast, semi-desert, open scrub, and open woodland savanna.	Low
	¹ <i>Proteles cristata</i>	Aardwolf	LC	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes.	High
	¹ <i>Felis silvestris</i>	African Wild Cat	LC	LC	Wide habitat tolerance.	High
	¹ <i>Felis nigripes</i>	Black-footed cat	VU	VU	Dry, open savannah, grasslands and Karoo semi-desert with sparse shrub and tree cover and a mean annual rainfall of 100 - 500 mm at altitudes up to 2 000 m.	High
	⁴ <i>Caracal caracal</i>	Caracal	LC	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions.	High
	¹ <i>Panthera pardus</i>	Leopard	VU	VU	Wide habitat tolerance, including woodland, grassland savanna and mountain habitats, but prefers densely wooded and rocky areas.	Low

LIST OF MAMMALS (cont.)

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	Scientific name	Common name	IUCN	SA MRL	Habitat	Potential of occurrence
SUIFORMES	² <i>Phacochoerus africanus</i>	Common Warthog	LC	LC	Open country, lightly wooded areas and savanna; also penetrates otherwise unsuitable country along watercourses.	Low
CETARTIODACTYLA	² <i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC	Wooded savanna and arid areas with stands of bush; wooded watercourses, acacia woodland and rocky hill country.	Confirmed
	² <i>Oryx gazella</i>	Gemsbok	LC	LC	Semi-arid and arid bushland and grassland of the Kalahari and Karoo and adjoining regions of Southern Africa.	Moderate
	² <i>Connochaetes taurinus</i>	Blue Wildebeest	LC	LC	Open savanna woodland and open grassland with access to drinking water.	Low
	² <i>Alcelaphus caama</i>	Red Hartebeest	LC	LC	Open savanna country and open woodland.	Low
	² <i>Antidorcas marsupialis</i>	Springbok	LC	LC	Open arid plains with short vegetation	Low
	² <i>Oreotragus oreotragus</i>	Klipspringer	LC	LC	Steep rocky and mountainous habitats, i.e., granite outcrops, koppies and gorges with rocky embankments	High
	² <i>Raphicerus campestris</i>	Steenbok	LC	LC	Wide habitat tolerance.	Confirmed
² <i>Sylvicapra grimmia</i>	Common Duiker	LC	LC	Wide habitat tolerance.	Confirmed	

LIST OF REPTILES

Reptiles protected according to NCNCA are indicated with their respective Schedule no. in superscript. South African endemics are indicated with ^E.

Family	Scientific name	Common name	IUCN status
AGAMIDAE	³ <i>Agama aculeata aculeata</i>	Western Ground Agama	LC
	³ <i>Agama atra</i>	Southern Rock Agama	LC
AMPHISBAENIDAE	³ <i>Monopeltis infuscata</i>	Dusky Worm Lizard	LC
	³ <i>Monopeltis mauricei</i>	Maurice's Spade-snouted Worm Lizard	LC
CHAMAELEONIDAE	¹ <i>Chamaeleo dilepis dilepis</i>	Common Flap-neck Chameleon	LC
COLUBRIDAE	³ <i>Dispholidus typus</i>	Boomslang	LC
	² <i>Philothamnus semivariiegatus</i>	Spotted Bush Snake	LC
	³ <i>Telescopus semiannulatus semiannulatus</i>	Eastern Tiger Snake	LC
CORDYLIDAE	¹ <i>Karusasaurus polyzonus</i>	Southern Karusa Lizard	LC
ELAPIDAE	³ <i>Aspidelaps scutatus scutatus</i>	Common Shield Cobra	LC
	³ <i>Naja nigricincta woodi</i>	Black Spitting Cobra	LC
	³ <i>Naja nivea</i>	Cape Cobra	LC
GEKKONIDAE	³ <i>Chondrodactylus angulifer angulifer</i>	Common Giant Gecko	LC
	³ <i>Chondrodactylus bibronii</i>	Bibron's Gecko	LC
	³ <i>Colopus wahlbergii wahlbergii</i>	Kalahari Ground Gecko	LC
	³ <i>Pachydactylus capensis</i>	Cape Gecko	LC
	³ <i>Pachydactylus rugosus</i>	Common Rough Gecko	LC
	³ <i>Ptenopus garrulus garrulus</i>	Common Barking Gecko	LC
	³ <i>Ptenopus garrulus maculatus</i>	Spotted Barking Gecko	LC
LACERTIDAE	² <i>Heliobolus lugubris</i>	Bushveld Lizard	LC
	² <i>Meroles squamulosus</i>	Common rough-scaled Lizard	LC
	² <i>Meroles suborbitalis</i>	Spotted Desert Lizard	LC
	² <i>Nucras intertexta</i>	Spotted Sandveld Lizard	LC
	² <i>Pedioplanis lineoocellata lineoocellata</i>	Spotted Sand Lizard	LC
LAMPROPHIIDAE	² <i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	LC
	² <i>Boaedon capensis</i>	Common House Snake	LC
	² <i>Lycophidion capense capense</i>	Cape Wolf Snake	LC
	² <i>Prosymna sundevallii</i>	Sundevall's Shovel-snout	LC
	³ <i>Psammophis trinasalis</i>	Fork-marked Sand Snake	LC
	³ <i>Pseudaspis cana</i>	Mole Snake	LC
PELOMEDUSIDAE	³ <i>Xenocalamus bicolor bicolor</i>	Bicoloured Quill-snouted Snake	LC
	³ <i>Pelomedusa subrufa</i>	Marsh Terrapin	LC
PYTHONIDAE	¹ <i>Python natalensis</i>	Southern African Python	LC

LIST OF REPTILES (cont.)

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Family	Scientific name	Common name	IUCN status
SCINCIDAE	³ <i>Acontias gracilicauda</i> ^E	Thin-tailed Legless Skink	LC
	³ <i>Acontias kgalagadi kgalagadi</i>	Kgalagadi Legless Skink	LC
	³ <i>Trachylepis occidentalis</i>	Western Three-striped Skink	LC
	³ <i>Trachylepis punctulata</i>	Speckled Sand Skink	LC
	³ <i>Trachylepis sparsa</i>	Karasburg Tree Skink	LC
	³ <i>Trachylepis spilogaster</i>	Kalahari Tree Skink	LC
	³ <i>Trachylepis sulcata sulcata</i>	Western Rock Skink	LC
	³ <i>Trachylepis variegata</i>	Variiegated Skink	LC
TESTUDINIDAE	² <i>Psammobates oculifer</i>	Serrated Tent Tortoise	LC
	² <i>Stigmochelys pardalis</i>	Leopard Tortoise	LC
VARANIDAE	² <i>Varanus albigularis albigularis</i>	Southern Rock Monitor	LC
VIPERIDAE	³ <i>Bitis arietans arietans</i>	Puff Adder	LC
	³ <i>Bitis caudalis</i>	Horned Adder	LC

LIST OF AMPHIBIANS

Amphibians protected according to NCNCA are indicated with their respective Schedule no. in superscript. SA endemics are indicated with ^E.

Family	Scientific name	Common name	IUCN status
BUFONIDAE	² <i>Amietophrynus gutturalis</i>	Guttural Toad	LC
	² <i>Amietophrynus poweri</i>	Western Olive Toad	LC
	² <i>Amietophrynus garmani</i>	Garman's Toad	LC
	² <i>Vandijkophrynus gariiepensis</i> ^E	Karoo Toad	LC
HYPEROLIIDAE	² <i>Kassina senegalensis</i>	Bubbling Kassina	LC
MICROHYLIDAE	² <i>Breviceps adspersus</i>	Bushveld Rain Frog	LC
PIPIDAE	² <i>Xenopus laevis</i>	Common Platanna	LC
PYXICEPHALIDAE	² <i>Amietia angolensis</i>	Common River Frog	LC
	² <i>Cacosternum boettgeri</i>	Boettger's Caco	LC
	² <i>Tomopterna cryptotis</i>	Tremolo Sand Frog	LC

LIST OF BIRDS

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Scientific name	Common name	IUCN Status	SA Red Data Book of Birds
¹ <i>Accipiter badius</i>	Shikra		
² <i>Acrocephalus baeticatus</i>	African Reed-Warbler		
² <i>Acrocephalus schoenobaenus</i>	Sedge Warbler		
² <i>Actitis hypoleucos</i>	Common Sandpiper		
² <i>Alario alario</i>	Black-headed Canary		
² <i>Alcedo cristata</i>	Malachite Kingfisher		
² <i>Alopochen aegyptiacus</i>	Egyptian Goose		
² <i>Amadina erythrocephala</i>	Red-headed Finch		
² <i>Amaurornis flavirostris</i>	Black Crake		
² <i>Anas capensis</i>	Cape Teal		
² <i>Anas erythrorhyncha</i>	Red-billed Teal		
² <i>Anas hottentota</i>	Hottentot Teal		
² <i>Anas smithii</i>	Cape Shoveler		
² <i>Anas sparsa</i>	African Black Duck		
² <i>Anas undulata</i>	Yellow-billed Duck		
² <i>Anhinga rufa</i>	African Darter		
² <i>Anthoscopus minutus</i>	Cape Penduline-Tit		
² <i>Anthropoides paradisea</i>	Blue Crane	VU	NT
² <i>Anthus cinnamomeus</i>	African Pipit		
² <i>Anthus crenatus</i>	African Rock Pipit	NT	NT
² <i>Anthus vaalensis</i>	Buffy Pipit		
² <i>Apus affinis</i>	Little Swift		
² <i>Apus apus</i>	Common Swift		
² <i>Apus bradfieldi</i>	Bradfield's Swift		
² <i>Apus caffer</i>	White-rumped Swift		
¹ <i>Aquila rapax</i>	Tawny Eagle	VU	EN
¹ <i>Aquila verreauxii</i>	Verreaux's Eagle		VU
² <i>Ardea cinerea</i>	Grey Heron		
² <i>Ardea melanocephala</i>	Black-headed Heron		
² <i>Ardea purpurea</i>	Purple Heron		
² <i>Ardeotis kori</i>	Kori Bustard	NT	NT
² <i>Batis pririt</i>	Pirit Batis		
² <i>Bostrychia hagedash</i>	Hadeda Ibis		
² <i>Bradornis infuscatus</i>	Chat Flycatcher		
² <i>Bradornis mariquensis</i>	Marico Flycatcher		
² <i>Bubalornis niger</i>	Red-billed Buffalo-Weaver		
¹ <i>Bubo africanus</i>	Spotted Eagle-Owl		
¹ <i>Bubo lacteus</i>	Verreaux's Eagle-Owl		
² <i>Bubulcus ibis</i>	Cattle Egret		
² <i>Burhinus capensis</i>	Spotted Thick-knee		
¹ <i>Buteo rufofuscus</i>	Jackal Buzzard		

LIST OF BIRDS (cont.)

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Scientific name	Common name	IUCN Status	SA Red Data Book of Birds
¹ <i>Buteo vulpinus</i>	Steppe Buzzard		
² <i>Calandrella cinerea</i>	Red-capped Lark		
² <i>Calendulauda africanoides</i>	Fawn-coloured Lark		
² <i>Calendulauda sabota</i>	Sabota Lark		
² <i>Calidris alba</i>	Sanderling		
² <i>Calidris ferruginea</i>	Curlew Sandpiper		
² <i>Calidris minuta</i>	Little Stint		
² <i>Campethera abingoni</i>	Golden-tailed Woodpecker		
² <i>Campethera bennettii</i>	Bennett's Woodpecker		
¹ <i>Caprimulgus europaeus</i>	European Nightjar		
¹ <i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar		
² <i>Cercomela familiaris</i>	Familiar Chat		
² <i>Cercotrichas coryphoeus</i>	Karoo Scrub-Robin		
² <i>Cercotrichas paena</i>	Kalahari Scrub-Robin		
² <i>Ceryle rudis</i>	Pied Kingfisher		
² <i>Charadrius asiaticus</i>	Caspian Plover		
¹ <i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT
² <i>Charadrius pecuarius</i>	Kittlitz's Plover		
² <i>Charadrius tricollaris</i>	Three-banded Plover		
² <i>Chersomanes albofasciata</i>	Spike-heeled Lark		
² <i>Chlidonias hybridus</i>	Whiskered Tern		
² <i>Chlidonias leucopterus</i>	White-winged Tern		
² <i>Chrysococcyx caprius</i>	Diderick Cuckoo		
² <i>Ciconia abdimii</i>	Abdim's Stork		NT
² <i>Ciconia ciconia</i>	White Stork		
¹ <i>Ciconia nigra</i>	Black Stork		VU
² <i>Cinnyris fusca</i>	Dusky Sunbird		
² <i>Cinnyris mariquensis</i>	Marico Sunbird		
² <i>Cinnyris talatala</i>	White-bellied Sunbird		
¹ <i>Circaetus cinereus</i>	Brown Snake-Eagle		
¹ <i>Circaetus pectoralis</i>	Black-chested Snake-Eagle		
¹ <i>Circus maurus</i>	Black Harrier	EN	EN
¹ <i>Circus pygargus</i>	Montagu's Harrier		
² <i>Cisticola aridulus</i>	Desert Cisticola		
² <i>Cisticola fulvicapillus</i>	Neddicky		
² <i>Cisticola juncidis</i>	Zitting Cisticola		
² <i>Cisticola subruficapillus</i>	Grey-backed Cisticola		
² <i>Cisticola tinniens</i>	Levaillant's Cisticola		
² <i>Clamator glandarius</i>	Great Spotted Cuckoo		
² <i>Clamator jacobinus</i>	Jacobin Cuckoo		
² <i>Clamator levaillantii</i>	Levaillant's Cuckoo		

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² <i>Colius colius</i>	White-backed Mousebird		
² <i>Columba guinea</i>	Speckled Pigeon		
² <i>Columba livia</i>	Rock Dove		
² <i>Coracias caudata</i>	Lilac-breasted Roller		
² <i>Coracias garrulus</i>	European Roller		NT
² <i>Coracias naevia</i>	Purple Roller		
² <i>Corvus albus</i>	Pied Crow		
² <i>Corvus capensis</i>	Cape Crow		
² <i>Cossypha caffra</i>	Cape Robin-Chat		
² <i>Coturnix coturnix</i>	Common Quail		
² <i>Creatophora cinerea</i>	Wattled Starling		
² <i>Cuculus clamosus</i>	Black Cuckoo		
² <i>Cuculus gularis</i>	African Cuckoo		
² <i>Cursorius rufus</i>	Burchell's Courser		VU
² <i>Cursorius temminckii</i>	Temminck's Courser		
² <i>Cypsiurus parvus</i>	African Palm-Swift		
² <i>Dendrocygna viduata</i>	White-faced Duck		
² <i>Dendropicos fuscescens</i>	Cardinal Woodpecker		
² <i>Dendropicos namaquus</i>	Bearded Woodpecker		
² <i>Dicrurus adsimilis</i>	Fork-tailed Drongo		
² <i>Egretta garzetta</i>	Little Egret		
² <i>Egretta intermedia</i>	Yellow-billed Egret		
¹ <i>Elanus caeruleus</i>	Black-shouldered Kite		
² <i>Emberiza capensis</i>	Cape Bunting		
² <i>Emberiza flaviventris</i>	Golden-breasted Bunting		
² <i>Emberiza impetuani</i>	Lark-like Bunting		
² <i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting		
² <i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela		
² <i>Eremopterix verticalis</i>	Grey-backed Sparrowlark		
² <i>Estrilda astrild</i>	Common Waxbill		
² <i>Estrilda erythronotos</i>	Black-faced Waxbill		
² <i>Euplectes orix</i>	Southern Red Bishop		
² <i>Eupodotis afraoides</i>	Northern Black Korhaan		
² <i>Eupodotis ruficrista</i>	Red-crested Korhaan		
¹ <i>Falco biarmicus</i>	Lanner Falcon		VU
¹ <i>Falco chicquera</i>	Red-necked Falcon	NT	
¹ <i>Falco naumanni</i>	Lesser Kestrel		
¹ <i>Falco peregrinus</i>	Peregrine Falcon		
¹ <i>Falco rupicolis</i>	Rock Kestrel		
¹ <i>Falco rupicoloides</i>	Greater Kestrel		
¹ <i>Falco vespertinus</i>	Red-footed Falcon	VU	NT

LIST OF BIRDS (cont.)

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Scientific name	Common name	IUCN Status	SA Red Data Book of Birds
² <i>Fulica cristata</i>	Red-knobbed Coot		
² <i>Gallinago nigripennis</i>	African Snipe		
² <i>Gallinula chloropus</i>	Common Moorhen		
¹ <i>Glareola nordmanni</i>	Black-winged Pratincole	NT	NT
¹ <i>Glaucidium perlatum</i>	Pearl-spotted Owlet		
² <i>Granatina granatina</i>	Violet-eared Waxbill		
¹ <i>Gyps africanus</i>	White-backed Vulture	CR	CR
¹ <i>Gyps coprotheres</i>	Cape Vulture	EN	EN
² <i>Halcyon chelicuti</i>	Striped Kingfisher		
¹ <i>Haliaeetus vocifer</i>	African Fish-Eagle		
¹ <i>Hieraaetus pennatus</i>	Booted Eagle		
² <i>Himantopus himantopus</i>	Black-winged Stilt		
² <i>Hippolais icterina</i>	Icterine Warbler		
² <i>Hirundo albigularis</i>	White-throated Swallow		
² <i>Hirundo cucullata</i>	Greater Striped Swallow		
² <i>Hirundo dimidiata</i>	Pearl-breasted Swallow		
² <i>Hirundo fuligula</i>	Rock Martin		
² <i>Hirundo rustica</i>	Barn Swallow		
² <i>Hirundo semirufa</i>	Red-breasted Swallow		
² <i>Hirundo spilodera</i>	South African Cliff-Swallow		
² <i>Indicator indicator</i>	Greater Honeyguide		
² <i>Ixobrychus minutus</i>	Little Bittern		
² <i>Lagonosticta senegala</i>	Red-billed Firefinch		
² <i>Lamprotornis nitens</i>	Cape Glossy Starling		
² <i>Laniarius atrococcineus</i>	Crimson-breasted Shrike		
² <i>Lanius collaris</i>	Common Fiscal		
² <i>Lanius collurio</i>	Red-backed Shrike		
² <i>Lanius minor</i>	Lesser Grey Shrike		
² <i>Larus cirrocephalus</i>	Grey-headed Gull		
¹ <i>Leptoptilos crumeniferus</i>	Marabou Stork		NT
² <i>Malcorus pectoralis</i>	Rufous-eared Warbler		
¹ <i>Melierax canorus</i>	Southern Pale Chanting Goshawk		
¹ <i>Melierax gabar</i>	Gabar Goshawk		
² <i>Merops apiaster</i>	European Bee-eater		
² <i>Merops hirundineus</i>	Swallow-tailed Bee-eater		
² <i>Milvus aegyptius</i>	Yellow-billed Kite		
¹ <i>Milvus migrans</i>	Black Kite		-
² <i>Mirafra fasciolata</i>	Eastern Clapper Lark		
² <i>Mirafra passerina</i>	Monotonous Lark		
² <i>Monticola brevipes</i>	Short-toed Rock-Thrush		
² <i>Motacilla capensis</i>	Cape Wagtail		

LIST OF BIRDS (cont.)

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN Status	SA Red Data Book of Birds
² <i>Muscicapa striata</i>	Spotted Flycatcher		
² <i>Myrmecocichla formicivora</i>	Anteater Chat		
¹ <i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN
² <i>Netta erythrophthalma</i>	Southern Pochard		
² <i>Nilaus afer</i>	Brubru		
² <i>Numenius phaeopus</i>	Common Whimbrel		
² <i>Numida meleagris</i>	Helmeted Guineafowl		
² <i>Nycticorax nycticorax</i>	Black-crowned Night-Heron		
² <i>Oena capensis</i>	Namaqua Dove		
² <i>Oenanthe monticola</i>	Mountain Wheatear		
² <i>Oenanthe pileata</i>	Capped Wheatear		
² <i>Onychognathus nabouroup</i>	Pale-winged Starling		
² <i>Oriolus oriolus</i>	Eurasian Golden Oriole		
² <i>Ortygospiza atricollis</i>	African Quailfinch		
¹ <i>Otus senegalensis</i>	African Scops-Owl		
² <i>Oxyura maccoa</i>	Maccoa Duck	VU	NT
² <i>Parisoma layardi</i>	Layard's Tit-Babbler		
² <i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler		
² <i>Parus cinerascens</i>	Ashy Tit		
² <i>Passer diffusus</i>	Southern Grey-headed Sparrow		
³ <i>Passer domesticus</i>	House Sparrow		
³ <i>Passer melanurus</i>	Cape Sparrow		
² <i>Passer motitensis</i>	Great Sparrow		
² <i>Phalacrocorax africanus</i>	Reed Cormorant		
² <i>Philetairus socius</i>	Sociable Weaver		
² <i>Philomachus pugnax</i>	Ruff		
¹ <i>Phoenicopterus minor</i>	Lesser Flamingo	NT	NT
¹ <i>Phoenicopterus ruber</i>	Greater Flamingo		NT
² <i>Phylloscopus trochilus</i>	Willow Warbler		
² <i>Pinarocorys nigricans</i>	Dusky Lark		
² <i>Platalea alba</i>	African Spoonbill		
² <i>Plectropterus gambensis</i>	Spur-winged Goose		
² <i>Plegadis falcinellus</i>	Glossy Ibis		
² <i>Plocepasser mahali</i>	White-browed Sparrow-Weaver		
³ <i>Ploceus velatus</i>	Southern Masked-Weaver		
² <i>Podiceps cristatus</i>	Great Crested Grebe		
¹ <i>Polemaetus bellicosus</i>	Martial Eagle	EN	EN
¹ <i>Polihierax semitorquatus</i>	Pygmy Falcon		-
¹ <i>Polyboroides typus</i>	African Harrier-Hawk		-
² <i>Porphyrio madagascariensis</i>	African Purple Swamphen		
² <i>Prinia flavicans</i>	Black-chested Prinia		

LIST OF BIRDS (cont.)

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN Status	SA Red Data Book of Birds
² <i>Psophocichla litsipsirupa</i>	Groundscraper Thrush		
² <i>Pternistis adspersus</i>	Red-billed Francolin		
² <i>Pterocles bicinctus</i>	Double-banded Sandgrouse		
² <i>Pterocles burchelli</i>	Burchell's Sandgrouse		
² <i>Pterocles namaqua</i>	Namaqua Sandgrouse		
¹ <i>Ptilopus granti</i>	Southern White-faced Scops-Owl		-
³ <i>Pycnonotus nigricans</i>	African Red-eyed Bulbul		
² <i>Pytilia melba</i>	Green-winged Pytilia		
³ <i>Quelea quelea</i>	Red-billed Quelea		
² <i>Rallus caerulescens</i>	African Rail		
² <i>Recurvirostra avosetta</i>	Pied Avocet		
² <i>Rhinopomastus cyanomelas</i>	Common Scimitarbill		
² <i>Rhinoptilus africanus</i>	Double-banded Courser		
² <i>Rhinoptilus chalcopterus</i>	Bronze-winged Courser		
² <i>Riparia cincta</i>	Banded Martin		
² <i>Riparia paludicola</i>	Brown-throated Martin		
² <i>Riparia riparia</i>	Sand Martin		
¹ <i>Sagittarius serpentarius</i>	Secretarybird	EN	VU
² <i>Saxicola torquatus</i>	African Stonechat		
² <i>Scleroptila levaillantoides</i>	Orange River Francolin		
² <i>Scopus umbretta</i>	Hamerkop		
² <i>Serinus albogularis</i>	White-throated Canary		
² <i>Serinus atrogularis</i>	Black-throated Canary		
² <i>Serinus flaviventris</i>	Yellow Canary		
² <i>Sigelus silens</i>	Fiscal Flycatcher		
² <i>Spizocorys conirostris</i>	Pink-billed Lark		
² <i>Spizocorys starki</i>	Stark's Lark		
² <i>Sporopipes squamifrons</i>	Scaly-feathered Finch		
² <i>Spreo bicolor</i>	Pied Starling		
² <i>Stenostira scita</i>	Fairy Flycatcher		
² <i>Streptopelia capicola</i>	Cape Turtle-Dove		
² <i>Streptopelia semitorquata</i>	Red-eyed Dove		
² <i>Streptopelia senegalensis</i>	Laughing Dove		
² <i>Struthio camelus</i>	Common Ostrich		
² <i>Sylvia borin</i>	Garden Warbler		
² <i>Sylvietta rufescens</i>	Long-billed Crombec		
² <i>Tachybaptus ruficollis</i>	Little Grebe		
² <i>Tachymarptis melba</i>	Alpine Swift		
² <i>Tadorna cana</i>	South African Shelduck		
² <i>Tchagra australis</i>	Brown-crowned Tchagra		
² <i>Telophorus zeylonus</i>	Bokmakierie		

LIST OF BIRDS (cont.)

Birds protected according to NCNCA are indicated with their respective Schedule no. in superscript.

Scientific name	Common name	IUCN Status	SA Red Data Book of Birds
¹ <i>Terathopius ecaudatus</i>	Bateleur	EN	EN
² <i>Threskiornis aethiopicus</i>	African Sacred Ibis		
² <i>Tockus leucomelas</i>	Southern Yellow-billed Hornbill		
² <i>Tockus nasutus</i>	African Grey Hornbill		
¹ <i>Torgos tracheliotus</i>	Lappet-faced Vulture	EN	EN
² <i>Tricholaema leucomelas</i>	Acacia Pied Barbet		
² <i>Tringa glareola</i>	Wood Sandpiper		
² <i>Tringa nebularia</i>	Common Greenshank		
² <i>Tringa stagnatilis</i>	Marsh Sandpiper		
² <i>Turdoides bicolor</i>	Southern Pied Babbler		
² <i>Turdus smithi</i>	Karoo Thrush		
² <i>Turnix sylvatica</i>	Small Buttonquail		
¹ <i>Tyto alba</i>	Barn Owl		-
² <i>Upupa africana</i>	African Hoopoe		
³ <i>Urocolius indicus</i>	Red-faced Mousebird		
² <i>Vanellus armatus</i>	Blacksmith Lapwing		
² <i>Vanellus coronatus</i>	Crowned Lapwing		
² <i>Vidua chalybeata</i>	Village Indigobird		
² <i>Vidua macroura</i>	Pin-tailed Whydah		
² <i>Vidua regia</i>	Shaft-tailed Whydah		
² <i>Zosterops pallidus</i>	Orange River White-eye		

APPENDIX 3

A photographic guide for species of conservation concern that was encountered on site and those with a high potential to occur on site

Lessertia frutescens

All *Lessertia* spp. are protected in terms of **Schedule 1** of NCNCA



- Small shrublet with leaves being:
 - Hairy
 - Imparipinnate, i.e., leaflets arranged on either side of the stem, typically in pairs opposite each other, with a single leaflet at the apex.
- Pods are membranous, slightly inflated or compressed
- Typical pea flowers

Jamesbrittenia integerrima

All *Jamesbrittenia* spp. are protected under **Schedule 2** of the NCNCA



Ruschia griquensis

All MESEMBRYANTHEMACEAE spp. are protected under Schedule 2 of the NCNCA



Characteristic hooks on leaf tips



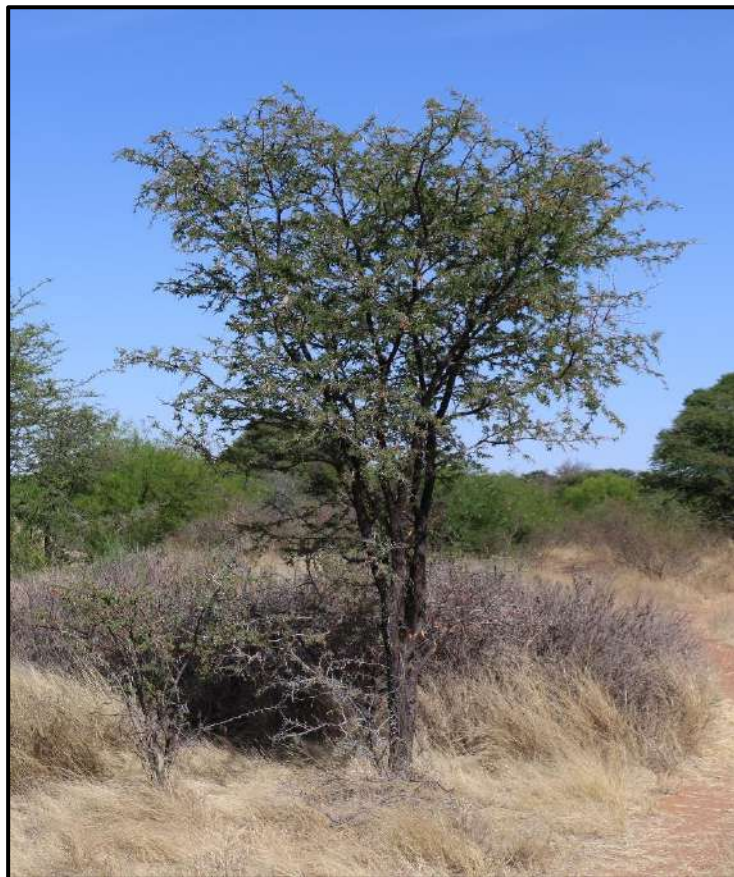
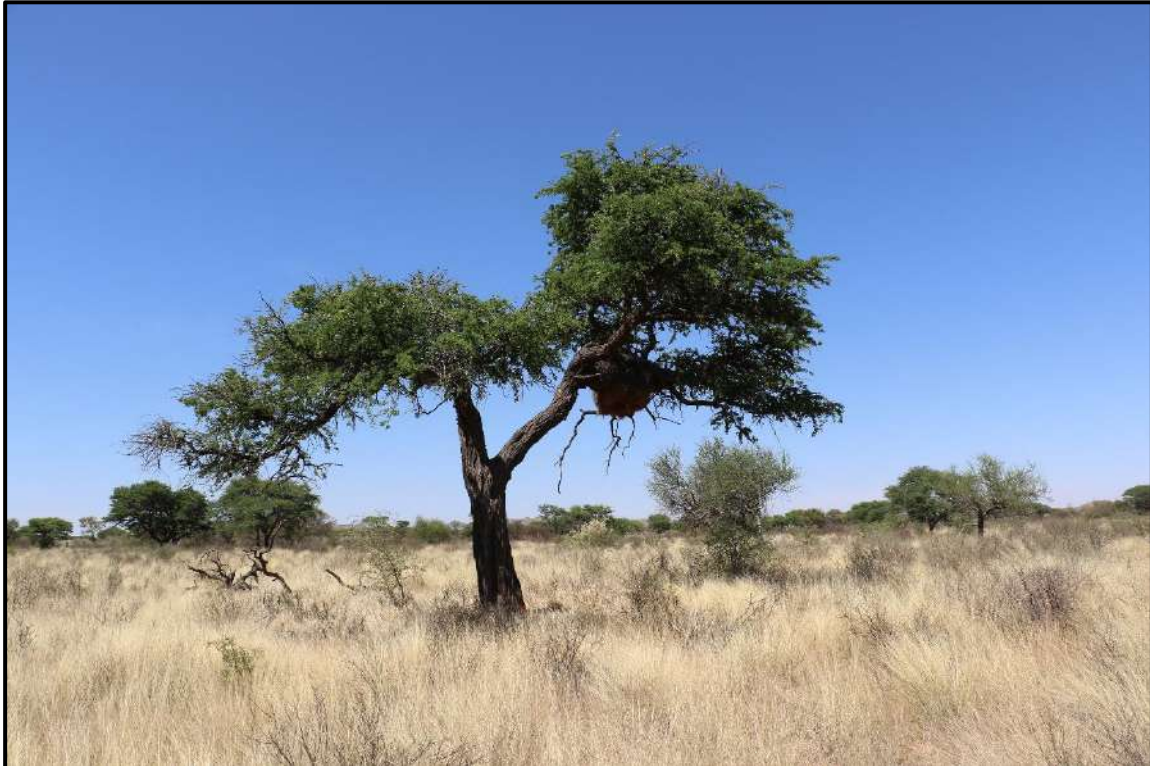
Boscia albitrunca

This species is Protected under the NFA and **Schedule 2** of the NCNCA



Vachellia erioloba

This species is protected under the NFA



- 1) Pods are thickened and velvety
- 2) Spines are often swollen and fused at the base

Vachellia haematoxylon
This species is protected under the NFA



Leaves and young stems are grey-velvety, giving this species their characteristic grey appearance.

Spines are straight and slender

