



ECOLOGICAL ASSESSMENT REPORT

KIMCRUSH (Pty) Ltd
Vooruitzigt Dolerite Mine



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KIMCRUSH (PTY) Ltd

**A portion of Portion 1 and a portion of Portion 351 of the Farm
Vooruitzicht 81**

**District of Kimberley
Northern Cape Province**

**Ecological Assessment Report in application for Environmental
Authorisation related to a Mining Right Application (Ref: NC
30/5/1/1/3/2/1/10118 MR) that was lodged with the Department of
Mineral Resources**

August 2017

EXECUTIVE SUMMARY

KIMCRUSH (Pty) Ltd is proposing the mining of dolerite, gravel, sand and clay on a portion of Portion 1 and a portion of Portion 351 of the Farm Vooruitzigt 81. The Mining right area is located within the Kimberley District Municipality of the Northern Cape Province. The company conducted prospecting activities on the property since a Prospecting Right was granted on 2 August 2012, and found that there are areas that can be viably mined. Subsequently, the company has submitted a Mining Right application, which triggers the requirement to apply for Environmental Authorisation.

An ecological assessment is required in order to consider the impacts that the proposed activities might have on the ecological integrity of Vooruitzigt. This terrestrial ecological assessment report describes the ecological characteristics 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 was performed to obtain ecological information for the proposed study area and identify the ecological characteristics and sensitivity of the site. Three plant communities were identified on site of which the open woodland communities in the west is included in the core mining area and considered to be of high sensitivity. The secondary woodland in the east is considered to be of medium sensitivity, while the transformed areas are of low sensitivity. The most profound impacts are expected to be related to the loss of indigenous vegetation, especially species of conservation concern.

Species of conservation concern that are found in the earmarked habitat include *Vachellia erioloba*, *Harpagophytum procumbens*, *Pelargonium aridum* and *Babiana bainesii*. Similarly, the mining operation will result in the large-scale clearance of indigenous vegetation. Permit applications regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation prior to any clearance of vegetation.

Similarly, if any of the *Vachellia erioloba* trees are to be affected, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries three months prior to any potential disturbances to these trees.

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1. INTRODUCTION

1.1. Background information

KIMCRUSH (Pty) Ltd is proposing the mining of dolerite, gravel, sand and clay on a portion of Portion 1 and a portion of Portion 351 of the Farm Vooruitzigt 81 (from hereon referred to as Vooruitzigt). The mining right area is located within the Kimberley District Municipality of the Northern Cape Province and lies \pm 8 km west of the city Kimberley on the N8 (Figure 1). The total extent of the mining right area is 176.3574 ha.

The company conducted prospecting activities on a portion of the aforementioned property since a Prospecting Right was granted on 2 August 2012, and found that there are areas that can be viably mined. Subsequently, the company has submitted a Mining Right application, which triggers the requirement to apply for Environmental Authorisation.

An ecological assessment is required in order to consider the impacts that the proposed activities might have on the ecological integrity of Vooruitzigt and therefore Boscia Ecological Consulting has been appointed by the applicant to conduct an assessment and provide an ecological assessment report.

This assessment report describes the characteristics of habitats in the proposed mining area, identifies 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 as well as the residual impacts after closure.

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

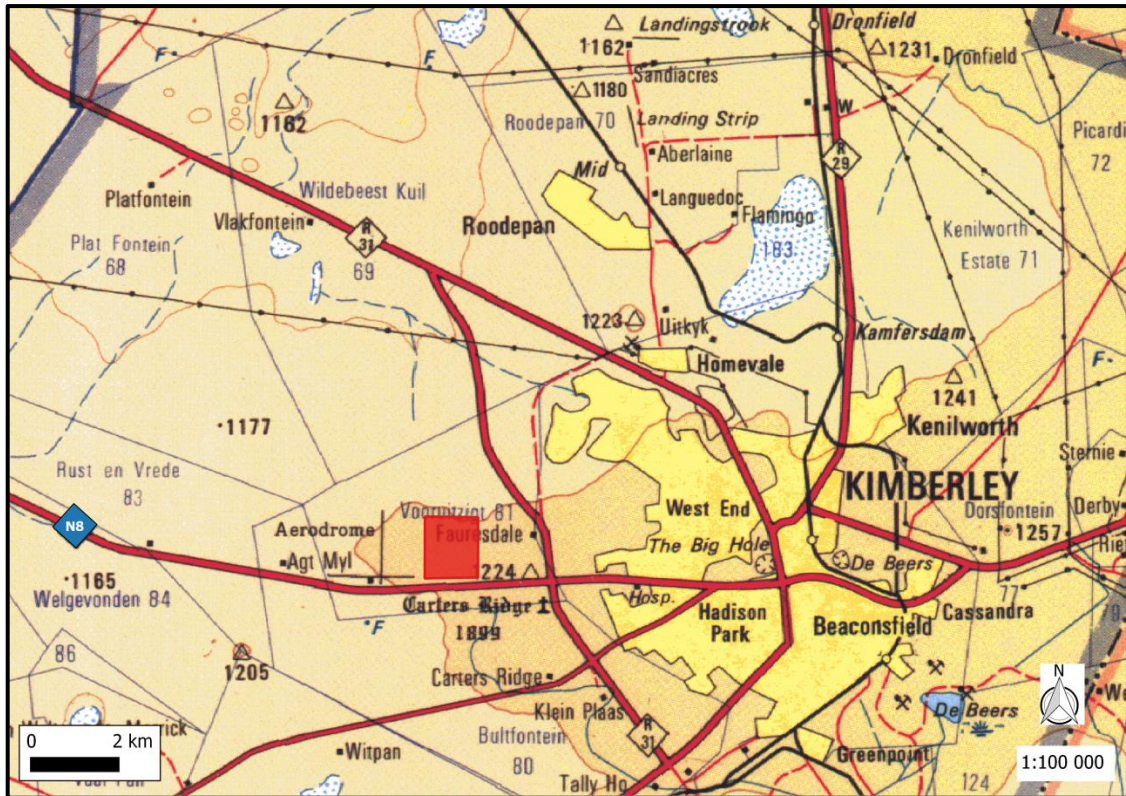


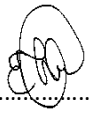
Figure 1. The location of the Vooruitzicht mining area is indicated in red.

1.2. Scope of study

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

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

1.3. Details of the specialist consultant

Company Name	Boscia Ecological Consulting cc	Registration no: 2011/048041/23
Contact Details	Cell: 082 992 1261	Email: BosciaEcology@gmail.com
Address	PostNet Suite #194 Private Bag X2 Diamond 8305	
Designated consultants:	<p>Mr Clayton Weatherall-Thomas <u>Tasks:</u> Field and impact assessment</p> <p><u>Qualifications:</u> MSc Botany (Nelson Mandela Metropolitan University), BSc (Hons) Botany (Nelson Mandela Metropolitan University)</p> <p>Dr Elizabeth (Betsie) Milne <u>Tasks:</u> Project coordination, assessment review and final collation</p> <p><u>Qualifications:</u> PhD Botany (Nelson Mandela Metropolitan University), Masters Environmental Management (University of the Free State), BTech Nature Conservation (Tshwane University of Technology)</p>	
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 primarily based on a dolerite sill, which comprises highly durable igneous rocks from the Early Jurassic Period. This intrusion occurs mainly in the north-west of the property (Figure 2). The dolerite will be mined by means of an opencast method using heavy earthmoving machinery. Vegetated soil will be stripped; whereafter overburden of red sand and weathered dolerite will be excavated. The weathered dolerite will be hauled, screened and all oversized material will be crushed. All screened gravel will then be stockpiled and sold. Subsequently, the intact dolerite will be drilled and blasted, before being hauled and crushed into various sized aggregate to be sold.

An estimated total volume of 20 million tons will be processed over thirty years. Bulk sampling operations that were conducted under the Prospecting Right produced a series of dolerite stockpiles (dumps) amounting to a total of 5 031.38 m³, which will also be sold during the mining operation. Mining activities will primarily make use of existing roads to gain access to the mining right area, but additional roads might be created in order to ease access to excavations or the processing site. A typical crushing plant, with associated infrastructure has already been erected. These include crushers, screens, conveyors, sorting facilities, offices, workshops, kitchens and a security office.

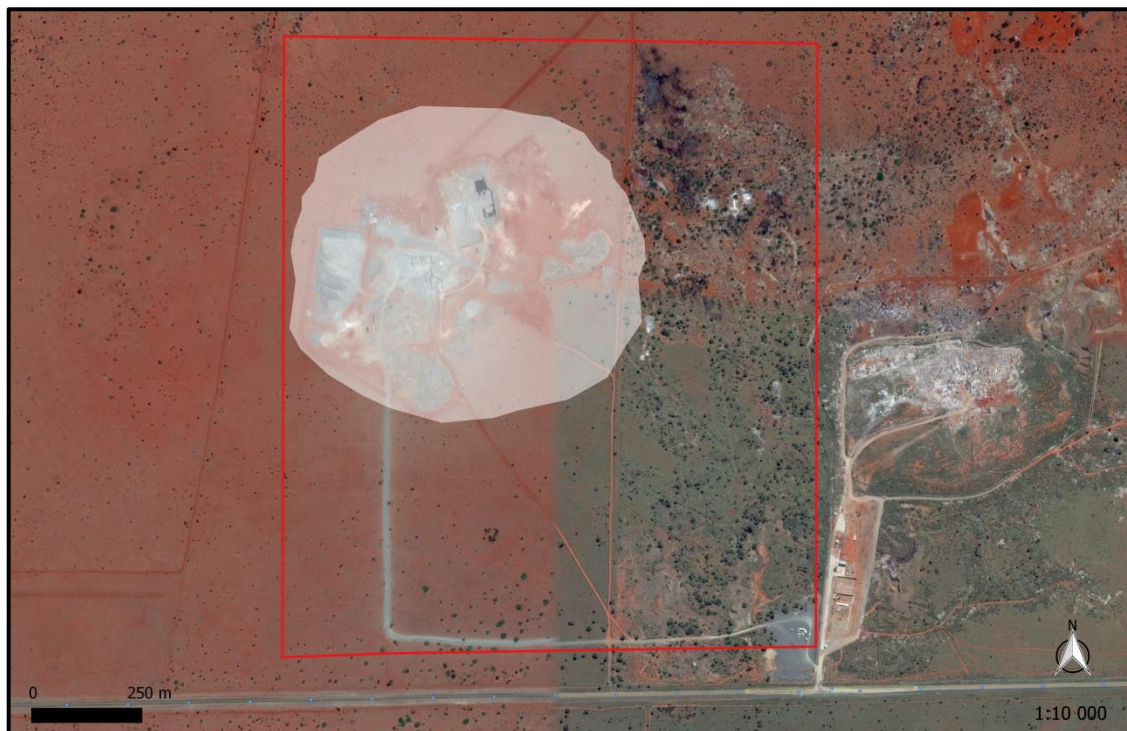


Figure 2. The core mining area is indicated in white, while the red line indicates the mining right area.

2. METHODOLOGY

2.1. Data collection

The study comprised a combination of field and desktop surveys for data collection on fauna and flora in order to obtain the most comprehensive data set for the assessment. The fieldwork component was conducted on 15 July 2017 and most data for the desktop component was obtained from the quarter degree square that include the study area (2824DA).

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 in order to characterise the species composition. The following quantitative data was collected:

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

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

2.2.2. Desktop survey

For the desktop component, the South African National Vegetation Map (Mucina and Rutherford 2006) was used to obtain data on broad scale vegetation types and their conservation status. The South African National Biodiversity Institute's (SANBI) BGIS database was also consulted to obtain information on biodiversity information for the Sol Plaatje Local Municipality (NC091), in which the study area falls.

Further searches were undertaken specifically for Red List plant species within the current study area. Historical occurrences of Red List plant species were obtained from the SANBI: POSA database for the quarter degree squares that include the study area. 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 2017).

2.3. Fauna

2.3.1. Desktop survey

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

Additional information on faunal distribution was extracted from the various databases hosted by the ADU web portal, <http://adu.org.za>. A map of important bird areas (BirdLifeSA 2015) was also consulted. The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.

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

2.3.2. Field survey

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

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

2.4. Assumptions and limitations

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

The site visit for the study took place during winter, which is not a favourable time of the year. Therefore, most grasses, annuals and other flowering plants were not in flower and also not in the most suitable condition for the survey. The best time to evaluate vegetation in the study area is after at least some summer rain when the vegetation has responded and is in an actively growing state. The results presented here can therefore only reflect the condition of the vegetation. Consequently, the timing of the site visit is considered to be a limiting factor and it is expected that some species of conservation concern were not visible during the time of sampling. Nevertheless, most of the common and significant species encountered were identifiable and therefore the condition of the veld did not have a major effect on the results.

Due to the fact that the earmarked site has already been subjected to prospecting activities, it is difficult to determine baseline information related to the natural conditions, especially for the eastern half of the study area that has clearly been transformed. However, the surrounding pristine habitats in the west can be used as comparative conditions due to similar geologies.

2.5. Sensitivity mapping and assessment

An ecological sensitivity map of the site was produced by integrating the information collected on site with 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 increased with probability and 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:

$$\begin{array}{c} \textit{CONSEQUENCE} \\ \text{(Severity + Spatial Scope + Duration)} \end{array} \quad \times \quad \begin{array}{c} \textit{PROBABILITY} \\ \text{(Frequency of activity + Frequency of impact)} \end{array}$$

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

Currently, the major land uses in the area are activities related to urbanisation, such as municipal waste facilities, residential buildings and commercial properties (Figure 3). According to AGIS, the land capability for the study site is non-arable with moderate potential grazing land. The grazing capacity is between 9 and 13 ha/AU, with the agricultural region being demarcated for cattle farming. The area is categorised to have no suitability for crop production.

Vooruitzigt is mainly used for the current KIMCRUSH operation, but hunting dogs were seen crossing the property during the site visit. This could suggest that illegal hunting of resident wildlife occurs here. The property does not seem to be fenced-off in the north and west and therefore reasonably accessible from these directions.

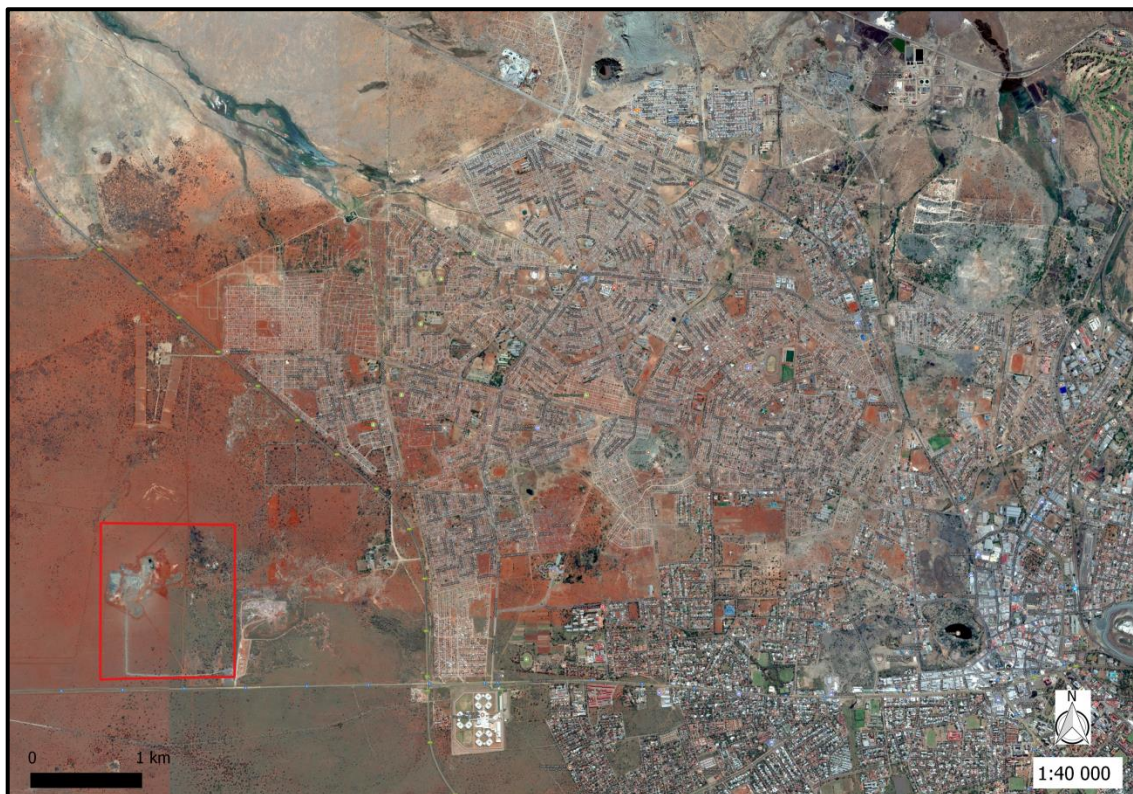


Figure 3. The extent of urbanisation in the area is clearly seen with the city of Kimberley in the east, while the proposed mining right area is indicated by the red line in the west.

3.2. Geology, soils and topography

According to CDSLI (1993) the geological features on Vooruitzigt mainly comprise quaternary deposits, where red windblown sand covers almost the entire surface. However, Dolerite from the Early Jurassic Period protrudes in the north-west and south-east corners of the study site (Figure 4). The mining operation is primarily based on a dolerite sill, which comprises highly durable igneous rocks from the Early Jurassic Period that occurs up to 24 m deep. This intrusion occurs mainly in the north-west of the property.

The area is generally flat, characterised by plains with open low hills or ridges. Altitudes are around 1 209 m above sea level. The terrain is indicated by a very gentle slope of less than 1 % running south-east. The site is closely associated with unit 3 of the Ae45 landtype (Figure 5). Here, red, freely drained soils with a high base status and a depth of more than 300 mm are found. Soils of the study areas predominantly constitute the Hutton form.

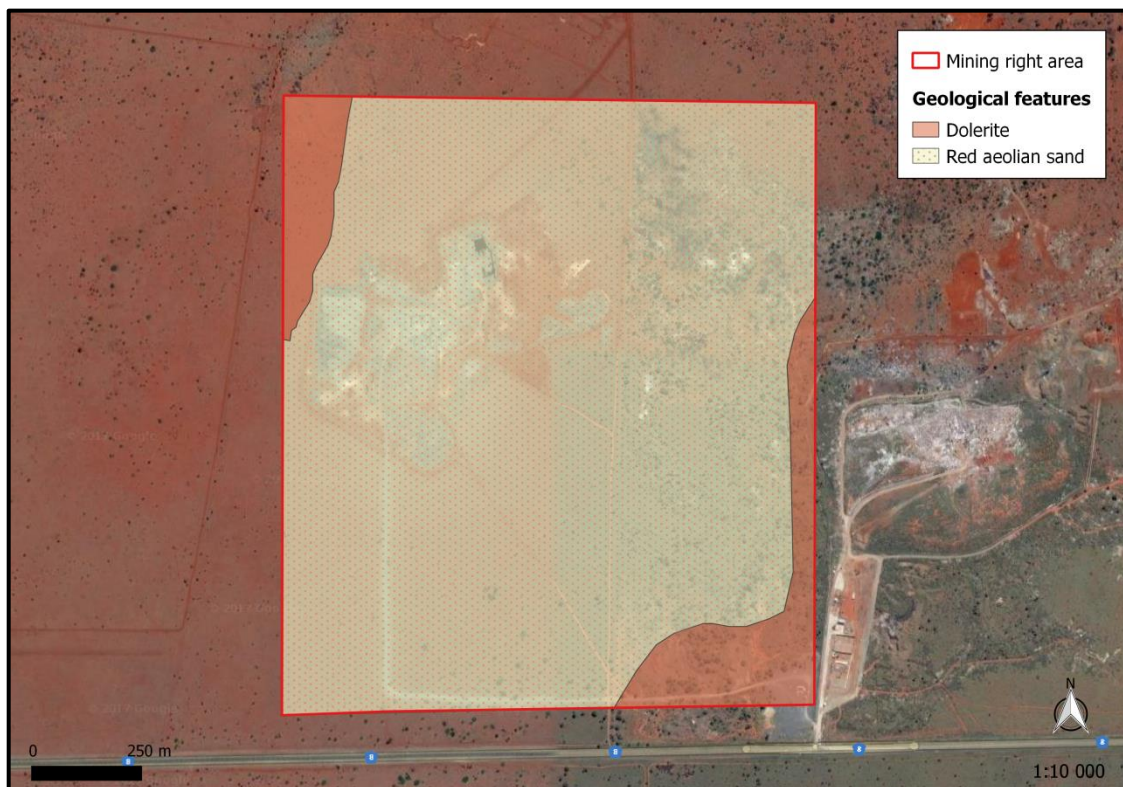


Figure 4. The distribution of geological features in the study area.

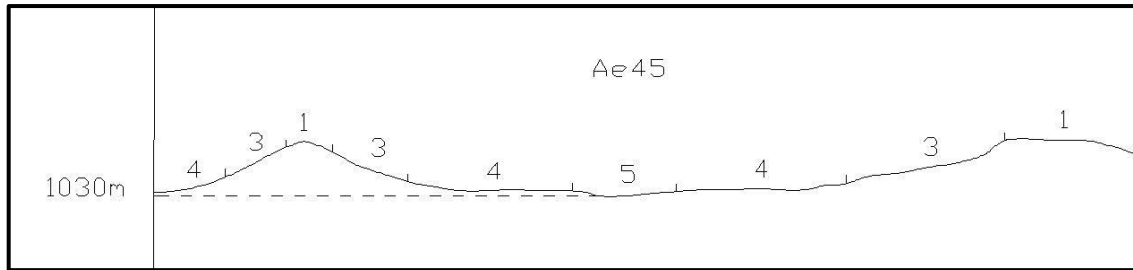


Figure 5. A terrain form sketch for the Ae45 landtype.

3.3. Vegetation

3.3.1. Broad-scale vegetation patterns

The study area falls within the Savanna Biome (Mucina and Rutherford 2006) and according to the vegetation map of Mucina and Rutherford (2012), the entire site is represented by Kimberley Thornveld (Figure 6).

Kimberley Thornveld is distributed in the North-West, Free State and Northern Cape Provinces at altitudes between 1 050 and 1 400 m. It is found in the Kimberley, Hartswater, Bloemhof and Hoopstad Districts, but is also within the Warrenton, Christiana, Taung, Boshof and Barkly West Districts. The unit is typically presented as slightly undulating sandy plains with a well-developed tree and shrub layer and an open grass layer. Andesitic lavas of the Allanridge Formation occur in the north and west, while fine-grained sediments of the Karoo Supergroup are found in the south and east. Soils are deep, sandy to loamy, and of the Hutton form. The most common land types are Ae and Ah. The unit is classified as being least threatened, but 18 % has already been transformed, predominantly by cultivation. Only 2 % is currently conserved in statutory reserves and no endemic species are known from this unit. It is specifically prone to *Senegalia mellifera* encroachment following overgrazing, but the occurrence and risk of erosion is very low.



Figure 6. The broad-scale vegetation units (Mucina and Rutherford 2012) present in the study area.

3.3.2. Fine-scale vegetation patterns

Plant communities in the study area are delineated according to plant species correspondences, change in soil structure and disturbance regimes. They can be divided into three distinct units (Figure 7), which are described below. These descriptions include unique characteristics and the dominant species found in each unit. A complete plant species list, including those species likely to occur here is presented in Appendix 1.

i) *Pogonarthria squarrosa* -*Vachellia tortilis* open woodland on red sandy soil

This community primarily covers the western half of the property, where no previous mining activities occurred (Figure 7). It has a high grass cover with less than 15 % bare ground. Trees and shrubs are widely scattered across the site, increasing in density in a northerly direction (Figure 8). Dwarf shrubs are also more common in the north. The vegetation is regarded to be intact, as the cover of alien and invasive plant species are low and the relatively high cover of palatable species, such as *Themeda triandra*, indicates that the veld is not overgrazed.

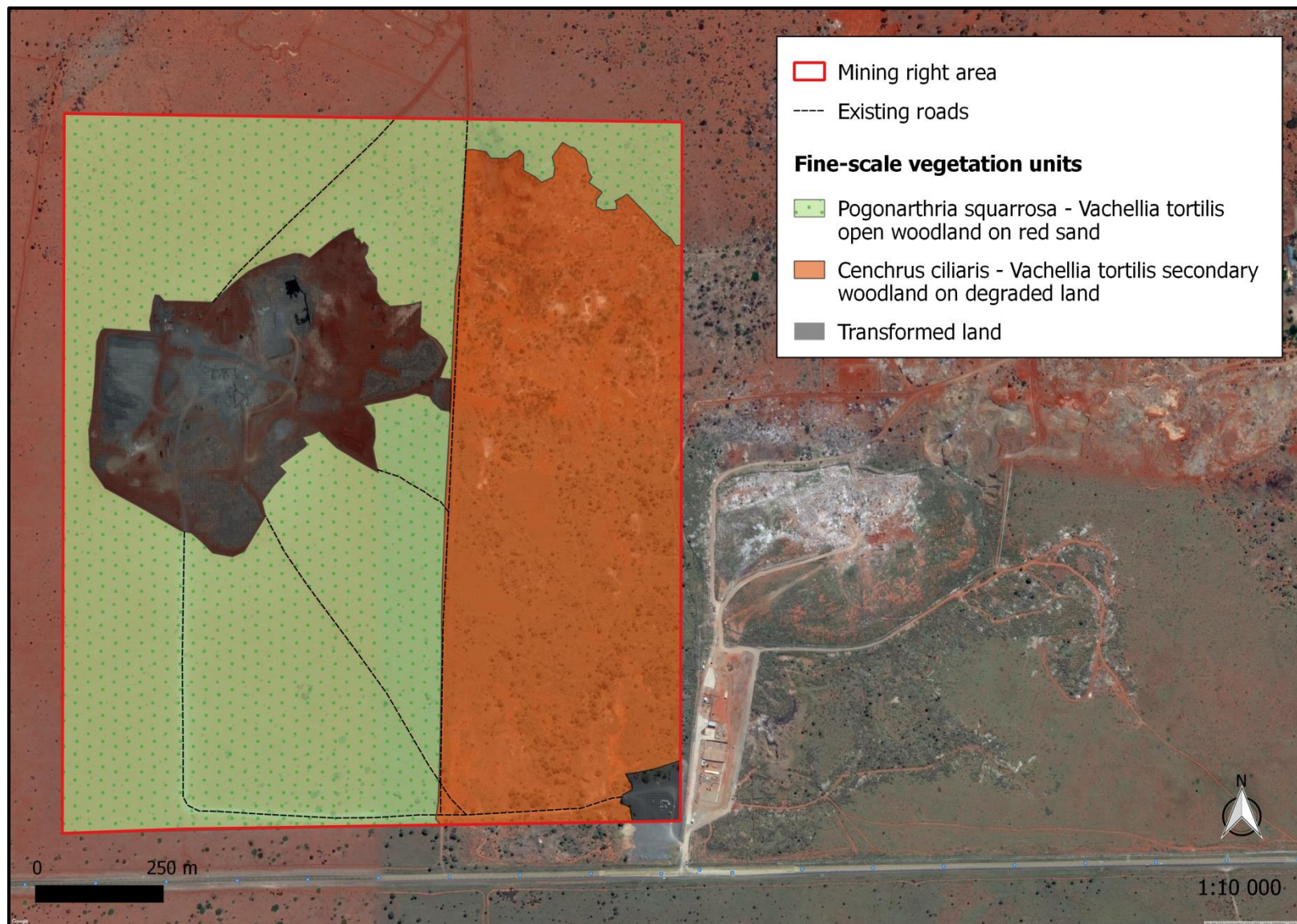


Figure 7. The distribution of fine-scale plant communities in the study area.



Figure 8. The density of trees varies in the open woodland, ranging from highly scattered in the south (top) to being more clustered in the north (bottom).

The scattered tall woody layer is dominated by *Vachellia tortilis* trees, with *V. erioloba*, *Ehretia rigida*, *Searsia lancea*, *S. ciliata*, *Tarchonanthus camphoratus*, *Ziziphus mucronata*, *Lycium hirsutum*, *Diospyros lycioides* and *Grewia flava* also found here. The number of *V. erioloba* trees greatly increases in the north.

The shrub and low shrub layer is not well developed, with common species including *Asparagus larycinus*, *Lasiosiphon polycephalus*, *Vachellia hebeclada* subsp. *hebeclada*, *Searsia ciliata*, *Plinthus karooicus*, *Pollichia campestris* and *Wahlenbergia nodosa*. A number of species occurred in very low densities, such as *Argyrobium pauciflorum*, *Asparagus suaveolens*, *Chrysocoma ciliata*, *Felicia muricata*, *Helichrysum zeyheri*, *Hermannia tomentosa*, *Hertia pallens*, *Kyphocarpa angustifolia* and *Pentzia globosa*.

Overall, the grass layer is dominated by *Aristida vestita*, *Pogonarthria squarrosa*, *Schmidtia pappophoroides* and *Themeda triandra*, with *Eragrostis lehmanniana*, *Eragrostis porosa* and *Stipagrostis uniplumis* being intermittently dominant. Other grasses such as *Aristida congesta* subsp. *congesta* and *A. congesta* subsp. *barbicollis*, *Brachiaria marlothii*, *Enneapogon cenchroides*, *Sporobolus fimbriatus*, *Tragus racemosus*, *Eragrostis trichophora* and *Cynodon dactylon* occur more sporadically.

The herb layer is not well developed, taking into account that the assessment was conducted during winter, but *Citrillus lanatus*, *Gazania krebsiana* subsp. *krebsiana*, *Hermannia comosa*, *Plectranthus* cf. *madagascariensis*, *Harpagophytum procumbens* and *Senecio consanguineous* occurred here. Two bulb species, namely *Babiana bainesii* and *Schizocarphus nervosus*, were found in the north.

Species of conservation concern include *Vachellia erioloba*, which is classified as declining by the Red List and protected under the NFA. *Harpagophytum procumbens* and *Babiana bainesii* is protected according to the NCNCA. Exotics include *Atriplex lindleyi* subsp. *inflata*, *Opuntia ficus-indica*, *Cymbopogon pospischilii* and *Bidens pilosa*.

ii) *Cenchrus ciliaris* – *Vachellia tortilis* secondary woodland on degraded land

This community occurs in a highly degraded and transformed landscape on the eastern side of the study area (Figure 7). The degraded status is suggested by old excavations, rows of overburden rock, many dumped builder's rubble as well as a large number of alien invasive species and garden escapes (Figure 9). The vegetation is presented as secondary woodland, with a high density of invasive trees in a shrubby grassland matrix. The cover of bare ground or rock varies between 20 and 30 %.

The dominant tree species found are *Eucalyptus camaldulensis*, *Searsia lancea*, *Melia azedarach*, *Prosopis glandulosa*, *Salix babylonica*, *Schinus terebinthifolius* and *Vachellia tortilis*. *Vachellia erioloba* occurs here in reduced numbers and individuals are generally younger. Two cactus tree species, namely *Opuntia ficus-indica* and *O. engelmannii* are fairly common as well.

The cover of shrubs and dwarf shrubs is higher compared to the open woodland community. The most conspicuous species include *Agave americana*, *Berkheya pinnatifida*, *Asparagus larycinus*, *Chrysocoma ciliata*, *Datura ferox*, *Lasiosiphon polycephalus*, *Lightfootia nodosa*, *Melolobium canescens*, *Plinthus karooicus*, *Phyllanthus maderaspatensis* and *Searsia ciliata*.

The dominant grass in this community is *Cenchrus ciliaris*. The majority of the grasses that occur in the open woodland community are also present here, but they are not as dominant. These include *Aristida vestita*, *Cynodon dactylon*, *Pennisetum clandestinum*, *Sporobolus fimbriatus*, *Schmidtia pappophoroides*, *Themeda triandra*, *Eragrostis lehmanniana*, *Eragrostis porosa* and *Stipagrostis uniplumis*. Stands of *Phragmites australis* also occur throughout this community.

A high cover of herbs is found in the secondary savanna, many of which are invasive species. The most common species include *Bidens pilosa*, *Citrillus lanatus*, *Dicoma capensis*, *Gazania krebsiana* subsp. *krebsiana*, *Gomphrena celosioides*, *Kali turgidum*, and *Kyphocarpa angustifolia*, but *Pelargonium aridum* was also found here.

Not many species of conservation concern are present in this community, but include *Vachellia erioloba* (Red List and NFA) and *Pelargonium aridum* (NCNCA).



Figure 9. The secondary woodland community has a large amount of rubble (top), as well as rocks and boulders (bottom) that dominate the surface. The widespread occurrence of invasive species such as *Opuntia engelmannii* (bottom) is illustrated as well.

Invasive species found in the secondary woodland include *Argemone ochroleuca*, *Eucalyptus camaldulensis*, *Melia azedarach*, *Opuntia ficus-indica*, *O. engelmannii*, *Prosopis glandulosa*, *Salix babylonica* and *Schinus terebinthifolius*.

iii) Transformed land

Two areas of the property assessed were completely transformed. The first area is the parking lot at the entrance to the mine in the south-east, while the second is the functional mine in the north-west (Figure 7 and Figure 10). These sites are dominated by grasses such as *Cenchrus ciliaris*, *Cynodon dactylon*, *Pogonarthria squarrosa*, *Aristida congesta* subsp. *congesta*, as well as weedy herbs and shrubs including *Argemone ochroleuca*, *Bidens pilosa*, *Citrillus lanatus*, *Datura ferox*, *Gomphrena celosioides*, and *Kali turgidum*. A number of *Vachellia tortilis* remain in these areas as well.



Figure 10. The transformed lands of the study site include the entrance to the mine (top) as well as the area where project activities are currently active (bottom).

3.3.3. Population of sensitive, threatened and protected plant species

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

Most species recorded in the area are classified as least concern; a category which includes widespread and abundant taxa (Table 2). However, two species, i.e. *Drimia sanguinea* (Near Threatened) and *Oxalis setosa* (Data Deficient – Taxonomically problematic) are listed. The population of *D. sanguinea* has declined by 20 - 25% in the last three generations (generation length 20 years) due to harvesting for the medicinal plant trade, especially for the Gauteng trade. Declines are expected to continue. None of these species were observed during the field survey, but the study site should ideally be transversed during summer to confirm their absence from the site.

Table 2. Plant species found in the region that are of conservation concern.

FAMILY	Scientific name	Status	NFA	NCNCA
FABACEAE	<i>Vachellia erioloba</i>	LC	X	
GERANIACEAE	<i>Pelargonium aridum</i>	LC		S1
HYACINTHACEAE	<i>Drimia sanguinea</i>	NT		S2
IRIDACEAE	<i>Babiana bainesii</i>	LC		S2
OXALIDACEAE	<i>Oxalis setosa</i>	DDT		S1
PEDALIACEAE	<i>Harpagophytum procumbens</i>	-		S1

Vachellia erioloba, previously listed as declining, is currently regarded to be widespread and common. Although it may be declining in some places, it is not in danger of extinction. Concerns in the past have been raised over the large volumes of Camel Thorn wood being removed for commercial sale of firewood. Many trees are also killed as a result of bush encroachment control through pesticides. A study conducted in the Northern Cape indicated that at present only dead trees are being harvested for firewood and only a very small percentage of the study area (<2%) was affected by clearing of this species. Nevertheless, this species is protected in terms of the National Forests (NFA) Act No 84 of 1998 (Table 2). It is mostly restricted to the open woodland community, where it ranges from approximately three trees per hectare in the south to over 12 individuals in the north.

They occur as large individual trees with canopies of ± 5 m tall and ± 8 m wide, as well as younger, more clustered individuals of ± 2 m tall and 1 m wide (Figure 11). There are a number of mature adults in the population and recruitment is evident from the saplings and young trees present. A number of individuals occur in the secondary woodland, but at considerably reduced numbers, around 1 to 2 per hectare. In order to damage or remove any protected trees (seedlings to adults) an application must be submitted to the Northern Cape Department of Agriculture, Forestry and Fisheries (DAFF) and a licence obtained from DAFF at least three months prior to such activities.






Figure 11. The protected tree *Vachellia erioloba* occurs as large individual trees (left) as well as younger, more clustered individuals (right).

Specially protected species in terms of Schedule 1 of the Northern Cape Nature Conservation (NCNCA) Act No. 9 of 2009 (Table 2) that are known from the study area include *Pelargonium aridum* and *Harpagophytum procumbens*. Only one individual of *P. aridum* was seen growing between the boulders in the secondary woodland community, while a few seed pods of *H. procumbens* were found in the open woodland community. Species that are protected in terms of Schedule 2 include *Babiana bainesii*. The first occurs at low densities in the open woodland, while *P. karooicus* is more common and occurs throughout the property in both the open- and secondary woodland communities.

A projection for species of conservation concern is presented in Table 3 and a photographic guide to those species encountered during the survey is attached as Appendix 3. Please note that the projections are only rough estimates to provide some form of indication as a guideline for species to be affected. It is impossible to confirm at this stage how large the final affected area will be as well as exactly where the project activities will take place. Therefore a “worst-case scenario” approach was applied.

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

Table 3. A projection of community sizes and species of conservation concern found in the study area.

Communities	Total size	Predicted extent to be affected	Associated species of conservation concern	Population density (ind/ha)	Estimated population to be affected
 <i>Pogonarthria squarrosa</i> - <i>Vachellia tortilis</i> open woodland on red sandy soil	± 85 ha	± 30 ha	<i>Vachellia erioloba</i> <i>Babiana bainesii</i> <i>Harpagophytum procumbens</i>	3 - 12 < 1 < 1	± 200 ± 30 ± 30
 <i>Cenchrus ciliaris</i> – <i>Vachellia tortilis</i> secondary woodland on degraded land	± 61 ha	± 61 ha	<i>Vachellia erioloba</i> <i>Pelargonium aridum</i>	< 1 < 1	± 50 ± 50
 Transformed land	± 30 ha	30 ha	None	n/a	n/a

3.3.4. Weeds and invader plant species

Weeds and invasive species are controlled in terms of the National Environmental Management: Biodiversity (NEMBA) Act 10 of 2004, the Conservation of Agricultural Resources (CARA) Act 43 of 1993, as well as the NCNCA (Schedule 6). These are species that do not naturally occur in a given area and exhibit tendencies to invade that area, and others; at the cost of locally indigenous species. To govern the control of such species, NEMBA and CARA have divided weeds and invader species into categories (see Table 4). All declared weeds and invasive species recorded in and around the study area are listed in

Table 5, along with their categories according to CARA, NEMBA and NCNCA.

Table 4. The categorisation of weeds and invader plant species, according to NEMBA and CARA.

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

Table 5. A list of declared weeds and invasive species recorded in the study area.

Scientific name	Common name	CARA	NEMBA	NCNCA
<i>Agave americana</i>	Spreading century plant	2	1b	S6
<i>Argemone ochroleuca</i>	Mexican poppy	1	1b	S6
<i>Cereus jamacaru</i>	Queen of the night	1	1b	S6
<i>Datura ferox</i>	Large thorn apple	1	-	S6
<i>Opuntia engelmannii</i>	Small round-leaf prickly pear	1	1b	S6
<i>Opuntia ficus-indica</i>	Sweet prickly pear	1	1b	S6
<i>Prosopis glandulosa</i> var. <i>glandulosa</i>	Honey mesquite	2	3	S6
<i>Salix babylonica</i>	Weeping Willow	2	-	S6
<i>Schinus terebinthifolius</i>	Brazilian pepper tree	1	3	S6
<i>Eucalyptus camaldulensis</i>	Red river gum	2	1b	S6

3.3.5. Indicators of bush encroachment

Bush encroacher species are controlled in terms of Regulation 16 of CARA; where land users of an area in which natural vegetation occurs and that contains communities of encroacher indicator plants are required to follow sound practices to prevent the deterioration of natural resources and to combat bush encroachment where it occurs. Declared indicators of bush encroachment in the Northern Cape, which were recorded in and around the study area, are listed in Table 6.

Table 6. A list of declared indicators of bush encroachment in the Northern Cape recorded in the study area.

Scientific name	Common name
<i>Senegalia mellifera</i>	Black thorn
<i>Vachellia tortilis</i> subsp. <i>heteracantha</i>	Umbrella thorn
<i>Grewia flava</i>	Wild raisin
<i>Tarchonanthus camphoratus</i>	Camphor bush

3.4. Faunal communities

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

The landscape features, i.e. plains and degraded land, does not provide diverse habitat opportunities to faunal communities. However, the micro-habitats provided by the pristine vegetation are likely to host a variety of small mammals, while the trees (exotic and indigenous) provide important nesting sites for birds. The overgrown piles of rocks and boulders could also potentially be important refugia for reptiles.

3.4.1. Mammals

As many as 50 terrestrial mammals and nine bat species have been recorded in the region (see Appendix 2), of which Steenbok were encountered during the site visit.

Nine listed terrestrial mammal species and four listed bat species potentially occur in the area (Table 7). The African Straw-coloured Fruit-bat and Geoffroy's Horseshoe Bat have a high chance of occurring on site, given their wide habitat tolerances. The Dent's Horseshoe Bat, Darling's Horseshoe Bat and Bushveld Gerbil have a moderate potential of occurring on site. Although their habitat preference is similar to what is found on site, the natural vegetation has already been transformed to a large extent.

The Sclater's Golden Mole, Ground Pangolin, Lesser Dwarf Shrew, South African Hedgehog, Black-footed cat, Brown Hyena, African Striped Weasel and Honey Badger all have a low potential of occurring on site due to the proximity of the site to residential and industrial development. Many of these are rather skittish and therefore they will most likely not occur here.

Table 7. A list of mammal species found in the study area, which are of conservation concern in terms of the international (IUCN) Red List and the South African Red Data Book (SA RDB). Their respective NCNCA schedule numbers are indicated in superscript.

Scientific name	Common name	IUCN Status	SA RDB Status
² <i>Eidolon helvum</i>	African Straw-coloured Fruit-bat	NT	<i>Not listed</i>
² <i>Rhinolophus denti</i>	Dent's Horseshoe Bat	LC	NT
² <i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	LC	NT
² <i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	NT
² <i>Chlorotalpa sclateri</i>	Sclater's Golden Mole	LC	DD
² <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	DD
¹ <i>Smutsia temminckii</i>	Ground Pangolin	VU	VU
² <i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	DD
¹ <i>Atelerix frontalis</i>	South African Hedgehog	LC	NT
¹ <i>Felis nigripes</i>	Black-footed cat	VU	LC
¹ <i>Hyaena brunnea</i>	Brown Hyena	NT	NT
¹ <i>Poecilogale albinucha</i>	African Striped Weasel	LC	DD
¹ <i>Mellivora capensis</i>	Honey Badger	LC	NT

Virtually all mammals of the study area are protected; either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Those that are specially protected, and not yet mentioned as listed, include Aardvark, Aardwolf, African Wild Cat, Cape Fox and Striped Polecat. These all have a low potential to occur on site due the proximity to residential areas. Problem animals (Schedule 4) include Black-backed Jackal, Vervet Monkey, Chacma Baboon and Caracal, of which Vervet Monkey is most likely to occur on site.

The core mining activities are associated with the existing project site and the open woodland community in the north-west of the property. Listed mammals that are most likely to be impacted in the form of species- and/or habitat loss resulting from the mining activities include bats and small mammal species that are associated with these habitats.

3.4.2. Reptiles

The site lies within the distribution range of at least 55 reptile species (see Appendix 2), of which none are of international or national conservation concern. Three species are endemic to South Africa, i.e. *Homopus femoralis* (Greater Padloper), *Pachydactylus mariquensis* (Common Banded Gecko) and *Agama aculeata distanti* (Eastern Ground Agama) and most area are protected either according to Schedule 1, 2 or 3 of NCNCA, except for agamas, geckos and skinks (see Appendix 2). Specially protected species include *Karusasaurus polyzonus* (Southern Karusa Lizard) and *Chamaeleo dilepis dilepis* (Namaqua Chamaeleon).

The habitat diversity for reptiles in the study area is not high, but the open woodland community as well as rocks and boulders are considered to be the most important habitat for reptiles at the site. It is however not foreseen that the mining activities will cause significant habitat loss for the local reptile population. In general, impacts by the proposed mining operations on reptiles are likely to be low.

3.4.3. Amphibians

Fifteen amphibian species are known from the region (Appendix 2). Low amphibian diversity is normal for an arid area, but is likely to increase within areas where water collects after rain. As a result, higher amphibian diversity is most likely to be found in these micro-habitats.

Pyxicephalus adspersus (Giant Bull Frog) is the amphibian species of conservation concern that potentially occur in the study area. It is listed as Near Threatened in terms of the Red Data Book of Frogs and is protected according to Schedule 1 of the NCNCA. All other amphibians of the study area are protected according to Schedule 2 of NCNCA (see Appendix 2). Impacts on amphibians are likely to be low.

3.4.4. Avifauna

The study site does not fall within any of the Important Bird Areas (IBA) defined by Birdlife South Africa, but lies close to Kamfers Dam (7 km), Dronfield (11 km) and Benfontein (14 km) as depicted on Figure 12.

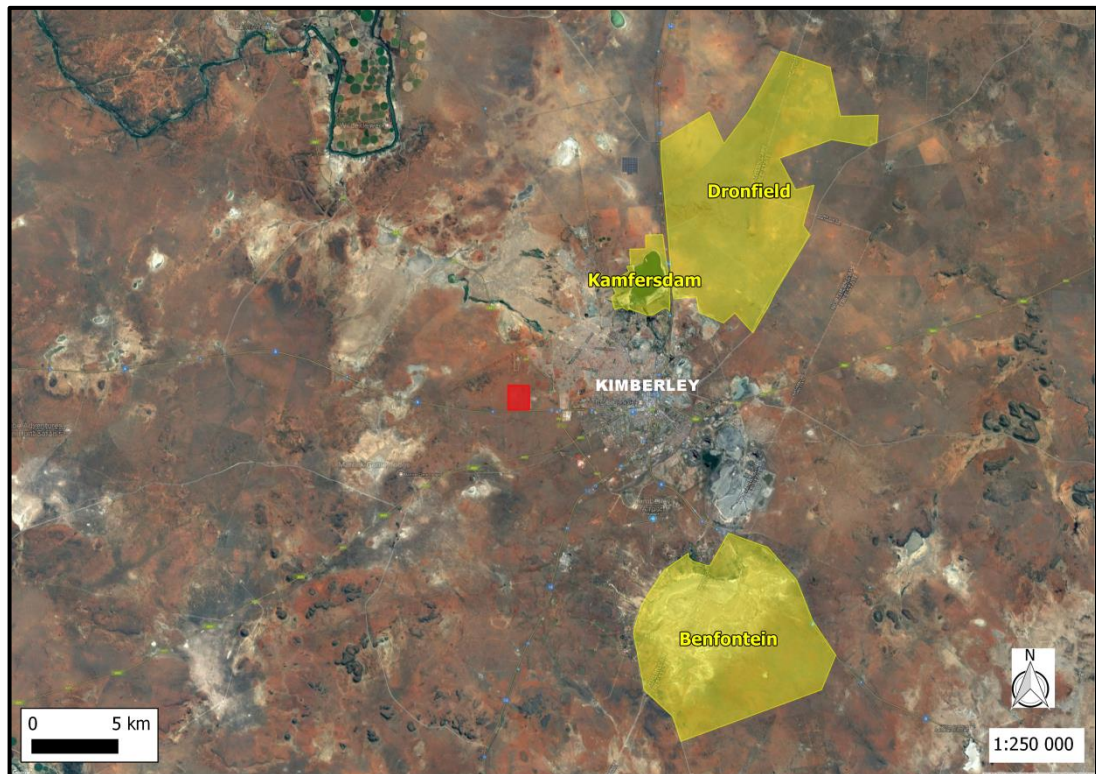


Figure 12. Vooruitzicht (indicated in red) lies in the vicinity of three Important Bird Areas (BirdLifeSA 2015), i.e. Kamfersdam and the Dronfield- and Benfontein Nature Reserves (indicated in yellow).

Kamfersdam is an endorheic pan that has been transformed into a permanent wetland over the past decade due to an increase in sewage effluent inflow. Hence, it has become an important habitat for birds, especially the Greater- and Lesser Flamingos. The dam supports the largest permanent population of Lesser Flamingos in southern Africa. The most significant threats to Kamfersdam are poor water quality, flooding and expansion of urban development, while threats to the bird population include illegal hunting of water birds and the collisions and mortality of flamingos and other water birds caused by power lines and the electrical transmission lines along the railway.

Dronfield supports large numbers of breeding White-backed Vulture, which comprises 41 % of the breeding pairs in the Kimberley region. These birds forage over wide areas and a pair was encountered soaring over the study area during the site visit. The use of poisons in farming areas to combat mammalian predators still poses a threat to scavenging raptors, and hundreds of vultures can be killed in a single poisoning incident. Collisions with transmission power lines and electrocutions on reticulation and distribution power lines also pose an ongoing threat to vultures and other trigger species.

Benfontein is a Nature Reserve owned by De Beers Consolidated Mines since 1891 and there has been significant investment by research groups over the years. The farm supports small numbers of breeding White-backed Vulture, Blue Crane and Blue Korhaan. The farm also holds several biome-restricted assemblage species and congregatory species, including Lesser Flamingo. More than 1 700 water birds are present during years of high rainfall on the ephemeral Benfontein Pan, and 65 water bird species have been recorded on the pan. There are presently few threats to this IBA as it is being well conserved. The invasive mesquite *Prosopis glandulosa*, currently present in the north-eastern section and spreading along the N8 on the eastern boundary, could become a significant threat if not controlled. Collisions with the power line transecting the eastern side of Benfontein are a threat to the White-backed Vultures and large terrestrial birds such as Blue Crane and Ludwig's Bustard. Anglo American has recently bought De Beers and this change of ownership may lead to a change in land use or the sale of the property.

A total number of 299 bird species have been recorded from the region and all of these species are protected either according to Schedule 1, 2 or 3 of NCNCA (see Appendix 2). Twenty-five listed bird species are known from the region, all of which are classified as Vulnerable, Near Threatened or Endangered (Table 8). Although none of these species were observed to reside on site, they are expected to potentially occur on site either by occasionally passing over the area or by frequently foraging in the various habitats.

In general, bird species of the study area are likely to experience the most disturbances among all fauna as a result of the Vooruitzicht mining activities. During the site visit it became evident that the abundance of trees and the grassy woodland matrix host rich bird diversity and are important for breeding, nesting and foraging. The most significant impacts are expected to be in the form of habitat destruction. This will especially impact the open woodland community in the west of the property.

Table 8. Bird species found in the study area that are of conservation concern.

Scientific name	Common name	Status
<i>Aquila rapax</i>	Tawny Eagle	EN
<i>Circus ranivorus</i>	African Marsh-Harrier	EN
<i>Gyps africanus</i>	White-backed Vulture	EN
<i>Gyps coprotheres</i>	Cape Vulture	EN
<i>Mycteria ibis</i>	Yellow-billed Stork	EN
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN
<i>Polemaetus bellicosus</i>	Martial Eagle	EN
<i>Torgos tracheliotus</i>	Lappet-faced Vulture	EN
<i>Anthropoides paradisea</i>	Blue Crane	NT
<i>Ardeotis kori</i>	Kori Bustard	NT
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT
<i>Ciconia abdimii</i>	Abdim's Stork	NT
<i>Eupodotis caerulescens</i>	Blue Korhaan	NT
<i>Glareola nordmanni</i>	Black-winged Pratincole	NT
<i>Leptoptilos crumeniferus</i>	Marabou Stork	NT
<i>Limosa limosa</i>	Black-tailed Godwit	NT
<i>Numenius arquata</i>	Eurasian Curlew	NT
<i>Oxyura maccoa</i>	Maccoa Duck	NT
<i>Phoenicopterus minor</i>	Lesser Flamingo	NT
<i>Phoenicopterus ruber</i>	Greater Flamingo	NT
<i>Aquila verreauxii</i>	Verreaux's Eagle	VU
<i>Circus maurus</i>	Black Harrier	VU
<i>Falco biarmicus</i>	Lanner Falcon	VU
<i>Rostratula benghalensis</i>	Greater Painted-snipe	VU
<i>Sagittarius serpentarius</i>	Secretarybird	VU

Apart from general disturbances and habitat loss, other potential impacts would come from the accidental or intentional killing of birds. Many of the raptors, including vultures and owls, are susceptible to intentional killing due to cultural beliefs. Monitoring during the mining operation would be vital in order to ensure no or low impact.

3.5. Critical biodiversity areas and broad-scale processes

The proposed mining site does not fall within a Critical Biodiversity Area, any formally protected area, or within a National Protected Areas Expansion Strategy Focus Area (Figure 13). Furthermore, the broad-scale vegetation unit of the study area (Kimberley Thornveld) is classified as least threatened and therefore no formal fine-scale conservation planning has been conducted. These vegetation units have however been identified as a medium conservation priority area within the Siyanda Environmental Management Framework, but the study area does not fall within a proposed conservation area for the District Municipality.

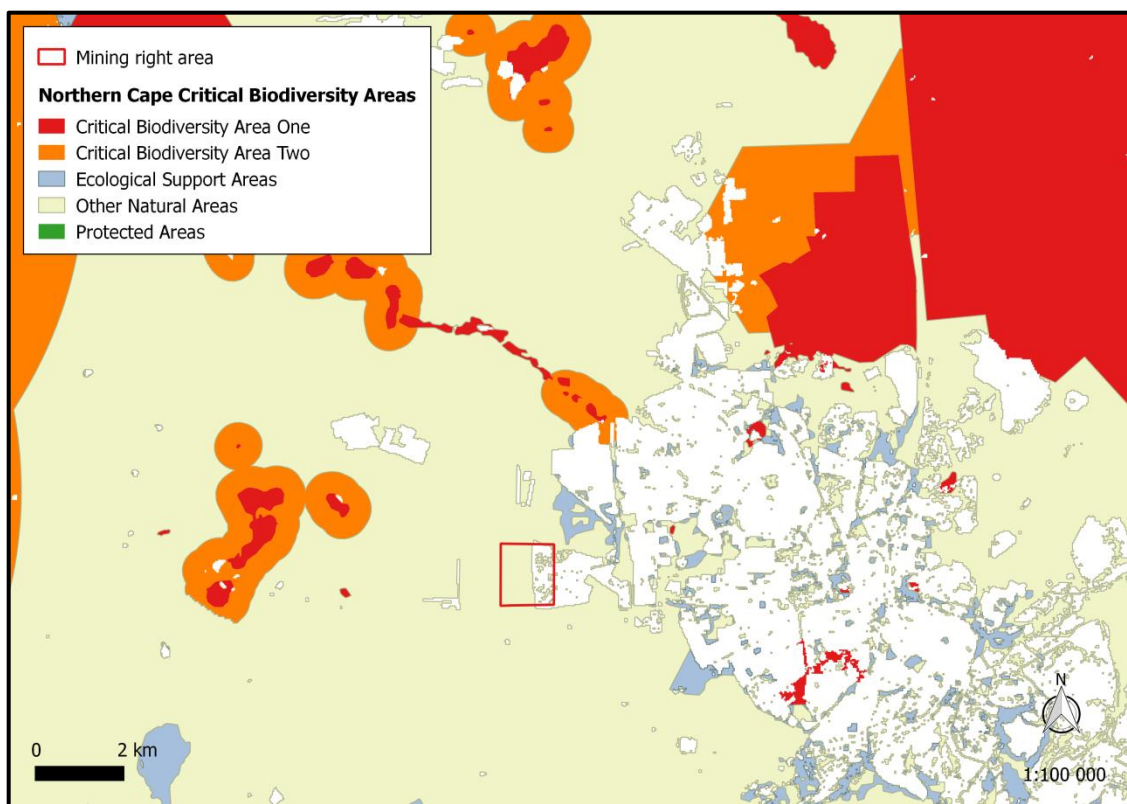


Figure 13. The study area in relation to the Northern Cape Critical Biodiversity areas.

The proposed mine falls within close proximity to an urban development zone and has also not been identified as important for long-term maintenance of broad-scale ecological processes within the Sol Plaatje Municipality (Kotze et al. 2009). The mining operation itself is not expected to cause severe habitat transformation and due to the high degree of transformation through previous mining activities on site it is not expected to contribute to severe cumulative habitat loss or the disruption of the broad-scale landscape connectivity in the region. However, it is advisable that the mining activities are restricted to the earmarked area as indicated in Figure 2.

3.6. Site sensitivity

The sensitivity map for the Vooruitzigt mining operation is illustrated in Figure 14. Open woodland is considered to be of high sensitivity due to the high occurrence of protected species like *Vachellia erioloba*, *Harpagophytum procumbens* and *Babiana bainesii*. Furthermore, the sandy substrate is highly prone to wind erosion after the natural vegetation has been removed. Although this unit is not regarded as a no-go area, activities should only proceed with caution as it may not be possible to mitigate all impacts appropriately.

The secondary woodland is considered to be of medium sensitivity. This area hosts only a few species of conservation concern and has already been degraded by past disturbances. Activities within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.

The transformed areas include the current project site, entrance gate and roads, and are considered to be of low sensitivity on account of the transformation of natural habitats that already occurred here.

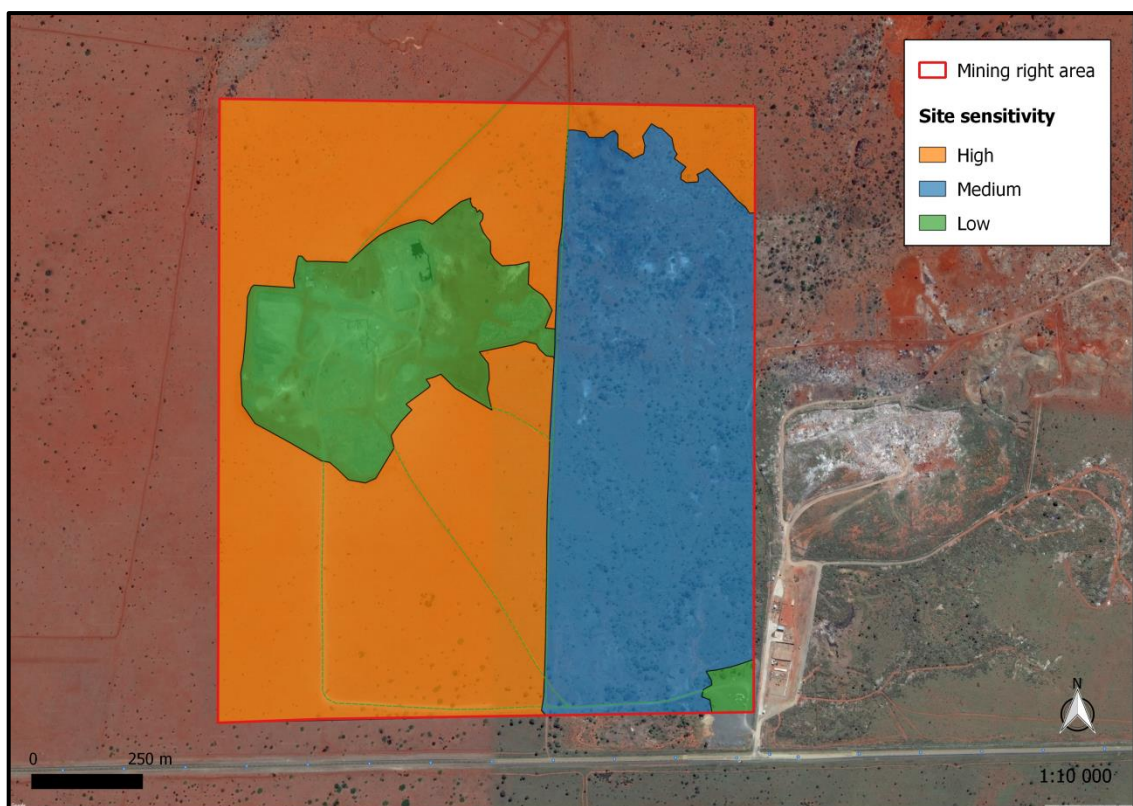


Figure 14. A sensitivity map for the Vooruitzigt mining area.

4. ECOLOGICAL IMPACT ASSESSMENT

In this section, the potential impacts and associated risk factors that may be generated by the Vooruitzigt mining operation are identified and described. A detailed analysis of each impact is provided in Table 9. 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. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the mining activities are listed.

4.1. Topography, soil erosion and associated degradation of landscapes

4.1.1. Loss of soil fertility

Source of the impact

During the removal of topsoil; stockpiling.

Description of the impact

Improper stockpiling and soil compaction can result in soil sterilisation. Leaching can also occur, resulting in the loss of nutrients.

Mitigation and monitoring

- Topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions.
- Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired.
- Topsoil must not be handled when the moisture content exceeds 12 %.
- Topsoil stockpiles must be kept separate from sub-soils.
- The topsoil should be replaced as soon as possible on to the backfilled areas, thereby allowing for the re-growth of the seed bank contained within the topsoil.

Table 9. A detailed analysis of ecological impacts identified for the Vooruitzigt mining operation.

	IMPACT	Phase			Extent	Duration	Probability	Severity	Significance	Significance after Mitigation
		C	O	D						
Landscape	Loss of soil fertility	✓	✓	✓	On-site (2)	Permanent (5)	Certain (6)	High (4)	Medium-High (66)	Low-Medium (45)
	Increase in soil erosion	✓	✓	✓	On-site (2)	Residual (5)	Probable (5)	Medium (3)	Low-Medium (50)	Low (35)
Flora	Loss of indigenous vegetation	✓	✓	✓	On-site (2)	Permanent (6)	Certain(6)	High (4)	Medium-High (72)	Low-Medium (60)
	Loss of Red data and/or protected floral species	✓	✓		On-site (2)	Residual (5)	Certain (6)	High (4)	Medium-High (66)	Low (40)
	Introduction or spread of alien species	✓	✓	✓	Local (3)	Residual (5)	Probable (5)	High (4)	Low-Medium (60)	Low (32)
	Bush encroachment			✓	On-site (2)	Residual (5)	Probable (5)	High (4)	Low-Medium (55)	Low (32)

	IMPACT	Phase			Extent	Duration	Probability	Severity	Significance	Significance after Mitigation
		C	O	D						
Fauna	Habitat fragmentation	✓	✓	✓	On-site (2)	Residual (5)	Probable (5)	High (4)	Low-Medium (55)	Low (28)
	Disturbance, displacement and killing of fauna	✓	✓		On-site (2)	Decommissioning (4)	Probable(5)	Medium(3)	Low-Medium (45)	Low (28)
Ecological Processes	Compromise of ecological processes	✓	✓		Local (3)	Residual (5)	Probable (5)	High (4)	Low-Medium (60)	Low (28)

4.1.2. Soil erosion

Source of the impact

Infrastructure; excavations.

Description of the impact

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

Mitigation and monitoring

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

4.2. Vegetation and floristics

4.2.1. Loss of indigenous vegetation

Source of the impact

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

Description of the impact

Construction and mining activities on site will reduce the natural habitat for ecological systems to continue their operation. It is not expected that the areas of high ecological function will rehabilitate following disturbance events. Vehicle traffic generates lots of dust which can reduce the growth success and seed dispersal of many small plant species.

Mitigation and monitoring

- Minimise the footprint of transformation.
- Encourage proper rehabilitation of excavated areas, by effective backfilling.
- Encourage the growth of natural plant species by sowing indigenous seeds or by planting seedlings.
- Ensure measures for the adherence to the speed limit to minimise dust plumes.

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

Source of the impact

Removal of listed or protected plant species; during the construction of roads and other necessary infrastructure; the placement of stockpiles; and the clearing of vegetation for excavations.

Description of the impact

There are a number of listed and protected species present at the site, such as *Vachellia erioloba*, *Harpagophytum procumbens*, *Pelargonium aridum* and *Babiana bainesii*. It is highly likely that some of these species might be damaged or removed during the operation.

Furthermore, any illegal fire wood collection or illegal harvesting of the plants for trade or medicinal use by staff, contractors or secondary land users could potentially have a negative impact on the population of these species. It is possible that mining activities will destroy protected species and other species of conservation concern.

Mitigation and monitoring

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

4.2.3. Introduction or spread of alien species

Source of the impact

Clearing of vegetation; mining activities.

Description of the impact

The extent of alien invasive species in the area shows the low levels of past disturbance interference in the natural ecosystem. While general clearing of the area and excavation activities destroy natural vegetation, invasive plants can increase due to their opportunistic nature in disturbed areas. If invasive plants establish in disturbed areas, it may cause an impact beyond the boundaries of the mining site. These alien invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity and ecological value of the area. Therefore, if alien invasive species are not controlled and managed, their propagation into new areas could have a high impact on the surrounding natural vegetation in the long term. With proper mitigation, the impacts can be substantially reduced.

Mitigation and monitoring

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

4.2.4. Encouraging bush encroachment

Source of the impact

Clearing of vegetation; disturbances through mining activities.

Description of the impact

The extent of bush encroaching species on site shows the moderate level of past disturbance interference in the natural ecosystem, primarily through mining practises.

While general clearing of the area and mining activities destroy natural vegetation, bush encroaching plants can increase due to their opportunistic nature in disturbed areas. If encroaching plants establish in disturbed areas, it may the lower potential for future land use and decrease biodiversity. With proper mitigation, the impacts can be substantially reduced.

Mitigation and monitoring

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

4.3. Fauna

4.3.1. Habitat fragmentation

Source of the impact

Clearance of vegetation; mining activities.

Description of the impact

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

Mitigation and monitoring

- All activities associated with the mining operation must be planned, where possible in order to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type.

- 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.
- Employ sound rehabilitation measures to restore the characteristics of the affected aquatic and riparian 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.

Description of the impact

The transformation of natural habitats will result in the loss of habitat, affecting individual species and ecological processes. This will result in the displacement of faunal species that depend on such habitats. Increased noise and vibration will disturb and possibly displace birds and other wildlife. Fast moving vehicles cause road kills of small mammals, birds, reptiles, amphibians and a large number of invertebrates. Intentional killing of snakes, reptiles, vultures and owls will negatively affect the local populations.

Mitigation and monitoring

- Careful planning of the operation is needed in order 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.
- A full-time ECO must render guidance to the staff and contractors with respect to suitable areas for all related disturbance.

- Everyone on site must undergo environmental induction for awareness on not harming or collecting species that are often persecuted out of superstition and to be educated about the conservation importance of the fauna occurring on site.
- Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert.
- Employ measures that ensure adherence to the speed limit.

4.4. Broad-scale ecological processes

Source of the impact

The construction of roads, plant site, as well as other necessary infrastructure; the clearing of vegetation for excavations.

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. Due to the amount of urbanisation in the area, the possibility of a cumulative impact does exist for the proposed mining operation.

Mitigation and monitoring

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

5. CONCLUSION, RECOMMENDATIONS AND OPINION REGARDING AUTHORISATION

Three plant communities were identified on site of which the open woodland communities in the west is included in the core mining area and considered to be of high sensitivity. The secondary woodland in the east is considered to be of medium sensitivity, while the transformed areas are of low sensitivity. The most profound impacts are expected to be related to the loss of indigenous vegetation, especially species of conservation concern.

Species of conservation concern that are found in the earmarked habitat include *Vachellia erioloba*, *Harpagophytum procumbens*, *Pelargonium aridum* and *Babiana bainesii*. Similarly, the mining operation will result in the large-scale clearance of indigenous vegetation. Permit applications regarding protected flora as well as the harvesting of indigenous vegetation need to be lodged with the Northern Cape Department of Environment and Nature Conservation prior to any clearance of vegetation.

Similarly, if any of the *Vachellia erioloba* trees are to be affected, a licence application regarding protected trees should be lodged with Department of Agriculture, Forestry and Fisheries three months prior to any potential disturbances to these trees.

To conclude, it is clear that the destruction of the natural habitat within the study area is inevitable. The significance of the impacts will be affected by the success of the mitigation measures implemented and the rehabilitation programme for the mining area. In my opinion, authorisation can be granted if the applicant commits to the adherence of effective avoidance, management, mitigation and rehabilitation measures.

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APPENDICES

APPENDIX 1

Plant species list

FAMILY	SPECIES	STATUS	NFA	NCNCA
ACANTHACEAE	<i>Barleria bechuanensis</i>	LC		
	<i>Barleria rigida</i>	LC		
	<i>Blepharis marginata</i>	LC		
	<i>Glossochilus burchellii</i>	LC		
	<i>Monechma divaricatum</i>	LC		
AIZOACEAE	<i>Galenia namaensis</i>	LC		
	<i>Plinthus karooicus*</i>	LC		
	<i>Tetragonia arbuscula</i>	LC		
AMARANTHACEAE	<i>Alternanthera pungens</i>	Nat. Exotic		
	<i>Alternanthera sessilis</i>	Nat. Exotic		
	<i>Hermbstaedtia odorata</i> var. <i>odorata</i>	LC		
	<i>Kyphocarpa angustifolia*</i>	LC		
AMARYLLIDACEAE	<i>Crinum bulbispermum</i>	LC		2
	<i>Crinum lugardiae</i>	LC		2
	<i>Nerine hesseoides</i>	LC		2
	<i>Nerine laticoma</i>	LC		2
ANACARDIACEAE	<i>Searsia ciliata</i>	LC		
	<i>Searsia lancea*</i>	LC		
	<i>Searsia pyroides</i> var. <i>pyroides*</i>	LC		
ANTHERICACEAE	<i>Chlorophytum fasciculatum</i>	LC		
APIACEAE	<i>Cyclospermum leptophyllum</i>	Nat. Exotic		2
	<i>Deverra burchellii</i>	LC		
APOCYNACEAE	<i>Cynanchum orangeanum</i>	LC		2
	<i>Fockea angustifolia</i>	LC		2
	<i>Microlooma armatum</i> var. <i>armatum</i>	LC		2
	<i>Microlooma armatum</i> var. <i>burchellii</i>	LC		2
	<i>Orthanthera jasminiflora</i>	LC		2
	<i>Pentarrhinum inspidum</i>	LC		2
	<i>Raphionacme velutina</i>	LC		2
	<i>Riocreuxia polyantha</i>	LC		2
	<i>Xysmalobium undulatum</i> var. <i>ensifolium</i>	LC		2
ASPARAGACEAE	<i>Asparagus glaucus</i>	LC		
	<i>Asparagus laricinus*</i>	LC		
	<i>Asparagus suaveolens*</i>	LC		
ASPHODELACEAE	<i>Bulbine abyssinica</i>	LC		
	<i>Bulbine narcissifolia</i>	LC		2
	<i>Trachyandra laxa</i> var. <i>laxa</i>	LC		2
	<i>Trachyandra laxa</i> var. <i>rigida</i>	LC		2
	<i>Trachyandra saltii</i> var. <i>saltii</i>	LC		2
ASTERACEAE	<i>Adenostemma caffrum</i>	LC		
	<i>Arctotheca calendula</i>	LC		
	<i>Berkheya pinnatifida</i> subsp. <i>pinnatifida*</i>	LC		
	<i>Conyza bonariensis</i>	Nat. Exotic		
	<i>Conyza canadensis</i>	Nat. Exotic		
	<i>Conyza podocephala</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
ASTERACEAE	<i>Denekia capensis</i>	LC		
	<i>Dicoma capensis</i> *	LC		
	<i>Felicia muricata</i> subsp. <i>muricata</i> *	LC		
	<i>Flaveria bidentis</i>	Inv. Alien		
	<i>Gazania krebsiana</i> subsp. <i>arctotooides</i> *	LC		
	<i>Geigeria brevifolia</i>	LC		
	<i>Geigeria filifolia</i>	LC		
	<i>Geigeria obtusifolia</i>	LC		
	<i>Gnaphalium confine</i>	LC		
	<i>Helichrysum arenicola</i>	LC		
	<i>Helichrysum caespitium</i>	LC		
	<i>Helichrysum dregeanum</i>	LC		
	<i>Helichrysum lineare</i>	LC		
	<i>Helichrysum nudifolium</i> var. <i>nudifolium</i>	LC		
	<i>Helichrysum paronychioides</i>	LC		
	<i>Helichrysum zeyheri</i> *	LC		
	<i>Hertia ciliata</i>	LC		
	<i>Hertia pallens</i> *	LC		
	<i>Ifloga glomerata</i>	LC		
	<i>Laggera decurrens</i>	LC		
	<i>Nolletia ciliaris</i>	LC		
	<i>Osteospermum leptolobum</i>	LC		
	<i>Osteospermum microphyllum</i>	LC		
	<i>Osteospermum muricatum</i> subsp. <i>muricatum</i>	LC		
	<i>Osteospermum spinescens</i> *	LC		
	<i>Pentzia argentea</i>	LC		
	<i>Pentzia calcarea</i>	LC		
	<i>Pentzia globosa</i> *	LC		
	<i>Pentzia lanata</i>	LC		
	<i>Pentzia quinquefida</i>	LC		
	<i>Pentzia viridis</i>	LC		
	<i>Pteronia glauca</i> *	LC		
	<i>Rosenia humilis</i>	LC		
	<i>Senecio cinerascens</i>	LC		
	<i>Senecio consanguineous</i> *	LC		
	<i>Senecio intricatus</i>	LC		
	<i>Tarchonanthus camphoratus</i> *	LC		
	<i>Xanthium strumarium</i>	Inv. Alien		
	<i>Zinnia peruviana</i>	Nat. Exotic		
	BORAGINACEAE	<i>Anchusa riparia</i>	LC	
<i>Ehretia alba</i> *		LC		
<i>Heliotropium nelsonii</i>		LC		
BRASSICACEAE	<i>Coronopus integrifolius</i>	Nat. Exotic		
	<i>Erucastrum griquense</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
BRASSICACEAE	<i>Sisymbrium burchellii</i> var. <i>burchellii</i>	LC		
BUDDLEJACEAE	<i>Gomphostigma virgatum</i>	LC		
CAMPANULACEAE	<i>Wahlenbergia nodosa</i> *	LC		
CAPPARACEAE	<i>Boscia albitrunca</i>	LC		2
	<i>Cleome gynandra</i>	LC		2
CARYOPHYLLACEAE	<i>Dianthus micropetalus</i>	LC		2
	<i>Pollichia campestris</i> *	LC		
CELASTRACEAE	<i>Gymnosporia buxifolia</i>	LC		2
CHENOPODIACEAE	<i>Salsola aphylla</i>	LC		
	<i>Salsola glabrescens</i>	LC		
	<i>Salsola rabieana</i>	LC		
COLCHICACEAE	<i>Colchicum leistneri</i>	LC		
	<i>Ornithoglossum dinteri</i>	LC		
COMBRETACEAE	<i>Combretum erythrophyllum</i>	LC		2
COMMELINACEAE	<i>Commelina africana</i> var. <i>barberae</i>	LC		
CONVOLVULACEAE	<i>Ipomoea obscura</i> var. <i>obscura</i>	LC		
	<i>Ipomoea oenotheroides</i>	LC		
CRASSULACEAE	<i>Cotyledon campanulata</i>	LC		2
	<i>Cotyledon orbiculata</i> var. <i>dactylopsis</i>	LC		2
	<i>Kalanchoe paniculata</i>	LC		2
CUCURBITACEAE	<i>Acanthosicyos naudinianus</i>	LC		
	<i>Citrullus lanatus</i> *	LC		
	<i>Coccinia rehmannii</i>	LC		
	<i>Cucumis heptadactylus</i>	LC		
	<i>Cucumis myriocarpus</i> subsp. <i>myriocarpus</i>	LC		
	<i>Trochomeria debilis</i>	LC		
EBENACEAE	<i>Diospyros lycioides</i> subsp. <i>lycioides</i> *	LC		
	<i>Euclea crispa</i> subsp. <i>ovata</i>	LC		
ERIOSPERMACEAE	<i>Eriospermum corymbosum</i>	LC		
	<i>Eriospermum porphyrium</i>	LC		
EUPHORBIACEAE	<i>Phyllanthus maderaspatensis</i> *	LC		
	<i>Seidelia triandra</i>	LC		
FABACEAE	<i>Vachellia erioloba</i> *	LC	X	
	<i>Vachellia hebeclada</i> subsp. <i>hebeclada</i> *	LC		
	<i>Vachellia karroo</i>	LC		
	<i>Senegalia mellifera</i> subsp. <i>detinens</i> *	LC		
	<i>Vachellia tortilis</i> subsp. <i>heteracantha</i> *	LC		
	<i>Argyrolobium pauciflorum</i> *	LC		
	<i>Calobota cuspidosa</i>	LC		
	<i>Chamaecrista biensis</i>	LC		
	<i>Chamaecrista capensis</i> var. <i>capensis</i>	LC		
	<i>Cullen biflora</i>	LC		
	<i>Cullen tomentosum</i>	LC		
	<i>Indigofera alternans</i> var. <i>alternans</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
FABACEAE	<i>Indigofera filipes</i>	LC		
	<i>Indigofera heterotricha</i>	LC		
	<i>Indigofera holubii</i>	LC		
	<i>Indigofera sessilifolia</i>	LC		
	<i>Medicago laciniata</i> var. <i>laciniata</i>	Nat. Exotic		
	<i>Melolobium canescens</i> *	LC		
	<i>Ptycholobium biflorum</i> subsp. <i>biflorum</i>	LC		
	<i>Rhynchosia confuse</i> *	-		
	<i>Rhynchosia holosericea</i>	LC		
	<i>Rhynchosia minima</i> var. <i>prostrata</i>	LC		
	<i>Senna italica</i> subsp. <i>arachoides</i>	LC		
<i>Tephrosia burchellii</i>	LC			
FUNARIACEAE	<i>Funaria rottleri</i>	-		
GENTIANACEAE	<i>Sebaea pentandra</i> var. <i>pentandra</i>	LC		
GERANIACEAE	<i>Monsonia angustifolia</i>	LC		1
	<i>Pelargonium aridum</i> R.A.Dyer	LC		1
GISEKIACEAE	<i>Gisekia pharnacioides</i> var. <i>pharnacioides</i>	LC		
HALORAGACEAE	<i>Myriophyllum spicatum</i>	-		
HYACINTHACEAE	<i>Dipcadi glaucum</i>	LC		
	<i>Dipcadi marlothii</i>	LC		
	<i>Dipcadi viride</i>	LC		
	<i>Drimia fasciata</i>	LC		
	<i>Drimia intricata</i>	LC		
	<i>Drimia sanguinea</i>	NT		
	<i>Lachenalia karooica</i>	LC		2
	<i>Ledebouria undulata</i>	LC		
	<i>Massonia jasminiflora</i>	LC		
	<i>Ornithogalum tenuifolium</i> subsp. <i>tenuifolium</i>	-		2
	<i>Schizocarphus nervosus</i> *	LC		
IRIDACEAE	<i>Babiana bainesii</i> *	LC		2
	<i>Babiana hypogaea</i>	LC		2
	<i>Duthieastrum linifolium</i>	LC		2
	<i>Freesia andersoniae</i>	LC		2
	<i>Gladiolus permeabilis</i> subsp. <i>edulis</i>	LC		2
	<i>Lapeirousia plicata</i> subsp. <i>plicata</i>	LC		2
	<i>Moraea falcifolia</i>	LC		2
	<i>Moraea pallida</i>	LC		2
JUNCACEAE	<i>Juncus exsertus</i>	LC		
LAMIACEAE	<i>Leonotis ocyimifolia</i> *	LC		
	<i>Leucas capensis</i>	LC		
	<i>Plectranthus</i> cf. <i>madagascariensis</i> *	LC		
	<i>Salvia disermas</i>	LC		
	<i>Salvia namaensis</i>	LC		
LOBELIACEAE	<i>Lobelia dregeana</i>	LC		
MALVACEAE	<i>Abutilon sonneratianum</i> *	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
MALVACEAE	<i>Althaea ludwigii</i>	LC		
	<i>Corchorus asplenifolius</i>	LC		
	<i>Grewia flava</i>	LC		
	<i>Hermannia boraginiflora</i>	LC		
	<i>Hermannia comosa*</i>	LC		
	<i>Hermannia linearifolia</i>	LC		
	<i>Hermannia pulchella</i>	LC		
	<i>Hermannia tomentosa*</i>	LC		
	<i>Hibiscus marlothianus</i>	LC		
	<i>Hibiscus pusillus</i>	LC		
	<i>Malva pusilla</i>	Nat. Exotic		
	<i>Melhania virescens</i>	LC		
	<i>Sida chrysantha</i>	LC		
	<i>Sida ternata</i>	LC		
	MENISPERMACEAE	<i>Antizoma angustifolia</i>	LC	
MESEMBRYANTHEMACEAE	<i>Mestoklema arboriforme</i>	LC		2
MOLLUGINACEAE	<i>Hypertelis salsoloides</i> var. <i>salsoloides</i>	LC		
	<i>Limeum aethiopicum</i> var. <i>glabrum</i>	LC		
	<i>Limeum viscosum</i> subsp. <i>transvaalense</i>	LC		
	<i>Mollugo cerviana</i> var. <i>cerviana</i>	LC		
	<i>Pharnaceum thunbergii</i>	LC		
NYCTAGINACEAE	<i>Boerhavia diffusa</i> var. <i>diffusa</i>	Nat. Exotic		
	<i>Commicarpus pentandrus</i>	LC		
OLEACEAE	<i>Olea europaea</i> subsp. <i>africana</i>	LC		2
OROBANCHACEAE	<i>Alectra pumila</i>	LC		
	<i>Cycnium tubulosum</i> subsp. <i>tubulosum</i>	LC		
	<i>Striga bilabiata</i> subsp. <i>bilabiata</i>	LC		
OXALIDACEAE	<i>Oxalis depressa</i>	LC		2
	<i>Oxalis pes-caprae</i> var. <i>pes-caprae</i>	LC		2
	<i>Oxalis setosa</i>	DDT		2
PASSIFLORACEAE	<i>Adenia repanda</i>	LC		
PEDALIACEAE	<i>Harpagophytum procumbens*</i>	-		1
PHYLLANTHACEAE	<i>Phyllanthus maderaspatensis</i>	LC		
POACEAE	<i>Agrostis lachnantha</i> var. <i>lachnantha</i>	LC		
	<i>Andropogon schirensis</i>	LC		
	<i>Aristida adscensionis*</i>	LC		
	<i>Aristida congesta</i> subsp. <i>barbicollis*</i>	LC		
	<i>Aristida congesta</i> subsp. <i>congesta*</i>	LC		
	<i>Aristida meridionalis</i>	LC		
	<i>Aristida stipitata</i> subsp. <i>graciliflora</i>	LC		
	<i>Aristida vestita*</i>	LC		
	<i>Brachiaria brizantha</i>	LC		
	<i>Brachiaria eruciformis</i>	LC		
	<i>Brachiaria marlothii</i>	LC		
<i>Brachiaria nigropedata</i>	LC			

FAMILY	SPECIES	STATUS	NFA	NCNCA
POACEAE	<i>Brachiaria serrata</i>	LC		
	<i>Cenchrus ciliaris</i> *	LC		
	<i>Chloris virgata</i>	LC		
	<i>Chrysopogon serrulatus</i>	LC		
	<i>Coelachyrum yemenicum</i>	LC		
	<i>Cymbopogon marginatus</i>	LC		
	<i>Cymbopogon pospischilii</i> *	Nat. Exotic		
	<i>Cynodon dactylon</i> *	LC		
	<i>Cynodon incompletes</i>	LC		
	<i>Digitaria polyphylla</i>	LC		
	<i>Digitaria ternate</i>	LC		
	<i>Eleusine coracana</i> subsp. <i>africana</i>	LC		
	<i>Enneapogon cenchroides</i> *	LC		
	<i>Enneapogon desvauxii</i>	LC		
	<i>Enneapogon scaber</i>	LC		
	<i>Enneapogon scoparius</i>	LC		
	<i>Eragrostis barrelieri</i>	Nat. Exotic		
	<i>Eragrostis bicolor</i>	LC		
	<i>Eragrostis biflora</i>	LC		
	<i>Eragrostis chloromelas</i>	LC		
	<i>Eragrostis cilianensis</i>	LC		
	<i>Eragrostis curvula</i>	LC		
	<i>Eragrostis echinochloidea</i>	LC		
	<i>Eragrostis gummiflua</i>	LC		
	<i>Eragrostis lehmanniana</i> var. <i>lehmanniana</i> *	LC		
	<i>Eragrostis macrochlamys</i> var. <i>wilmaniae</i>	LC		
	<i>Eragrostis nindensis</i>	LC		
	<i>Eragrostis pallens</i>	LC		
	<i>Eragrostis porosa</i> *	LC		
	<i>Eragrostis remotiflora</i>	LC		
	<i>Eragrostis stapfii</i>	LC		
	<i>Eragrostis superba</i>	LC		
	<i>Eragrostis trichophora</i> *	LC		
	<i>Eragrostis x pseud-obtusa</i>	-		
	<i>Eriochloa fatmensis</i>	LC		
	<i>Eustachys paspaloides</i>	LC		
	<i>Fingerhuthia africana</i>	LC		
	<i>Heteropogon contortus</i>	LC		
	<i>Melinis repens</i> subsp. <i>grandiflora</i>	LC		
	<i>Panicum arcurameum</i>	LC		
	<i>Panicum coloratum</i> var. <i>coloratum</i>	LC		
	<i>Panicum stapfianum</i>	LC		
	<i>Phragmites australis</i> *	LC		
	<i>Pogonarthria squarrosa</i> *	LC		
	<i>Setaria verticillata</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
POACEAE	<i>Sporobolus discosporus</i>	LC		
	<i>Sporobolus fimbriatus*</i>	LC		
	<i>Sporobolus ioclados</i>	LC		
	<i>Sporobolus ludwigii</i>	LC		
	<i>Stipagrostis hochstetterianavar. secalina</i>	LC		
	<i>Stipagrostis uniplumis var. neesii</i>	LC		
	<i>Stipagrostis uniplumis var. uniplumis*</i>	LC		
	<i>Themeda triandra*</i>	LC		
	<i>Tragus koelerioides</i>	LC		
	<i>Tragus racemosus</i>	LC		
	<i>Trichoneura grandiglumis</i>	LC		
	<i>Triraphis andropogonoides</i>	LC		
	<i>Triraphis purpurea</i>	LC		
POLYGALACEAE	<i>Polygala hottentotta</i>	LC		
	<i>Polygala leptophylla var. leptophylla</i>	LC		
POLYGONACEAE	<i>Oxygonum alatum var. alatum</i>	LC		
	<i>Persicaria hystricula</i>	LC		
PORTULACACEAE	<i>Portulaca quadrifida</i>	LC		
POTAMOGETONACEAE	<i>Potamogeton crispus</i>	LC		
RANUNCULACEAE	<i>Ranunculus multifidus</i>	Nat. Exotic		
RHAMNACEAE	<i>Ziziphus mucronata subsp. mucronata*</i>	LC		
RUBIACEAE	<i>Anthospermum rigidum subsp. rigidum</i>	LC		
	<i>Kohautia caespitosa subsp. brachyloba</i>	LC		
	<i>Rubia petiolaris</i>	LC		
SALICACEAE	<i>Salix babylonica var. babylonica</i>	Inv. Alien		
	<i>Salix mucronata subsp. mucronata</i>	LC		
SANTALACEAE	<i>Thesium zeyheri</i>	LC		
SCROPHULARIACEAE	<i>Aptosimum lineare var. lineare</i>	LC		
	<i>Chaenostoma patrioticum</i>	LC		
	<i>Diclis petiolaris</i>	LC		
	<i>Diclis rotundifolia</i>	LC		
	<i>Limosella longiflora</i>	LC		
	<i>Mimulus gracilis</i>	LC		
	<i>Peliostomum leucorrhizum</i>	LC		
	<i>Selago albomarginata</i>	LC		
	<i>Veronica anagallis-aquatica</i>	LC		
	SINOPTERIDACEAE	<i>Cheilanthes hirta var. brevopilosa</i>	LC	
<i>Pellaea calomelanos var. calomelanos</i>		LC		
SOLANACEAE	<i>Datura ferox</i>	Inv. Alien		
	<i>Lycium arenicola</i>	LC		
	<i>Lycium cinereum</i>	LC		
	<i>Lycium hirsutum*</i>	LC		
	<i>Lycium horridum</i>	LC		
	<i>Nicotiana glauca</i>	Inv. Alien		
	<i>Solanum capense</i>	LC		

FAMILY	SPECIES	STATUS	NFA	NCNCA
SOLANACEAE	<i>Solanum nigrum</i>	Nat. Exotic		
	<i>Solanum retroflexum</i>	LC		
	<i>Solanum supinum</i> var. <i>supinum</i>	LC		
THYMELAEACEAE	<i>Gnidia microphylla</i>	LC		
	<i>Lasiosiphon polycephalus</i> *	LC		
VERBENACEAE	<i>Chascanum pinnatifidum</i> var. <i>pinnatifidum</i>	LC		
	<i>Lantana rugosa</i>	LC		
	<i>Lippia scaberrima</i>	LC		
	<i>Verbena officinalis</i>	Inv. Alien		
VISCACEAE	<i>Viscum rotundifolium</i>	LC		
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>	LC		

APPENDIX 2

Fauna species list

LIST OF MAMMALS

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

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

LIST OF MAMMALS (cont.)

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

	Scientific name	Common name	IUCN	SA RDB	Habitat	Potential of occurrence
CHRYSOCHLORIDAE	² <i>Chlorotalpa sclateri</i>	Sclater's Golden Mole	LC	DD	Restricted to high-altitude grasslands, scrub and forested kloofs in the Nama Karoo and Grassland biomes of South Africa.	Low
MACROSCELIDIDAE	² <i>Elephantulus myurus</i>	Eastern Rock Sengi	LC	LC	Rocky environments.	Moderate
TUBULENTATA	¹ <i>Orycteropus afer</i>	Aardvark	LC	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil.	Low
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.	Moderate

LIST OF MAMMALS (cont.)

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	Scientific name	Common name	IUCN	SA RDB	Habitat	Potential of occurrence
LAGOMORPHA	² <i>Lepus capensis</i>	Cape Hare	LC	LC	Dry, open regions, with palatable bush and grass.	Moderate
	² <i>Lepus saxatilis</i>	Scrub Hare	LC	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	Moderate
	² <i>Pronolagus rupestris</i>	Smith's Red Rock Rabbit	LC	LC	Rocky habitats, from isolated outcrops to mountain ranges; in high and low rainfall areas, but absent from true desert.	Low
RODENTIA	² <i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC	Catholic in habitat requirements.	Moderate
	² <i>Xerus inauris</i>	South African Ground Squirrel	LC	LC	Open terrain with a sparse bush cover and hard substrate.	Moderate

LIST OF MAMMALS (cont.)

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

	Scientific name	Common name	IUCN	SA RDB	Habitat	Potential of occurrence
RODENTIA	² <i>Pedetes capensis</i>	Springhare	LC	LC	Occurs widespread: open sandy ground, sandy scrub, overgrazed grassland, edges of vleis and dry river beds.	Moderate
	² <i>Graphiurus ocellatus</i>	Spectacled Dormouse	LC	LC	Rocky habitats, but also trees.	Moderate
	² <i>Saccostomus campestris</i>	Pouched Mouse	LC	LC	Wide habitat tolerance but prefers soft, particularly sandy soils; can be found in open and dense vegetation and in rocky areas; annual rainfall of 250 - 1 200 mm.	Moderate
	² <i>Malacothrix typica</i>	Large-eared (Gerbil) Mouse	LC	LC	Short grass habitats over hard soil.	Moderate
	² <i>Rhabdomys pumilio</i>	Four-striped Grass Mouse	LC	LC	Essentially a grassland species; occurs in wide variety of habitats where there is good grass cover.	Moderate
	² <i>Mus minutoides</i>	Pygmy Mouse	LC	LC	Wide habitat tolerance.	High
	³ <i>Mus musculus</i>	House Mouse	LC	Not listed	Wide habitat tolerance.	High
	² <i>Mastomys natalensis</i>	Natal Multimammate Mouse	LC	LC	Wide habitat tolerance.	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.	Low	

LIST OF MAMMALS (cont.)

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

	Scientific name	Common name	IUCN	SA RDB	Habitat	Potential of occurrence
RODENTIA	² <i>Myotomys unisulcatus</i>	Bush Karoo Rat	LC	LC	Shrub and fynbos associations in areas with rocky outcrops. Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	Low
	² <i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	LC	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush.	Moderate
	² <i>Gerbillurus paeba</i>	Pygmy Hairy-footed Gerbil	LC	LC	Associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover.	Moderate
	² <i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	DD	Sandy soils; wooded and more open grassland; areas of cultivation.	Moderate
	² <i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC	Sandy soils; wooded and more open grassland; areas of cultivation.	Moderate
PRIMATES	⁴ <i>Papio ursinus</i>	Chacma Baboon	LC	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	Low
	⁴ <i>Chlorocebus pygerythrus</i>	Vervet Monkey	LC	LC	Woodland savanna, riverine woodland, isolated stands of trees along river courses.	High

LIST OF MAMMALS (cont.)

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

	Scientific name	Common name	IUCN	SA RDB	Habitat	Potential of occurrence
PHOLIDOTA	¹ <i>Smutsia temminckii</i>	Ground Pangolin	VU	VU	Low to high rainfall areas, including open grassland, woodland and rocky hills, but excluding forest and true desert; nevertheless present throughout the Kalahari sand country.	Low
EULIPTYPHLA	² <i>Crocidura cyanea</i>	Reddish-Grey Musk Shrew	LC	DD	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	Low
	² <i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	DD	Generally associated with termite mounds, grassland habitat.	Low
	¹ <i>Atelerix frontalis</i>	South African Hedgehog	LC	NT	Generally found in semi-arid and sub-temperate environments with ample ground cover.	Low
CARNIVORA	¹ <i>Proteles cristata</i>	Aardwolf	LC	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes.	Low
	⁴ <i>Caracal caracal</i>	Caracal	LC	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions.	Low
	¹ <i>Felis silvestris</i>	African Wild Cat	LC	LC	Wide habitat tolerance.	Low

LIST OF MAMMALS (cont.)

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

	Scientific name	Common name	IUCN	SA RDB	Habitat	Potential of occurrence
CARNIVORA	¹ <i>Felis nigripes</i>	Black-footed cat	VU	LC	Associated with arid country, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	Low
	² <i>Genetta genetta</i>	Common (Small-spotted) Genet	LC	LC	Occur in open arid habitats.	Low
	² <i>Suricata suricatta</i>	Suricate	LC	LC	Open arid country with hard and stony substrate. Occur in Nama- and Succulent Karoo but also fynbos.	Moderate
	² <i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC	Semi-arid country on a sandy substrate.	High
	² <i>Galerella pulverulentus</i>	Cape (Small) Grey Mongoose	LC	LC	Wide habitat tolerance.	High
	² <i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC	Wide habitat tolerance, but areas with adequate cover.	High
	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.	Low
	⁴ <i>Canis mesomelas</i>	Black-backed Jackal	LC	LC	Wide habitat tolerance.	Low
	¹ <i>Hyaena brunnea</i>	Brown Hyena	NT	NT	Found in dry areas, generally with annual rainfall of 100 - 700 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna.	Low
¹ <i>Otocyon megalotis</i>	Bat-eared Fox	LC	LC	Open country with mean annual rainfall of 100-600 mm.	Low	

LIST OF MAMMALS (cont.)

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

	Scientific name	Common name	IUCN	SA RDB	Habitat	Potential of occurrence
CARNIVORA	¹ <i>Poecilogale albinucha</i>	African Striped Weasel	LC	DD	Wide habitat tolerance, but most common in grassland areas.	Low
	¹ <i>Ictonyx striatus</i>	Striped Polecat	LC	LC	Widely distributed throughout the sub-region.	Moderate
	¹ <i>Mellivora capensis</i>	Honey Badger	LC	NT	Wide habitat tolerance.	Low
SUIFORMES	² <i>Phacochoerus africanus</i>	Common Warthog	LC	LC	Open country, lightly wooded areas and savanna; also penetrates otherwise unsuitable country along watercourses.	Low
CETARTIODACTYLA	² <i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC	Wooded savanna and arid areas where there are stands of bush; wooded watercourses, acacia woodland and rocky hill country.	Low
	² <i>Raphicerus campestris</i>	Steenbok	LC	LC	Inhabits open country.	Confirmed
	² <i>Sylvicapra grimmia</i>	Common Duiker	LC	LC	Presence of bushes are important.	Moderate

LIST OF REPTILES

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

Family	Scientific name	Common name	IUCN status
PELOMEDUSIDAE	<i>Pelomedusa subrufa</i>	Helmeted Terrapin	LC
TESTUDINIDAE	² <i>Homopus femoralis</i>	Greater Padloper	LC
	² <i>Psammobates oculifer</i>	Serrated Tent Tortoise	LC
	² <i>Stigmochelys pardalis</i>	Leopard Tortoise	LC
GEKKONIDAE	<i>Chondrodactylus bibronii</i>	Bibron's Gecko	LC
	<i>Lygodactylus capensis capensis</i>	Common Dwarf Gecko	LC
	<i>Pachydactylus capensis</i>	Cape Gecko	LC
	<i>Pachydactylus mariquensis</i>	Common Banded Gecko	LC
	<i>Ptenopus garrulus garrulus</i>	Common Barking Gecko	LC
AMPHISBAENIDAE	<i>Monopeltis capensis</i>	Cape Worm Lizard	LC
	<i>Monopeltis infuscata</i>	Dusky Spade-snouted Worm Lizard	LC
LACERTIDAE	² <i>Meroles squamulosus</i>	Savanna Lizard	LC
	² <i>Nucras holubi</i>	Holub's Sandveld Lizard	LC
	² <i>Nucras intertexta</i>	Spotted Sandveld Lizard	LC
	² <i>Pedioplanis lineocellata lineocellata</i>	Spotted Sand Lizard	LC
	² <i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	LC
CORDYLIDAE	¹ <i>Karusasaurus polyzonus</i>	Southern Karusa Lizard	LC LC
GERRHOSAURIDAE	<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	
SCINCIDAE	<i>Acontias occidentalis</i>	Savanna Legless Skink	LC
	<i>Afroablepharus wahlbergii</i>	Wahlberg's Snake-eyed Skink	LC
	<i>Trachylepis capensis</i>	Cape Skink	LC
	<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC
	<i>Trachylepis punctulata</i>	Speckled Sand Skink	LC
	<i>Trachylepis spilogaster</i>	Kalahari Tree Skink	LC
	<i>Trachylepis sulcata sulcata</i>	Western Rock Skink	LC
	<i>Trachylepis varia</i>	Variable Skink	LC
	<i>Trachylepis variegata</i>	Variiegated Skink	LC
VARANIDAE	² <i>Varanus albigularis albigularis</i>	Southern Rock Monitor	LC
	² <i>Varanus niloticus</i>	Nile Monitor	LC
CHAMAELEONIDAE	¹ <i>Chamaeleo dilepis dilepis</i>	Common Flap-neck Chameleon	LC
AGAMIDAE	<i>Agama aculeata aculeata</i>	Western Ground Agama	LC
	<i>Agama aculeata distanti</i>	Eastern Ground Agama	LC
	<i>Agama atra</i>	Southern rock Agama	LC

LIST OF REPTILES (cont.)

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

Family	Scientific name	Common name	IUCN status
TYPHLOPIDAE	³ <i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	LC
LEPTOTYPHLOPIDAE	³ <i>Leptotyphlops scutifrons</i>	Peter's Thread Snake	LC
VIPERIDAE	³ <i>Bitis arietans arietans</i>	Puff Adder	LC
LAMPROPHIIDAE	³ <i>Aparallactus capensis</i>	Black-headed Centipede-eater	LC
	³ <i>Atractaspis bibronii</i>	Bibron's Stiletto Snake	LC
	³ <i>Xenocalamus bicolor bicolor</i>	Bicoloured Quill-snouted Snake	LC
	² <i>Boaedon capensis</i>	Brown House Snake	LC
	² <i>Lamprophis aurora</i>	Aurora Snake	LC
	² <i>Lycodonomorphus rufulus</i>	Brown Water Snake	LC
	² <i>Lycophidion capense capense</i>	Cape Wolf Snake	LC
	³ <i>Psammophis brevirostris</i>	Short-snouted Grass Snake	LC
	³ <i>Psammophis notostictus</i>	Karoo Sand Snake	LC
	³ <i>Psammophis trinasalis</i>	Fork-marked Sand Snake	LC
	³ <i>Psammophylax tritaeniatus</i>	Striped Grass Snake	LC
	² <i>Prosymna bivittata</i>	Two-striped Shovel-snout	LC
² <i>Pseudaspis cana</i>	Mole Snake	LC	
ELAPIDAE	³ <i>Elapsoidea sundevallii media</i>	Sundevall's Garter Snake	LC
	³ <i>Naja nivea</i>	Cape Cobra	LC
COLUBRIDAE	³ <i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	LC
	² <i>Dasypeltis scabra</i>	Rhombic Egg-eater	LC
	³ <i>Dispholidus typus</i>	Boomslang	LC
	² <i>Philothamnus semivariegatus</i>	Spotted Bush Snake	LC

LIST OF AMPHIBIANS

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

Family	Scientific name	Common name	IUCN status
BUFONIDAE	² <i>Amietophrynus poweri</i>	Western Olive Toad	LC
	² <i>Amietophrynus rangeri</i>	Raucous Toad	LC
	² <i>Bufo gutturalis</i>	Guttural Toad	LC
	² <i>Poyntonophrynus vertebralis</i>	Southern Pygmy Toad	LC
	² <i>Vandijkophrynus gariensis</i>	Karoo Toad	LC
HYPEROLIIDAE	² <i>Kassina senegalensis</i>	Bubbling Kassina	LC
PHRYNOBATRACHIDAE	² <i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	LC
PIPIDAE	² <i>Xenopus laevis</i>	Common Platanna	LC
PYXICEPHALIDAE	² <i>Cacosternum boettgeri</i>	Boettger's Caco	LC
	² <i>Amietia queketti</i>	Common River Frog	LC
	² <i>Amietia fuscigula</i>	Cape River Frog	LC
	¹ <i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT
	² <i>Tomopterna cryptotis</i>	Tremolo Sand Frog	LC
	² <i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC

LIST OF BIRDS

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

Scientific name	Common name	IUCN status
² <i>Acrocephalus arundinaceus</i>	Great Reed-Warbler	LC
² <i>Acrocephalus baeticatus</i>	African Reed-Warbler	LC
² <i>Acrocephalus gracilirostris</i>	Lesser Swamp-Warbler	LC
² <i>Actitis hypoleucos</i>	Common Sandpiper	LC
² <i>Actophilornis africanus</i>	African Jacana	LC
² <i>Alcedo cristata</i>	Malachite Kingfisher	LC
² <i>Alopochen aegyptiacus</i>	Egyptian Goose	LC
² <i>Amadina erythrocephala</i>	Red-headed Finch	LC
² <i>Amaurornis flavirostris</i>	Black Crake	LC
² <i>Anas capensis</i>	Cape Teal	LC
² <i>Anas erythrorhyncha</i>	Red-billed Teal	LC
² <i>Anas hottentota</i>	Hottentot Teal	LC
² <i>Anas smithii</i>	Cape Shoveler	LC
² <i>Anas sparsa</i>	African Black Duck	LC
² <i>Anas undulata</i>	Yellow-billed Duck	LC
² <i>Anhinga rufa</i>	African Darter	LC
² <i>Anthoscopus minutus</i>	Cape Penduline-Tit	LC
² <i>Anthropoides paradisea</i>	Blue Crane	NT
² <i>Anthus cinnamomeus</i>	African Pipit	LC
² <i>Anthus leucophrys</i>	Plain-backed Pipit	LC
² <i>Anthus longicaudatus</i>	Long-tailed Pipit	LC
² <i>Anthus vaalensis</i>	Buffy Pipit	LC
² <i>Apus affinis</i>	Little Swift	LC
² <i>Apus apus</i>	Common Swift	LC
² <i>Apus barbatus</i>	African Black Swift	LC
² <i>Apus bradfieldi</i>	Bradfield's Swift	LC
² <i>Apus caffer</i>	White-rumped Swift	LC
² <i>Apus horus</i>	Horus Swift	LC
² <i>Aquila rapax</i>	Tawny Eagle	EN
² <i>Aquila verreauxii</i>	Verreaux's Eagle	VU
² <i>Ardea cinerea</i>	Grey Heron	LC
² <i>Ardea goliath</i>	Goliath Heron	LC
² <i>Ardea melanocephala</i>	Black-headed Heron	LC
² <i>Ardea purpurea</i>	Purple Heron	LC
² <i>Ardeola ralloides</i>	Squacco Heron	LC
² <i>Ardeotis kori</i>	Kori Bustard	NT
¹ <i>Asio capensis</i>	Marsh Owl	LC
² <i>Batis pririt</i>	Pririt Batis	LC
² <i>Bostrychia hagedash</i>	Hadedda Ibis	LC
² <i>Bradornis infuscatus</i>	Chat Flycatcher	LC

LIST OF BIRDS (cont.)

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

	Scientific name	Common name	IUCN status
²	<i>Bradornis mariquensis</i>	Marico Flycatcher	LC
¹	<i>Bubo africanus</i>	Spotted Eagle-Owl	LC
¹	<i>Bubo lacteus</i>	Verreaux's Eagle-Owl	LC
²	<i>Bubulcus ibis</i>	Cattle Egret	LC
²	<i>Burhinus capensis</i>	Spotted Thick-knee	LC
¹	<i>Buteo rufofuscus</i>	Jackal Buzzard	LC
¹	<i>Buteo vulpinus</i>	Steppe Buzzard	LC
²	<i>Butorides striatus</i>	Green-backed Heron	LC
²	<i>Calandrella cinerea</i>	Red-capped Lark	LC
²	<i>Calendulauda africanoides</i>	Fawn-coloured Lark	LC
²	<i>Calendulauda bradfieldi</i>	Bradfield's Lark	LC
²	<i>Calendulauda sabota</i>	Sabota Lark	LC
²	<i>Calidris alba</i>	Sanderling	LC
²	<i>Calidris ferruginea</i>	Curlew Sandpiper	LC
²	<i>Calidris minuta</i>	Little Stint	LC
²	<i>Campethera abingoni</i>	Golden-tailed Woodpecker	LC
¹	<i>Caprimulgus europaeus</i>	European Nightjar	LC
¹	<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar	LC
²	<i>Centropus burchellii</i>	Burchell's Coucal	LC
²	<i>Cercomela familiaris</i>	Familiar Chat	LC
²	<i>Cercomela schlegelii</i>	Karoo Chat	LC
²	<i>Cercomela sinuata</i>	Sickle-winged Chat	LC
²	<i>Cercotrichas coryphoeus</i>	Karoo Scrub-Robin	LC
²	<i>Cercotrichas paena</i>	Kalahari Scrub-Robin	LC
²	<i>Ceryle rudis</i>	Pied Kingfisher	LC
²	<i>Charadrius asiaticus</i>	Caspian Plover	LC
²	<i>Charadrius hiaticula</i>	Common Ringed Plover	LC
¹	<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT
²	<i>Charadrius pecuarius</i>	Kittlitz's Plover	LC
²	<i>Charadrius tricollaris</i>	Three-banded Plover	LC
²	<i>Chersomanes albofasciata</i>	Spike-heeled Lark	LC
²	<i>Chlidonias hybridus</i>	Whiskered Tern	LC
²	<i>Chlidonias leucopterus</i>	White-winged Tern	LC
²	<i>Chrysococcyx caprius</i>	Diderick Cuckoo	LC
²	<i>Ciconia abdimii</i>	Abdim's Stork	NT
²	<i>Ciconia ciconia</i>	White Stork	LC
¹	<i>Ciconia nigra</i>	Black Stork	LC
²	<i>Cinnyris fusca</i>	Dusky Sunbird	LC
¹	<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle	LC
¹	<i>Circus aeruginosus</i>	Western Marsh-Harrier	LC

LIST OF BIRDS (cont.)

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

Scientific name	Common name	IUCN status
¹ <i>Circus maurus</i>	Black Harrier	VU
¹ <i>Circus pygargus</i>	Montagu's Harrier	LC
¹ <i>Circus ranivorus</i>	African Marsh-Harrier	EN
² <i>Cisticola aridulus</i>	Desert Cisticola	LC
² <i>Cisticola fulvicapillus</i>	Neddicky	LC
² <i>Cisticola juncidis</i>	Zitting Cisticola	LC
² <i>Cisticola textrix</i>	Cloud Cisticola	LC
² <i>Cisticola tinniens</i>	Levaillant's Cisticola	LC
² <i>Clamator glandarius</i>	Great Spotted Cuckoo	LC
² <i>Clamator jacobinus</i>	Jacobin Cuckoo	LC
³ <i>Colius colius</i>	White-backed Mousebird	LC
² <i>Columba guinea</i>	Speckled Pigeon	LC
² <i>Columba livia</i>	Rock Dove	LC
² <i>Coracias caudata</i>	Lilac-breasted Roller	LC
² <i>Coracias garrulus</i>	European Roller	LC
² <i>Coracias naevia</i>	Purple Roller	LC
³ <i>Corvus albus</i>	Pied Crow	LC
³ <i>Corvus capensis</i>	Cape Crow	LC
² <i>Cossypha caffra</i>	Cape Robin-Chat	LC
² <i>Coturnix coturnix</i>	Common Quail	LC
² <i>Creatophora cinerea</i>	Wattled Starling	LC
² <i>Cuculus solitarius</i>	Red-chested Cuckoo	LC
² <i>Cursorius rufus</i>	Burchell's Courser	LC
² <i>Cursorius temminckii</i>	Temminck's Courser	LC
² <i>Cypsiurus parvus</i>	African Palm-Swift	LC
² <i>Delichon urbica</i>	Common House-Martin	LC
² <i>Dendrocygna bicolor</i>	Fulvous Duck	LC
² <i>Dendrocygna viduata</i>	White-faced Duck	LC
² <i>Dendropicos fuscescens</i>	Cardinal Woodpecker	LC
² <i>Dicrurus adsimilis</i>	Fork-tailed Drongo	LC
² <i>Egretta alba</i>	Great Egret	LC
² <i>Egretta ardesiaca</i>	Black Heron	LC
² <i>Egretta garzetta</i>	Little Egret	LC
² <i>Egretta intermedia</i>	Yellow-billed Egret	LC
¹ <i>Elanus caeruleus</i>	Black-shouldered Kite	LC
² <i>Emberiza capensis</i>	Cape Bunting	LC
² <i>Emberiza flaviventris</i>	Golden-breasted Bunting	LC
² <i>Emberiza impetuani</i>	Lark-like Bunting	LC
² <i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting	LC
² <i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela	LC

LIST OF BIRDS (cont.)

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

Scientific name	Common name	IUCN status
² <i>Eremopterix leucotis</i>	Chestnut-backed Sparrowlark	LC
² <i>Eremopterix verticalis</i>	Grey-backed Sparrowlark	LC
² <i>Estrilda astrild</i>	Common Waxbill	LC
² <i>Estrilda erythronotos</i>	Black-faced Waxbill	LC
² <i>Euplectes afer</i>	Yellow-crowned Bishop	LC
³ <i>Euplectes orix</i>	Southern Red Bishop	LC
² <i>Euplectes progne</i>	Long-tailed Widowbird	LC
² <i>Eupodotis afraoides</i>	Northern Black Korhaan	LC
² <i>Eupodotis caerulescens</i>	Blue Korhaan	NT
² <i>Eupodotis ruficrista</i>	Red-crested Korhaan	LC
¹ <i>Falco biarmicus</i>	Lanner Falcon	VU
¹ <i>Falco naumanni</i>	Lesser Kestrel	LC
¹ <i>Falco peregrinus</i>	Peregrine Falcon	LC
¹ <i>Falco rupicolis</i>	Rock Kestrel	LC
¹ <i>Falco rupicoloides</i>	Greater Kestrel	LC
² <i>Fulica cristata</i>	Red-knobbed Coot	LC
² <i>Galerida magnirostris</i>	Large-billed Lark	LC
² <i>Gallinago nigripennis</i>	African Snipe	LC
² <i>Gallinula chloropus</i>	Common Moorhen	LC
¹ <i>Glareola nordmanni</i>	Black-winged Pratincole	NT
² <i>Granatina granatina</i>	Violet-eared Waxbill	LC
¹ <i>Gyps africanus</i>	White-backed Vulture	EN
¹ <i>Gyps coprotheres</i>	Cape Vulture	EN
² <i>Halcyon albiventris</i>	Brown-hooded Kingfisher	LC
¹ <i>Haliaeetus vocifer</i>	African Fish-Eagle	LC
² <i>Hieraaetus pennatus</i>	Booted Eagle	LC
² <i>Himantopus himantopus</i>	Black-winged Stilt	LC
² <i>Hippolais icterina</i>	Icterine Warbler	LC
² <i>Hirundo albigularis</i>	White-throated Swallow	LC
² <i>Hirundo cucullata</i>	Greater Striped Swallow	LC
² <i>Hirundo dimidiata</i>	Pearl-breasted Swallow	LC
² <i>Hirundo fuligula</i>	Rock Martin	LC
² <i>Hirundo rustica</i>	Barn Swallow	LC
² <i>Hirundo semirufa</i>	Red-breasted Swallow	LC
² <i>Hirundo spilodera</i>	South African Cliff-Swallow	LC
² <i>Indicator indicator</i>	Greater Honeyguide	LC
² <i>Indicator minor</i>	Lesser Honeyguide	LC
² <i>Ixobrychus minutus</i>	Little Bittern	LC
² <i>Lagonosticta senegala</i>	Red-billed Firefinch	LC
² <i>Lamprotornis nitens</i>	Cape Glossy Starling	LC

LIST OF BIRDS (cont.)

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

Scientific name	Common name	IUCN status
² <i>Laniarius atrococcineus</i>	Crimson-breasted Shrike	LC
² <i>Lanius collaris</i>	Common Fiscal	LC
² <i>Lanius collurio</i>	Red-backed Shrike	LC
² <i>Lanius minor</i>	Lesser Grey Shrike	LC
² <i>Larus cirrocephalus</i>	Grey-headed Gull	LC
² <i>Larus fuscus</i>	Lesser Black-backed Gull	LC
¹ <i>Leptoptilos crumeniferus</i>	Marabou Stork	NT
² <i>Limosa limosa</i>	Black-tailed Godwit	NT
² <i>Macronyx capensis</i>	Cape Longclaw	LC
² <i>Malcorus pectoralis</i>	Rufous-eared Warbler	LC
² <i>Megaceryle maxima</i>	Giant Kingfisher	LC
¹ <i>Melierax canorus</i>	Southern Pale Chanting Goshawk	LC
¹ <i>Melierax gabar</i>	Gabar Goshawk	LC
² <i>Merops apiaster</i>	European Bee-eater	LC
² <i>Merops bullockoides</i>	White-fronted Bee-eater	LC
² <i>Merops hirundineus</i>	Swallow-tailed Bee-eater	LC
² <i>Merops persicus</i>	Blue-cheeked Bee-eater	LC
² <i>Milvus aegyptius</i>	Yellow-billed Kite	Not listed
¹ <i>Milvus migrans</i>	Black Kite	LC
² <i>Mirafrā africana</i>	Rufous-naped Lark	LC
² <i>Mirafrā fasciolata</i>	Eastern Clapper Lark	LC
² <i>Mirafrā passerina</i>	Monotonous Lark	LC
² <i>Monticola brevipes</i>	Short-toed Rock-Thrush	LC
² <i>Motacilla aguimp</i>	African Pied Wagtail	LC
² <i>Motacilla capensis</i>	Cape Wagtail	LC
² <i>Motacilla flava</i>	Yellow Wagtail	LC
² <i>Muscicapa striata</i>	Spotted Flycatcher	LC
¹ <i>Mycteria ibis</i>	Yellow-billed Stork	EN
² <i>Myrmecocichla formicivora</i>	Anteating Chat	LC
¹ <i>Neotis ludwigii</i>	Ludwig's Bustard	LC
² <i>Netta erythrophthalma</i>	Southern Pochard	LC
² <i>Nilaus afer</i>	Brubru	LC
² <i>Numenius arquata</i>	Eurasian Curlew	NT
² <i>Numenius phaeopus</i>	Common Whimbrel	LC
² <i>Numida meleagris</i>	Helmeted Guineafowl	LC
² <i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	LC
² <i>Oena capensis</i>	Namaqua Dove	LC
² <i>Oenanthe monticola</i>	Mountain Wheatear	LC
² <i>Oenanthe pileata</i>	Capped Wheatear	LC
² <i>Onychognathus naboroupp</i>	Pale-winged Starling	LC

LIST OF BIRDS (cont.)

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

	Scientific name	Common name	IUCN status
²	<i>Oriolus oriolus</i>	Eurasian Golden Oriole	LC
²	<i>Ortygospiza atricollis</i>	African Quailfinch	LC
²	<i>Oxyura maccoa</i>	Maccoa Duck	NT
¹	<i>Pandion haliaetus</i>	Osprey	LC
²	<i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler	LC
²	<i>Parus cinerascens</i>	Ashy Tit	LC
²	<i>Passer diffusus</i>	Southern Grey-headed Sparrow	LC
³	<i>Passer domesticus</i>	House Sparrow	LC
²	<i>Passer melanurus</i>	Cape Sparrow	LC
²	<i>Passer motitensis</i>	Great Sparrow	LC
²	<i>Phalacrocorax africanus</i>	Reed Cormorant	LC
²	<i>Phalacrocorax lucidus</i>	White-breasted Cormorant	LC
²	<i>Philetairus socius</i>	Sociable Weaver	LC
²	<i>Philomachus pugnax</i>	Ruff	LC
¹	<i>Phoenicopterus minor</i>	Lesser Flamingo	NT
¹	<i>Phoenicopterus ruber</i>	Greater Flamingo	NT
²	<i>Phoeniculus purpureus</i>	Green Wood-Hoopoe	LC
²	<i>Phylloscopus trochilus</i>	Willow Warbler	LC
²	<i>Platalea alba</i>	African Spoonbill	LC
²	<i>Plectropterus gambensis</i>	Spur-winged Goose	LC
²	<i>Plegadis falcinellus</i>	Glossy Ibis	LC
²	<i>Plocepasser mahali</i>	White-browed Sparrow-Weaver	LC
³	<i>Ploceus velatus</i>	Southern Masked-Weaver	LC
²	<i>Podiceps cristatus</i>	Great Crested Grebe	LC
²	<i>Podiceps nigricollis</i>	Black-necked Grebe	LC
¹	<i>Polemaetus bellicosus</i>	Martial Eagle	EN
¹	<i>Polihierax semitorquatus</i>	Pygmy Falcon	LC
¹	<i>Polyboroides typus</i>	African Harrier-Hawk	LC
²	<i>Porphyrio madagascariensis</i>	African Purple Swamphen	LC
²	<i>Porzana pusilla</i>	Baillon's Crake	LC
²	<i>Prinia flavicans</i>	Black-chested Prinia	LC
²	<i>Psophocichla litsipsirupa</i>	Groundscraper Thrush	LC
²	<i>Pternistis natalensis</i>	Natal Francolin	LC
²	<i>Pternistis swainsonii</i>	Swainson's Spurfowl	LC
²	<i>Pterocles burchelli</i>	Burchell's Sandgrouse	LC
²	<i>Pterocles namaqua</i>	Namaqua Sandgrouse	LC
¹	<i>Ptilopus granti</i>	Southern White-faced Scops-Owl	LC
³	<i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	LC
²	<i>Pytilia melba</i>	Green-winged Pytilia	LC
³	<i>Quelea quelea</i>	Red-billed Quelea	LC

LIST OF BIRDS (cont.)

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

Scientific name	Common name	IUCN status
² <i>Rallus caerulescens</i>	African Rail	LC
² <i>Recurvirostra avosetta</i>	Pied Avocet	LC
² <i>Rhinopomastus cyanomelas</i>	Common Scimitarbill	LC
² <i>Rhinoptilus africanus</i>	Double-banded Courser	LC
² <i>Riparia cincta</i>	Banded Martin	LC
² <i>Riparia paludicola</i>	Brown-throated Martin	LC
² <i>Riparia riparia</i>	Sand Martin	LC
¹ <i>Rostratula benghalensis</i>	Greater Painted-snipe	VU
¹ <i>Sagittarius serpentarius</i>	Secretarybird	VU
² <i>Sarkidiornis melanotos</i>	Comb Duck	LC
² <i>Saxicola torquata</i>	African Stonechat	LC
² <i>Scleroptila levaillantoides</i>	Orange River Francolin	LC
² <i>Scopus umbretta</i>	Hamerkop	LC
² <i>Serinus albogularis</i>	White-throated Canary	LC
² <i>Serinus atrogularis</i>	Black-throated Canary	LC
² <i>Serinus canicollis</i>	Cape Canary	LC
² <i>Serinus flaviventris</i>	Yellow Canary	LC
² <i>Sigelus silens</i>	Fiscal Flycatcher	LC
² <i>Spizocorys conirostris</i>	Pink-billed Lark	LC
² <i>Sporopipes squamifrons</i>	Scaly-feathered Finch	LC
² <i>Spreo bicolor</i>	Pied Starling	LC
² <i>Stenostira scita</i>	Fairy Flycatcher	LC
¹ <i>Sterna caspia</i>	Caspian Tern	LC
² <i>Streptopelia capicola</i>	Cape Turtle-Dove	LC
² <i>Streptopelia semitorquata</i>	Red-eyed Dove	LC
² <i>Streptopelia senegalensis</i>	Laughing Dove	LC
² <i>Struthio camelus</i>	Common Ostrich	LC
² <i>Sylvia borin</i>	Garden Warbler	LC
² <i>Sylvietta rufescens</i>	Long-billed Crombec	LC
² <i>Tachybaptus ruficollis</i>	Little Grebe	LC
² <i>Tachymarptis melba</i>	Alpine Swift	LC
² <i>Tadorna cana</i>	South African Shelduck	LC
² <i>Tchagra australis</i>	Brown-crowned Tchagra	LC
² <i>Telophorus zeylonus</i>	Bokmakierie	LC
² <i>Terpsiphone viridis</i>	African Paradise-Flycatcher	LC
² <i>Thalassornis leuconotus</i>	White-backed Duck	LC
² <i>Threskiornis aethiopicus</i>	African Sacred Ibis	LC
² <i>Tockus leucomelas</i>	Southern Yellow-billed Hornbill	LC
² <i>Tockus nasutus</i>	African Grey Hornbill	LC
² <i>Torgos tracheliotus</i>	Lappet-faced Vulture	EN
² <i>Trachyphonus vaillantii</i>	Crested Barbet	LC

LIST OF BIRDS (cont.)

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

Scientific name	Common name	IUCN status
² <i>Tricholaema leucomelas</i>	Acacia Pied Barbet	LC
² <i>Tringa glareola</i>	Wood Sandpiper	LC
² <i>Tringa nebularia</i>	Common Greenshank	LC
² <i>Tringa stagnatilis</i>	Marsh Sandpiper	LC
² <i>Turdus smithi</i>	Karoo Thrush	<i>Not listed</i>
² <i>Turnix sylvatica</i>	Small Buttonquail	LC
¹ <i>Tyto alba</i>	Barn Owl	LC
² <i>Upupa africana</i>	African Hoopoe	LC
² <i>Uraeginthus angolensis</i>	Blue Waxbill	LC
³ <i>Urocolius indicus</i>	Red-faced Mousebird	LC
² <i>Vanellus armatus</i>	Blacksmith Lapwing	LC
² <i>Vanellus coronatus</i>	Crowned Lapwing	LC
² <i>Vidua chalybeata</i>	Village Indigobird	LC
² <i>Vidua macroura</i>	Pin-tailed Whydah	LC
² <i>Vidua paradisaea</i>	Long-tailed Paradise-Whydah	LC
² <i>Vidua regia</i>	Shaft-tailed Whydah	LC
² <i>Zosterops pallidus</i>	Orange River White-eye	LC

APPENDIX 3

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

Harpagophytum procumbens subsp. *procumbens*
(Protected in terms of **Schedule 1** of the NCNCA)



A perennial, prostrate
creeper with annual stems

Rough, shallowly-lobed
leaves

Dry seed head (Devil's claw)

Pelargonium aridum

(All *Pelargonium* spp. are protected in terms of **Schedule 1** of the NCNCA)



Vachellia erioloba
(Protected under the NFA)



Pods are thickened and velvety

Spines are often swollen and fused at the base

Babiana bainesii

(All IRIDACEAE spp. are protected under Schedule 2 of NCNCA)

