



ECOLOGICAL ASSESSMENT REPORT

Renosterkop Mining Company (Pty) Ltd

Renosterkop Tin, Tungsten and Zinc Mining Project



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Renosterkop Mining Company (Pty) Ltd

Remaining Extent of Lot 1726

Lot 1288

Lot 1279

Administrative District of Kenhardt

Northern Cape Province

**Ecological Assessment Report in application for Environmental
Authorisation related to a Mining Right Application ((NC) 30/5/1/2/2/
10172 MR) that was lodged with the Department of Mineral Resources**

July 2022

EXECUTIVE SUMMARY

Renosterkop Mining Company (Pty) Ltd is proposing the mining of tin, tungsten, and zinc on Remaining Extent of Lot 1726, Lot 1288, and Lot 1279, near Kakamas. The mining right area is located within the Kai !Garib Local Municipality (Z F Mgcau District) of the Northern Cape Province. Renosterkop Mining Company has submitted a Mining 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. This terrestrial ecological assessment report describes the ecological characteristics and biodiversity of the proposed mining 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 identify the ecological characteristics and sensitivity of the site. Three plant communities were identified within the area earmarked for mining activities in the study area. Of these, the drainage lines are most sensitive (Very High), primarily based on their national protection status as watercourses. The remainder of the pristine portion of the site (hills and grassland habitats) are of High sensitivity based on several plant species of conservation concern recorded here, and potential important habitat it provides to protected bird-, reptile- and invertebrate species.

The most profound impacts expected to be related to the proposed mining operation include cumulative loss of intact habitat on landscape level, as well as loss and disturbances to specialised flora and fauna species, especially those restricted to the hills. Permit applications need to be lodged with the Northern Cape Department of Environment and Nature Conservation three months prior to any destruction, death or displacement of protected flora and fauna species and license application to remove any of the protected tree species need to be lodged with the Department of Forestry and Fisheries.

If mining takes place, then the destruction of sensitive natural habitats on site is inevitable. The significance of the ecological impacts will ultimately be affected by the success of the mitigation measures implemented during the mining operation. In my opinion, authorisation for the proposed operation should only be granted if the applicant commits to strictly adhere to effective avoidance, management, mitigation, and rehabilitation measures.

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1. INTRODUCTION

1.1. Background information

Renosterkop Mining Company (Pty) Ltd is proposing the mining of tin, tungsten, and zinc on Remaining Extent of Lot 1726, Lot 1288, and Lot 1279 (from hereon referred to as Renosterkop), located within the Kai !Garib Local Municipality (Z F Mgqawu District) of the Northern Cape Province. It lies directly east of the town Augrabies, and approximately 17 km north-west of the town Kakamas on the R359 that leads to the Augrabies Falls National Park (Figure 1). The total extent of the mining right area is ± 540 ha. The applicant submitted a Mining Right application, which triggers the requirement 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 a desktop assessment and field investigation and provide an ecological assessment report. This assessment report describes the characteristics of habitats in the proposed mining area, identifies the biodiversity and species of conservation concern, identifies invasive and encroaching species and their distribution, indicates the source of impacts from the mining operation and assesses these impacts and residual impacts after closure. 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, which should be included in the EMPR.

1.2. Scope of study

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

- conduct a desktop study and field investigation 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.

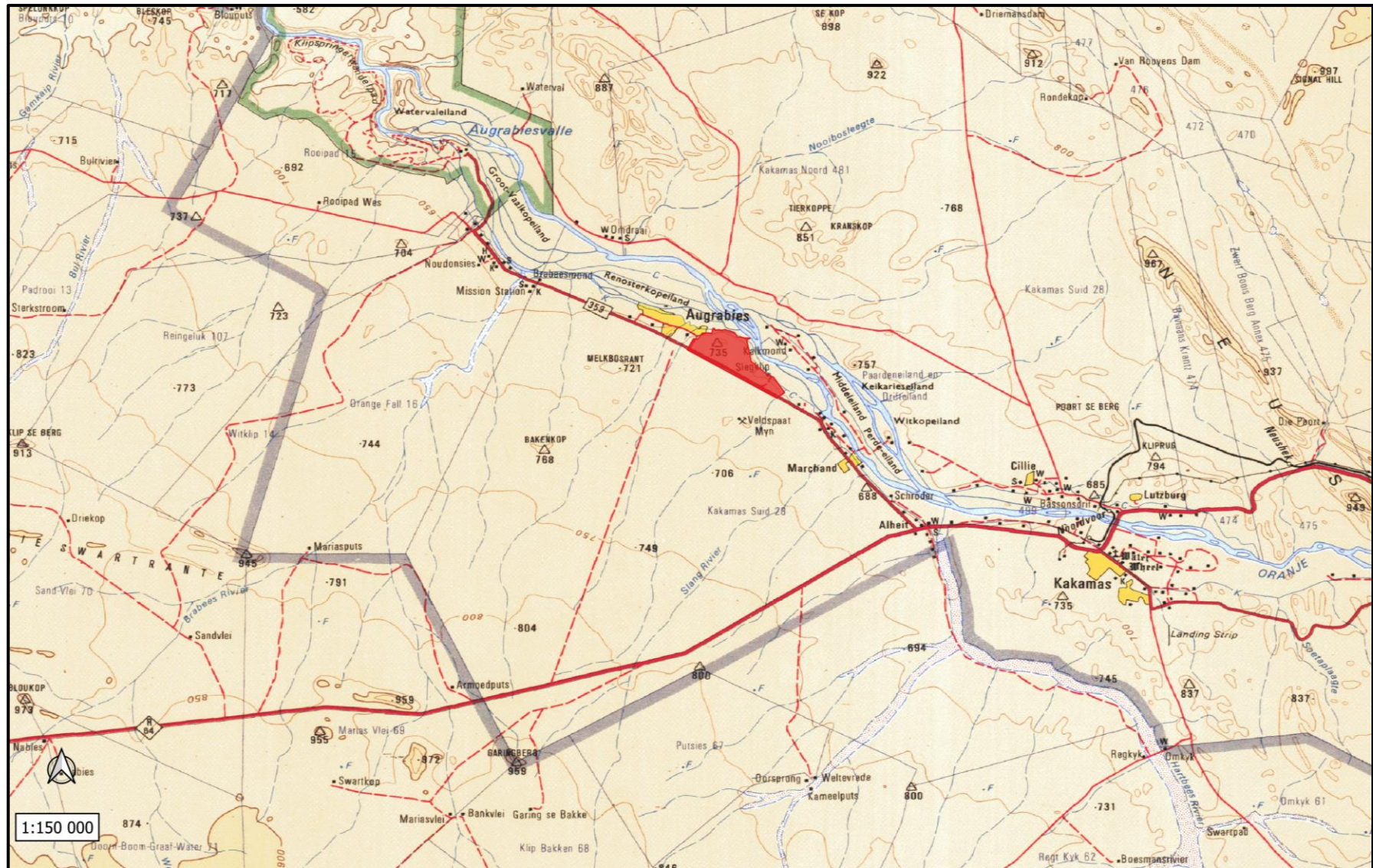
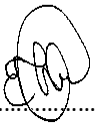


Figure 1. The location of the Renosterkop mining area is indicated in red.

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	<p>I, Elizabeth (Betsie) Milne, owner of Boscia Ecological Consulting, declare that I:</p> <ul style="list-style-type: none"> • 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. <p style="text-align: center;">  </p>		

1.4. Description of the proposed activity

The mining operation is based on tin-tungsten-zinc deposits that are restricted to the Quartz-topaz Gneiss of the Renosterkop hill (Figure 2). The deposits will be sampled by means of an opencast method, involving drilling and blasting. Mined deposit will be crushed and screened on site, whereafter it will be sold for further beneficiation elsewhere. An estimated total volume of 90 000 tonnes of ore will be processed each month, when at full capacity, for about 30 years.

Mining activities will make use of existing roads where possible, but haul roads will be created to access the mining areas. Supporting infrastructure include crushing and screening plant, explosives magazine, sewage facilities, stormwater dam, fuel storage facility, office, workshop and ablution facilities, storage facility, salvage yard, waste disposal site, a central processing plant, water tanks, and pipeline infrastructure.



Figure 2. The proposed core footprint area of mining activities on Renosterkop.

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 a relatively comprehensive data set for the assessment. The fieldwork component was conducted on 1 July 2022 and most data for the desktop assessment was obtained from the quarter degree squares that include the study area (2820CB).

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 mining 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. The Environmental Management Framework for the Siyanda (now Z F Mgcawu) District Municipality was also consulted to obtain information on conservation plans for the municipality in which the study area falls. Historical occurrences of Red List plant species were obtained from the SANBI: POSA database for the broad geographical area that includes the study site (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).

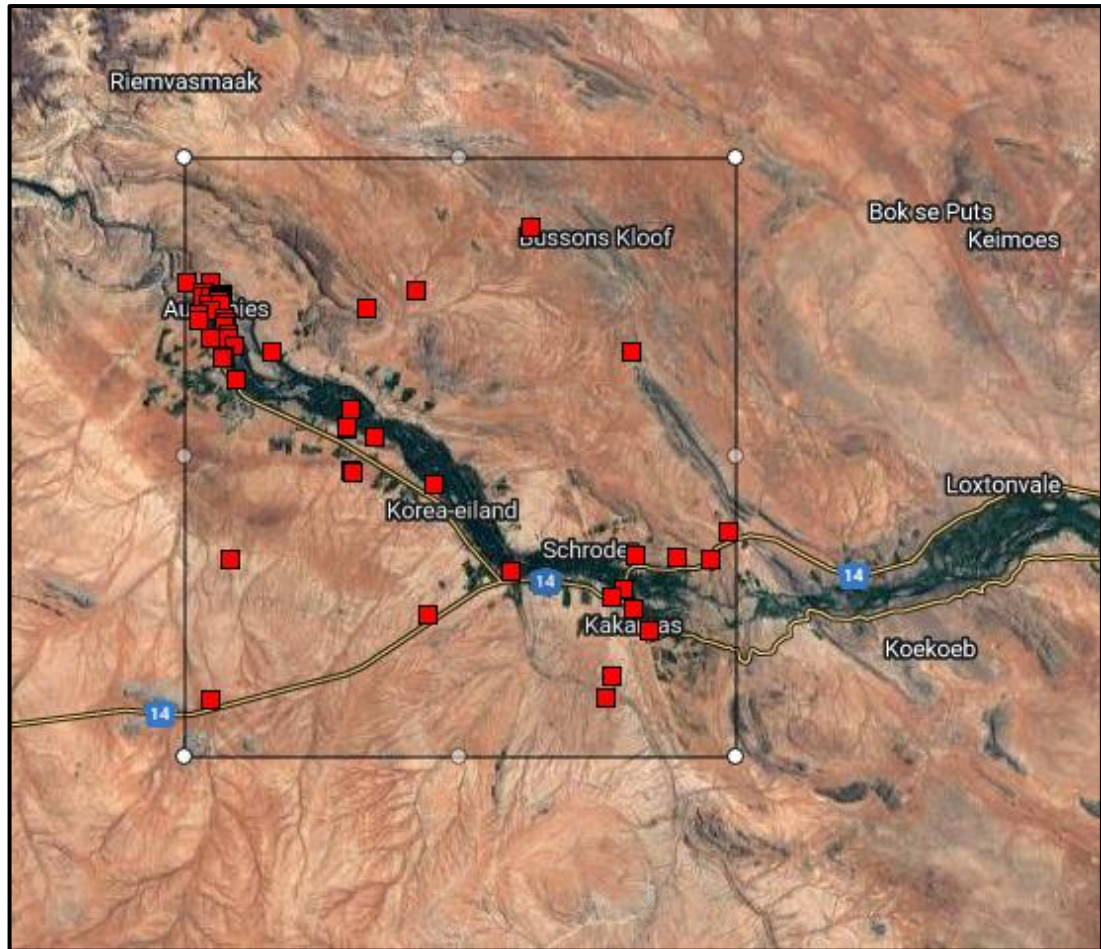


Figure 3. The extent of the map filter applied on the POSA website to extract species information is shown by the large black square. The small red squares indicate historical data points.

2.3. Fauna

2.3.1. Desktop Survey

A desktop survey was undertaken to obtain lists of mammals, reptiles, amphibians, birds, fish, and invertebrate species which are likely to occur in the study area. The faunal species lists 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, Kleynhans (2007) for fish and Thirion (2007), Picker et al. (2004) and Griffiths et al. (2015) 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/>, the Freshwater Biodiversity Information System (FBIS) <https://freshwaterbiodiversity.org/>, 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 an assessment of the availability and quality of suitable habitat at the site.

The likelihood of Red Data species occurring on site was 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 habitats 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 the various red lists/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

The field survey took place during mid-winter, which was not an optimal time of the year for this summer-rainfall region. However, the area experienced higher than normal rainfall this year, and the vegetation was in a suitable state for the assessment. Most grasses still held seeds and many plants were flowering. Due to the brief duration of the survey, the species list obtained cannot be regarded as comprehensive. Ideally, a site should be visited several times during different seasons to ensure a full complement of plant and animal species present, are captured. However, this is rarely possible due to time and cost constraints related to mining right application processes.

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 area are agriculture. The region is arable and classified as the Orange River Potential Agricultural Area, which is an area with High Agricultural Potential (B rating). This is due to the Good and Excellent irrigation suitability of the land. The grazing capacity is 36 - 42 ha/LSU, with the grazing land being demarcated for sheep.

Apart from the proposed mining activities, Renosterkop is currently utilised for extensive irrigation of export crops (Figure 4). Existing landuse features include farm tracks and other supporting infrastructure, with associated surface disturbances. A canal traverses the northern boundary of the site and there is a communal soccer field in the far south-eastern corner. An old field is present in the north-east and disturbances associated with historic mining occur on the hills (Figure 5).



Figure 4. Extensive irrigation of export crops on Renosterkop.

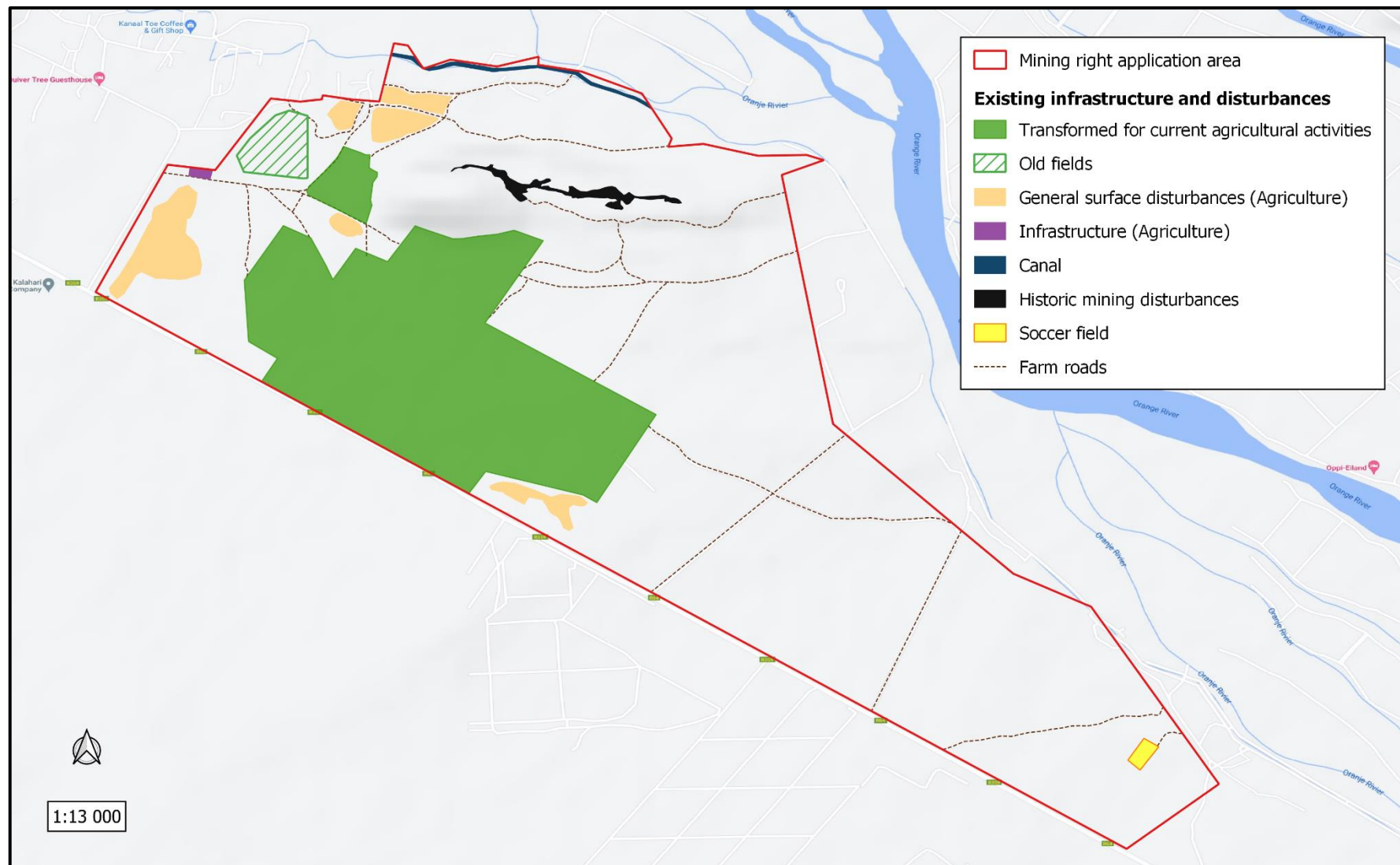


Figure 5. Evidence of existing infrastructure and past disturbances in the study area.

3.2. Geology, soils, and topography

According to the 1:250 000 Geological Map of 2820 Upington, published by the Council for Geoscience in 1988, the geological features on Renosterkop comprise Quaternary and Mokolian deposits. The hills earmarked for mining comprise Quartz-topaz gneiss (Renosterkop Formation), while the plains are associated with pink-weathering granite gneiss with a granular texture (Riemvasmaak Formation) (Figure 6). A very small section along the river, in the north-east, comprise alluvium (Figure 6). The earmarked deposits are associated with the Renosterkop gneiss.

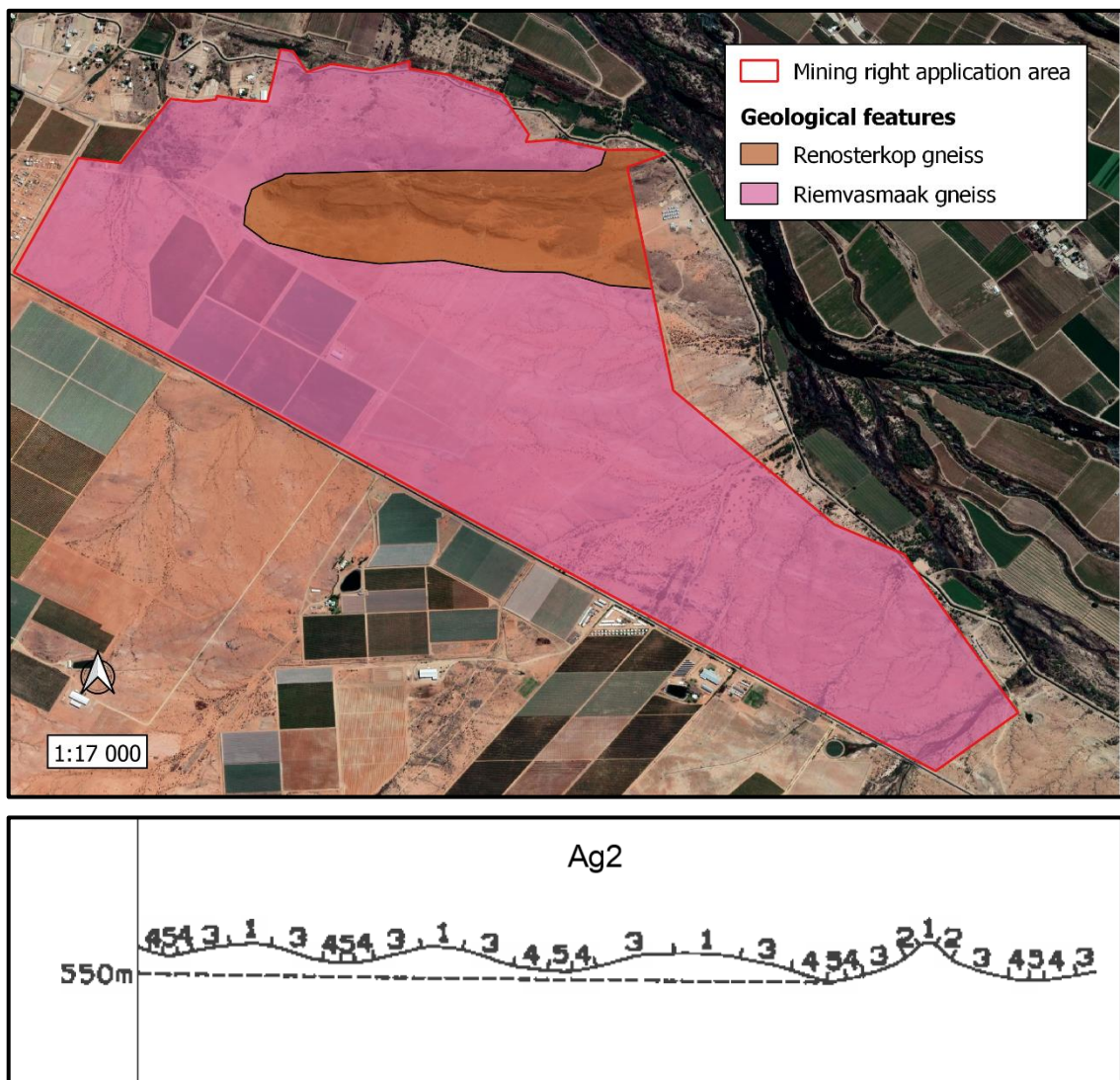


Figure 6. The distribution of geological features in the study area (top) and the dominant land type terrain units (bottom).

The terrain comprises plains with open low hills or ridges. Altitude ranges from 660 - 680 m.a.s.l. on the plains, and 700 - 730 m on the hill. The slope on the plains is gentle (< 1 %) and becomes very steep (20 – 30 %) along the hill. The land type is Ag2, which comprise red-yellow apedal, freely drained soils, red, high base status, and less than 300 mm deep. The hill is represented by terrain units 1 (hill tops) and 2 (slopes), the plains by terrain units 3 and 4, and the drainage lines by terrain unit 5 (Figure 6). The terrain on the plains has low susceptibility to erosion and flooding hazards, but the hill terrain is highly susceptible to erosion. The soils of the site have moderately low susceptibility to wind erosion, but moderately high water erosion susceptibility.

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 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 the DWS in terms of Section 21 (c) and (i).

The Renosterkop study area falls within the Vioolsdrif quaternary catchment D81A of the Lower Orange Water Management Area (Figure 7). This quaternary catchment has been allocated a Present Ecological State (PES) of 'Moderately Modified' (C) by Smook et al. (2002). Information regarding its mean annual rainfall, evaporation potential and runoff is provided in Table 2.

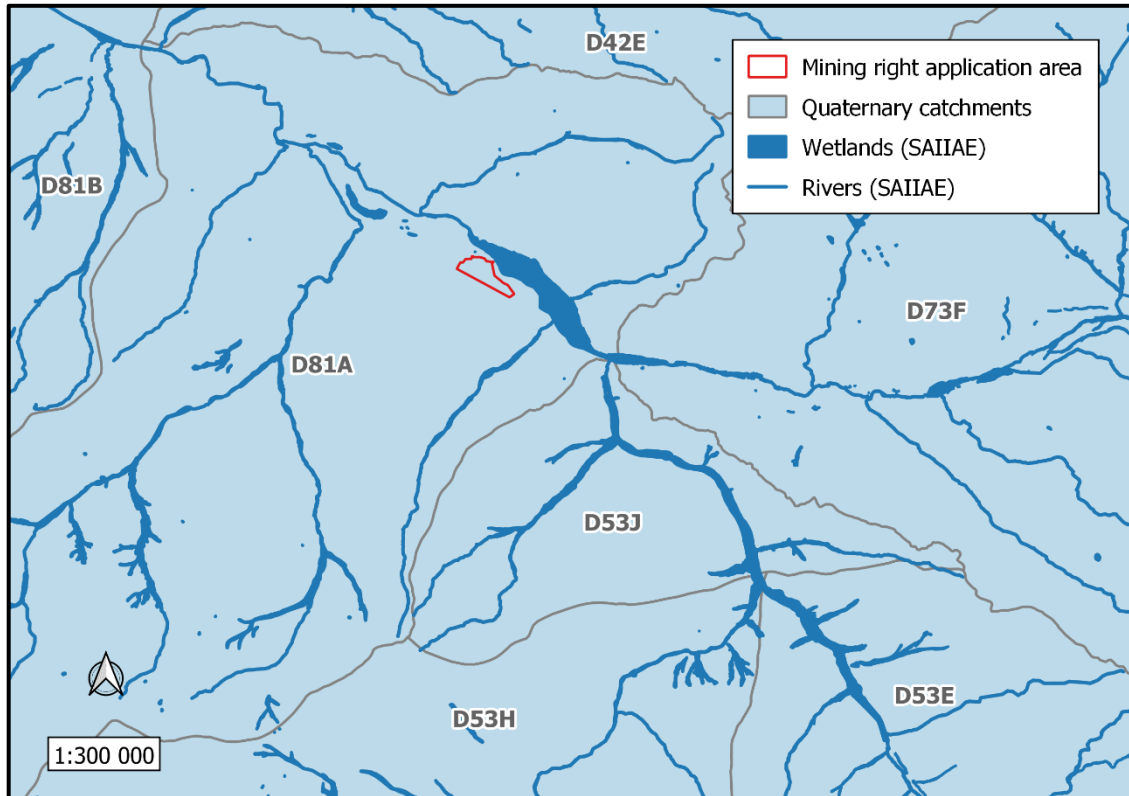


Figure 7. The locality of the proposed mining area in relation to the Violsdrif quaternary catchment of the Lower Orange Water Management Area.

Table 2. Catchment characteristics for the Violsdrif quaternary catchment in which the study area falls, as presented by Smook et al. (2002).

Quaternary catchment	Catchment Area (km ²)	Mean Annual Rainfall (mm)	Mean Annual Evaporation (mm)	Mean Annual Runoff (10 ⁶ m ³)
D81A	2 311	128	2 700	2.74

According to the South African Inventory of Inland Aquatic Ecosystems (SAIIAE), the study area falls within the Bushmanland Bioregion. Here, 4.2 % 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 present ecological status per wetland type is depicted in Table 3. Depressional wetlands are most abundant in this bioregion, with the majority being severely modified. Most of the remaining wetland types in this Bioregion are also moderately- to severely modified.

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

Wetland type	Total Extent (%)	% Natural or near-natural (A/B)	% Moderately modified (C)	% Heavily to severely/critically modified (D/E/F)
Depression	74.9	16.0	33.6	50.4
Floodplains	10.3	1.9	29.4	68.7
Seeps	0.8	38.0	18.7	43.2
Valley-bottom	13.9	1.5	62.6	35.9

No wetlands or rivers occur on Renosterkop, but an extensive network of drainage lines traverse the property (Figure 8). These all drain towards the Orange River in the north and therefore play an important role in the catchment area. However, many drainage lines in the centre of the property have already been destroyed by agricultural activities.

3.4. Vegetation

3.4.1. Broad-scale vegetation patterns

Renosterkop falls within the Nama Karoo Biome (Mucina and Rutherford 2006). According to the vegetation map of Mucina and Rutherford (2012), the site is represented by one broad-scale vegetation unit, i.e. Bushmanland Arid Grassland (Figure 9).

Bushmanland Arid Grassland is restricted to the Northern Cape. It spans from Aggeneys in the west to Prieska in the east, with its boundaries being defined by the edges of the Bushmanland Basin in the south, desert vegetation near Upington in the north and the edges of the Namaqualand hills in the west. Altitude varies from 600 to 1 200 m. The topography includes extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland, dominated by *Stipagrostis* spp. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich display of annual herbs can be expected. A third of the geology of this unit comprises recent (Quaternary) alluvium and calcrete. Superficial deposits of the Kalahari Group are also present in the east. The extensive Palaeozoic diamictites of the Dwyka Group also outcrop in the area, along with gneisses and metasediments of Mokolian age. The soils are primarily red-yellow apedal soils, freely drained, with a high base status and < 300 mm deep. However, about a fifth of the area comprises soils deeper than 300 mm. The land types include mainly Ag and Ae.



Figure 8. The location of drainage lines on the proposed mining right area. No SAIIE wetlands or rivers occur on the property.

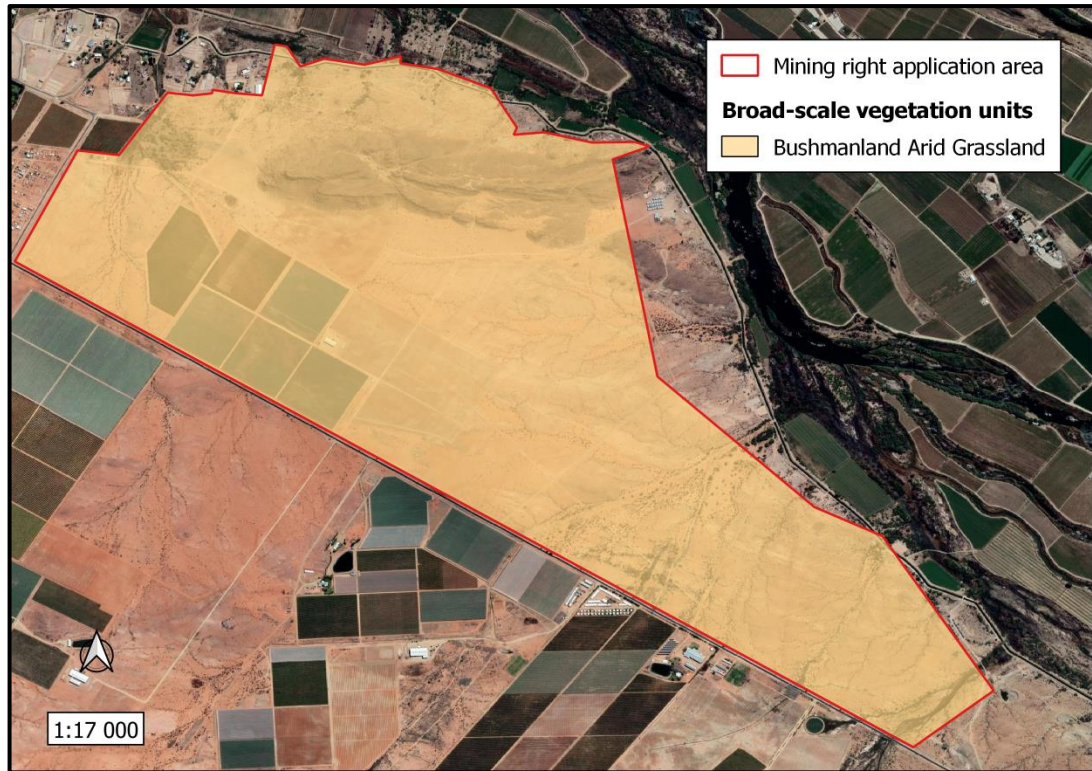


Figure 9. The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

Bushmanland Arid Grassland is classified as least threatened with very little being transformed. Small portions are conserved within the Augrabies Falls National Park and Goegap Nature Reserve. Endemic plant species include *Dinteranthus pole-evansii*, *Larryleachia dinteri*, *L. marlothii*, *Ruschia kenhardtensis*, *Lotononis oligocephala* and *Nemesia maxii*.

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 three 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.

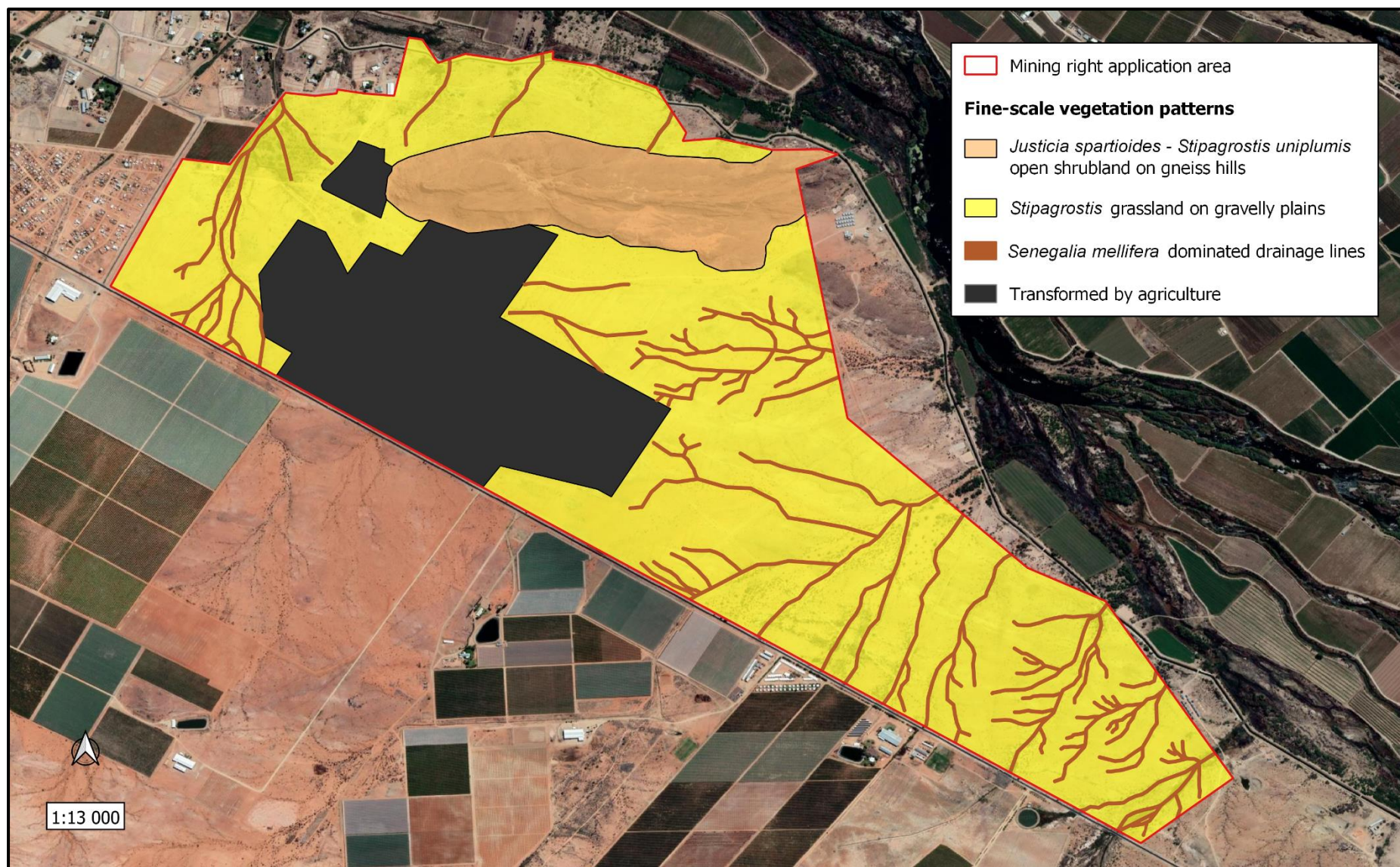


Figure 10. The distribution of fine-scale plant communities in the study area

i) *Justicia spartioides* - *Stipagrostis uniplumis* open shrubland on gneiss hills

This community is restricted to the hills of the study area (Figure 10). The vegetation is presented as an open shrubland, dominated by low shrubs, intermixed with grasses. Shallow soils and rocks constitute approximately 30 - 40% of the ground cover (Figure 11).

The shrub layer is dominated by *Justicia spartioides* and *Indigofera heterotricha*, but *Rogeria longiflora* is also abundant. Other common species include *Hermannia stricta*, *H. minutiflora*, *Aptosimum spinescens*, *Justicia australis*, *Barleria rigida*, *Tetraena rigida*, *Berkheya chamaepeuce*, *Kissenia capensis*, *Cryptolepis decidua* and *Solanum tomentosum*. Common tall shrubs include *Senegalia mellifera*, *Boscia albitrunca*, *Boscia foetida*, *Cadaba aphylla* and *Phaeoptilum spinosum*.

The grass layer is dominated by *Stipagrostis uniplumis*, but *S. ciliata*, *Stipagrostis obtusa*, *Panicum arbusculum*, *Enneapogon scaber*, *E. cenchroides*, *E. desvauxii*, *Eragrostis nindensis*, *Aristida engleri* and *A. adscensionis* are also common. Other grasses include *Triraphis ramosissima*, *Antheophora pubescens* and *Cenchrus ciliaris*.

Codon royenii dominates the herb layer, but *Chascanum garipense* and *Forsskaolea candida* are also common. Other herbs include *Osteospermum microcarpum*, *Senecio sisymbriifolius*, *Aizoon canariense*, *Oxalis haedulipes* and *Tetraena simplex*. The bulb *Nerine laticoma* are also common, while the fern *Cheilanthes deltoidea* and the moss *Riccia okahandjana* are abundant in shaded areas.



Figure 11. The open shrubland on the hills is defined by a sparse low shrub layer intermixed with grasses and grows on shallow soil among the rocks.

ii) *Stipagrostis* grassland on gravelly plains

This community covers the plains that have not yet been transformed by agriculture (Figure 10). Here, the vegetation is defined by grassland growing on shallow sand and gravelly soil, which constitute 10 – 20 % of the ground cover (Figure 12). *Stipagrostis uniplumis* dominate the grass layer, but *S. ciliata* and *S. obtusa* are also abundant. *Enneapogon cenchroides* is also found here.

The grass layer is intermixed with low shrubs, herbs, and succulents. Here, *Aizoon schellenbergii*, *Aptosimum spinescens*, *Geigeria ornativa*, *Justicia australis*, *Blepharis mitrata*, *Barleria lichtensteiniana*, *Hermannia stricta*, *Tetraena microcarpa*, *T. rigida*, *Kyphocarpa angustifolia*, *Dicoma capensis* and *Salsola* sp. are common. Other species include *Rhigozum trichotomum*, *Justicia spartioides*, *Leucosphaera bainesii*, *Lotononis rabenaviana*, *Tephrosia dregeana*, *Gorteria corymbosa*, *Aizoon burchellii*, *Chascanum garipense*, *Ruschia intricata*, *Jamesbrittenia megadenia*, *Oxalis extensa*, *Acanthopsis hoffmannseggiana*, *Peliostomum leucorrhizum*, *Aloe claviflora* and *Euphorbia braunsii*. *Monsonia crassicaulis*, *M. umbellata* and *Anacampseros albissima* are important elements on shallow gravel patches.

Tall shrubs and trees are sparsely distributed and include *Parkinsonia africana*, *Senegalia mellifera*, *Vachellia erioloba* and *Lycium bosciifolium*.



Figure 12. The *Stipagrostis* grassland on the plains grow on shallow sand and gravelly soil.

iii) *Senegalia mellifera* dominated drainage lines

This community lines the natural drainage lines on the property (Figure 10). The vegetation is dominated by *Senegalia mellifera* growing along the banks of the bare, alluvium channels (Figure 13). Other shrubs include *Boscia foetida*, *Asparagus pearsoni*, *Lycium bosciifolium*, *Phaeoptilum spinosum*, *Rhigozum trichotomum*, *Indigofera heterotricha*, *Justicia spartioides* and *Ptychobium biflorum*. Common grasses include *Stipagrostis uniplumis*, *S. hochstetteriana* and *S. namaquensis*. The herb *Kyphocarpa angustifolia* and bulb *Nerine laticoma* are also found here. In contrast, the hydrological regime of the drainage line in the far west, near the entrance gate, have been altered and here dense stands of *Phragmites australis* has infested the channels (Figure 13).



Figure 13. The natural drainage lines are lined with *Senegalia mellifera* dominated shrubland (top), but the altered drainage line in the west is infested by *Phragmites australis* (bottom).

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, which are protected under the National Environmental: Biodiversity Act (Act No. 10 of 2004) (NEMBA), 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 from the region are classified as least concern; a category which includes widespread and abundant taxa (Appendix 1). However, three species are listed, albeit data deficient (Table 4). *Acanthopsis hoffmannseggiana* (**Data Deficient - Taxonomically Problematic**), is a widespread and variable species that possibly contains several taxa, some of which may be of conservation concern. More study is needed to find reliable distinguishing characters to separate individual taxa. *Salsola tuberculata* (**Data Deficient - Taxonomically Problematic**) is part of a complex genus of which species are poorly defined and difficult to separate. The entire *Salsola* needs taxonomic revision. Based on currently available data, the risk of extinction of this species cannot be assessed. *Oxalis extensa* (**Data Deficient - Insufficient Information**) was last officially collected in 1936 and not enough is known about the distribution, specific habitat, or population status of this species to determine its status. All three of these species were recorded in the grassland community on site.

Species from the study area protected in terms of the NFA include *Boscia albitrunca* and *Vachellia erioloba* (Figure 14). Only one large adult tree of *V. erioloba* occurs in the grassland, but *B. albitrunca* is widespread and abundant on the hills. Here, they occur at densities of 3 – 4 individuals per hectare, mainly as stunted adult shrubs (50 - 80 cm (h) x 2 - 3 m (d)) or trees (1.5 - 2 m (h) x 3 - 4 m (d)).

Table 4. Plant species of conservation concern recorded from the study region. Those species recorded on site are highlighted in red.

FAMILY	Scientific name	Status	NFA	NCNCA
ACANTHACEAE	<i>Acanthopsis hoffmannseggiana</i>	DDT		
AIZOACEAE	<i>Mesembryanthemum coriarium</i>			S2
	<i>Mesembryanthemum guerichianum</i>			S2
	<i>Mesembryanthemum tetragonum</i>			S2
	<i>Ruschia barnardii</i>			S2
	<i>Ruschia intricata</i>			S2
AMARANTHACEAE	<i>Salsola tuberculata</i>	DDT		
AMARYLLIDACEAE	<i>Nerine gaberonensis</i>			S2
	<i>Nerine laticoma</i>			S2
ANACAMPSEROTACEAE	<i>Anacampseros albissima</i>			S2
	<i>Anacampseros baeseckeii</i>			S2
ANACARDIACEAE	<i>Ozoroa dispar</i>			S1
	<i>Ozoroa namaensis</i>			S1
APOCYNACEAE	<i>Cryptolepis decidua</i>			S2
	<i>Cynanchum viminale</i> subsp. <i>viminale</i>			S2
	<i>Microlooma incanum</i>			S2
ASPHODELACEAE	<i>Aloe claviflora</i>			S2
	<i>Aloe gariepensis</i>			S2
BURSERACEAE	<i>Commiphora gracilifrondosa</i>			S2
CAPPARACEAE	<i>Boscia albitrunca</i>		X	S2
	<i>Boscia foetida</i> subsp. <i>foetida</i>			S2
CELASTRACEAE	<i>Gymnosporia linearis</i> subsp. <i>lanceolata</i>			S2
COMBRETACEAE	<i>Combretum erythrophyllum</i>			S2
CRASSULACEAE	<i>Crassula sericea</i>			S2
EBENACEAE	<i>Euclea pseudebenus</i>		X	
EUPHORBIACEAE	<i>Euphorbia braunsii</i>			S2
	<i>Euphorbia gariepina</i> subsp. <i>gariepina</i>			S2
	<i>Euphorbia gregaria</i>			S2
	<i>Euphorbia rhombifolia</i>			S2
	<i>Euphorbia spartaria</i>			S2
	<i>Euphorbia spinea</i>			S2
FABACEAE	<i>Vachellia erioloba</i>		X	
HYACINTHACEAE	<i>Ornithogalum deltoideum</i>			S2
IRIDACEAE	<i>Lapeirousia plicata</i> subsp. <i>foliosa</i>			S2
	<i>Romulea obscura</i> var. <i>subtestacea</i>			S2
MELIACEAE	<i>Nymania capensis</i>			S2
OLEACEAE	<i>Olea europaea</i> subsp. <i>africana</i>			S2
OXALIDACEAE	<i>Oxalis extensa</i>	DDD		S2
	<i>Oxalis haedulipes</i>			S2
SCROPHULARIACEAE	<i>Diascia engleri</i>			S2
	<i>Jamesbrittenia aridicola</i>			S2
	<i>Jamesbrittenia canescens</i>			S2
	<i>Jamesbrittenia megadenia</i>			S2
	<i>Jamesbrittenia ramosissima</i>			S2
	<i>Manulea gariepina</i>			S2
	<i>Manulea schaeferi</i>			S2

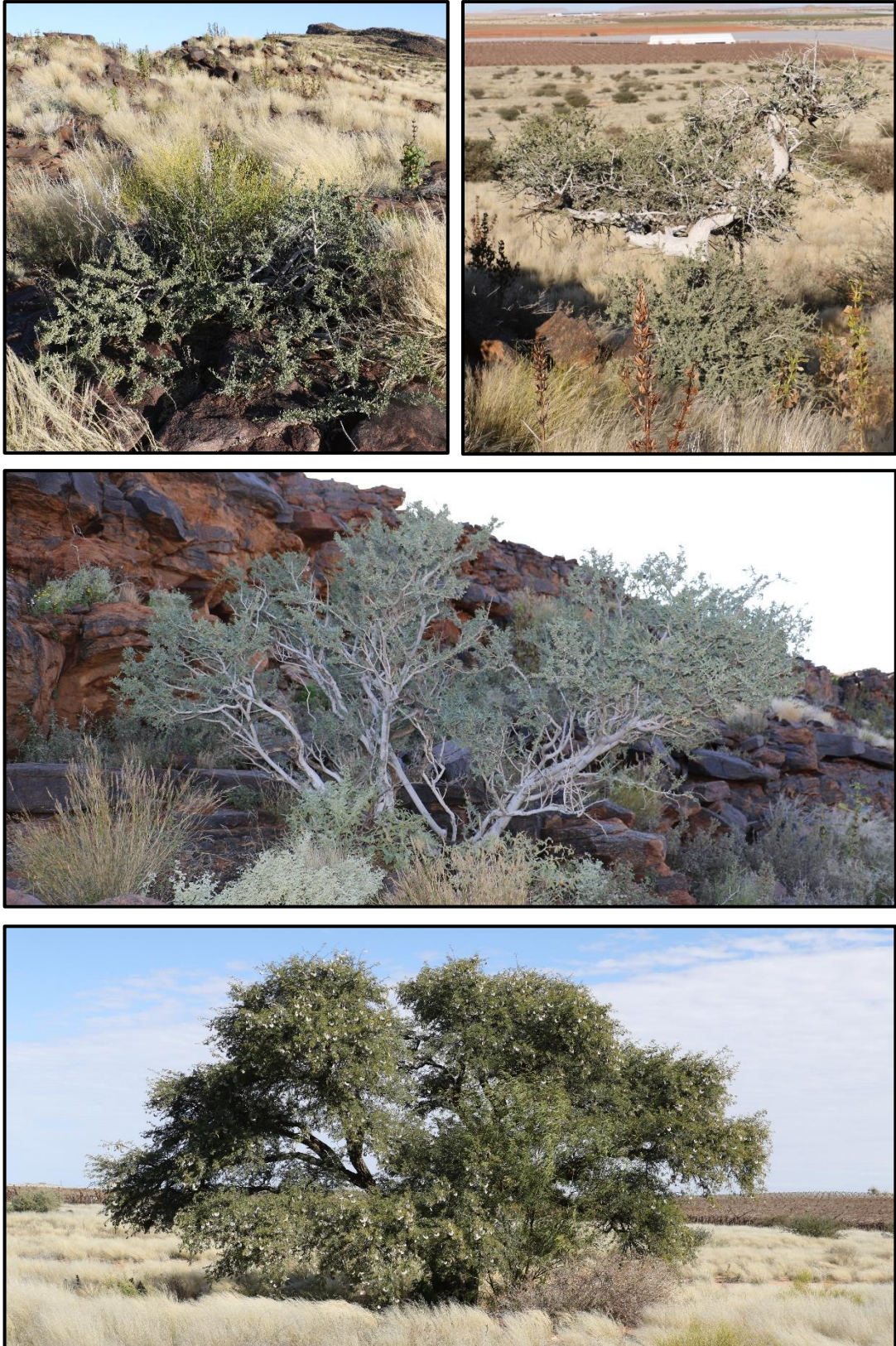


Figure 14. Species protected in terms of the NFA include *Boscia albitrunca* (top and centre) and *Vachellia erioloba* (bottom).

In addition to these, specially protected species (Schedule 1) and protected species (Schedule 2) of the NCNCA known from the study region are also indicated in Table 4. Of these, *Ruschia intricata*, *Anacampseros albissima*, *Aloe claviflora*, *Euphorbia braunsii* and *Jamesbrittenia megadenia* were recorded in the grassland. *Cryptolepis decidua* and *Oxalis haedulipes* were restricted to the hills, while *Nerine laticoma* and *Boscia foetida* subsp. *foetida* occurred on the hills and in the drainage lines. A photo guide to all species of conservation concern recorded in the study area is provided in Appendix 3. Furthermore, 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, 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 species do not naturally occur in an area and exhibit tendencies to invade areas at the cost of 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 on site are listed in Table 6, along with their categories according to the Acts.

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

NEMBA		CARA	
1a	Listed invasive species that must be combatted or eradicated.	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.
1b	Listed invasive species that must be controlled.	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.
2	Listed invasive species that require a permit to carry out a restricted activity within an area.	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.
3	Listed invasive species that are subject to exemptions and prohibitions		

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

Scientific name	Common name	CARA	NEMBA	NCNCA
<i>Atriplex lindleyi</i>	Sponge - fruit saltbush	3	1b	S6
<i>Azolla filiculoides</i>	Red water fern	1	1b	S6
<i>Nicotiana glauca</i>	Wild tobacco	1	1b	S6
<i>Prosopis glandulosa</i>	Honey mesquite	2	3	S6
<i>Prosopis velutina</i>	Velvet mesquite	2	3	S6
<i>Salsola kali</i>	Tumbleweed	-	1b	-

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 recorded on site are listed in Table 7.

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

Scientific name	Common name
<i>Rhigozum trichotomum</i>	Three – thorn rhigozum
<i>Senegalia mellifera</i> subsp. <i>detinens</i>	Black thorn
<i>Vachellia karroo</i>	Sweet thorn
<i>Grewia flava</i>	Velvet raisin

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 (Schedule 2) or specially protected (Schedule 1) wild 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. According to the act “wild animal” means live vertebrate or invertebrate animal, and the egg or spawn of such animal. Species likely to be found on site are discussed in their respective faunal groups.

3.5.1. Mammals

As many as 56 terrestrial mammals and ten bat species have been recorded in the region (Appendix 2), of which seven are listed either in the IUCN or the Mammal Red List of South Africa, Lesotho and Swaziland (Table 8). Virtually all mammals of the study area are protected; either according to Schedule 1, 2 or 3 of NCNCA (Appendix 2). Those that are specially protected are also indicated in Table 8. Cape Fox, Bat-eared Fox, Honey Badger, Striped Polecat, Aardwolf and African Wild Cat have a high probability to occur across the site based on their wide habitat tolerance and affinity for open and arid grassland habitats. Aardvark could potentially occur in the deeper sandy habitats, but there is not ample ideal habitat available for them on site. African Straw-coloured Fruit-bat is not expected to occur on site based on the absence of suitable trees on which they feed. Temminck's Pangolin, Black-footed Cat, Leopard and Giraffe are also not expected to occur on site. The small size of the property that is fenced in, and the agricultural activities occurring on site are expected to deter these species. No suitable habitat for Littledale's Whistling Rat is found on site and the African Clawless Otter is expected to be restricted to the aquatic habitat of the Orange River, north of the study area. Yellow Mongoose and South African Ground Squirrel were encountered frequently during the site visit. Rock Hyrax and their middens were abundant on the hills. Problem animals (Schedule 4) with a high likelihood to occur on site include Black-backed Jackal, Caracal and Vervet Monkey.

Table 8. Mammals of conservation concern known from the region. Conservation values are indicated in terms of the international (IUCN) Red List, the Mammal Red List of South Africa, Lesotho and Swaziland (SAMRL) and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	IUCN	SAMRL	NCNCA
<i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT		
<i>Smutsia temminckii</i>	Temminck's Pangolin	VU	VU	X
<i>Parotomys littledalei</i>	Littledale's Whistling Rat		NT	
<i>Vulpes chama</i>	Cape Fox			X
<i>Otocyon megalotis</i>	Bat-eared Fox			X
<i>Mellivora capensis</i>	Honey Badger			X
<i>Ictonyx striatus</i>	Striped Polecat			X
<i>Aonyx capensis</i>	African Clawless Otter	NT	NT	
<i>Proteles cristata</i>	Aardwolf			X
<i>Felis nigripes</i>	Black-footed Cat	VU	VU	X
<i>Felis silvestris</i>	African Wild Cat			X
<i>Panthera pardus</i>	Leopard	VU	VU	X
<i>Orycteropus afer</i>	Aardvark			X
<i>Giraffa camelopardalis</i>	Giraffe	VU		

3.5.2. Reptiles

The Renosterkop mining area lies within the distribution range of at least 60 reptile species (see Appendix 2). No red listed species occur in the area, but most of the reptiles of the study area are protected either according to Schedule 1 or 2 of NCNCA (see Appendix 2). Specially protected species include *Chamaeleo dilepis* (Common Flap-necked Chameleon) and *Karusasaurus polyzonus* (Southern Karusa Lizard).

The Common Flap-necked Chameleon occurs in a variety of habitats and is usually found high up in bushes and trees. It therefore is expected to occur on site. The Southern Karusa Lizard is a rock-dwelling species and is expected to be restricted to the hills. Images of these reptile species of conservation concern are shown in Figure 15.



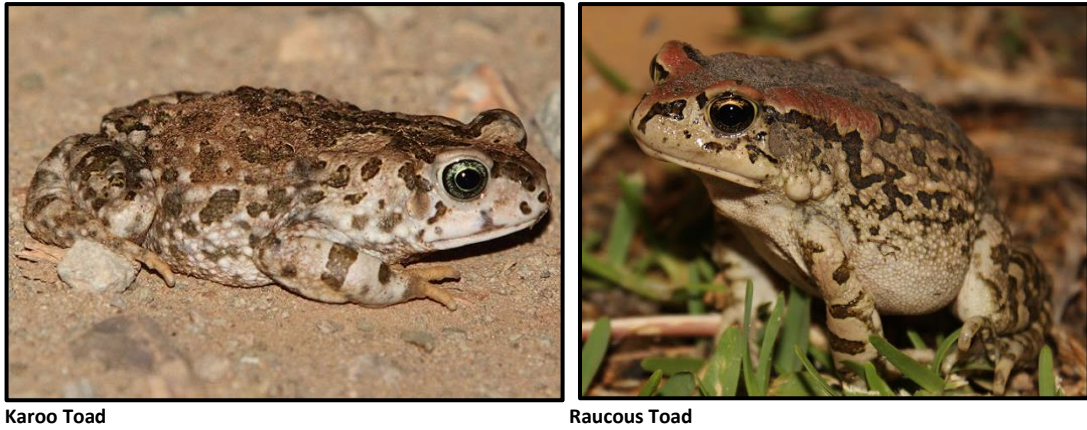
Common Flap-necked Chameleon

Southern Karusa Lizard

Figure 15. Reptile species of conservation concern that are known from the area, as well as the Spotted Desert Lizard which was abundant and very active during the field survey.

3.5.3. Amphibians

Seven amphibian species are known from the region (Appendix 2). None of these species are red listed, but two are regional endemics. *Vandijkophrynus garipeensis* (Karoo Toad) and *Amietophrynus rangeri* (Raucous Toad) are regional endemics (Figure 16). All the frog species from the study region are protected according to Schedule 2 of the NCNCA. Most of them are well adapted to arid habitats, but still rely on temporary waterbodies for breeding. The Angolan River Frog however is dependent on permanent streams and is not expected to occur on site. The Marbled Rubber Frog is restricted to inselbergs and rocky areas and is expected to be restricted to the hills on site.



Karoo Toad

Raucous Toad

Figure 16. Amphibian species of conservation concern that are known from the area.

3.5.4. Avifauna

Renosterkop does not fall within any of the Important Bird Areas (IBA) defined by Birdlife South Africa, but it lies near (8km) the Augrabies Falls National Park IBA (Figure 17). This IBA is a formally protected national park, established in 1966. It is an important tourist attraction, drawing up to 89 000 visitors a year. Despite having a low species diversity, this IBA is important for many biome-restricted assemblage birds and a host of other arid-zone species. Globally threatened species found here include Martial Eagle, Kori Bustard and Ludwig's Bustard. Regionally threatened species are Karoo Korhaan, Lanner Falcon and breeding Verreaux's' Eagle. The IBA is well managed, with far fewer threats than the surrounding landscape. Overgrazing of the surrounding farmland is, however, a threat. It results in degradation of habitat outside the park, potentially reducing populations of wide-ranging species such as bustards, which depend on large foraging areas that fall mostly outside the IBA's borders. Invasive alien plants are a continuing threat, especially in the riparian vegetation zone.

A total number of 221 bird species have been recorded from the study area, of which 19 are listed either according to the IUCN or the SA Red Data Book of Birds (Table 9). Furthermore, all birds are protected either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Specially protected species (Schedule 1) are also listed in Table 9.

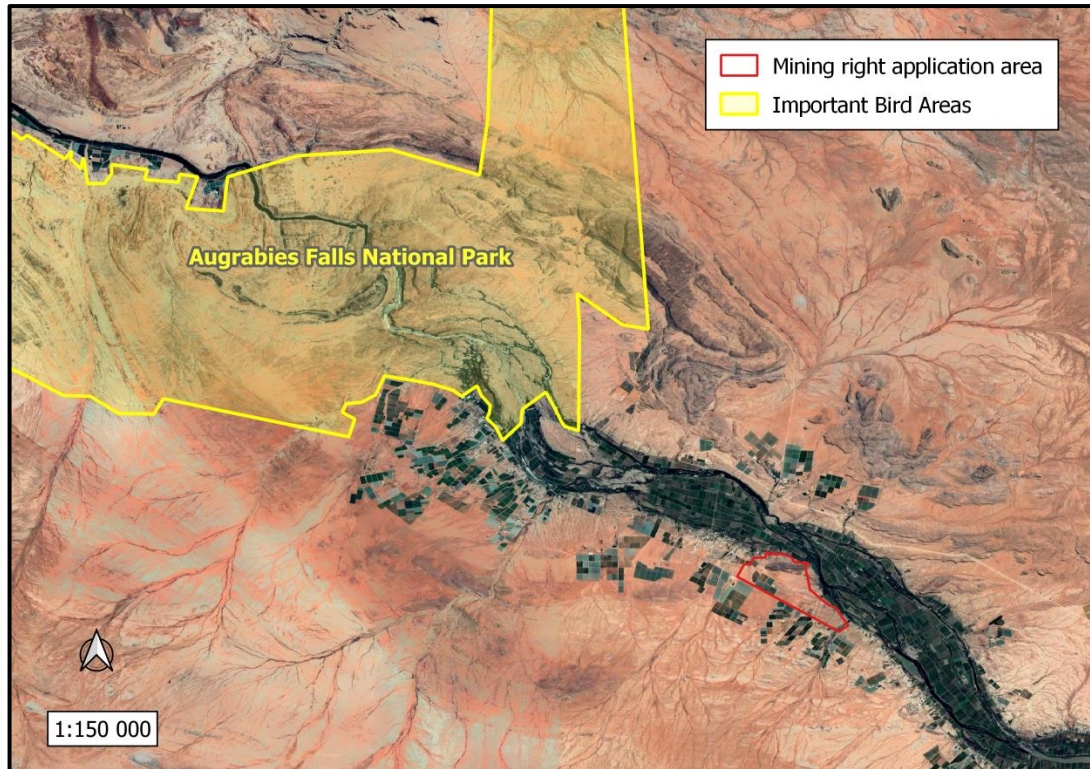


Figure 17. Important Bird Areas in the vicinity of the study area.

The hills, drainage lines and grassland provide ample micro-habitats to several bird species on Renosterkop. No bird species of conservation concern were encountered on site, but those expected to occur in the hills, earmarked for mining, include Verreaux's Eagle, Jackal Buzzard, Lanner Falcon, Rock Kestrel. Images of these bird species of conservation concern are shown in Figure 18. The grassland habitat is expected to host Sclater's Lark, Kori Bustard, Ludwig's Bustard, Martial Eagle, Burchell's Courser and Secretarybird, as well as many of the remaining owls and raptors of conservation concern. None of the bird species dependent on water (Curlew Sandpiper, African Fish-Eagle, Chestnut-banded Plover, Black Stork, Marabou Stork, Lesser Flamingo, Greater Flamingo) are expected to occur on site.

Table 9. Bird of conservation concern that are likely to occur on site. Species are indicated in terms of the IUCN, SA Bird Atlas and Schedule 1 of the Northern Cape Nature Conservation Act (NCNCA).

Scientific name	Common name	IUCN status	SA RDB	NCNCA
<i>Aquila verreauxii</i>	Verreaux's Eagle		VU	X
<i>Ardeotis kori</i>	Kori Bustard	NT	NT	X
<i>Bubo africanus</i>	Spotted Eagle-Owl			X
<i>Bubo lacteus</i>	Verreaux's Eagle-Owl			X
<i>Buteo rufofuscus</i>	Jackal Buzzard			X
<i>Buteo vulpinus</i>	Steppe Buzzard			X
<i>Calidris ferruginea</i>	Curlew Sandpiper	NT		
<i>Caprimulgus europaeus</i>	European Nightjar			X
<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar			X
<i>Caprimulgus tristigma</i>	Freckled Nightjar			X
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT	X
<i>Ciconia nigra</i>	Black Stork		VU	X
<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle			X
<i>Circus maurus</i>	Black Harrier	EN		X
<i>Cursorius rufus</i>	Burchell's Courser		VU	
<i>Elanus caeruleus</i>	Black-shouldered Kite			X
<i>Eupodotis vigorsii</i>	Karoo Korhaan		NT	
<i>Falco biarmicus</i>	Lanner Falcon		VU	X
<i>Falco chicquera</i>	Red-necked Falcon	NT		X
<i>Falco naumanni</i>	Lesser Kestrel			X
<i>Falco peregrinus</i>	Peregrine Falcon			X
<i>Falco rupicolis</i>	Rock Kestrel			X
<i>Falco rupicoloides</i>	Greater Kestrel			X
<i>Haliaeetus vocifer</i>	African Fish-Eagle			X
<i>Leptoptilos crumeniferus</i>	Marabou Stork		NT	X
<i>Macrodipteryx vexillarius</i>	Pennant-winged Nightjar			X
<i>Melierax canorus</i>	Southern Pale Chanting Goshawk			X
<i>Melierax gabar</i>	Gabar Goshawk			X
<i>Milvus migrans</i>	Black Kite			X
<i>Neophron percnopterus</i>	Egyptian Vulture	EN		
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN	X
<i>Oxyura maccoa</i>	Maccoa Duck	VU	NT	
<i>Phoenicopterus minor</i>	Lesser Flamingo	NT	NT	X
<i>Phoenicopterus ruber</i>	Greater Flamingo		NT	X
<i>Polemaetus bellicosus</i>	Martial Eagle	EN	EN	X
<i>Polihierax semitorquatus</i>	Pygmy Falcon			X
<i>Ptilopus granti</i>	Southern White-faced Scops-Owl			X
<i>Sagittarius serpentarius</i>	Secretarybird	EN	VU	X
<i>Spizocorys sclateri</i>	Sclater's Lark	NT	NT	X
<i>Tyto alba</i>	Barn Owl			X



Verreux's Eagle



Jackal Buzzard



Lanner Falcon



Rock Kestrel

Figure 18. Bird species of conservation concern that are expected to occur in the study area (top). The Greater Kestrel is breeding along the Eskom Powerlines (bottom).

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. No fish species are expected to be found in the drainage lines on site.

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 study. Invertebrates have also not been surveyed as comprehensively as plants, mammals and birds 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.

Eight invertebrate species of the Northern Cape appear on the IUCN Red Data list of threatened species and are listed in Table 10. None of these species' distribution ranges overlap with that of the study area. 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, the baboon spider *Harpactira* sp. has been recorded near the study area (Figure 19).

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 Gossamer-winged Butterflies and Brush-footed Butterflies have been recorded in the region, as well as the Burrowing Scorpions, *Opisthophthalmus wahlbergii* and *Opisthophthalmus carinatus*. The Brush-footed Butterflies, *Vanessa cardui* (Painted lady) and *Junonia hierta* (Yellow pansy) were also recorded on site during the field visit (Figure 19).

One major habitat delimits possible invertebrate communities in the study area, i.e., vegetation classified as Karoo (Picker et al. 2004). This habitat represents unique species assemblages, with an above-average representation of beetles, grasshoppers, flies, wasps, and lacewings. The protected butterflies, baboon spiders and scorpions discussed above are all associated with this habitat, which includes the hills and grassland on site. Furthermore, the desert snail, *Dorcasia* sp. and Short-horned Grasshoppers (Acrididae sp.) were especially abundant on the hills, while Karoo Balbyter Ants (*Camponotus fulvopilosus*) were common in the grassland. The false crab spiders *Thanatus* sp. was also observed (Figure 19).

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	
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	
		LEPIDOPTERA	<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>Alfredectes browni</i>		Brown's Shieldback	DD		
<i>Brinckiella serricauda</i>		Serrated Winter Katydid	DD		
<i>Brinckiella arboricola</i>		Tree Winter Katydid	EN		
<i>Brinckiella aptera</i>		Mute Winter Katydid	VU		
<i>Brinckiella karoensis</i>		Karoo Winter Katydid	VU		
<i>Brinckiella mauerbergerorum</i>	Mauerberger's Winter Katydid	VU			
ONYCHOPHORA		All Velvet worms	S1		



Harpactira sp. (S1)



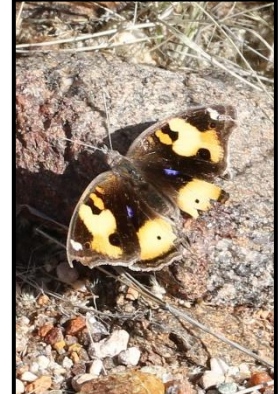
Opisthophthalmus wahlbergii (S2)



Opisthophthalmus carinatus (S2)



Vanessa cardui (S2)



Junonia hierta (S2)



Short-horned Grasshopper



Thanatus sp.



Dorcasia sp.



Karoo Balbyter Ants

Figure 19. Species of conservation concern from the study area, as well as common species encountered on site.

3.6. Critical biodiversity areas and broad-scale processes

The proposed mining site falls within critical biodiversity areas (Figure 20), 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. The entire site is classified as *Critical Biodiversity Area Two*. The Orange River, that borders the study area to the north, is classified as *Critical Biodiversity Area One*, while the Augrabies National Park (*Protected Area*) lies 8km north-west of the study area (Figure 20).

Similarly, the Mining and Biodiversity Guidelines (DENC et al. 2013) recognises the site to be of *High- and Moderate Biodiversity Importance* (Figure 21), which constitute a high and moderate risk for mining. 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.

Furthermore, according to the National Web based Environmental Screening Tool the study area is considered to have sensitive environmental features (Figure 22). 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 Renosterkop study area is of very high sensitivity in terms of the animal species theme, which is based on the suitable habitat and known distribution of the birds *Falco biarmicus* (Lanner falcon) and *Neotis ludwigii* (Ludwig's bustard). The Terrestrial Biodiversity Theme is also of very high sensitivity, as a direct function of the Northern Cape Critical Biodiversity Areas Map (discussed above). Renosterkop is of medium sensitivity based on the Plant Species Theme. This sensitivity is attributed to the red listed *Aloidendron dichotomum*, (Vulnerable) that is known from the region. It however does not occur on site. The site is of low sensitivity based on the Aquatic Biodiversity Theme.

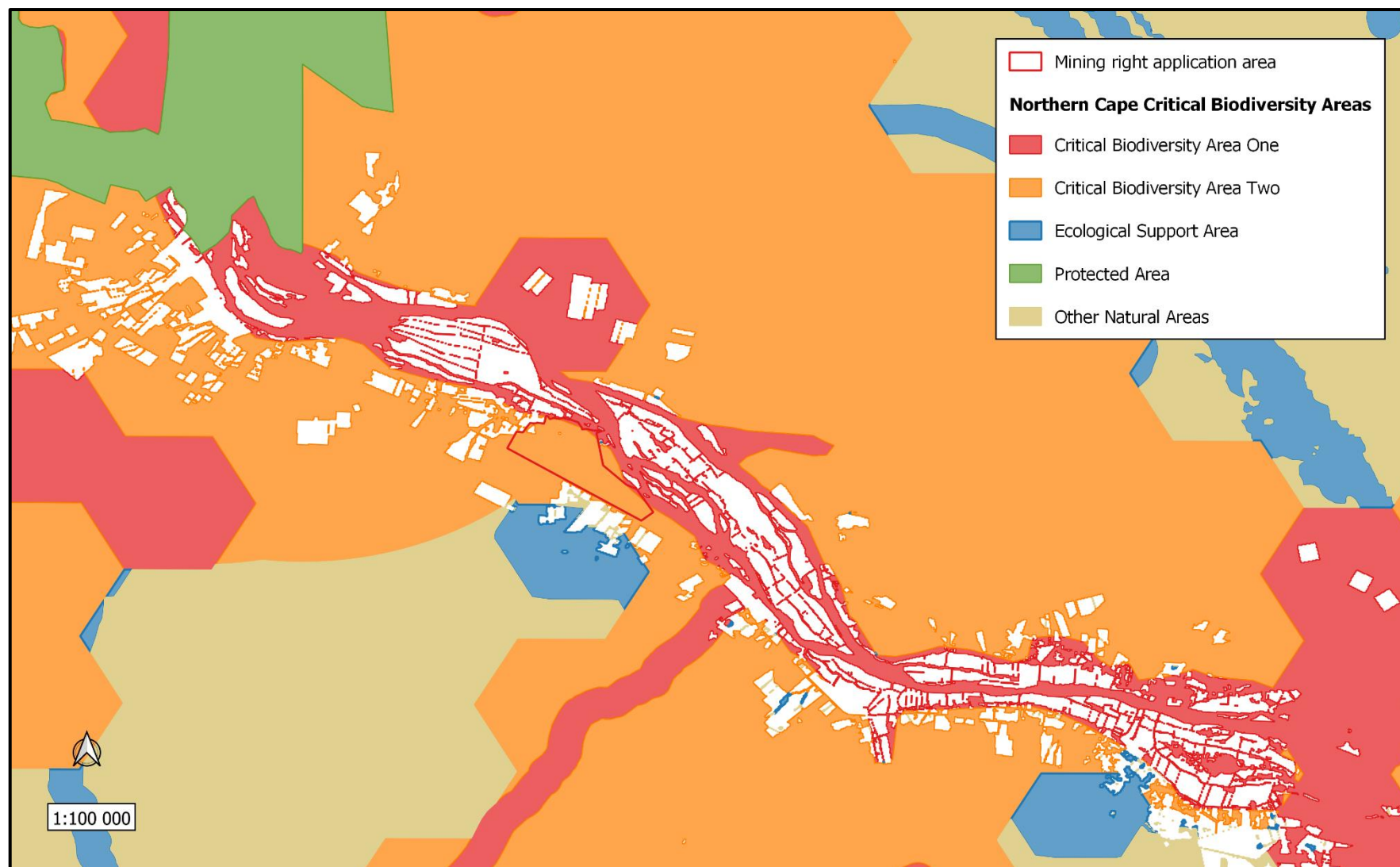


Figure 20. The study area in relation to the Northern Cape Critical Biodiversity Areas.

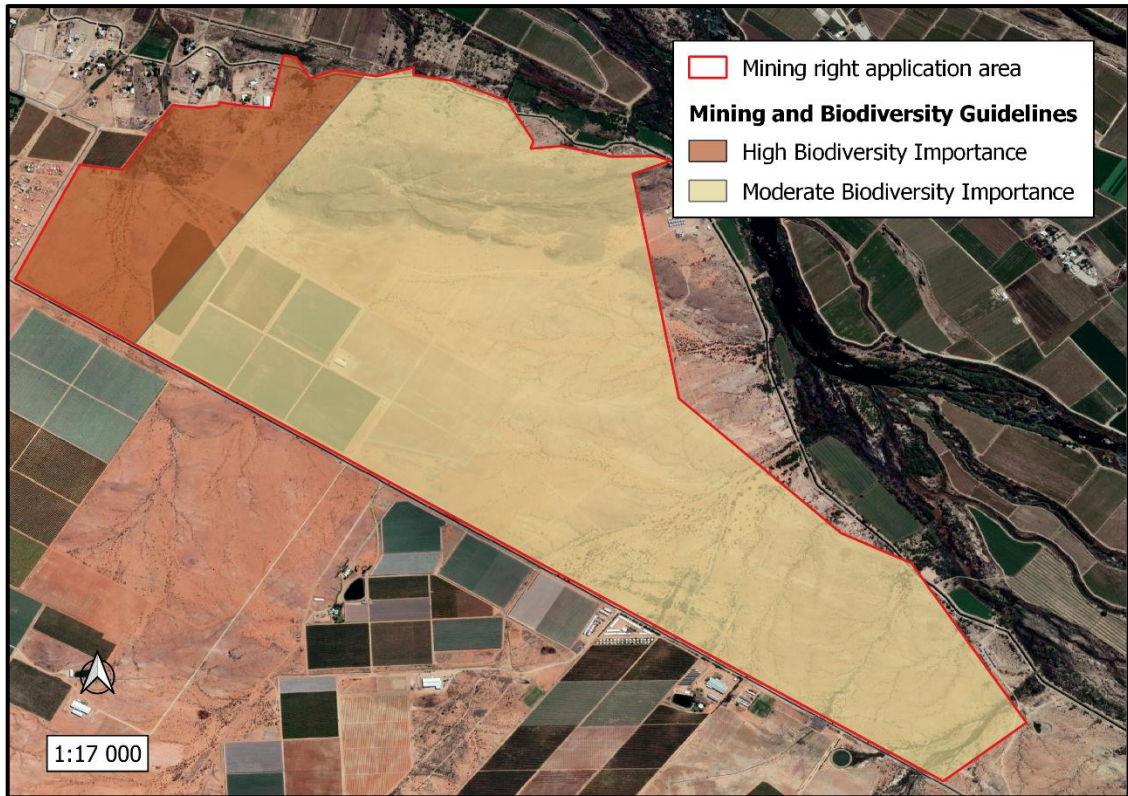


Figure 21. The study area in relation to the Mining and Biodiversity Guidelines.

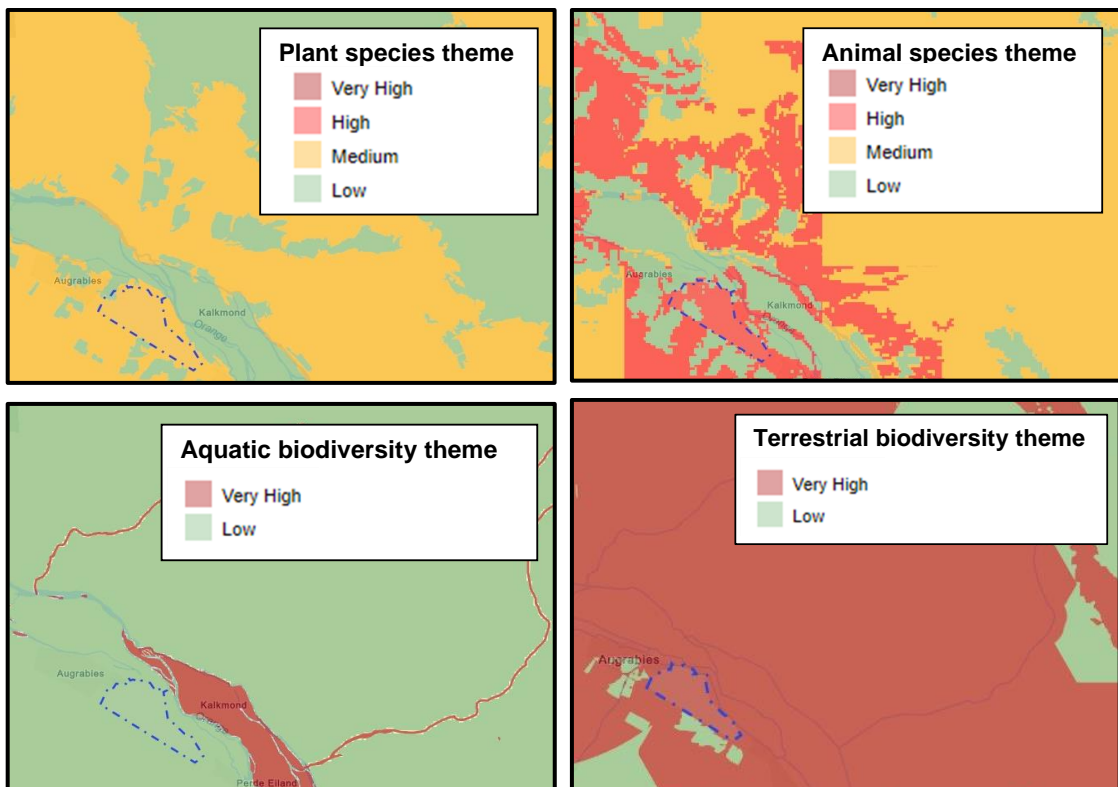


Figure 22. Environmental sensitivities in the study area, according to the National Web based Environmental Screening Tool.

According to the Siyanda Environmental Management Framework Report (SEMF) the study area does not fall within one of the proposed conservation areas for the District Municipality. The SEMF further classified the study area to have an overall Environmental Sensitivity of 1 (Low). Therefore, it has been assigned to Environmental Control Zone 7. This zone has relatively less sensitivity than the other zones and no special parameters, except those already implemented or required by law, are proposed for this zone.

Finally, even though mining is not considered one of the major sectors within the study region, agriculture has transformed extensive areas along the Orange River (Figure 23). These factors increase the proposed operation's cumulative impacts in terms of habitat transformation.

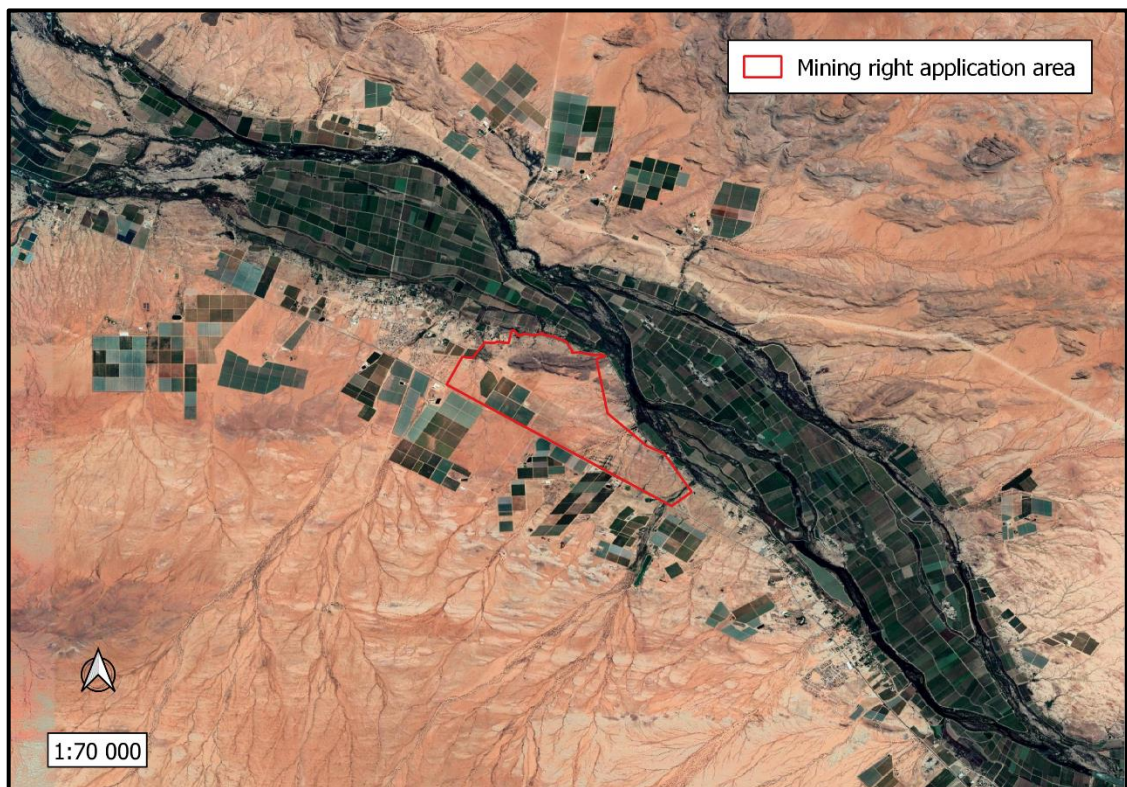


Figure 23. The extent of habitat transformation near the study area.

3.7. Site sensitivity

The ecological sensitivity map for Renosterkop is illustrated in Figure 24. The drainage lines are all considered to be of **very high** sensitivity. They are highly sensitive due to their vital hydrological functionality and all watercourses are unique habitats protected in terms of the National Water Act (Act No 36 of 1998). These areas should be considered as **no-go areas**.

The hills and grassland habitat harbour several plant species of conservation concern and provide potential habitat for protected bird-, reptile- and invertebrate species, as highlighted in this report. These habitats are of **high** sensitivity. These areas are not regarded as no-go areas, but activities should proceed with caution as it may not be possible to mitigate all impacts appropriately.

Those areas disturbed by existing land use activities are of **medium** sensitivity. Activities within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken. The transformed areas are of **low** sensitivity. Here, the habitat has already been severely transformed and the proposed mining activities would not have any impact on ecological processes and biodiversity in these areas.

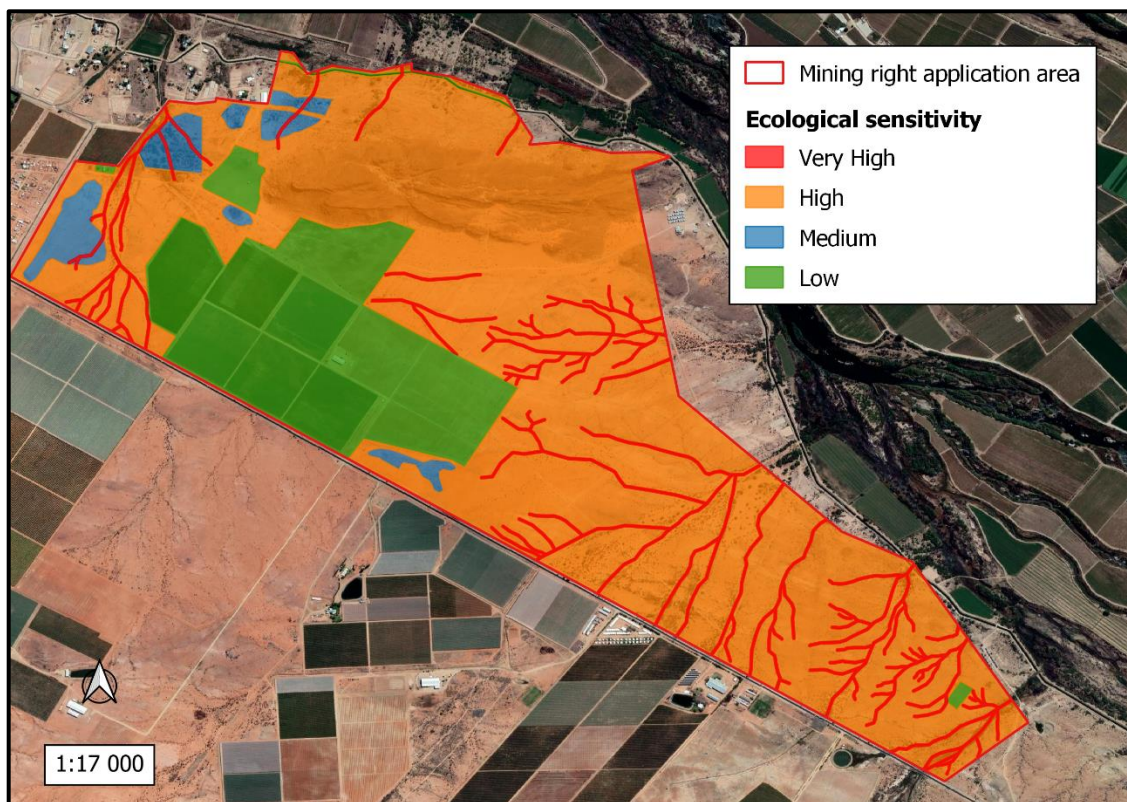


Figure 24. A sensitivity map for the Renosterkop mining area.

4. ECOLOGICAL IMPACT ASSESSMENT

In this section, the potential impacts and associated risk factors that may be generated by the Renosterkop mining 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.

4.1. Topography, soil erosion and associated degradation of landscapes

4.1.1. Alteration of soil character and quality

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, oil and petrochemical spills.

Description of the impact

Topsoil contains living organisms and seed banks that provide ecological resilience against disturbances, and any disturbances to the intact soil profile will change its ability to sustain natural ecological functioning. Vehicles and mining equipment may potentially leak hazardous fluids on the soil surface, which will cause soil pollution. Apart from the direct disturbances caused by the mining activities, soil compaction by dump loads as well as heavy machinery and vehicles will cause a decrease in large pores, and subsequently the water infiltration rate into soil.

Mitigation and monitoring

- Topsoil needs to be removed and stored separately during mining and the construction of roads, infrastructure, and stockpile areas.
- These 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 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 by no means be mixed with sub-soils.
- The topsoil should be replaced as soon as possible on to the disturbed 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 Renosterkop mining operation.

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Soil	Alteration of soil character and quality	✓	✓	✓	On-site (1)	Residual (4)	High (3)	Certain for life of operation (10)	Medium - High (80)	Low-Medium
	Loss of topsoil and soil fertility	✓	✓	✓	On-site (1)	Residual (4)	High (3)	Certain for life of operation (10)	Medium - High (80)	Low-Medium
	Increase in soil erosion	✓	✓		Local (2)	Decommissioning (3)	Medium (2)	Possible, frequently (8)	Low - Medium (56)	Low
Flora	Loss of indigenous vegetation	✓	✓		On-site (1)	Residual (4)	Medium (2)	Certain for life of operation (10)	Low - Medium (70)	Low-Medium
	Loss of Red data and/or protected floral species	✓	✓		On-site (1)	Residual (4)	Major (4)	Certain for life of operation (10)	Medium - High (90)	Low-Medium
	Introduction or spread of alien species	✓	✓	✓	Local (2)	Residual (4)	Medium (2)	Possible, infrequent (7)	Low-Medium (56)	Very low
	Bush encroachment	✓	✓	✓	On-site (1)	Residual (4)	Minimal (1)	Possible, infrequent (7)	Low (42)	Very low
Fauna	Habitat fragmentation	✓	✓		Regional (3)	Residual (4)	High (3)	Certain for life of operation (10)	Medium - High (100)	Low-Medium
	Disturbance, displacement and killing of fauna	✓	✓	✓	Local (2)	Decommissioning (2)	High (3)	Certain, for life of operation (70)	Low-Medium (70)	Low

Table 11 (cont.). A detailed analysis of ecological impacts identified for the Renosterkop mining operation.

	IMPACT	Phase			Extent	Duration	Severity	Probability	Significance	Significance after Mitigation
		C	O	D						
Water	Alteration/destruction of watercourses	✓	✓		Regional (3)	Permanent (5)	High (3)	Possible, life of operation (9)	Medium - High (99)	Low-Medium
	Siltation of surface water	✓	✓	✓	Regional (3)	Decommissioning (3)	Medium (2)	Possible, infrequent (7)	Low-Medium (56)	Low
Cumulative	Compromise of broadscale ecological processes	✓	✓		Regional (3)	Residual (4)	High (3)	Certain for life of operation (10)	Medium - High (100)	Low-Medium

- For restoration of the affected areas without topsoil, soils can be sourced from other sustainable areas and chemically changed to match with the surrounding environment.
- To restore areas where compacted soil occurs, a ripper blade or deep plow can be pulled across the affected area to alleviate compaction.
- Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings and succulent cuttings.
- Vehicles and machinery should be regularly serviced and maintained.
- Refuelling and vehicle maintenance must take place in well demarcated areas and over suitable drip trays to prevent soil pollution.
- Drip trays must be available on site and installed under all stationary vehicles.
- Spill kits to clean up accidental spills must be well-marked and available on site.
- Workers must undergo induction to ensure they are prepared for rapid clean-up procedures.
- Any soil or area that is contaminated must be cleaned immediately by removing the soil and disposing it as hazardous waste in the correct manner.

4.1.2. Loss of soil fertility

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.

Description of the impact

Topsoil contains living organisms that naturally regulate the ecological functioning of a habitat. Therefore, any disturbances to the intact soil profile can result in soil sterilisation which will directly affect vegetation communities. Apart from the direct disturbances caused by the mining activities, loss of soil fertility can also occur through soil compaction by dump loads as well as heavy machinery and vehicles.

Mitigation and monitoring

- Topsoil needs to be removed and stored separately during mining and the construction of roads, infrastructure and stockpile areas.
- These 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 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 by no means be mixed with sub-soils.
- The topsoil should be replaced as soon as possible on to the disturbed areas, thereby allowing for the re-growth of the seed bank contained within the topsoil.
- For restoration of the affected areas without topsoil, soils can be sourced from other sustainable areas and chemically changed to match with the surrounding environment.
- To restore areas where compacted soil occurs, a ripper blade or deep plow can be pulled across the affected area to alleviate compaction.
- Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings and succulent cuttings.

4.1.3. Soil erosion

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, natural events.

Description of the impact

Vegetation will be stripped for construction of new roads, infrastructure, and excavations. As a result, these areas will be bare, and susceptible to wind and water erosion. Furthermore, any topsoil-, overburden- and ore stockpiles can be eroded by wind, rain, and flooding. Exposed sediments in the watercourses can be carried away during runoff causing downstream sediment deposition. Any leaking pipes can also cause additional water erosion.

Mitigation and monitoring

- Bare ground exposure should always be minimised in terms of the surface area and duration.
- Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in the area have ceased.
- No new roads, infrastructure or mining areas should be developed over the drainage lines.
- Disturbances during the rainy season should be monitored and controlled.
- Any potential run-off from exposed ground should be controlled with flow retarding barriers.
- Regular monitoring during the mining operation should be carried out to identify areas where erosion is occurring; followed by appropriate remedial actions.

4.2. Vegetation and floristics

4.2.1. Loss of indigenous vegetation

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.

Description of the impact

The Renosterkop mining activities are expected to destroy a large area of the habitat on the hills. It is expected that the ecological functioning and biodiversity will take many years to fully recover. Furthermore, vehicle traffic and mining activities generate lots of dust which can reduce the growth success and seed dispersal of many small plant species in the adjacent areas.

Mitigation and monitoring

- Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible.
- Implement effective avoidance measures to limit any activities in the highly sensitive areas, by applying the no-go principles.
- Ensure measures for the adherence to a maximum speed limit of 40 km/h to minimise dust fallout and associated effects on plants in the adjacent pristine areas.
- Encourage the growth of natural plant species in all affected areas by sowing indigenous seeds or by planting seedlings.
- The setup of a small nursery is advisable to maximise translocation and re-establishment efforts of affected areas.
- Apply for permits to authorise the clearance of indigenous plants 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

Removal of listed or protected plant species during clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling. Intentional removal of listed or protected plant species for non-mine related purposes, e.g., illegal succulent trade.

Description of the impact

There are numerous plant species of conservation concern present in the Renosterkop Mining Right area, including the red listed *Acanthopsis hoffmannseggiana* (DDT), *Salsola tuberculata* (DDT), and *Oxalis extensa* (DDD), as well as several species protected under Schedule 2 of the NCNCA (*Ruschia intricata*, *Nerine laticoma*, *Anacampseros albissima*, *Cryptolepis decidua*, *Aloe claviflora*, *Boscia albitrunca*, *B. foetida* subsp. *foetida*, *Euphorbia braunsii*, *Vachellia erioloba*, *Oxalis haedulipes* and *Jamesbrittenia megadenia*. Therefore, it is likely that the mining operation could potentially have a major impact on these species if their local populations are destroyed. Furthermore, any illegal harvesting of these plants of conservation concern for trade by staff, contractors or secondary land users could have devastating effects on the population of these species.

Mitigation and monitoring

- The footprint areas of the mining activities must be scanned for Red Listed and protected plant species prior to any destructive activities by means of a search-and-rescue operation.
- 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, due to the nature of the proposed mining activities they will most likely all be removed or relocated (if possible). The relevant permits from DENC should be applied for at least three months before such activities will commence.
- The setup of a small nursery is advisable to maximise translocation and re-establishment efforts of all the rescued plants.
- 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 an environmental officer is recommended 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 as well as the legislation relating to protected species.
- Employ regulatory measures to ensure that no illegal harvesting takes place.

4.2.3. Introduction or spread of alien species

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, improper rehabilitation practises. Existing populations.

Description of the impact

Several invasive species (*Salsola kali*, *Prosopis glandulosa*, *P. velutina*, and *Nicotiana glauca*) occur within and around the study area. Anthropogenic disturbances to natural vegetation, especially the clearance of large areas of land, provide the opportunity for invasive plants to increase. This is due to their opportunistic nature of dispersal and establishing in disturbed areas. If invasive plants establish in disturbed areas, it may cause an impact beyond the boundaries of the mining site. These alien invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity as well as reduction in the ecological value and land use potential 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.

Mitigation and monitoring

- Implement best practise principles to minimise the footprint of transformation, by keeping to existing roads and earmarked areas where possible.
- Mechanical methods of control should be implemented pro-actively as soon as invasive species start to emerge.
- Regular follow-up monitoring of invasive control areas needs to be implemented to ensure effective eradication.
- Encourage proper rehabilitation of disturbed areas through soil restoration and reseedling of indigenous plant species.

4.2.4. Encouraging bush encroachment

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, improper rehabilitation practises. Existing populations.

Description of the impact

Bush encroachment is a natural phenomenon characterised by the excessive expansion of certain shrub species at the expense of other plant species. While general clearing of the area and mining activities destroy natural vegetation, bush encroaching plants can 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. *Senegalia mellifera* was especially common on site. However, the removal of these species during mining activities may potentially reduce their abundance and therefore mining could have a positive effect on bush encroachment.

Mitigation and monitoring

- Mechanical methods of control should be implemented pro-actively when encroaching species form dense stands.
- Regular follow-up monitoring of encroached control areas needs to be implemented to ensure effective eradication.
- Encourage proper rehabilitation of disturbed areas through soil restoration and reseedling of indigenous plant species.

4.3. Fauna

4.3.1. Habitat fragmentation

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling.

Description of the impact

Fragmentation of habitats typically leads to the loss of migration corridors, in turn resulting in degeneration of the affected population's genetic make-up. This can be in the form of small-scale fragmentation for reptiles, amphibians, and invertebrates, to more large-scale fragmentation that hinder dispersal of birds and plants. It also includes the destruction of burrows, tunnels, and chambers as well as the degradation of ephemeral aquatic habitats in the drainage channels. Small-scale fragmentation disconnects breeding and foraging links, increasing stress and energy budget deficits, which is especially taxing on animals living in arid environments.

Larger scale fragmentation 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. The mining activities is expected to result in the loss of connectivity and fragmentation of natural micro-habitats primarily on a local scale.

Mitigation and monitoring

- All activities associated with the mining operation must be planned, where possible to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type.
- The footprint areas of the mining activities must be scanned for any nests and dens prior to any destructive activities by means of a search-and-rescue operation.
- It is recommended that nests and dens are identified and marked prior to intended activity and should be incorporated into the design layout and left in situ. However, due to the nature of the proposed mining activities they will most likely be destroyed. The relevant permits from DENC should be applied for at least three months before such activities will commence.
- The extent of the earmarked area 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 or even visitors.
- No new roads should be created across a watercourse.
- No mining should take place in the drainage lines. If this is unavoidable, a water use license to alter the beds and banks of the watercourses should be obtained from DWS prior to such activities.
- Employ sound rehabilitation measures to restore characteristics of all affected habitats.

4.3.2. Disturbance, displacement and killing of fauna

Source of the impact

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

Description of the impact

The site provides suitable habitat for several species of conservation concern, as discussed in the various faunal taxon groups in this report. The proposed mining activities could lead to the death and displacement of some of these species.

The transformation of natural habitats will result in the loss of micro-habitats, affecting individual species and ecological processes. This will result in the displacement of faunal species that depend on such habitats, e.g., birds that nest in trees or animals residing in holes in the ground, among rocks or underneath plants. Increased noise and vibration will disturb and possibly displace wildlife. Fast moving vehicles cause road kills of small mammals, birds, reptiles, amphibians, and many invertebrates. Intentional killing of snakes, reptiles, and owls will negatively affect their 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 mining 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.
- The footprint areas of the mining activities must be scanned for any protected faunal species prior to any destructive activities by means of a search-and-rescue operation.
- If any of the protected wildlife species are directly threatened by habitat destruction or displacement during the mining operation, then the relevant permits from DENC should be obtained followed by the relevant mitigation procedures stipulated in the permits.
- It is recommended that these individuals be rescued and relocated by a registered professional prior to intended activities.
- No mining should take place in the drainage lines and no new roads should be created across drainage lines. If this is unavoidable, a water use license to alter the beds and banks of each earmarked watercourse should be obtained from DWS prior to such activities.
- Everyone on site must undergo environmental induction for awareness on not capturing or harming species that are often persecuted out of superstition and to be educated about the conservation importance of the fauna occurring on site.
- All reptiles, amphibians as well as bird nests and small mammal litters 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 a maximum speed limit of 40 km/h as well as driving mindfully on site to lower the risk of animals being killed on the roads or elsewhere in the mining area.

4.4. Water resources

4.4.1. Alteration/destruction of watercourses

Source of the impact

During excavation of minerals, construction of infrastructure and roads, stockpiling.

Description of the impact

During mining activities there is a possibility that the watercourses on site (i.e., drainage lines) might be altered or indirectly affected. This includes direct mining within the watercourses as well as development of roads, infrastructure or stockpiles within their channels, catchment areas, or buffer zones. Such activities can completely change the hydrologic regime or habitat conditions of the watercourses, which will not only compromise their ecological functioning, but also have downstream effects.

Mitigation and monitoring

- All activities associated with the mining operation must be planned to avoid any disturbances to the watercourses and their buffer zones.
- No new roads should be created across the drainage lines and no mining should take place in the drainage lines. If this is unavoidable, a water use license to alter the beds and banks of each earmarked watercourse should be obtained from DWS prior to such activities.
- Employ sound rehabilitation measures to restore characteristics of all affected watercourses.

4.4.2. Siltation of surface water

Source of the impact

During clearing of an area for the excavation of minerals, construction of infrastructure and roads, stockpiling, natural events.

Description of the impact

Vegetation will be stripped in preparation for the mining areas and associated infrastructure. These bare areas will be susceptible to water erosion without plants to stabilise the soil, creating potential sediment source zones. High runoff events could potentially cause the drainage lines to be filled with silt from mining areas if the sediment source zones lie along the drainage paths towards these watercourses. This may lead to a change in hydrologic regime or character of the watercourses on site, and the Orange River further downstream.

Mitigation and monitoring

- Bare ground exposure should always be minimised in terms of the surface area and duration.
- Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in the area have ceased.
- No new roads, infrastructure or mining areas should be developed over watercourses.
- Disturbances during the rainy season should be monitored and controlled.
- Any potential run-off from exposed ground should be controlled with flow retarding barriers.
- Regular monitoring during the mining operation should be carried out to identify areas where erosion is occurring; followed by appropriate remedial actions.

4.5. Broad-scale ecological processes

Source of the impact

Clearing of vegetation and disturbance during the construction of roads and mining activities; alterations to watercourse habitat characteristics.

Description of the impact

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. The vast extent of agricultural activities in the region have already transformed large natural landscapes and the proposed mining activities will add to the fragmentation of habitats on a landscape level. Habitat alterations will also destroy connectivity of vital ecological corridors of aquatic food webs in the ephemeral drainage lines, which could have cascading effects on a catchment level.

Mitigation and monitoring

- Implement best practise principles to minimise the footprint of transformation.
- No new roads should be created across the drainage lines and no mining should take place in the drainage lines. If this is unavoidable, a water use license to alter the beds and banks of each earmarked watercourse should be obtained from DWS prior to such activities.
- Employ sound rehabilitation measures to restore characteristics of all affected habitats.

5. CONCLUSION, RECOMMENDATIONS AND OPINION REGARDING AUTHORISATION

Three plant communities were identified within the area earmarked for mining activities in the study area. Of these, the drainage lines are most sensitive (Very High), primarily based on their national protection status as watercourses. The remainder of the pristine portion of the site (hills and grassland habitats) are of High sensitivity based on several plant species of conservation concern recorded here, and potential important habitat it provides to protected bird-, reptile- and invertebrate species.

The most profound impacts expected to be related to the proposed mining operation include cumulative loss of intact habitat on landscape level, as well as loss and disturbances to specialised flora and fauna species, especially those restricted to the hills. Permit applications need to be lodged with the Northern Cape Department of Environment and Nature Conservation three months prior to any destruction, death or displacement of protected flora and fauna species and license application to remove any of the protected tree species need to be lodged with the Department of Forestry and Fisheries.

If mining takes place, then the destruction of sensitive natural habitats on site is inevitable. The significance of the ecological impacts will ultimately be affected by the success of the mitigation measures implemented during the mining operation. In my opinion, authorisation for the proposed operation should only be granted if the applicant commits to strictly adhere to effective avoidance, management, mitigation, and rehabilitation measures.

6. REFERENCES

- ADU. 2016. Summary Data of the Frogs of South Africa, Lesotho and Swaziland. Animal Demography Unit, Department of Zoology, University of Cape Town. .
- ALEXANDER, G. and MARAIS, J. 2007. A guide to the reptiles of southern Africa. Struik Nature, Cape Town.
- BATES, F., BRANCH, W.R., BAUER, A.M., BURGER, M., MARAIS, J., ALEXANDER, G.J., and DE VILLIERS, M.S. 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. South African National Biodiversity Institute, Pretoria.
- BIRDLIFESA. 2015. Important Bird Areas Map.
- DENC, DMR, COM, SAMBF, and SANBI. 2013. Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector, Pretoria.
- DU PREEZ, L. and CARRUTHERS, V. 2009. A complete guide to the frogs of southern Africa. Struik Nature, Cape Town.
- FRIEDMANN, Y. and DALY, B. 2004. Red data book of the mammals of South Africa: a conservation assessment. CBSG-EWT, Johannesburg.
- GIBBON, G. 2006. Robert's Multimedia Birds of Southern Africa version 3. . Southern African Birding cc.
- GRIFFITHS, C., DAY, J., and PICKER, M. 2015. Freshwater Life: A field guide to the plants and animals of Southern Africa. Struik Nature, Cape Town.
- HOLNESS, S. and OOSTHUYSEN, E. 2016. Critical Biodiversity Areas of the Northern Cape. Northern Cape Department of Environment and Nature Conservation, <http://bgis.sanbi.org>.
- HORNSVELD, H. 1977. 2822 Postmasburg, 1:250 000 scale published geological sheet. The Government Printer, Pretoria.

IUCN. 2019. IUCN Red List of Threatened Species. Version 2019.1

KLEYNHANS, C.J. 2007. Module D: Fish Response Assessment Index in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry, Pretoria.

KREMEN, C., COLWELL, R.K., ERWIN, T.L., MURPHY, D.D., NOSS, R.F., and SANJAYAN, M.A. 1993. Terrestrial arthropod assemblages: their use in conservation planning. *Conservation Biology* 7:4, 796-808.

MINTER, L.R., BURGER, M., HARRISON, J.A., BRAACK, H.H., BISHOP, P.J., and KLOEPFER, D. 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. Smithsonian Institution, Washington, DC.

MUCINA, L. and RUTHERFORD, M.C. 2006. The Vegetation Map of South Africa, Lesotho and Swaziland. SANBI, Pretoria, South Africa.

MUCINA, L. and RUTHERFORD, M.C. 2012. Vegetation Map of South Africa, Lesotho and Swaziland. SANBI, Claremont.

PICKER, M., GRIFFITHS, C., and WEAIVING, A. 2004. Field Guide to the Insects of South Africa. Struik Nature, Cape Town.

SANBI. 2020. Red List of South African Plants. Version 2020.1

SMOOK, A.J., POURNARA, D.J., and CRAIG, A.R. 2002. Lower Orange Water Management Area: Water resource situation assessment. REPORT NO: 14000/00/0101. DEPARTMENT: WATER AFFAIRS AND FORESTRY.

SNIJMAN, D.A. 2013. Plants of the Greater Cape Floristic Region, Vol. 2: the Extra Cape flora. *Strelitzia* 30. South African National Biodiversity Institute, Pretoria.

TAYLOR, M.R., PEACOCK, F., and WANLESS, R.M. 2015. The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Dunkeld West.

- THIRION, C. 2007. Module E: Macroinvertebrate Response Assessment Index in River EcoClassification: Manual for EcoStatus Determination (version 2). *WRC Report No. TT 332/08*, Joint Water Research Commission and Department of Water Affairs and Forestry, Pretoria.
- VAN DEVENTER, H., SMITH-ADAO, L., COLLINS, N.B., GRENFELL, M., GRUNDLING, A., GRUNDLING, P.-L., IMPSON, D., JOB, N., LÖTTER, M., OLLIS, D., PETERSEN, C., SCHERMAN, P., SIEBEN, E., SNADDON, K., TERERAI, F., and VAN DER COLFF, D. 2019. South African National Biodiversity Assessment 2018: Technical Report. Volume 2b: Inland Aquatic (Freshwater) Realm. South African National Biodiversity Institute, Pretoria.
- WEISSER, W.W. and SIEMANN, E. 2004. The various effects of insects on ecosystem functioning. Pages 3-24 *in* W. W. Weisser and E. Siemann, editors. *Insects and Ecosystem Function*, Ecological Studies Series, Volume 173. Springer-Verlag, Berlin.



APPENDICES

APPENDIX 1

Plant species list

FAMILY	SPECIES	STATUS	NFA	NCNCA	
ACANTHACEAE	<i>Acanthopsis hoffmannseggiana</i>	DDT			
	<i>Barleria lichtensteiniana</i>	LC			
	<i>Barleria rigida</i>	LC			
	<i>Blepharis mitrata</i>	LC			
	<i>Justicia australis</i>	LC			
	<i>Justicia divaricata</i>	LC			
	<i>Justicia spartioides</i>	LC			
	<i>Petalidium lucens</i>	LC			
	AIZOACEAE	<i>Aizoon burchellii</i>	LC		
		<i>Aizoon canariense</i>	LC		
<i>Aizoon schellenbergii</i>		LC			
<i>Galenia pubescens</i>		LC			
<i>Galenia sarcophylla</i>		LC			
<i>Galenia secunda</i>		LC			
<i>Mesembryanthemum coriarium</i>		LC		S2	
<i>Mesembryanthemum guerichianum</i>		LC		S2	
<i>Mesembryanthemum tetragonum</i>		LC		S2	
<i>Ruschia barnardii</i>		LC		S2	
<i>Ruschia intricata</i>		LC		S2	
<i>Tetragonia arbuscula</i>		LC			
<i>Tetragonia reduplicata</i>		LC			
AMARANTHACEAE	<i>Atriplex semibaccata</i>	Nat. Exotic			
	<i>Chenopodium pumilio</i>	Nat. Exotic			
	<i>Kyphocarpa angustifolia</i>	LC			
	<i>Leucosphaera bainesii</i>	LC			
	<i>Salsola arborea</i>	-			
	<i>Salsola barbata</i>	LC			
	<i>Salsola kali</i>	Inv. Alien			
	<i>Salsola namaqualandica</i>	-			
	<i>Salsola tuberculata</i>	DDT			
	<i>Suaeda fruticosa</i>	LC			
<i>Suaeda merxmulleri</i>	LC				
AMARYLLIDACEAE	<i>Nerine gaberonensis</i>	LC		S2	
	<i>Nerine laticoma</i>	LC		S2	
ANACAMPSEROTACEAE	<i>Anacampseros albissima</i>	LC		S2	
	<i>Anacampseros baeseckeii</i>	LC		S2	
ANACARDIACEAE	<i>Ozoroa dispar</i>	LC		S1	
	<i>Ozoroa namaensis</i>	LC		S1	
	<i>Searsia lancea</i>	LC			
	<i>Searsia populifolia</i>	LC			
APOCYNACEAE	<i>Cryptolepis decidua</i>	LC		S2	
	<i>Cynanchum viminale</i> subsp. <i>viminale</i>	LC		S2	
	<i>Microloma incanum</i>	LC		S2	
ASPARAGACEAE	<i>Asparagus cooperi</i>	LC			
	<i>Asparagus pearsonii</i>	LC			
	<i>Asparagus retrofractus</i>	LC			
ASPHODELACEAE	<i>Aloe claviflora</i>	LC		S2	
	<i>Aloe gariensis</i>	LC		S2	

FAMILY	SPECIES	STATUS	NFA	NCNCA
ASTERACEAE	<i>Amellus epaleaceus</i>	LC		
	<i>Amellus tridactylus</i> subsp. <i>arenarius</i>	LC		
	<i>Arctotis leiocarpa</i>	LC		
	<i>Athrixia heterophylla</i> subsp. <i>sessilifolia</i>	LC		
	<i>Berkheya chamaepeuce</i>	LC		
	<i>Berkheya spinosissima</i> subsp. <i>spinosissima</i>	LC		
	<i>Chrysocoma ciliata</i>	LC		
	<i>Crassothonna floribunda</i>	LC		
	<i>Dicoma capensis</i>	LC		
	<i>Dimorphotheca polyptera</i>	LC		
	<i>Eriocephalus pauperrimus</i>	LC		
	<i>Felicia namaquana</i>	LC		
	<i>Foveolina dichotoma</i>	LC		
	<i>Geigeria ornativa</i> subsp. <i>ornativa</i>	LC		
	<i>Geigeria vigintiquamea</i>	LC		
	<i>Gorteria corymbosa</i>	LC		
	<i>Helichrysum herniarioides</i>	LC		
	<i>Helichrysum micropoides</i>	LC		
	<i>Ifloga molluginoides</i>	LC		
	<i>Kleinia longiflora</i>	LC		
	<i>Leysera tenella</i>	LC		
	<i>Myxopappus acutilobus</i>	LC		
	<i>Nidorella resedifolia</i> subsp. <i>resedifolia</i>	LC		
	<i>Nolletia chrysocomoides</i>	LC		
	<i>Nolletia gariepina</i>	LC		
	<i>Osteospermum microcarpum</i> subsp. <i>microcarpum</i>	LC		
	<i>Osteospermum moniliferum</i> subsp. <i>pisiferum</i>	LC		
	<i>Pentzia pinnatisecta</i>	LC		
	<i>Pentzia quinquefida</i>	LC		
	<i>Senecio arenarius</i>	LC		
	<i>Senecio consanguineus</i>	LC		
	<i>Senecio eenii</i>	LC		
	<i>Senecio glutinosus</i>	LC		
	<i>Senecio inaequidens</i>	LC		
<i>Senecio niveus</i>	LC			
<i>Senecio repandus</i>	LC			
<i>Senecio sisymbriifolius</i>	LC			
AYTONIACEAE	<i>Plagiochasma rupestre</i> var. <i>rupestre</i>	-		
BIGNONIACEAE	<i>Rhigozum trichotomum</i>	Encr.		
BORAGINACEAE	<i>Codon royenii</i>	LC		
	<i>Codon schenckii</i>	LC		
	<i>Heliotropium curassavicum</i>	Nat. Exotic		
	<i>Heliotropium ovalifolium</i>	LC		
BRASSICACEAE	<i>Trichodesma africanum</i>	LC		
	<i>Heliophila deserticola</i> var. <i>deserticola</i>	LC		
	<i>Lepidium englerianum</i>	Nat. Exotic		
BRYACEAE	<i>Bryum apiculatum</i>	-		
BURSERACEAE	<i>Commiphora gracilifrondosa</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
CAMPANULACEAE	<i>Wahlenbergia annularis</i>	LC		
	<i>Wahlenbergia prostrata</i>	LC		
CAPPARACEAE	<i>Boscia albitrunca</i>	LC	X	S2
	<i>Boscia foetida</i> subsp. <i>foetida</i>	LC		S2
	<i>Cadaba aphylla</i>	LC		
	<i>Maerua gilgii</i>	LC		
CELASTRACEAE	<i>Gymnosporia linearis</i> subsp. <i>lanceolata</i>	LC		S2
CLEOMACEAE	<i>Cleome foliosa</i> var. <i>lutea</i>	LC		
	<i>Cleome oxyphylla</i> var. <i>oxyphylla</i>	LC		
	<i>Cleome paxii</i>	LC		
COMBRETACEAE	<i>Combretum erythrophyllum</i>	LC		S2
CRASSULACEAE	<i>Crassula sericea</i>	LC		S2
CUCURBITACEAE	<i>Coccinia rehmannii</i>	LC		
	<i>Cucumis africanus</i>	LC		
	<i>Cucumis sagittatus</i>	LC		
	<i>Cucumis zeyheri</i>	LC		
CYPERACEAE	<i>Bulbostylis humilis</i>	LC		
	<i>Cyperus laevigatus</i>	LC		
	<i>Cyperus marginatus</i>	LC		
	<i>Cyperus squarrosus</i>	LC		
DIDIEREACEAE	<i>Portulacaria namaquensis</i>	LC		
EBENACEAE	<i>Diospyros lycioides</i> subsp. <i>lycioides</i>	LC		
	<i>Euclea pseudebenus</i>	LC	X	
EUPHORBIACEAE	<i>Euphorbia braunsii</i>	LC		S2
	<i>Euphorbia gariiepina</i> subsp. <i>gariiepina</i>	LC		S2
	<i>Euphorbia gregaria</i>	LC		S2
	<i>Euphorbia rhombifolia</i>	LC		S2
	<i>Euphorbia spartaria</i>	LC		S2
	<i>Euphorbia spinea</i>	LC		S2
FABACEAE	<i>Adenolobus garipensis</i>	LC		
	<i>Calobota spinescens</i>	LC		
	<i>Cullen tomentosum</i>	LC		
	<i>Indigastrum argyroides</i>	LC		
	<i>Indigastrum niveum</i>	LC		
	<i>Indigofera auricoma</i>	LC		
	<i>Indigofera heterotricha</i>	LC		
	<i>Indigofera pungens</i>	LC		
	<i>Leobordea platycarpa</i>	LC		
	<i>Leobordea quinata</i>	LC		
	<i>Lotononis rabenaviana</i>	LC		
	<i>Medicago laciniata</i> var. <i>laciniata</i>	Nat. Exotic		
	<i>Parkinsonia africana</i>	LC		
	<i>Pomaria lactea</i>	LC		
	<i>Prosopis glandulosa</i>	Inv. Alien		
	<i>Prosopis velutina</i>	Inv. Alien		
<i>Ptychlobium biflorum</i> subsp. <i>biflorum</i>	LC			
<i>Requienia sphaerosperma</i>	LC			
<i>Rhynchosia totta</i> var. <i>rigidula</i>	LC			

FAMILY	SPECIES	STATUS	NFA	NCNCA
FABACEAE	<i>Schotia afra</i> var. <i>angustifolia</i>	LC		
	<i>Senegalia mellifera</i> subsp. <i>detinens</i>	Encr.		
	<i>Tephrosia dregeana</i> var. <i>dregeana</i>	LC		
	<i>Trigonella hamosa</i>	Nat. Exotic		
	<i>Vachellia erioloba</i>	LC	X	
	<i>Vachellia karroo</i>	Encr.		
GERANIACEAE	<i>Monsonia crassicaulis</i>	LC		
	<i>Monsonia luederitziana</i>	LC		
	<i>Monsonia parvifolia</i>	LC		
	<i>Monsonia salmoniflora</i>	LC		
	<i>Monsonia umbellata</i>	LC		
GISEKIACEAE	<i>Gisekia africana</i> var. <i>africana</i>	LC		
	<i>Gisekia pharnacioides</i> var. <i>pharnacioides</i>	LC		
HYACINTHACEAE	<i>Albuca collina</i>	LC		
	<i>Bowiea volubilis</i> subsp. <i>gariensis</i>	LC		
	<i>Dipcadi bakerianum</i>	LC		
	<i>Dipcadi gracillimum</i>	LC		
	<i>Drimia intricata</i>	LC		
	<i>Ornithogalum deltoideum</i>	LC		S2
IRIDACEAE	<i>Lapeirousia plicata</i> subsp. <i>foliosa</i>	LC		S2
	<i>Romulea obscura</i> var. <i>subtestacea</i>	LC		S2
KEWACEAE	<i>Kewa salsoloides</i>	LC		
LIMEACEAE	<i>Limeum aethiopicum</i>	LC		
	<i>Limeum dinteri</i>	LC		
LOASACEAE	<i>Kissenia capensis</i>	LC		
LOPHIOPHYLLACEAE	<i>Lophiopus polystachyus</i>	LC		
LORANTHACEAE	<i>Tapinanthus oleifolius</i>	LC		
MALVACEAE	<i>Abutilon pycnodon</i>	LC		
	<i>Grewia flava</i>	Encr.		
	<i>Hermannia comosa</i>	LC		
	<i>Hermannia minutiflora</i>	LC		
	<i>Hermannia pulchella</i>	LC		
	<i>Hermannia spinosa</i>	LC		
	<i>Hermannia stricta</i>	LC		
	<i>Hermannia tomentosa</i>	LC		
	<i>Hibiscus elliotiae</i>	LC		
	<i>Hibiscus engleri</i>	LC		
MELIACEAE	<i>Nymphaea capensis</i>	LC		S2
MOLLUGINACEAE	<i>Coelanthum grandiflorum</i>	LC		
	<i>Suessenguthiella scleranthoides</i>	LC		
MONTINIACEAE	<i>Montinia caryophyllacea</i>	LC		
MORACEAE	<i>Ficus cordata</i> subsp. <i>cordata</i>	LC		
NYCTAGINACEAE	<i>Phaeoptilum spinosum</i>	LC		
OLEACEAE	<i>Olea europaea</i> subsp. <i>africana</i>	LC		S2
ONAGRACEAE	<i>Ludwigia adscendens</i> subsp. <i>diffusa</i>	LC		
OXALIDACEAE	<i>Oxalis extensa</i>	DDD		S2
	<i>Oxalis haedulipes</i>	LC		S2
PEDALIACEAE	<i>Rogeria longiflora</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
PLUMBAGINACEAE	<i>Dyerophytum africanum</i>	LC		
POACEAE	<i>Anthephora pubescens</i>	LC		
	<i>Aristida adscensionis</i>	LC		
	<i>Aristida congesta</i> subsp. <i>congesta</i>	LC		
	<i>Aristida engleri</i> var. <i>engleri</i>	LC		
	<i>Bothriochloa bladhii</i>	LC		
	<i>Cenchrus ciliaris</i>	LC		
	<i>Centropodia glauca</i>	LC		
	<i>Chloris virgata</i>	LC		
	<i>Diandrochloa namaquensis</i>	LC		
	<i>Dichanthium annulatum</i> var. <i>papillosum</i>	LC		
	<i>Digitaria ciliaris</i>	Nat. Exotic		
	<i>Digitaria eriantha</i>	LC		
	<i>Echinochloa colona</i>	LC		
	<i>Enneapogon cenchroides</i>	LC		
	<i>Enneapogon desvauxii</i>	LC		
	<i>Enneapogon scaber</i>	LC		
	<i>Eragrostis aspera</i>	LC		
	<i>Eragrostis brizantha</i>	LC		
	<i>Eragrostis caesia</i>	LC		
	<i>Eragrostis cylindriflora</i>	LC		
	<i>Eragrostis echinochloidea</i>	LC		
	<i>Eragrostis homomalla</i>	LC		
	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i>	LC		
	<i>Eragrostis mexicana</i> subsp. <i>virescens</i>	Nat. Exotic		
	<i>Eragrostis nindensis</i>	LC		
	<i>Eragrostis porosa</i>	LC		
	<i>Eragrostis rotifer</i>	LC		
	<i>Eragrostis tef</i>	Nat. Exotic		
	<i>Eragrostis trichophora</i>	LC		
	<i>Eragrostis viscosa</i>	LC		
	<i>Hemarthria altissima</i>	LC		
	<i>Hyparrhenia hirta</i>	LC		
	<i>Leucophrys mesocoma</i>	LC		
	<i>Melinis repens</i> subsp. <i>grandiflora</i>	LC		
	<i>Oropetium capense</i>	LC		
	<i>Panicum arbusculum</i>	LC		
	<i>Paspalum distichum</i>	LC		
	<i>Phragmites australis</i>	LC		
	<i>Polypogon monspeliensis</i>	Nat. Exotic		
	<i>Schmidtia kalahariensis</i>	LC		
	<i>Setaria appendiculata</i>	LC		
	<i>Sporobolus ioclados</i>	LC		
	<i>Stipagrostis ciliata</i>	LC		
	<i>Stipagrostis hochstetteriana</i>	LC		
	<i>Stipagrostis namaquensis</i>	LC		
	<i>Stipagrostis obtusa</i>	LC		
	<i>Stipagrostis uniplumis</i> var. <i>uniplumis</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
POACEAE	<i>Triraphis purpurea</i>	LC		
	<i>Triraphis ramosissima</i>	LC		
POLYGALACEAE	<i>Muraltia spinosa</i>	LC		
	<i>Polygala leptophylla</i> var. <i>leptophylla</i>	LC		
	<i>Polygala seminuda</i>	LC		
POLYGONACEAE	<i>Persicaria decipiens</i>	LC		
PORTULACACEAE	<i>Portulaca kermesina</i>	LC		
POTAMOGETONACEAE	<i>Zannichellia palustris</i>	LC		
POTTIACEAE	<i>Microbryum davallianum</i> var. <i>conicum</i>	-		
PTERIDACEAE	<i>Cheilanthes deltoidea</i> subsp. <i>deltoidea</i>	LC		
RESEDACEAE	<i>Oligomeris dipetala</i> var. <i>dipetala</i>	LC		
RHAMNACEAE	<i>Ziziphus mucronata</i> subsp. <i>mucronata</i>	LC		
RICCIACEAE	<i>Riccia albolimbata</i>	-		
	<i>Riccia atropurpurea</i>	-		
	<i>Riccia cavernosa</i>	-		
	<i>Riccia crinita</i>	-		
	<i>Riccia okahandjana</i>	-		
RUBIACEAE	<i>Kohautia caespitosa</i> subsp. <i>brachyloba</i>	LC		
	<i>Kohautia cynanchica</i>	LC		
	<i>Plocama crocyllis</i>	LC		
RUSCACEAE	<i>Eriospermum bakerianum</i> subsp. <i>bakerianum</i>	LC		
	<i>Sansevieria aethiopica</i>	LC		
SALICACEAE	<i>Salix mucronata</i> subsp. <i>mucronata</i>	LC		
SALVINIACEAE	<i>Azolla filiculoides</i>	Inv. Alien		
SANTALACEAE	<i>Thesium lineatum</i>	LC		
SAPINDACEAE	<i>Pappea capensis</i>	LC		
SCROPHULARIACEAE	<i>Antherothamnus pearsonii</i>	LC		
	<i>Aptosimum spinescens</i>	LC		
	<i>Diascia engleri</i>	LC		S2
	<i>Gomphostigma virgatum</i>	LC		
	<i>Jamesbrittenia aridicola</i>	LC		S2
	<i>Jamesbrittenia canescens</i>	LC		S2
	<i>Jamesbrittenia megadenia</i>	LC		S2
	<i>Jamesbrittenia ramosissima</i>	LC		S2
	<i>Manulea gariepina</i>	LC		S2
	<i>Manulea schaeferi</i>	LC		S2
	<i>Peliostomum leucorrhizum</i>	LC		
	<i>Zaluzianskya diandra</i>	LC		
	SOLANACEAE	<i>Lycium bosciifolium</i>	LC	
<i>Lycium oxycarpum</i>		LC		
<i>Nicotiana glauca</i>		Inv. Alien		
<i>Solanum burchellii</i>		LC		
<i>Solanum capense</i>		LC		
<i>Solanum nigrum</i>		Nat. Exotic		
TAMARICACEAE	<i>Solanum tomentosum</i>	LC		
TAMARICACEAE	<i>Tamarix usneoides</i>	LC		
THYMELAEACEAE	<i>Passerina falcifolia</i>	LC		
URTICACEAE	<i>Forsskaolea candida</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
VAHLIACEAE	<i>Vahlia capensis</i> subsp. <i>capensis</i>	LC		
VERBENACEAE	<i>Chascanum garipense</i>	LC		
	<i>Chascanum pinnatifidum</i> var. <i>pinnatifidum</i>	LC		
	<i>Chascanum pumilum</i>	LC		
ZYGOPHYLLACEAE	<i>Roepera microphyllum</i>	LC		
	<i>Sisyndite spartea</i>	LC		
	<i>Tetraena microcarpa</i>	LC		
	<i>Tetraena rigida</i>	LC		
	<i>Tetraena simplex</i>	LC		
	<i>Tribulus cristatus</i>	LC		
	<i>Zygophyllum dregeanum</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	SAMRL	Habitat	Potential occurrence
CHIROPTERA	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.	High
	² <i>Rhinolophus damarensis</i>	Damara Horseshoe Bat	LC	LC	Arid savannah and shrubland habitats in Nama-Karoo Biome. Roosts in caves and mines.	High
	² <i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	LC	Savanna habitats	High
	² <i>Rhinolophus denti</i>	Dent's Horseshoe Bat	LC	NT	Arid savanna. Roosts in caves, caverns, crevices in rocky outcrops, and abandoned mines.	High
	² <i>Sauromys petrophilus</i>	Roberts's Flat-headed Bat	LC	LC	Closely associated with rocky habitats. It roosts in crevices, narrow cracks and exfoliated rock.	High
	² <i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC	Wide habitat tolerance.	High
	² <i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT	LC	Wide habitat tolerance, but the presence of trees are important.	Low
	² <i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	LC	LC	Associated with mountainous terrain near water. Roosts in caves, mines and rock crevices.	Medium
	² <i>Neoromicia capensis</i>	Cape Serotine Bat	LC	LC	Wide habitat tolerance. Roosts under the bark of trees and similar vegetation.	High
	² <i>Miniopterus natalensis</i>	Natal Long-fingered Bat	LC	LC	Wide habitat tolerance. Roosts in caves or mine shafts, but also in crevices and holes in trees.	High

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
MACROSCELIDIDAE	² <i>Macroscelides proboscideus</i>	Round-eared Sengi	LC	LC	Restricted to gravel / alluvial plains and relatively flat areas between higher elevation areas such as outcrops, hills and mountains.	High
	² <i>Elephantulus intufi</i>	Bushveld Sengi	LC	LC	Arid terrain. Cover is an essential habitat requirement and is provided by low bushes that are scattered in open grasslands.	High
	² <i>Elephantulus rupestris</i>	Western Rock Sengi	LC	LC	Arid habitats, including deserts, dry savannas, and dry shrublands. Associated with rocky ridges, outcrops or koppies, and boulder fields.	High
EULIPO-TYPHILA	² <i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	LC	Generally associated with termite mounds, grassland habitat.	Medium
HYRACOIDEA	² <i>Procavia capensis</i>	Rock Hyrax	LC	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies.	Confirmed
PRIMATES	⁴ <i>Papio ursinus</i>	Chacma Baboon	LC	LC	Fynbos, montane grasslands, riverine courses in deserts. Only needs water and access to refuge.	Low
	⁴ <i>Chlorocebus pygerythrus</i>	Vervet Monkey	LC	LC	Woodland savanna, riverine woodland, isolated stands of trees along rivers.	High

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
HOLIDOTA	¹ <i>Smutsia temminckii</i>	Temminck's Pangolin	VU	VU	Various woodland and savannah habitats, although largely confined to protected areas and well-managed livestock and wildlife farms.	Low
LAGOMORPHA	² <i>Lepus capensis</i>	Cape Hare	LC	LC	Dry, open regions, with palatable bush and grass.	High
RODENTIA	² <i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC	Wide habitat tolerance.	High
	² <i>Aethomys chrysophilus</i>	Red Rock Rat	LC	LC	Savanna habitats.	High
	² <i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	LC	LC	Prefers hard ground, unlike other gerbil species, with some cover of grass or karroid bush.	High
	² <i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC	Sandy soils or sandy alluvium with some cover of grass, scrub or open woodland.	High
	² <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	LC	Predominantly associated with light sandy soils or sandy alluvium.	High
	² <i>Gerbillurus paeaba</i>	Pygmy Hairy-footed Gerbil	LC	LC	Nama and Succulent Karoo, preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover.	High

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
RODENTIA	² <i>Gerbillurus vallinus</i>	Bushy-tailed Hairy-footed Gerbil	LC	LC	Restricted to areas of consolidated soils, bare gravel plains, dry river beds or shallow sand overlying gravels with scant vegetation. Lives in complex burrows constructed around the base of bushes, especially <i>Phaeoptilum spinosum</i> and <i>Rhigozum trichotomum</i>	High
	² <i>Mastomys coucha</i>	Southern Multimammate Mouse	LC	LC	Wide habitat tolerance.	High
	² <i>Micaelamys namaquensis</i>	Namaqua Rock Mouse	LC	LC	Catholic habitat requirements, but prefer rocky hills, outcrops or boulder-strewn hillsides.	High
	³ <i>Mus musculus</i>	House Mouse	LC	<i>Not assessed</i>	Wide habitat tolerance.	High
	² <i>Parotomys brantsii</i>	Brants's Whistling Rat	LC	LC	Restricted to areas with consolidated sands in semi-desert landscapes, with a low percentage plant cover.	Low
	² <i>Parotomys littledalei</i>	Littledale's Whistling Rat	LC	NT	Occurs in shrublands, specifically in coastal hummocks, sand dunes, gravel plains and dry riverine systems. Avoids open habitats.	Low
	² <i>Rhabdomys bechuanae</i>	Four-striped Grass Mouse	LC	LC	Wide habitat tolerance.	High

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
RODENTIA	² <i>Thallomys nigricauda</i>	Black-tailed Tree Rat	LC	LC	Generally associated with arid savannahs, especially bushland habitats and Kalahari thornveld with <i>Vachellia erioloba</i> , <i>A. luederitzii</i> , <i>Boscia albitrunca</i> , <i>Terminalia sericea</i> trees and <i>Senegalia mellifera</i> .	High
	² <i>Malacothrix typica</i>	Large-eared (Gerbil) Mouse	LC	LC	Short grass habitats over hard soil.	Low
	² <i>Petromyscus collinus</i>	Pygmy Rock Mouse	LC	LC	Rocky outcrops or koppies in arid and semi-arid shrubland	High
	² <i>Petromyscus monticularis</i>	Brukkaros Pygmy Rock Mouse	LC	LC	Favours rocky outcrops within semi-arid shrubland habitats	High
	² <i>Saccostomus campestris</i>	Pouched Mouse	LC	LC	Wide habitat tolerance.	High
	² <i>Pedetes capensis</i>	Springhare	LC	LC	Wide distribution in flat, arid and semi-arid habitats, but prefers relatively flat and open habitats with short grass.	High
	² <i>Petromus typicus</i>	Dassie Rat	LC	LC	Rocky outcrops, seeking shelter for nest sites in crevices and under large boulders.	High
	² <i>Xerus inauris</i>	South African Ground Squirrel	LC	LC	Open terrain with a sparse bush cover and hard substrate.	Confirmed

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential 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	Prefers short-grass plains, shrub lands and open arid savanna. Absent from true desert or afforested areas.	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>Ictonyx striatus</i>	Striped Polecat	LC	LC	Widely distributed through sub-region.	High
	² <i>Aonyx capensis</i>	African Clawless Otter	NT	NT	Predominantly aquatic. Fresh water is an essential habitat requirement	Low
	² <i>Herpestes pulverulentus</i>	Cape Grey Mongoose	LC	LC	Wide habitat tolerance, but prefers Karoo and karroid bushveld and sclerophyllous scrub.	High
	² <i>Herpestes sanguineus</i>	Common Slender Mongoose	LC	LC	Wide habitat tolerance.	High
	² <i>Atilax paludinosus</i>	Water mongoose	LC	LC	Mainly restricted to riparian habitats, wherever there is suitable vegetation cover and water in close proximity.	Low
² <i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC	Semi-arid country on a sandy substrate.	Confirmed	

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
CARNIVORA	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.	High
	² <i>Genetta genetta</i>	Common (Small-spotted) Genet	LC	LC	Occur in open arid habitats.	High
	¹ <i>Proteles cristata</i>	Aardwolf	LC	LC	Common in the 100-600mm rainfall range, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes. Absent from true desert and forests.	High
	¹ <i>Felis nigripes</i>	Black-footed Cat	VU	VU	Dry, open savanna, grasslands and Karoo semi-desert with sparse shrub and tree cover. Prefers hollowed out abandoned termite mounds or dens dug out by other animals.	Low
	¹ <i>Felis silvestris</i>	African Wild Cat	LC	LC	Wide habitat tolerance.	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, but prefers densely wooded and rocky areas.	Low

LIST OF MAMMALS (continued)

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

	Scientific name	Common name	IUCN	SAMRL	Habitat	Potential occurrence
TUBULEN-TATA	¹ <i>Orycteropus afer</i>	Aardvark	LC	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil.	Medium
	² <i>Oryx gazella</i>	Gemsbok	LC	LC	Semi-arid and arid bushland and grassland of the Kalahari and Karoo and adjoining regions.	Low
CETARTIODACTYLA	² <i>Oreotragus oreotragus</i>	Klipspringer	LC	LC	Steep rocky and mountain habitats, including granite outcrops, koppies and gorges with rocky embankments	Low
	² <i>Tragelaphus oryx</i>	Common Eland	LC	LC	Wide habitat tolerance, but absent from true deserts and dense forests.	Low
	² <i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC	Mixed scrub woodland on lowlands, hills, and mountains.	Medium
	² <i>Giraffa camelopardalis</i>	Giraffe	VU	LC	Prefers savannah and open woodland, where there are abundant woody trees.	Low
	² <i>Antidorcas marsupialis</i>	Springbok	LC	LC	Open arid plains with short vegetation	Low
	² <i>Raphicerus campestris</i>	Steenbok	LC	LC	Inhabits open country.	High
	² <i>Sylvicapra grimmia</i>	Common Duiker	LC	LC	Occurs extensively across a variety of habitats, except deserts and rainforests.	High

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
AMPHISBAENIDAE	³ <i>Monopeltis infuscata</i>	Dusky Worm Lizard	LC
	³ <i>Monopeltis mauricei</i>	Maurice's Worm Lizard	LC
	³ <i>Zygaspis quadrifrons</i>	Kalahari Dwarf Worm Lizard	LC
AGAMIDAE	³ <i>Agama aculeata aculeata</i>	Western Ground Agama	LC
	³ <i>Agama anchietae</i>	Anchietta's Agama	LC
	³ <i>Agama atra</i>	Southern Rock Agama	LC
CHAMAELEONIDAE	¹ <i>Chamaeleo dilepis dilepis</i>	Common Flap-necked Chameleon	LC
COLUBRIDAE	² <i>Dasypeltis scabra</i>	Rhombic Egg-eater	LC
	² <i>Telescopus beetzii</i>	Beetz's Tiger Snake	LC
	² <i>Telescopus semiannulatus polystictus</i>	Damara Tiger Snake	LC
CORDYLIDAE	¹ <i>Karusasaurus polyzonus</i>	Southern Karusa Lizard	LC
	² <i>Platysaurus broadleyi</i> ^E	Augrabies Flat Lizard	LC
ELAPIDAE	³ <i>Aspidelaps lubricus lubricus</i>	Coral 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>Chondrodactylus turneri</i>	Turner's Gecko	LC
	³ <i>Colopus wahlbergii furcifer</i>	Striped Ground Gecko	LC
	³ <i>Lygodactylus bradfieldi</i>	Bradfield's Dwarf Gecko	LC
	³ <i>Pachydactylus atorquatus</i>	Augrabies Gecko	LC
	³ <i>Pachydactylus capensis</i>	Cape Gecko	LC
	³ <i>Pachydactylus haackei</i>	Haacke's Gecko	LC
	³ <i>Pachydactylus latirostris</i>	Quartz Gecko	LC
	³ <i>Pachydactylus montanus</i>	Namaqua Mountain Gecko	LC
	³ <i>Pachydactylus punctatus</i>	Speckled Gecko	LC
	³ <i>Pachydactylus purcelli</i>	Purcell's Gecko	LC
	³ <i>Pachydactylus rugosus</i>	Common Rough Gecko	LC
GERRHOSAURIDAE	³ <i>Cordylus garrulus garrulus</i>	Common Barking Gecko	LC
	³ <i>Ptenopus garrulus maculatus</i>	Spotted Barking Gecko	LC
GERRHOSAURIDAE	³ <i>Cordylus subbrevicaudus</i>	Dwarf Plated Lizard	LC
	³ <i>Cordylus subbrevicaudus</i>	Dwarf Plated Lizard	LC
LACERTIDAE	² <i>Meroles suborbitalis</i>	Spotted Desert Lizard	LC
	² <i>Nucras tessellata</i>	Western Sandveld Lizard	LC
	² <i>Pedioplanis inornata</i>	Plain Sand Lizard	LC
	² <i>Pedioplanis laticeps</i> ^E	Karoo Sand Lizard	LC
	² <i>Pedioplanis lineoocellata lineoocellata</i>	Spotted Sand Lizard	LC
	² <i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	LC

LIST OF REPTILES (continued)

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
LAMPROPHIIDAE	³ <i>Xenocalamus bicolor bicolor</i>	Bicoloured Quill-snouted Snake	LC
	³ <i>Boaedon capensis</i>	Common House Snake	LC
	² <i>Lycophidion capense capense</i>	Cape Wolf Snake	LC
	³ <i>Dipsina multimaculata</i>	Dwarf Beaked Snake	LC
	³ <i>Psammophis notostictus</i>	Karoo Sand Snake	LC
	³ <i>Psammophis trinasalis</i>	Fork-marked Sand Snake	LC
	² <i>Prosymna frontalis</i>	Southwestern Shovel-snout	LC
LEPTOTYPHLOPIDAE	³ <i>Namibiana occidentalis</i>	Western Thread Snake	LC
SCINCIDAE	³ <i>Acontias lineatus</i>	Striped Dwarf Legless Skink	LC
	³ <i>Trachylepis capensis</i>	Cape Skink	LC
	³ <i>Trachylepis occidentalis</i>	Western Three-striped 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 tentorius</i>	Tent Tortoise	LC
	² <i>Stigmochelys pardalis</i>	Leopard Tortoise	LC
TYPHLOPIDAE	³ <i>Rhinotyphlops schinzi</i>	Schinz's Beaked Blind Snake	LC
VARANIDAE	² <i>Varanus albigularis albigularis</i>	Southern Rock Monitor	LC
	² <i>Varanus niloticus</i>	Water Monitor	LC
VIPERIDAE	³ <i>Bitis arietans arietans</i>	Puff Adder	LC
	³ <i>Bitis arietans caudalis</i>	Horned Adder	LC
	³ <i>Bitis xeropaga</i>	Desert Mountain Adder	LC

LIST OF AMPHIBIANS

Amphibians 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	SA Frog Atlas
BUFONIDAE	² <i>Vandijkophrynus gariensis</i> ^E	Karoo Toad	LC	LC
	² <i>Amietophrynus gutturalis</i>	Guttural Toad	LC	LC
	² <i>Amietophrynus poweri</i>	Western Olive Toad	LC	LC
	² <i>Amietophrynus rangeri</i> ^E	Raucous Toad	LC	LC
MICROHYLIDAE	² <i>Phrynomantis annectens</i>	Marbled Rubber Frog	LC	LC
PYXICEPHALIDAE	² <i>Amietia angolensis</i>	Angolan River Frog	LC	LC
	² <i>Tomopterna cryptotis</i>	Tremolo Sand Frog	LC	LC

LIST OF BIRDS

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

Scientific name	Common name	IUCN status	SA RDB
² <i>Acrocephalus baeticatus</i>	African Reed-Warbler	LC	LC
² <i>Actitis hypoleucos</i>	Common Sandpiper	LC	LC
² <i>Agapornis roseicollis</i>	Rosy-faced Lovebird	LC	LC
² <i>Alario alario</i>	Black-headed Canary	LC	LC
³ <i>Alario leucolaema</i>	Damara Canary	-	LC
² <i>Alcedo cristata</i>	Malachite Kingfisher	LC	LC
² <i>Alopochen aegyptiacus</i>	Egyptian Goose	LC	LC
² <i>Amadina erythrocephala</i>	Red-headed Finch	LC	LC
² <i>Amaurornis flavirostris</i>	Black Crake	LC	LC
² <i>Anas capensis</i>	Cape Teal	LC	LC
² <i>Anas erythrorhyncha</i>	Red-billed Teal	LC	LC
² <i>Anas smithii</i>	Cape Shoveler	LC	LC
² <i>Anas sparsa</i>	African Black Duck	LC	LC
² <i>Anas undulata</i>	Yellow-billed Duck	LC	LC
² <i>Anhinga rufa</i>	African Darter	LC	LC
² <i>Anthoscopus minutus</i>	Cape Penduline-Tit	LC	LC
² <i>Anthus cinnamomeus</i>	African Pipit	LC	LC
² <i>Anthus similis</i>	Long-billed Pipit	LC	LC
² <i>Apus affinis</i>	Little Swift	LC	LC
² <i>Apus apus</i>	Common Swift	LC	LC
² <i>Apus bradfieldi</i>	Bradfield's Swift	LC	LC
² <i>Apus caffer</i>	White-rumped Swift	LC	LC
¹ <i>Aquila verreauxii</i>	Verreaux's Eagle	LC	VU
² <i>Ardea cinerea</i>	Grey Heron	LC	LC
² <i>Ardea goliath</i>	Goliath Heron	LC	LC
² <i>Ardea melanocephala</i>	Black-headed Heron	LC	LC
² <i>Ardea purpurea</i>	Purple Heron	LC	LC
¹ <i>Ardeotis kori</i>	Kori Bustard	NT	NT
² <i>Batis pririt</i>	Pririt Batis	LC	LC
² <i>Bostrychia hagedash</i>	Hadeda Ibis	LC	LC
² <i>Bradornis infuscatus</i>	Chat Flycatcher	LC	LC
¹ <i>Bubo africanus</i>	Spotted Eagle-Owl	LC	LC
¹ <i>Bubo lacteus</i>	Verreaux's Eagle-Owl	LC	LC
² <i>Bubulcus ibis</i>	Cattle Egret	LC	LC
² <i>Burhinus capensis</i>	Spotted Thick-knee	LC	LC
¹ <i>Buteo rufofuscus</i>	Jackal Buzzard	LC	LC
¹ <i>Buteo vulpinus</i>	Steppe Buzzard	LC	LC
² <i>Calandrella cinerea</i>	Red-capped Lark	LC	LC
² <i>Calendulauda africanoides</i>	Fawn-coloured Lark	LC	LC
³ <i>Calendulauda bradfieldi</i>	Bradfield's Lark	-	LC
² <i>Calidris alba</i>	Sanderling	LC	LC
² <i>Calidris ferruginea</i>	Curlew Sandpiper	NT	LC
² <i>Calidris minuta</i>	Little Stint	LC	LC

LIST OF BIRDS (Cont.)

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

Scientific name	Common name	IUCN status	SA RDB
² <i>Campethera abingoni</i>	Golden-tailed Woodpecker	LC	LC
¹ <i>Caprimulgus europaeus</i>	European Nightjar	LC	LC
¹ <i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar	LC	LC
¹ <i>Caprimulgus tristigma</i>	Freckled Nightjar	LC	LC
² <i>Cercomela familiaris</i>	Familiar Chat	LC	LC
² <i>Cercomela schlegelii</i>	Karoo Chat	LC	LC
² <i>Cercomela sinuata</i>	Sickle-winged Chat	LC	LC
² <i>Cercomela tractrac</i>	Tractrac Chat	LC	LC
² <i>Cercotrichas coryphoeus</i>	Karoo Scrub-Robin	LC	LC
² <i>Cercotrichas paena</i>	Kalahari Scrub-Robin	LC	LC
² <i>Certhilauda subcoronata</i>	Karoo Long-billed Lark	LC	LC
² <i>Ceryle rudis</i>	Pied Kingfisher	LC	LC
¹ <i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT
² <i>Charadrius tricollaris</i>	Three-banded Plover	LC	LC
² <i>Chersomanes albofasciata</i>	Spike-heeled Lark	LC	LC
² <i>Chlidonias hybridus</i>	Whiskered Tern	LC	LC
² <i>Chrysococcyx caprius</i>	Diderick Cuckoo	LC	LC
² <i>Ciconia ciconia</i>	White Stork	LC	LC
¹ <i>Ciconia nigra</i>	Black Stork	LC	VU
² <i>Cinnyris chalybeus</i>	Southern Double-collared Sunbird	LC	LC
² <i>Cinnyris fusca</i>	Dusky Sunbird	LC	LC
¹ <i>Circaetus pectoralis</i>	Black-chested Snake-Eagle	LC	LC
¹ <i>Circus maurus</i>	Black Harrier	EN	LC
² <i>Cisticola aridulus</i>	Desert Cisticola	LC	LC
² <i>Cisticola juncidis</i>	Zitting Cisticola	LC	LC
² <i>Cisticola subruficapillus</i>	Grey-backed Cisticola	LC	LC
² <i>Cisticola tinniens</i>	Levaillant's Cisticola	LC	LC
² <i>Clamator jacobinus</i>	Jacobin Cuckoo	LC	LC
³ <i>Colius colius</i>	White-backed Mousebird	LC	LC
² <i>Columba guinea</i>	Speckled Pigeon	LC	LC
² <i>Columba livia</i>	Rock Dove	LC	LC
³ <i>Corvus albus</i>	Pied Crow	LC	LC
³ <i>Corvus capensis</i>	Cape Crow	LC	LC
² <i>Cossypha caffra</i>	Cape Robin-Chat	LC	LC
² <i>Coturnix coturnix</i>	Common Quail	LC	LC
² <i>Creatophora cinerea</i>	Wattled Starling	LC	LC
² <i>Cursorius rufus</i>	Burchell's Courser	LC	VU
² <i>Cypsiurus parvus</i>	African Palm-Swift	LC	LC
² <i>Dendropicops fuscescens</i>	Cardinal Woodpecker	LC	LC
² <i>Dicrurus adsimilis</i>	Fork-tailed Drongo	LC	LC
² <i>Egretta garzetta</i>	Little Egret	LC	LC
² <i>Egretta intermedia</i>	Yellow-billed Egret	LC	LC

LIST OF BIRDS (Cont.)

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

Scientific name	Common name	IUCN status	SA RDB
¹ <i>Elanus caeruleus</i>	Black-shouldered Kite	LC	LC
² <i>Emberiza capensis</i>	Cape Bunting	LC	LC
² <i>Emberiza impetuani</i>	Lark-like Bunting	LC	LC
² <i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting	LC	LC
² <i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela	LC	LC
² <i>Eremopterix australis</i>	Black-eared Sparrowlark	LC	LC
² <i>Eremopterix verticalis</i>	Grey-backed Sparrowlark	LC	LC
² <i>Estrilda astrild</i>	Common Waxbill	LC	LC
³ <i>Euplectes orix</i>	Southern Red Bishop	LC	LC
² <i>Eupodotis afraoides</i>	Northern Black Korhaan	LC	LC
² <i>Eupodotis vigorsii</i>	Karoo Korhaan	LC	NT
² <i>Eurypytila subcinnamomea</i>	Cinnamon-breasted Warbler	LC	LC
¹ <i>Falco biarmicus</i>	Lanner Falcon	LC	VU
¹ <i>Falco chicquera</i>	Red-necked Falcon	NT	LC
¹ <i>Falco naumanni</i>	Lesser Kestrel	LC	LC
¹ <i>Falco peregrinus</i>	Peregrine Falcon	LC	LC
¹ <i>Falco rupicolis</i>	Rock Kestrel	LC	LC
¹ <i>Falco rupicoloides</i>	Greater Kestrel	LC	LC
² <i>Ficedula albicollis</i>	Collared Flycatcher	LC	LC
² <i>Fulica cristata</i>	Red-knobbed Coot	LC	LC
² <i>Gallinula chloropus</i>	Common Moorhen	LC	LC
¹ <i>Haliaeetus vocifer</i>	African Fish-Eagle	LC	LC
² <i>Hieraaetus pennatus</i>	Booted Eagle	LC	LC
² <i>Himantopus himantopus</i>	Black-winged Stilt	LC	LC
² <i>Hirundo albigularis</i>	White-throated Swallow	LC	LC
² <i>Hirundo cucullata</i>	Greater Striped Swallow	LC	LC
² <i>Hirundo dimidiata</i>	Pearl-breasted Swallow	LC	LC
² <i>Hirundo fuligula</i>	Rock Martin	LC	LC
² <i>Hirundo rustica</i>	Barn Swallow	LC	LC
² <i>Hirundo spilodera</i>	South African Cliff-Swallow	LC	LC
² <i>Indicator minor</i>	Lesser Honeyguide	LC	LC
² <i>Ixobrychus minutus</i>	Little Bittern	LC	LC
² <i>Lagonosticta senegala</i>	Red-billed Firefinch	LC	LC
² <i>Lamprotornis nitens</i>	Cape Glossy Starling	LC	LC
² <i>Laniarius atrococcineus</i>	Crimson-breasted Shrike	LC	LC
² <i>Lanius collaris</i>	Common Fiscal	LC	LC
² <i>Lanius collurio</i>	Red-backed Shrike	LC	LC
² <i>Lanius minor</i>	Lesser Grey Shrike	LC	LC
¹ <i>Leptoptilos crumeniferus</i>	Marabou Stork	LC	NT
¹ <i>Macrodipteryx vexillarius</i>	Pennant-winged Nightjar	LC	LC
² <i>Malcorus pectoralis</i>	Rufous-eared Warbler	LC	LC
² <i>Megaceryle maxima</i>	Giant Kingfisher	LC	LC
¹ <i>Melierax canorus</i>	Southern Pale Chanting Goshawk	LC	LC

LIST OF BIRDS (Cont.)

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

Scientific name	Common name	IUCN status	SA RDB
¹ <i>Melierax gabar</i>	Gabar Goshawk	LC	LC
² <i>Merops apiaster</i>	European Bee-eater	LC	LC
² <i>Merops hirundineus</i>	Swallow-tailed Bee-eater	LC	LC
³ <i>Milvus aegyptius</i>	Yellow-billed Kite	LC	LC
¹ <i>Milvus migrans</i>	Black Kite	LC	LC
² <i>Mirafra fasciolata</i>	Eastern Clapper Lark	LC	LC
² <i>Monticola brevipes</i>	Short-toed Rock-Thrush	LC	LC
² <i>Motacilla aguimp</i>	African Pied Wagtail	LC	LC
² <i>Motacilla capensis</i>	Cape Wagtail	LC	LC
² <i>Muscicapa striata</i>	Spotted Flycatcher	LC	LC
² <i>Myrmecocichla formicivora</i>	Anteater Chat	LC	LC
¹ <i>Neophron percnopterus</i>	Egyptian Vulture	EN	LC
¹ <i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN
² <i>Netta erythrophthalma</i>	Southern Pochard	LC	LC
² <i>Nilaus afer</i>	Brubru	LC	LC
² <i>Numenius phaeopus</i>	Common Whimbrel	LC	LC
² <i>Numida meleagris</i>	Helmeted Guineafowl	LC	LC
² <i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	LC	LC
² <i>Oena capensis</i>	Namaqua Dove	LC	LC
² <i>Oenanthe monticola</i>	Mountain Wheatear	LC	LC
² <i>Oenanthe pileata</i>	Capped Wheatear	LC	LC
² <i>Onychognathus naboroupp</i>	Pale-winged Starling	LC	LC
² <i>Oxyura maccoa</i>	Maccoa Duck	VU	NT
² <i>Parisoma layardi</i>	Layard's Tit-Babbler	LC	LC
² <i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler	LC	LC
² <i>Parus cinerascens</i>	Ashy Tit	LC	LC
² <i>Passer diffusus</i>	Southern Grey-headed Sparrow	LC	LC
³ <i>Passer domesticus</i>	House Sparrow	LC	LC
³ <i>Passer melanurus</i>	Cape Sparrow	LC	LC
² <i>Phalacrocorax africanus</i>	Reed Cormorant	LC	LC
² <i>Phalacrocorax lucidus</i>	White-breasted Cormorant	LC	LC
² <i>Philetairus socius</i>	Sociable Weaver	LC	LC
² <i>Philomachus pugnax</i>	Ruff	LC	LC
¹ <i>Phoenicopterus minor</i>	Lesser Flamingo	NT	NT
¹ <i>Phoenicopterus ruber</i>	Greater Flamingo	LC	NT
² <i>Phragmacia substriata</i>	Namaqua Warbler	LC	LC
² <i>Phylloscopus trochilus</i>	Willow Warbler	LC	LC
² <i>Plectropterus gambensis</i>	Spur-winged Goose	LC	LC
² <i>Plocepasser mahali</i>	White-browed Sparrow-Weaver	LC	LC
³ <i>Ploceus capensis</i>	Cape Weaver	LC	LC
³ <i>Ploceus velatus</i>	Southern Masked-Weaver	LC	LC
¹ <i>Polemaetus bellicosus</i>	Martial Eagle	EN	EN
¹ <i>Polihierax semitorquatus</i>	Pygmy Falcon	LC	LC

LIST OF BIRDS (Cont.)

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

Scientific name	Common name	IUCN status	SA RDB
² <i>Porphyrio madagascariensis</i>	African Purple Swamphen	LC	LC
² <i>Prinia flavicans</i>	Black-chested Prinia	LC	LC
² <i>Pternistis capensis</i>	Cape Francolin	LC	LC
² <i>Pterocles bicinctus</i>	Double-banded Sandgrouse	LC	LC
² <i>Pterocles namaqua</i>	Namaqua Sandgrouse	LC	LC
¹ <i>Ptilopus granti</i>	Southern White-faced Scops-Owl	LC	LC
³ <i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	LC	LC
³ <i>Quelea quelea</i>	Red-billed Quelea	LC	LC
² <i>Rallus caerulescens</i>	African Rail	LC	LC
² <i>Recurvirostra avosetta</i>	Pied Avocet	LC	LC
² <i>Rhinopomastus cyanomelas</i>	Common Scimitarbill	LC	LC
² <i>Rhinoptilus africanus</i>	Double-banded Courser	LC	LC
² <i>Riparia paludicola</i>	Brown-throated Martin	LC	LC
² <i>Riparia riparia</i>	Sand Martin	LC	LC
¹ <i>Sagittarius serpentarius</i>	Secretarybird	EN	VU
² <i>Scopus umbretta</i>	Hamerkop	LC	LC
² <i>Serinus albogularis</i>	White-throated Canary	LC	LC
² <i>Serinus atrogularis</i>	Black-throated Canary	LC	LC
² <i>Serinus flaviventris</i>	Yellow Canary	LC	LC
² <i>Sigelus silens</i>	Fiscal Flycatcher	LC	LC
² <i>Spizocorys conirostris</i>	Pink-billed Lark	LC	LC
¹ <i>Spizocorys sclateri</i>	Sclater's Lark	NT	NT
² <i>Spizocorys starki</i>	Stark's Lark	LC	LC
² <i>Sporopipes squamifrons</i>	Scaly-feathered Finch	LC	LC
² <i>Stenostira scita</i>	Fairy Flycatcher	LC	LC
² <i>Streptopelia capicola</i>	Cape Turtle-Dove	LC	LC
² <i>Streptopelia semitorquata</i>	Red-eyed Dove	LC	LC
² <i>Streptopelia senegalensis</i>	Laughing Dove	LC	LC
² <i>Struthio camelus</i>	Common Ostrich	LC	LC
² <i>Sylvia borin</i>	Garden Warbler	LC	LC
² <i>Sylvietta rufescens</i>	Long-billed Crombec	LC	LC
² <i>Tachybaptus ruficollis</i>	Little Grebe	LC	LC
² <i>Tachymarptis melba</i>	Alpine Swift	LC	LC
² <i>Tadorna cana</i>	South African Shelduck	LC	LC
² <i>Telophorus zeylonus</i>	Bokmakierie	LC	LC
² <i>Threskiornis aethiopicus</i>	African Sacred Ibis	LC	LC
² <i>Tricholaema leucomelas</i>	Acacia Pied Barbet	LC	LC
² <i>Tringa glareola</i>	Wood Sandpiper	LC	LC
² <i>Tringa nebularia</i>	Common Greenshank	LC	LC
² <i>Tringa stagnatilis</i>	Marsh Sandpiper	LC	LC
² <i>Turdus smithi</i>	Karoo Thrush	LC	LC
¹ <i>Tyto alba</i>	Barn Owl	LC	LC
² <i>Upupa africana</i>	African Hoopoe	LC	LC

LIST OF BIRDS (Cont.)

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

Scientific name	Common name	IUCN status	SA RDB
³ <i>Urocolius indicus</i>	Red-faced Mousebird	LC	LC
² <i>Vanellus armatus</i>	Blacksmith Lapwing	LC	LC
² <i>Vanellus coronatus</i>	Crowned Lapwing	LC	LC
² <i>Vidua macroura</i>	Pin-tailed Whydah	LC	LC
² <i>Zosterops pallidus</i>	Orange River White-eye	LC	LC

APPENDIX 3

**A photographic guide for species of conservation concern that occur on
site**

Acanthopsis hoffmannseggiana

Listed as **Data Deficient – Taxonomically problematic**

Widespread and variable species that possibly contains several taxa, some of which may be of conservation concern. More studies needed to find reliable distinguishing characters to separate individual taxa.



Salsola tuberculata

Listed as **Data Deficient – Taxonomically problematic**

Salsola is in need of taxonomic revision. Species are poorly defined and difficult to separate. Based on currently available data, the risk of extinction of this species cannot be assessed.



Oxalis extensa

Listed as **Data Deficient – Insufficient Information**

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

Last officially collected in 1936. Not enough is known about the distribution, specific habitat, or population status of this species to determine its status.



Oxalis haedulipes

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



Nerine laticoma

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



Cryptolepis decidua

All Apocynaceae are protected under **Schedule 2** of the NCNCA



Jamesbrittenia megadenia

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



Ruschia intricata

All Aizoaceae (Mesembryanthemaceae) are protected under **Schedule 2** of the NCNCA



Anacampseros albissima

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



Euphorbia braunsii

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



Aloe claviflora

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



Vachellia erioloba

Protected under the NFA



Boscia albitrunca

Protected under the NFA

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



Boscia foetida* subsp. *foetida

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

