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Eskom Vryburg 132kV Powerlines and Associated Substations, North West Province, South Africa

Biodiversity Impact Assessment

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Checked by:	Leisl Koch
Approved:	Leisl Koch
Signature:	
For:	ESKOM TRANSMISSION

Declaration

I, Liesl Koch, declare that I –

- act as an independent specialist consultant in the fields of Biodiversity (Fauna and Flora) for the **Biodiversity Impact Assessment Report for the Mookodi Integration Project**;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent 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, 2006; and
- will provide the competent authority with access to all information at our disposal regarding the application, whether such information is favourable to the applicant or not.

Liesl Koch
Senior Environmental Scientist
SiVEST Environmental Division

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CONSTRUCTION OF ESKOM VRYBURG 132kV POWER LINES AND ASSOCIATED SUBSTATIONS

BIODIVERSITY IMPACT ASSESSMENT

Contents **Page**

List of Figures

List of Tables

Appendices

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CONSTRUCTION OF ESKOM VRYBURG 132Kv POWER LINES AND ASSOCIATED SUBSTATIONS

BIODIVERSITY IMPACT ASSESSMENT

1 INTRODUCTION

1.1 Background

SiVEST have been appointed by Eskom Distribution to undertake a specialist biodiversity assessment for the proposed Vryburg 132kV power lines and associated substations in North West Province. These studies form part of a wider Environmental Impact Assessment (Scoping and Environmental Impact Assessment) that needs to be undertaken by the project proponent to identify and assess all the potential environmental impacts associated with the proposed project. The Scoping phase has been completed and this report presents the EIA phase Biodiversity studies.

The study falls within the Savanna Biome. Vegetation units within this Biome will be elaborated in the sections to follow.

1.2 Policy and Legislation

1.2.1 National Environmental Management Act: Biodiversity Act

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) operates in conjunction with the National Environmental Management: Protected Areas Act No. 57 of 2003. Both Acts emerge from the recommendations of the White Paper on the Conservation and Sustainable Use of South Africa's Biodiversity (1998) and were originally conceived of as one Act.

The objectives of the Act are:

- within the framework of the National Environmental Management Act, to provide for:
- the management and conservation of biological diversity within the Republic and of the components of such biological diversity;
- the use of indigenous biological resources in a sustainable manner; and
- the fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources;
- to give effect to ratified international agreements relating to biodiversity which are binding on the Republic;
- to provide for co-operative governance in biodiversity management and conservation; and to provide for a South African National Biodiversity Institute (SANBI) to assist in achieving the objectives of the Act.

The Act provides specifically for the issuing of permits. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. Regulations may be made pertaining to various matters regulated by the Act, offences and penalties are provided for, and consultation processes are prescribed. Should Red Data species be directly affected by the proposed lines or substation site, then the necessary permits will be required to be applied for.

1.2.2 Nature Conservation Ordinance

These are developed to protect both animal and plant species within the various provinces of the country which warrant protection. These may be species which are under threat or which are already considered to be endangered. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation. The Transvaal Nature Conservation Ordinance No. 12 of 1983 is the ordinance of relevance in the North West Province.

1.2.3 National Forest Act, 1998 (Act No. 84 of 1998)

The National Forest Act, 1998 (Act No. 84 of 1998) was promulgated to provide for the sustainable management and development of forests for the benefit of all and to promote the sustainable use of these forests. In addition to this function, the Act also provides for the protection of trees which are threatened. A protected tree list was published in GN 32731 of 27 November 2009 and will need to be consulted during the walk down if trees are to be removed for the proposed power lines.

1.3 Project Description

This project includes the construction of two (2) substations and five (5) separate 132 KV power lines, with a total length of approximately 110km. The primary power line runs from the proposed Bophirima Substation to Kalplats Substation in the North West Province and is approximately 89 km. The Kalplats-Edwards Dam Ring Extension will consist of an additional ±35km 132kV power line, to be stepped down to 88kV at Edwards Dam existing Distribution Substation. A detailed project and route description is provided in the sections below.

1.3.1 Project Components

The proposed project consists of a number of components which are listed below:

Substations:

- the proposed Bophirima 132/88kV Distribution Substation; and
- the proposed Kalplats 132kV Distribution Substation.

132kV power lines:

- the proposed Bophirima Substation to Kalplats Substation 132kV servitude power line (~89km);
- the proposed Kalplats Substation to the existing Edwards Dam Substation 132kV servitude power line to be stepped down to 88kV at the Edwards Dam substation (~35km);
- the proposed Bophirima Substation to existing Vryburg Municipal Substation 132kV servitude power line (~7km);
- the proposed Bophirima Substation to existing Woodhouse 132kV servitude power line (~0.1km – temporary line until the decommissioning of Woodhouse Substation); and
- the proposed Bophirima Substation to Mookodi Transmission Substation 132kV servitude power line (~14km)[+].

[+] It should be noted that the Mookodi Transmission Substation does not form part of the scope of this project, as environmental authorisation for the substation has been obtained as part of a separate EIA process. However, a single alignment for the Mookodi Transmission Substation site to the proposed Bophirima Substation Alternatives is included as part of the component of this proposed project.

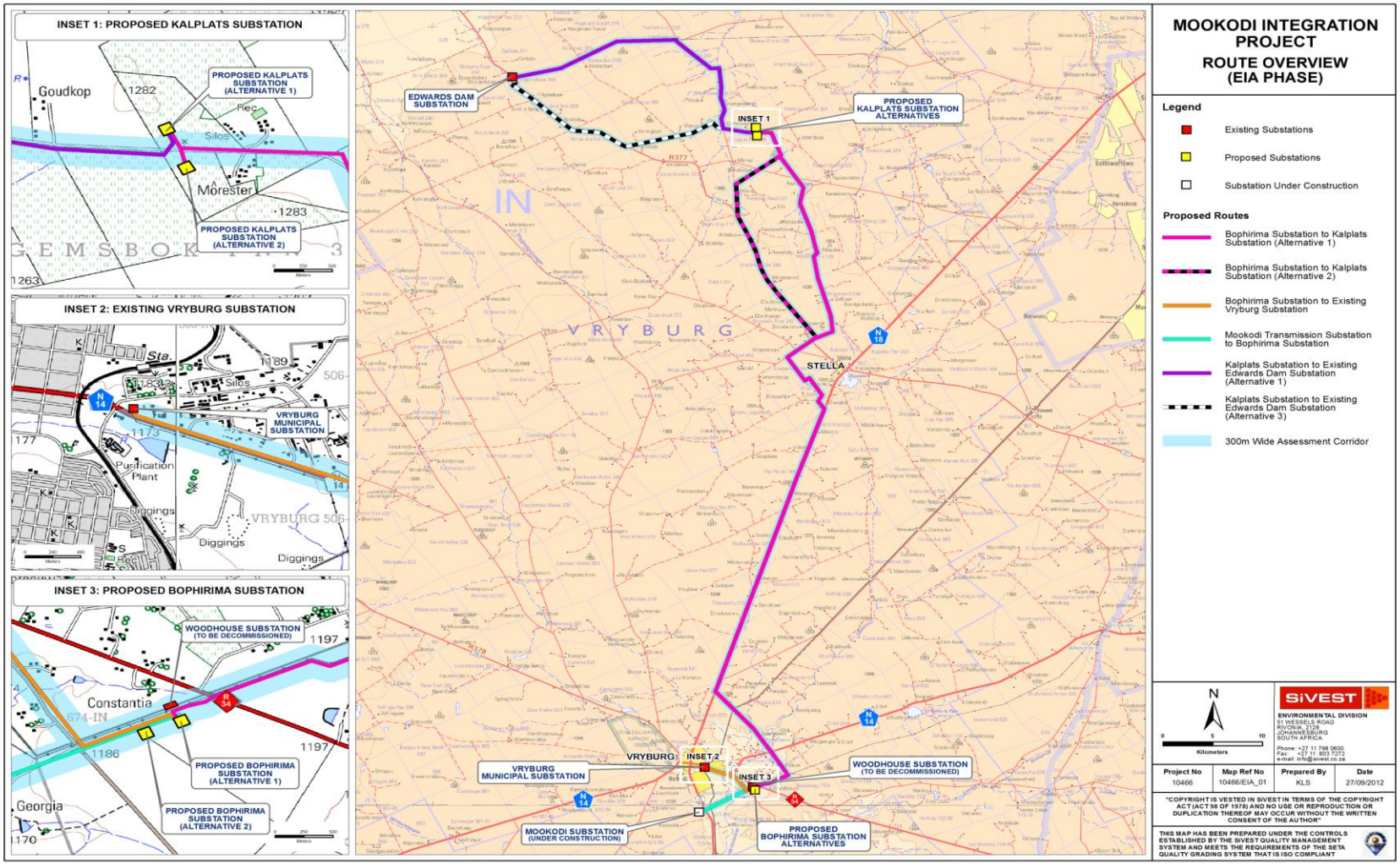


Figure 1: Map of the Study Area showing proposed power line alignments and proposed substation locations

1.3.2 Substations

The proposed substations will occupy an approximate area of 100m X 100m (~10,000m^2 or 1ha). The substations will consist of a number of different components, including feeder bays, transformers, a central control room, lightning conductor mast (14m-high) and a bunded oil drainage area (into which transformer oil / liquids would drain in the event of a spillage). The substation would be enclosed by two levels of fencing to secure the area. The substations will also be lit at night (by a number of 400 Watt floodlights) for security and emergency operational maintenance reasons. A number of power lines will typically enter / leave the substation.

1.3.3 Tower Types and Servitudes

It is proposed that both monopole structures (Figure 3) and lattice structures (Figure 4) will be used where appropriate. Single-tern conductor power lines are proposed. Monopole and lattice tower types that are bird-friendly will be used for the proposed power lines. The monopole tower type is approximately 25m in height. The footprint will be unique for each tower based on the ground conditions such as slope etc. A diagram of the proposed tower types are indicated below. Strain towers will also be used (A strain tower is a larger tower utilised in bends and where reinforcement is required with regards to tower stability).

In most cases the land beneath the overhead lines can be used, as normal, by the landowners. Eskom, however, require that no dwellings or vegetation/crops higher than 4m be established within the servitude.

The minimum servitude width for each line will be 31m.

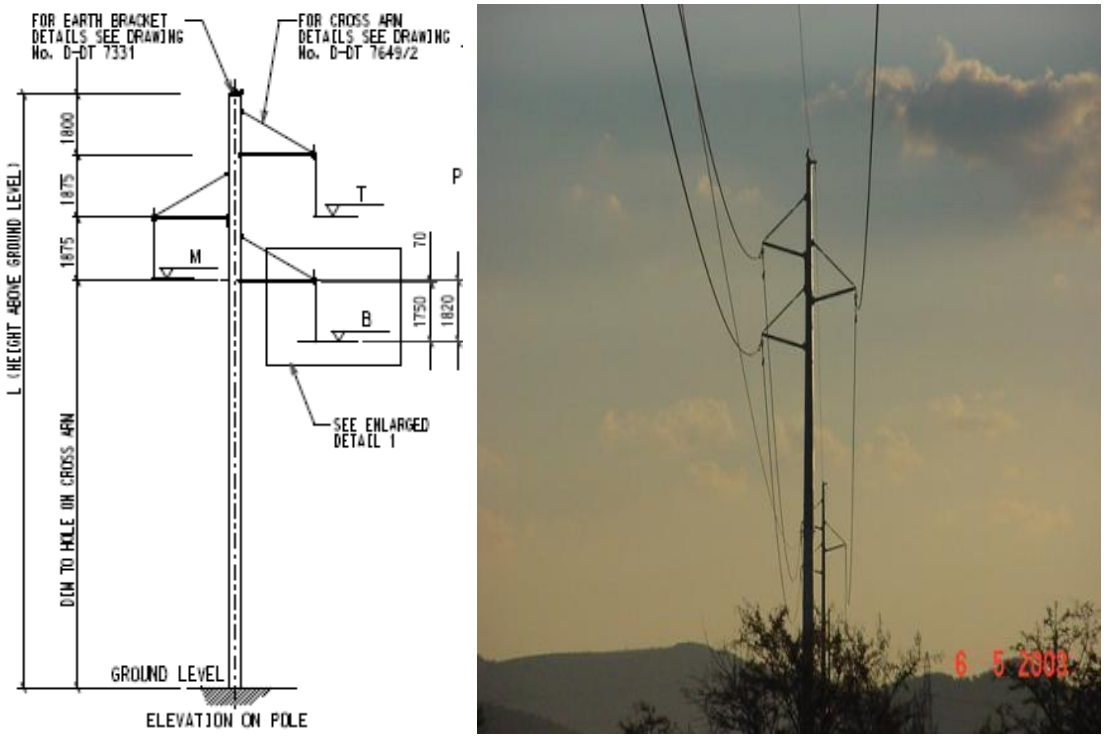
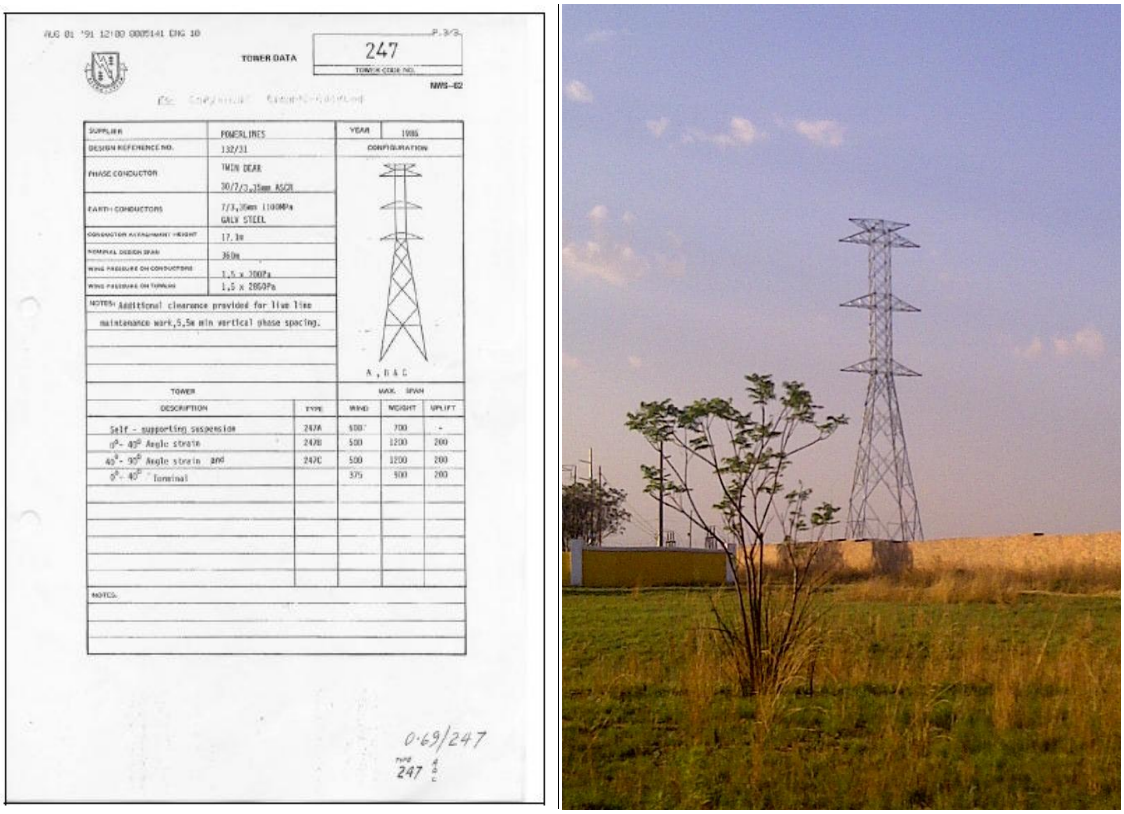


Figure 2: Proposed Monopole Structures



TOWER DATA 247

SUPPLIER	POWERLINES	YEAR	1985
DESIGN REFERENCE NO.	132/31	CONFIGURATION	
PHASE CONDUCTOR	TWIN DEAR 30/7/3,35mm ASCR		
EARTH CONDUCTORS	7/3,05mm 1100MPa GALV STEEL		
CONDUCTOR ATTACHMENT HEIGHT	17.1m		
NOMINAL DESIGN SPAN	360m		
WIND PRESSURE ON CONDUCTORS	1.5 x 300Pa		
WIND PRESSURE ON TOWERS	1.5 x 2850Pa		

NOTES: Additional clearance provided for live line maintenance work,5.5m min vertical phase spacing.

A , B & C

TOWER DESCRIPTION	TYPE	MAX. SPAN WIND	WEIGHT	UPLIFT
Self - supporting suspension	247A	500	700	-
0°- 40° Angle strain	247B	500	1200	200
40°- 90° Angle strain and	247C	500	1200	200
0°- 40° Terminal		375	900	200

NOTES:

0·69/247

Figure 3: Proposed Lattice Structures

1.3.4 Assessment Corridor

A 300m-wide corridor is currently being investigated to allow some flexibility during construction, and to take any site-specific environmental sensitivities into account. The corridor will allow for numerous route alternatives within its width to potentially be selected, and thus forms part of the location alternative assessment. The 31m servitude will be placed within this corridor, unless the EIA studies identify the need to re-route the proposed alignment to avoid sensitive environmental or no-go areas.

1.4 Route Description

A number of proposed components have been included as part of the Mookodi Integration Project. These components are illustrated in the figures in Section 5.1 above and are described in detail below.

1.4.1 Proposed Bophirima Distribution Substation - Alternatives 1 and 2:

The general area of the proposed Bophirima Distribution Substation is located beyond the south-eastern outskirts of Vryburg close to the Bernauw smallholdings. The two substation alternative sites are located to the south of the R34 road, relatively close to the farmstead Constantia and the existing Woodhouse Substation. Alternative 1 and 2 are located in relatively close proximity to one another, with Alternative 1 being located immediately adjacent to the Woodhouse Substation and Alternative 2 being situated further to the south west from Alternative 1.

1.4.2 Proposed Kalplats Distribution Substation - Alternatives 1 and 2:

The general area of the proposed Kalplats Distribution Substation is located approximately 28.5km to the north of the town of Stella. The nearest settlement is the hamlet of Papiesvlakte located 8km to the south-east of the Alternatives locations. The two substation alternative sites are situated on agricultural land on the farm Gemsbokpan, to the west of the Môrester farmstead. Alternative 1 is located to the north of a district road, and Alternative 2 is located 500m to the south, on the southern side of the road.

1.4.3 Mookodi Transmission Substation to Bophirima Substation 132kV Power Line Route

The Mookodi Transmission Substation site is located approximately 6km to the south of the town of Vryburg, to the west of the N18 road on the farm Rosendal 673-IN. A single alignment for the 132kV lines that will link the Mookodi Transmission Substation and the proposed Bophirima Distribution Substation have been provided for assessment. The alignment runs from the Mookodi Transmission Substation site in a north easterly direction. It crosses the N18 road and a railway line, running in a north-easterly direction across open natural veld, passing north of the Georgia farmstead. The alignment then follows parallel to two existing distribution power lines in this area, as well as parallel to the initial section of the proposed Bophirima Substation to Vryburg Municipal Substation 132kV route alignment.

1.4.4 Bophirima Distribution Substation to Vryburg Municipal Substation 132kV power line route

From the proposed Bophirima Substation alternative sites the route of the proposed alignment runs to the south-west across open vacant land, running parallel to two existing distribution power

lines and parallel to the alignment for the proposed Mookodi to Bophirima 132kV power line route. The route turns north west before an unsurfaced district road. The route runs parallel with the unsurfaced district road until it meets with the N14. The route then crosses the N14 and runs in a north westerly direction for approximately 400m before turning north east for a short distance of approximately 100m, and then turns to the north-west behind a BP filling station / truck stop-over complex. The alignment heads back towards the N14 and crosses the Leeuspruit wetland. The alignment then runs towards the Vryburg town centre running through a light industrial area. The proposed power line will then run parallel to the N14 in the road reserve to where the existing Vryburg Municipal Substation is located.

1.4.5 Bophirima Distribution Substation to Kalplats Distribution Substation 132kV Power Line Route

Alternative alignments have been provided for comparative assessment along a part of the alignment to the north of the town of Stella. Both alternatives follow the same alignment between Vryburg (Bophirima) and Stella.

The route is proposed to exit the proposed Bophirima Substation, running north-east from the substation site and crossing the R34 road into the Bernauw smallholdings. The alignment crosses mostly open vacant grazing land in this area and is proposed to run parallel to a set of existing distribution power lines. To the south of the farmstead Helena, the alignment turns and runs in a north-westerly direction along a cadastral boundary between the farms Bernauw and Welgelegen. The alignment runs across open natural veld used for livestock grazing to where it crosses the N14 road near the farmstead Oppie Koppie. The route continues in a north-westerly alignment, crossing a railway, across open grazing land. The route intersects the Paradise unsurfaced local access road, running parallel to it before intersecting the N18 road.

To the north of this point the alignment turns to run parallel to the N18 in a north-easterly direction towards Stella. The alignment passes the Boereplaas Resort and the turn-off to Devondale, traversing the farms Elma, Thabanchu, Mabula, Weltevreden, Pan Plaats and Spitz Kop. The route traverses open veld and pastures which are used mainly for grazing through this area. Approximately 3km to the south of Stella the route turns away to the north-west from the N18, following a farm access road to the Chwaing farmstead. The alignment then moves away from the farm access road to follow a cadastral boundary, thus running to the east of the Chwaing farmstead. The route continues to run across open grazing pastures along the cadastral boundary of Zoutpansfontein to where it intersects with a local district road. The route turns to the north-east to run parallel to the road, then running across more pastures to the south of the Stroebelsrus farmstead. The route traverses the R377 (unsurfaced) road to the point where Alternative 1 and 2 split.

The proposed Bophirima Substation to Kalplats Substation Alternative 1 runs to the north east for a short distance along the boundary of the Farm Wilgemoed 344 consisting mainly of dry land maize cultivation before turning predominantly northwards. The proposed power line route runs through the farms Wilgemoed 344 (close to the Gelboer farmstead), Wonderklip 339 (close to the Waterval farmstead), and Koodos Rand near the Paardepan farmstead. The alignment traverses a mix of natural bushveld vegetation and cleared pastures and cultivated fields as it passes the farms Wonderklip and Koodoos Rand. From this point, the proposed route turns to the northwest, traversing a district road and the farm boundary of the Koodoos Rand and Gemsbok Pan for a relatively short distance. The proposed route then turns to the west where it eventually meets with the two proposed Kalplats Substation Sites.

Bophirima Substation to Kalplats Substation Alternative 2 leaves Alternative 1 to the north of Stella, running across maize fields before intersecting, and then running parallel to the R377 in a north-westerly direction. It crosses a mix of farming land (maize fields) and natural thornveld, traversing the farms Welgemoed, Koodoos Dam, Blink Klip and Koodoos Rand. At the intersection of the R377 and a district road, the route turns away from the R377 in a northerly direction for a short distance before following the cadastral boundary of the farm Koodoos Rand to the north east. The route intersects the district road still running in a north easterly direction until meeting up with the Bophirima Substation to Kalplats Substation Alternative 1 where the proposed alignment follows the same route to the Kalplats Substation Sites.

1.4.6 Proposed Kalplats Substation Alternatives 1 and 2 to existing Edwards Dam Substation 132kV power line route

Alternative 1 exits the proposed Kalplats substation and heads west over agricultural/ cultivated land for approximately 3.7kms until it meets with a district road. The route then turns north, following the district road alignment across the farm Groot Gewaagd to Klip Pan, and then heads north-west towards Heeferslust. Just south of Heeferslust, the route turns west and then south-west following an existing power line servitude all the way to Edwards Dam situated adjacent to the Provincial Road R377. This last sector of the route travels across cultivated lands comprising the farms Heefers Lust, Kinderdam, Houmoed and Helpmekaar.

Alternative 3 exits the proposed Kalplats substation and heads west across the District Road following the alignment of a local road for approximately 2kms through agricultural land. The route then runs along the northern boundary of the farm Gemsbok Pan heading in a westerly direction where it then follows the Groot Verdriet 310 farm boundary until it meets up with the R377. The proposed route then follows the alignment of the Provincial Road R377 to Edwards Dam crossing the farms Bont Bok 259 and Helpmekaar.

2 METHODOLOGY

2.1 Desk top and Field Assessments

2.1.1 Approach

A detailed floral inventory has been undertaken for the project which documents the floral diversity across the study area. Documenting the faunal species on the same level across such a large area would take a significant amount of time and resources. The approach for assessing faunal populations is thus based on the presence of suitable habitat and the level of transformation that is present in an area.

The approach to the study was thus to divide the study area into sections and strategically assess the route in terms of vegetation present, available habitat for faunal species and ultimately what the implications of the project would be on this area. Please refer to the detailed route assessment for the detailed approach to the study in terms of the sections (Section).

The fieldwork component of the biodiversity study was undertaken between the 22nd and the 24th of March 2011.

2.1.2 Flora Assessments

- Assessment
    - *Desktop:* based on the above, vegetation types were assessed for extent transformed, sensitivity, fragmentation and conservation status. Recommendations for amendments to the routes were made, based upon the desktop assessment and observations during the field trip.
    - *Fieldwork:* where possible, flora was sampled along, or where access was difficult and therefore time-consuming, adjacent to the proposed routing, ensuring that in the latter case vegetation was the same in terms of general habitat.

Detailed plant species lists were made of random 0.1 ha plots in vegetation representative of that occurring along the route in a particular area.

Searches were undertaken specifically for Red List plant species (according to SANBI 2006) and any other species with potential conservation value within the study area. Furthermore Vegetation types and flora therein was identified through SANBI as well as Mucina and Rutherford (2006). Mucina and Rutherford (2006) was also used to describe the various vegetation units.

2.1.3 Fauna Assessments

During site surveys, the corridor was driven and areas conducive to faunal habitation identified. Similarly areas which were heavily transformed were also identified.

In addition, the availability of habitat has been assessed as per the above mentioned sections.

This report concentrates on habitat provision of the following faunal groupings:

- Mammals
- Amphibians
- Reptiles
- Invertebrates

Where data was available a broad level probability analysis was undertaken to determine the probability of a species being present in the study area. This method utilises two criteria; namely habitat availability and food availability. It must be remembered that this probability analysis has been utilised as a tool to highlight the importance of Red Data species within the study area and is by no means a definitive indicator of the presence of these species. Each criteria is provided with a percentage out of 100% which then calculates the probability of occurrence within the site in question. This method has only been used for faunal groupings where enough data is available in order to meet each criteria.

Avi-fauna is addressed in a separate specialist report conducted by the Endangered Wildlife Trust (EWT).

Potential species lists have been compiled with attention given to protected and endangered species in terms of the IUCN Red Data List. In order to identify areas that are likely to provide habitat for faunal species, a landuse layer based on the Environmental Potential Atlas (ENPAT) data, SANBI Biodiversity GISmaps and Google Earth Pro imagery were used. This information was supplemented by a field trip. Land use and the level of transformation are explored at length

in the route assessment section below which identifies areas which provide intact habitat as well as areas that have been transformed in some way.

2.2 Impact Assessment

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

2.2.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 2.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

2.2.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

- Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Description of impacts

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		

This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).

3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY/ MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.

74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

Table 2: Rating of impacts

IMPACT TABLE FORMAT		
Environmental Parameter	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Issue/Impact/Environmental Effect/Nature	*A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water*	
Extent	*A brief description indicating the chances of the impact occurring*	
Probability	*A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity*	
Reversibility	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Irreplaceable loss of resources	*A brief description of the degree in which irreplaceable resources are likely to be lost*	
Duration	*A brief description of the amount of time the proposed activity is likely to take to its completion*	
Cumulative effect	*A brief description of whether the impact will be exacerbated as a result of the proposed activity*	
Intensity/magnitude	*A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily*	
Significance Rating	*A brief description of the importance of an impact which in turn dictates the level of mitigation required*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	1

IMPACT TABLE FORMAT		
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	*Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analyzing the significance. These measures will be detailed in the EMPR.*	

2.3 Assumptions and Limitations

Because faunal populations are dependent on the flora that supports them, assumptions regarding the presence of fauna have been made based on the flora present. Detailed walk downs once the tower locations are final will be required to reduce impacts identified in this report.

3 DESCRIPTION OF THE ENVIRONMENT

3.1 Geology

The study area is underlain by a variety of parent materials. The area around Vryburg has an assortment of geologic materials including sedimentary rocks and tillite. The Bophirima to Kalplats routing, crosses the same tillite and limited sedimentary rock as well as an extensive stretch of Andesite, an extrusive igneous rock. North of Stella the routes cross sandstone parent material.

3.2 Topography

The study area is characterised by flat and gently sloping topography.

3.3 Land Use

The land use in the study area is characterized by various forms of agricultural activities mainly cattle grazing. Cultivation was also noted although this was not a dominant activity. According to Bohlweki-SSI Environmental, (2010), in areas near Vryburg, it was observed that rotational grazing involving the use of camps was practiced. This was evident by the high utilization grazing in parts.

Several natural areas were noted north of Stella where game farming and cattle grazing are being practiced.

3.4 Climate

The climate of the study area can be classified as semi-arid with a summer rainfall regime i.e. most of the rainfall is confined to summer and early autumn. Mean Annual Precipitation (MAP) is relatively uniform over the area and fluctuates between 440 to 450 mm per year and without some form of supplementary irrigation natural rainfall is generally insufficient to produce sustainable harvests. This is reflected in the limited dry land crop production within the study area compared to the wetter areas to the east which are associated with an increase in dry land crop production. Average daily temperatures range from 33 ^{o}C in summer to 19 ^{o}C in winter, while average night time temperatures range from 18 ^{o}C in summer to 0 ^{o}C in winter.

3.5 Flora of the Study Area

The vegetation of the broad study area falls within the Savanna Biome, Grassland Biome and Inland Azonal Vegetation. Several vegetation types are present along the proposed route and these are listed below (Table 3 and Figure 4). Two Vulnerable vegetation types i.e. Mafikeng Bushveld and Stella Bushveld and two endangered vegetation types i.e. Schweizer-Reneke Bushveld and Western Highveld Sandy Grassland are present. Meanwhile Ghaap Plateau Vaalbosveld, Southern Kalahari Salt Pans and Highveld Alluvial Vegetation vegetation types are least threatened.

Table 3: Vegetation types in the study area

Vegetation Class	Conservation Status	Protection Status
Mafikeng Bushveld	Vulnerable	Not Protected
Stella Bushveld	Vulnerable	Not Protected
Ghaap Plateau Vaalbosveld	Least Threatened	Not Protected
Southern Kalahari Salt Pans	Least Threatened	Poorly Protected
Highveld Alluvial Vegetation	Least Threatened	Poorly protected
Schweizer-Reneke Bushveld	Endangered	Not Protected
Western Highveld Sandy Grassland	Endangered	Hardly protected

Greater Study area
Directly affected

Vegetation will be used for identification of habitat in the EIA phase.

It is important to note that only Mafikeng Bushveld, Stella Bushveld and Ghaap Plateau Vaalbosveld vegetation types are anticipated to be directly affected by the proposed development as they are traversed by the power lines. The other vegetation types are quite distant from the proposed development and hence the impact is not expected to be significant.

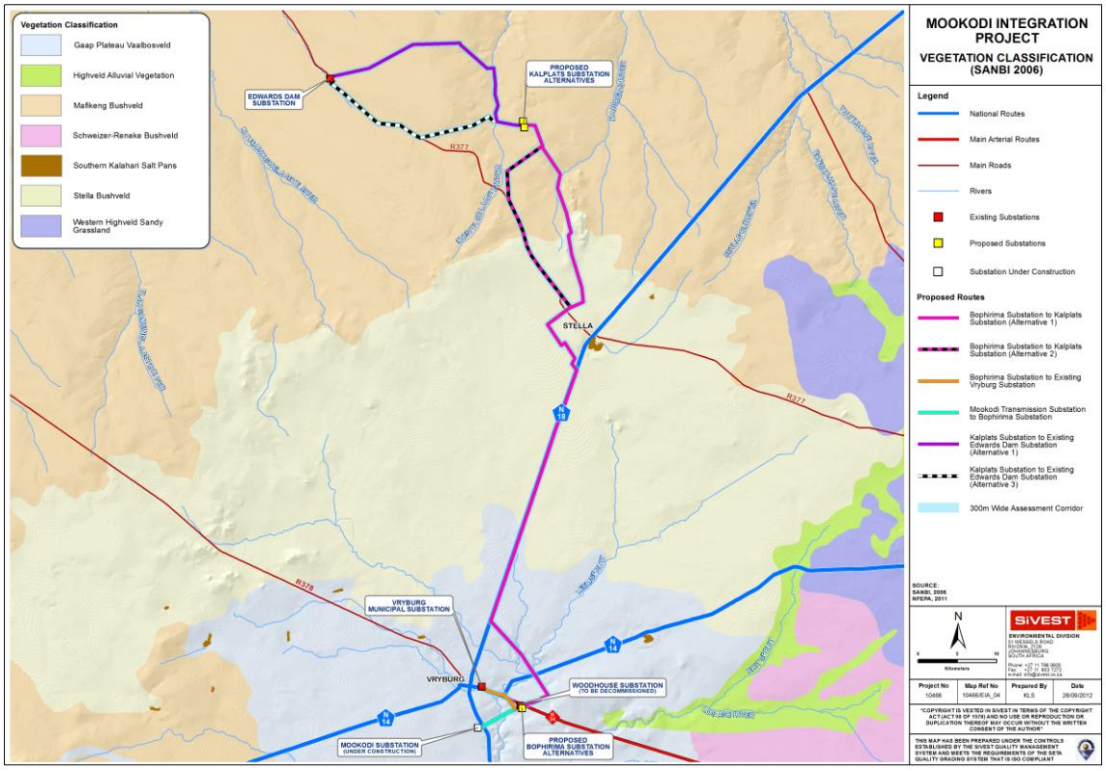


Figure 4: Vegetation of the study area

- Mafikeng Bushveld

This bushveld is occurs on Aelioan Kalahari sand of tertiary to recent age, flat sandy plains and soils deep. It is vulnerable with about 25% already transformed mainly by cultivation and urban development. While tall tree species are dominated by *Acacia erioloba*, small tree species are dominated by *Acacia karroo*, *Ziziphus mucronata* and *Terminalia sericea*. Shrubs include: *Dichrostachys cinerea*, *Grewia flava*, *Rhus tenuinervis* and *Acacia hebeclada* subsp. *Hebeclada*. (Mucina & Rutherford, 2006).

- Stella Bushveld

The Stella Bushveld is found on plains to sometimes slightly undulating plains with open tree and shrub layers. Trees such as *Acacia erioloba* and *A. tortillis* and shrubs such as *A. hebeclada*, *Dichrostachys cinerea*, *Grewia flava* and *Tarchonanthus camphorates* (Mucina & Rutherford, 2006). Soils are that of the Andesitic lavas of the Allanridge formation of the Ventersdorp supergroup. Up to 21% has been transformed by cultivation (Mucina & Rutherford, 2006).

- Ghaap Plateau vaalbosveld

This vegetation type occurs on a flat plateau with well developed shrub layer with *Tarchonanthus camphorates* and *Acacia karroo*. The open tree layer has *Olea europaea* subsp. *africana*, *A. tortilis*, *Ziziphus mucronata* and *Rhus lancea* (Mucina & Rutherford., 2006). Much of the South-central part of this unit has remarkably low cover of Acacia species for an arid savanna and is dominated by the nonthorny *T. camphoratus*, *R. lancea* and *O. europaea* subsp. *africana*. Soils are surface limestone of tertiary to recent age and dolomite and chert of the Campbell Group (Griqualand West Supergroup, Vaalian Erathem) support shallow soils (0.1-0.25 m) of Mispah and Hutton soil forms (Mucina & Rutherford, 2006). Only about 1% is already transformed (Mucina & Rutherford, 2006).

- Southern Kalahari Salt Pans

It occurs on low grassland on pan bottoms which are often devoid of vegetation and dominated by *Sporobolus* species mixed with dwarf shrubs (Mucina & Rutherford, 2006). Low shrublands are dominated by *Lycium* and/or *Rhigozum* which normally form the salt pan zonation system outer belt (Mucina & Rutherford, 2006). Soils are sandy sediments of the Cenozoic Kalahari Group (Mucina & Rutherford, 2006)

- Highveld Alluvia Vegetation

This vegetation type is found on flat topography supporting riparian thickets dominated by *Acacia karroo* which is accompanied by seasonally flooded grasslands and disturbed herblands. The herblands are often dominated by alien plants. The soils within this vegetation type are deep, sandy to clayey alluvial soils developed over Quaternary alluvial sediments. Some of the dominant species include *Acacia karroo*, *Salix mucronata*, *Phragmites australis*, *Felicia muricata* among others. In terms of conservation, the vegetation type is least threatened (Mucina & Rutherford, 2006).

- Schweizer-Reneke Bushveld

Schweizer-Reneke Bushveld occurs on Plains, slightly undulating plains and a few hills (Mucina & Rutherford, 2006). It is characterised by open woodland with a fairly dense shrub layer. Trees include *Acacia erioloba, A. Karroo, A. tortilis, Rhus lancea*. Shrubs include *A. hebeclada, Diospyros lyciodes, Grewia flava* and *Tarchonanthus camphorates* (Mucina & Rutherford, 2006). Soils are Andesitic lavas of the Allanridge formation of the Ventersdorp subgroup (Mucina & Rutherford, 2006).

- Western Highveld Sandy Grassland

Found on flat gently undulating plains with short, dry grassland with some woody species occurring in bush clumps. Soils are basaltic lavas of the Klipriviersberg group and andesitic lavas of the Allan ridge formation (Mucina & Rutherford, 2006). Some of the dominant species include: *Anthephora pubescens*, *Aristida congesta*, *Sporobolous africana*, *Themeda triandra*, *Eragrostis chloromelas, Gazania krebsiana* and *Stachys spathulata*. The vegetation type is endangered and more than 60% has been ploughed (Mucina & Rutherford, 2006).

3.5.1 Red Data Plant Species

A list of Red Data plant species is presented in Appendix 1. No Red Data species were noted during the detailed site inspection.

3.5.2 Protected Plant Species

The prominent plant of concern in this regard is Camel thorn *Acacia erioloba* which is common throughout the area (Figure 5). It is declared as a Protected Tree under the National Forests Act of 1998. In terms of this Act, protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the Department of Water Affairs and Forestry (or a delegated authority).

Applications for permits to undertake such activities should be applied for with the Department of Forestry and Fisheries (DAFF). Each application is evaluated on merit (including site visits) before a decision is taken whether or not to issue a license (with or without conditions). Such decisions must be in line with national policy and guidelines.

Figure 5: Camel thorn *Acacia erioloba.* Photo taken along alternative 1 between Kalplats substation to the existing Edwards dam substation

Acacia erioloba ranges from a 2m spiny shrub to a 16m robust tree. The stem is shiny reddish brown when young. The bark of a mature tree is grey to blackish brown and is deeply furrowed; bearing pairs of almost straight, whitish or brown spines. Spines often have swollen bases and appear at the bases of the leaves. The fully developed spines may be up to 60 mm long. The leaves are twice divided. There are normally 2 to 5 pairs of pinnae per leaf and 8 to 18 pairs of leaflets (pinnules) per pinna. They are hairless and have a prominent underside vein on the undersurface (SANParks 2009).

The tree bears bright yellow ball-like flowers that are sweetly scented. They are borne in late winter and last through to summer. The fruit is variable and ranges from small and almost cylindrical to typically large, flat, thick, semicircular or half-moon-shaped pods. They are up to 130 mm long and 50 mm wide and are covered by velvety grey hairs. They are semi-woody, but spongy inside; the pods do not open even when ripe but fall to the ground in winter. Seeds are thick, robust and lens-shaped.

Mitigation measures will thus need to be included within the EMPr and a permit applied for with the DAFF if these trees are to be removed.

3.6 Fauna of the Study Area

Friedman and Daly, (2004) list several red data mammal species that could potentially occur in the study area e.g. the Brown Hyaena (*Hyaena brunnea*) and the Honey Badger (*Mellivora capensis*) and Schreiber's Long-fingered Bat (*Miniopterus schreibersii*) are listed as Near Threatened. However due to the large amount of anthropogenic activities present in the area, particularly near Vryburg, these species may not exist in the study area.

Bird life in the study area is will be investigated by the Avifauna assessment investigates this further.

The African Giant Bullfrog (*Pyxicephalus adspersus*) which is a Red Data species potentially occurs within the study area (Du Preez and Carruthers, 2009). It occurs in seasonal shallow grassy pans, vleis and other rain filled depressions in open flat areas of grassland or savanna (Du Preez and Carruthers, 2009). This species is considered to be Near Threatened as its specialized habitat is at risk from increasing urbanization and agricultural activity (Du Preez and Carruthers, 2009).

Reptile species e.g. Southern African Python (*Python natalensis*) listed as Vulnerable and Blunt-tailed Worm-lizard (*Dalophia pistillum)* could potentially occur in the study area (Cook, 2008).

Invertebrate information for the study area is limited although several species are anticipated to be present.

3.6.1 Mammals

Various mammal species are likely to occur within the study area. Appendix 2 comprises a list of mammals that are likely to occur in study area with the assigned level of threat facing a particular species. A map was used to correlate the occurrence of the Red Data species with their approximate occurrence within the study area. According to Friedman and Daly, (2004), the majority of species within the study area are listed as species of least concern. However, a few species are such as Brown Hyaena (*Hyaena brunnea*); Honey Badger (*Mellivora capensis*); Schreiber's Long-fingered Bat (*Miniopterus schreibersii*); Geoffroy's Horseshoe Bat (*Rhinolophus clivosus*); and Darling's Horseshore Bat (*Rhinolophus darling*) are listed as Near Threatened. Roan Antelope (*Hippotragus equinus*) is Vulnerable. African Wild Dog (*Lycaon pictus*) and White-tailed Rat (*Mystromys albicaudatus*) are Endangered while Black Rhinoceros (*Diceros bicornis*) is Critically Endangered. Table 4 below identifies the probability of these species occurring within

the study area. The analysis indicates that the likelihood of the majority of Red Data species occurring within the study area is fairly low although the possibility still remains.

Table 4: Mammal probability analysis

Common Name	Scientific name	SA Red data list status	Habitat availability	Food availability	Probability of occurrence
Black Rhinoceros	*Diceros bicornis bicornis*	CE	very little	very little	low
Honey Badger	*Mellivora capensis*	NT	very little	minimal food available	low
Schreibers' Long-fingered Bat	*Miniopterus schreibersii*	NT	very little	minimal food available	low
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*	NT	very little	minimal food available	low
Darling's Horseshoe Bat	*Rhinolophus darling*	NT	very little	minimal food available	low
Roan Antelope	*Hippotragus equinus*	VU	very little	very little	low
African Wild Dog	*Lycaon pictus*	EN	very little	very little	low
White-tailed Rat	*Mystromys albicaudatus*	EN	minimal habitat available	minimal food available	low to medium

Table 5 below presents mammal species listed in GN 1187 published under the National Environmental Management: Biodiversity Act on the 23rd of February 2007 which potentially occur within the study area.

Table 5: Mammal species listed in GN 1187 published under the National Environmental Management: Biodiversity Act on the 23rd of February 2007

Common name	Scientific name	Status under GN 1187
White Rhinoceros	*Ceratotherium simum*	Protected
Black Wildebeest	*Connochaetes gnou*	Protected
Black-footed Cat	*Felis nigripes*	Protected
Brown Hyaena	*Hyaena brunnea*	Protected
Honey Badger	*Mellivora capensis*	Protected
Cape Fox	*Vulpes chama*	Protected
South African Hedgehog	*Atelerix frontalis*	Protected
Black Rhinoceros	*Diceros bicomis bicomis*	Endangered

Common name	Scientific name	Status under GN 1187
African Wild Dog	*Lycaon pictus*	Endangered
Leopard	*Panthera pardus*	Vulnerable
Roan Antelope	*Hippotragus equinus*	Vulnerable

Note that Friedman and Daly, (2004) list Black Rhinoceros as Critically Endangered while GN 1187 lists the species as Endangered.

Overall, the majority of these species are highly unlikely to occur within the study area, particularly the large mammals due to the level of transformation and lack of protected areas.

3.6.2 Amphibians

Several frog species potentially occur in the study area (Table 6). Most species are of Not Threatened except for the Giant Bullfrog which is considered Near Threatened (Du Preez and Carruthers, 2009).

The Giant Bullfrog (*Pyxicephelus adspersus*) breeds in seasonal shallow grassy pans, vleis and other rain filled depressions in open flat areas of grassland or savanna (Du Preez and Carruthers, 2009). This habitat is present along the proposed routes however these are likely to be spanned and thus habitat for these species is not likely to be affected.

Bullfrog density commonly varies within certain habitats (open grassland habitat). High densities are often associated with specific microhabitats or patches (hygrophytic or aquatic ephemerophytic grass and sedge dominated temporary pans) that can be identified and randomly sampled (Cook, 2008). Emphasis must be placed on remaining natural open grassland habitats (important migratory and foraging areas) as well as seasonal wetlands (drainage and marshland vegetation) in the study area. The seasonal wetland habitats offer the most suitable breeding habitat for Giant Bullfrogs in the area (Cook, 2008).

Table 6: Red data amphibian species in the study area

Common name	Scientific name	Category (Du Preez and Carruthers, 2009)	Habitat
Eastern Olive Toad	*Amietophrynus garmani*	Not Threatened	Bushveld vegetation types (Savanna biome)
Guttural Toad	*Amietophrynus gutturalis*	Not Threatened	Savanna, Grassland, and Thicket biomes

Common name	Scientific name	Category (Du Preez and Carruthers, 2009)	Habitat
Bubbling Kassina	*Kassina senegalensis*	Not Threatened	Savanna and Grassland biomes
Bushveld Rain Frog	*Breviceps adspersus*	Not Threatened	Semi-arid habitats with Sandy to sandy-loam soils (Savanna biome)
Banded Rubber Frog	*Phrynomantis bifasciatus*	Not Threatened	Bushveld vegetation types (Savanna biome)
Boettger's Caco	*Cacosternum boettgeri*	Not Threatened	Savanna, Grassland, Nama Karoo, Fynbos and Thicket biomes
Common Platanna	*Xenopus laevis*	Not Threatened	Natural water bodies, Farm dams and ponds
Giant Bullfrog	*Pyxicephalus adspersus*	Near Threatened	Savanna, Grassland, Nama Karoo and Thicket biomes Savanna and Grassland biomes (Breeds in seasonal shallow grassy pans, vleis and other rain filled depressions in open flat areas of grassland or savanna)
Tremolo Sand Frog	*Tomopterna cryptotis*	Not Threatened	A variety of habitats in Savanna and Grassland Biomes. Breeds in shallow, standing water at the edges of dams, pans and small water bodies i.e. roadside puddles

The Giant Bullfrog is a protected species in terms of GN 1187 published under the National Environmental Management: Biodiversity Act on the 23rd of February 2007.

Based on habitat assessments during field surveys, the habitat for Giant Bullfrogs in the study area is minimal and hence food availability is minimal. Therefore the probability of occurrence of this species in the study area is medium.

A number of large termite mounds *Trinervitermes haberlandii* which potentially house numerous amphibian species are present in the Vryburg area (Cook, 2008).

Apart from the Giant Bullfrog, no other amphibian species listed in GN 1187 published under the National Environmental Management: Biodiversity Act on the 23rd of February 2007 potentially occurs within the study area.

3.6.3 Reptiles

Several reptile species are present in the study area. Table 7 highlights the species which are likely to be present within the study area. The only Red Data species which is likely to be present is the Southern African Python (*Python natalensis)* which is listed as Vulnerable in the outdated South African Red Data Book (Cook, 2008).

Table 7: Reptile species potentially present in the study area (Branch, 1998)

Common name	**Scientific name**
Leopard Tortoise	*Geochelone pardalis*
Cape Thick-toed Gecko	*Pachydactylus capensis*
Serrated or Kalahari Tent Tortoise	*Psammobates Oculiferus*
Marsh or Helmeted Terrapin	*Pelomedusa subrufa*
Delalande's Beaked Blind Snake	*Rhinotyphlops lalandei*
Bibron's Blind Snake	*Typhlops bibronii*
Peters' Thread Snake	*Leptotyphlops scrutifrons*
Southern African Python	*Python natalensis*
Southern or Bibron's Burrowing Asp	*Atractaspis bibronii*
Brown House Snake	*Lamprophis fuliginosis*
Cape Wolf Snake	*Lycophidion capense*
Mole snake	*Pseudoaspis cana*
Two-striped Shovel-snout	*Prosymna bivittata*
Striped Skaapsteker	*Psammophylax tritaeniatus*
Kalahari Sand Snake	*Psammophis trinasalis*
Cross-marked or Montane Grass Snake	*Psammophis crucifer*
Common or Rhombic Egg Eater	*Dasypeltis scabra*

Common name	Scientific name
Herald or Red-lipped Snake	*Crotaphopeltis hotamboeia*
Eastern Tiger Snake	*Telescopus semiannulatus*
Boomslang	*Dispholidus typus*
Cape Cobra	*Naja nivea*
Puff adder	*Bitisarietansarietans*
Kalahari Round-headed Worm Lizard	*Zygaspis quadrifrons*
Blunt-tailed Worm Lizard	*Dalophia pistillum*
Cape Skink	*Mabuya capensis*
Montane Speckled Skink	*Mabuya striata punctatissima*
Variable Skink	*Mabuya varia*
Common Rough-scaled Lizard	*Ichnotropis squamulosa*
Spotted Sandveld Lizard	*Nucras intertexta*
Holub's Sandveld Lizard	*Nucras holubi*
Spotted Sand Lizard	*Pedioplanis lineoocellata*
Namaqua Sand Lizard	*Pedioplanis namaquensis*
Yellow-throated Plated Lizard	*Gerrhosaurus flavigularis*
Karoo Girdled Lizard	*Cordylus polyzonus*
Transvaal Girdled Lizard	*Cordylus vittifer*
Rock or White-throated Monitor	*Varanus albigularis*
Nile or Water Monitor	*Varanus niloticus*
Ground Agama	*Agama aculeata*
Southern rock and Knobel's Agama	*Agama atra*
Flap-neck Chameleon	*Chamaeleo dilepis*
Cape Dwarf Gecko	*Lygodactylus capensis*

Some reptile species recorded in the study area (Table 7) are listed in CITES Appendix II (Convention in the Trade of Endangered Species). These species include: Leopard Tortoises (*Geochelone pardalis*); Rock or White-throated Monitor (*Varanus albigularis*) and Nile or Water monitor (*Varanus niloticus*). These species have been placed on the CITES list due to the illegal pet trade.

During the preliminary field survey, a Leopard Tortoise was sighted in the study area (Figure 6). Its habitat varies from montane grassland, fynbos, valley bushveld as well as arid and mesic savanna (Branch 1988).

Figure 6: Leopard Tortoise (*Geochelone pardalis*)

The African Rock Python (*Python natalensis)* which potentially occurs in the study area is a protected species in terms of GN 1187 published under the National Environmental Management: Biodiversity Act on the 23rd of February 2007.

No other reptile species listed species in terms of GN 1187 published under the National Environmental Management: Biodiversity Act on the 23rd of February 2007 potentially occurs in the study area.

3.6.4 Invertebrates

Appendix 2 lists Lepidoptera species that may possibly occur in the North West province. This information was obtained from the 2008 North West Environmental outlook (a report on the state of the Environment).

No reptile species listed species in terms of GN 1187 published under the National Environmental Management: Biodiversity Act on the 23rd of February 2007 potentially occurs in the study area.

No detailed assessment of invertebrates have been undertaken due to the scale of the project although it is not likely that invertebrate species would be affected by the proposed construction process as they are mobile. Suitable vegetation is currently available for these invertebrate species and the project is not going to result in massive habitat destruction.

3.7 Habitats

Faunal populations are dependent on the flora that supports them therefore assumptions regarding the presence of fauna can be made based on the flora present. Habitats within the study area are dominated by Stella Bushveld vegetation type, followed by Ghaap Plateau Bushveld vegetation type and Mafikeng Bushveld vegetation type (Figure 7, Figure 8 and Figure 9).

The Leeuspruit River, the Losase River and a few wetlands near Vryburg within the Ghaap Plateau Vaalbosveld vegetation type are potential habitats for several faunal species.

Figure 7: Scrub vegetation near Vryburg (Ghaap Plateau Vaalbosveld)

Figure 8: Transformed vegetation along road to Stella (Stella Bushveld)

Figure 9: Bushveld vegetation north of Stella (Mafikeng Bushveld)

3.8 Transformation

The study area has been affected by habitat transformation to a certain degree. Large expanses of natural vegetation have been impacted by cattle farming however habitat connectivity has still been retained. The northern part of the study area is considered to be relatively natural with evidence of more natural vegetation being present in this area. Along the N18 the level of transformation is more evident with more uniform grasslands dominating the landscape. The level of transformation increases closer to Vryburg.

4 ROUTE ASSESSMENT AND SENSITIVE AREAS

In order to determine the impacts that could result from the proposed project, a detailed route assessment was undertaken from a biodiversity perspective. In order to ensure a thorough assessment and allow for easy reading, the route was split up into four Biodiversity sections namely:

- Vryburg Biodiversity section
- Vryburg to Stella Biodiversity section
- Stella to Kalplats Biodiversity section
- Kalplats to Edwards dam Biodiversity section

Each section involved the assessment of the following:

- General land use description
- Vegetation type
- Faunal habitat provision and faunal species of concern
- Implications for development

4.1 Biodiversity Route Assessment

4.1.1 Vryburg Biodiversity Section

The Vryburg section encompasses the following sections of the route:

- The proposed Bophirima Substation to Mookodi Transmission Substation 132kV servitude power line (~14km – green alignment)
- Bophirima Substation to existing Vryburg Substation (white alignment)
- A portion of the route from Bophirima Substation to Kalplats Substation. This portion ends at the intersection of N18 and the dirt road (purple alignment).

Figure 10: Vryburg biodiversity section

- General land use description

The Vryburg area is characterised by several land uses such as vacant/ unspecified, residential, commercial/ industrial, cultivated land and forestry (ENPAT data). The route running from Mookodi transmission substation to Bophirima substation predominantly cross vacant or unspecified land. The alignment also crosses a river, a dirt road, a tar road (N18) as well as a railway line.

A portion of the alignment from the Bophirima substation to existing Vryburg substation traverses a commercial/ industrial area (in the area closer to the existing Vryburg substation). The other portion of this route crosses vacant/ unspecified land. Furthermore, the area of the Mookodi and the Bophirima substations is classified as vacant/ unspecified. But during site visits, illegal dumping and signs of a previous fire were observed in portions near the Mookodi substation and the alignment. Also, there are existing power lines running near the Bophirima substation (Figure 11). This section of the study area is generally transformed in terms of biodiversity by small holdings and agricultural practices.

Figure 11: Existing power lines near the Bophirima substation

The portion of the route from Bophirima Substation to Kalplats Substation (which ends in the area of N18) is characterized by vacant/ unspecified land and a small section of cultivated land (ENPAT data). During site visits, land uses such as smallholdings, cultivation - maize (including farm houses) and cattle farming where noted in this section of the route. The route is also traversed by a railway and powerlines.

Figure 12: Existing power lines and farm house along a portion of the proposed Bophirima Substation to Kalplats Substation route

Generally, the Vryburg area is largely transformed due to anthropogenic activities as well as poor land management practices as a result of overgrazing and dense human settlement (Cook, 2008). Nevertheless, small portions of relatively natural vegetation persist in the area traversed by the alignments.

- Vegetation type and dominant species

The Vryburg section falls under the Ghaap Plateau Vaalbosveld vegetation which is least threatened and not protected. The vegetation type is considered least threatened and it is not protected. According to Mucina and Rutherford, (2006), only about 1% of the vegetation type is already transformed. It dominated by a well developed shrub layer e.g. *Tarchonanthus camphorates* and *Acacia karroo*, the open tree layer has *Olea europaea* subsp. *africana*, *A. tortilis*, *Ziziphus mucronata* and *Rhus lancea* (Mucina and Rutherford, 2006). Much of the South-central part of this unit is dominated by the nonthorny *T. camphoratus*, *R. lancea* and *O. europaea* subsp. *Africana* (Mucina and Rutherford, 2006).

- Faunal habitat provision and faunal species of concern

In terms of terrestrial ecosystem status, Vryburg is located in an area that is generally considered least threatened whereas some portions present but no natural habitat remaining (SANBI Biodiversity GIS, 2007). Furthermore there are no protected areas in Vryburg.

Faunal sensitivity in this area relates mainly to reptiles, amphibian species as well as small mammals.

With regards to reptiles, only two reptile species are considered to be of conservation importance. These include the Southern African Python (*Python natalensis)* is listed as Vulnerable (although recent reports indicate that the species is being down listed) and the Blunt-tailed Worm Lizard *Dalophia pistillum* which is Peripheral. The Southern African Pythons are protected in South Africa. Pythons are exploited for their skins as well as for the muti trade and are thus threatened with extinction (Cook, 2008). The Blunt-tailed Worm Lizard has also been recorded in the Vryburg area and is relatively common due to the abundance of sandy soils within the study area (Cook 2008). The habitat for the Southern African Python and the Blunt-tailed Worm Lizard is present in the Vryburg area.

The rivers as well as the rocky outcrops (Figure 13) noted in the Vryburg area potentially house the Southern African Python. According to Branch, 1998, the Southern African Python is particulary found in rocky areas and riverine scrub.

Furthermore, several large termite mounds *Trinervitermes haberlandii* which house numerous snakes e.g. the Southern African Python and lizards were observed in the Vryburg area by Cook, (2008). Furthermore Trees including stumps, bark and holes are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors) (Cook, 2008).

Figure 13: A rocky outcrop characterized by dense vegetation. This is a potential habitat for a few skinks, snakes and other reptiles.

The majority of reptile species are sensitive to severe habitat alteration and fragmentation yet large portions of the Vryburg area are transformed due to agricultural activities, removal of vegetation and poor land management practices such as overgrazing and dense human settlement. As such, the remaining habitat should be preserved as much as possible.

The habitat for several amphibians is potentially present near the streams and in termite mounds observed in the study area.

- Implications for development

As indicated above, although the Vryburg area is heavily transformed (Figure 14) due to anthropogenic activities and land management practices, small portions of relatively natural vegetation remain along most alignments (Figure 15). Therefore, the sensitive reptile species that occur in the study area could potentially be affected by the proposed development. In addition, river systems that are present are also considered to be sensitive as they provide habitat for all faunal groupings. It is assumed that intact habitat would result in higher faunal and floral species diversity.

Suitable mitigation measures can play an important role in preserving potential habitats and hence reducing impacts on flora and fauna. For instance, the few areas exhibiting dense natural vegetation can be avoided/ spanned in order to reduce vegetation loss. River systems must be spanned and no towers should be placed within the buffer zones dictated by the surface water studies.

Figure 14: Transformed area facing south east in a portion where the route traverses N14

Figure 15: Area of relatively natural vegetation along the proposed Bophirima Substation to Kalplats Substation route (Photo taken in the area between the railway line and N18).

4.1.2 Vryburg to Stella Biodiversity Section

This is the section of the Bophirima Substation to Kalplats Substation route between Vryburg and Stella. This section specifically starts at the intersection of N14 and the dirt road to the area in Stella where alternative 2 starts.

Figure 16: Vryburg to Stella Biodiversity Section

- General land use description

According to ENPAT data this section of the route traverses a vacant/ unspecified area and cultivated areas. The route runs adjacent to N18 to Stella for about 33km and the turns northwest. Vegetation along the entire section of the route is heavily transformed by activities such as cattle grazing, cultivation. Also, certain sections of the route indicated signs of a recent fire in the area.

Overall, this section of the route exhibits more transformed areas compared to the Vryburg section which exhibited a few areas of relatively natural vegetation. Agricultural practices, particularly grazing dominate this section of the route and the natural regime has been transformed dramatically. Shrubveld has been transformed into grasslands for grazing purposes. The route follows adjacent to the N18 thus following existing infrastructure. Small surface water features are also present along this section of the route.

- Vegetation type and dominant species

Table 8: Vegetation types in Vryburg to Stella Biodiversity Section

Vegetation Class	Ecological Status	Protection Status
Ghaap Plateau Vaalbosveld	Least Threatened	Not Protected
Stella Bushveld	Vulnerable	Not Protected

  - Ghaap Plateau Vaalbosveld

About one-third of the section falls within this vegetation type. The Ghaap Plateau Vaalbosveld vegetation type is considered least threatened and it is not protected. According to Mucina and Rutherford, (2006), only about 1% of the vegetation type is already transformed. It dominated by a well developed shrub layer e.g. *Tarchonanthus camphorates* and *Acacia karroo*, the open tree layer has *Olea europaea* subsp. *africana*, *A. tortilis*, *Ziziphus mucronata* and *Rhus lancea* (Mucina and Rutherford, 2006). Much of the South-central part of this unit is dominated by the nonthorny *T. camphoratus*, *R. lancea* and *O. europaea* subsp. *Africana* (Mucina and Rutherford, 2006).

  - Stella Bushveld

The reminder of the section along this route falls under the Stella Bushveld vegetation type. The vegetation type is vulnerable and not protected. Up to 21% has been transformed by cultivation (Mucina & Rutherford, 2006). Dorminant species include: *Acacia erioloba, A. tortillis*, *A. hebeclada*, *Dichrostachys cinerea*, *Grewia flava* and *Tarchonanthus camphorates* (Mucina & Rutherford, 2006).

One of the most problematic declared weeds in the North West Province, Sweet prickly pear (*Opuntia ficus-indica*) was noted along the route near a farm house.

In addition, a few individuals of *A. erioloba* were noted in the area of the route northwest of Stella. In terms of terrestrial ecosystem status, this section of the route is located in an area that is considered least threatened and some portions present no natural habitat whatsoever (SANBI Biodiversity GIS, 2007). Furthermore there are no protected areas along this section of the route.

- Faunal habitat provision and faunal species of concern

This section of the route is not expected to provide good habitat for faunal species due to the level of transformation by mainly cattle grazing as mentioned above. However, a ground squirrel burrow was observed in the area of the route northwest of Stella (Figure 17).

Figure 17: Possible ground squirrel habitat. Note burrow in this area of the route.

Amphibian species would be isolated to the wetland areas while common reptile species would be found throughout the area.

- Implications for development

The area is heavily transformed and hardly any habitat exists for faunal species. Apart from the area where ground squirrel activity was noted, no other faunal activities were observed along the entire section of this route. The small wetlands scattered along the route as presented by SANBI Biodiversity GIS, (2007) can easily be avoided. Furthermore vegetation removal must be limited to tower footprints and access roads.

No Red Data floral species were documented.

4.1.3 Stella to Kalplats Biodiversity Section

This section of the route starts in an area about 3km northwest of the small town of Stella. It comprises of a portion of the route from Bophirima substation to Kalplats substation, alternative 1 (Purple alignment) and Bophirima substation to Kalplats substation, alternative 2 (Blue alignment) (Figure 18)

Figure 18: Stella to Kalplats Biodiversity Section

- General land use description

According to ENPAT data this section of the route traverses a vacant/ unspecified area as well as cultivated areas. Maize growing and cattle grazing were observed along this section of the route. Alternative 1 runs along an existing dirt road. It was noted during site investigations that in a number of portions along the route, the density of plants differed from one side of the road to another. While some sides of the road along the route presented denser and relatively intact vegetation, others exhibited sparse vegetation, transformed mainly due to cultivation activities (Figure 19 and Figure 20).

Alternative 1 follows an existing dirt road and passes through farming areas dominated by cattle farming. The vegetation regime has general been transformed from natural in this section. Patches of natural vegetation are present along the route however these are farily isolated. The route follows existing infrastructure for the most part and will thus have little impact on the vegetation.

Alternative 2 follows a dirt road in part however it moves away from the road to follow cadastral farm boundaries. Grazing practices are also taking place in this area. More Camelthorn trees were noted along this section, one within the proposed servitude.

A portion of alternative 2 i.e. approximately 13km runs along the R377 and through cultivated lands. Furthermore, a few houses were noted along the route.

Figure 19: Photograph showing denser and relatively intact vegetation on the western side of the road

Figure 20: Photograph showing transformed vegetation on the eastern side of the road.

- Vegetation type and dominant species

Table 9: Vegetation types the Stella to Kalplats Biodiversity Section Biodiversity

Vegetation Class	Ecological Status	Protection Status
Mafikeng Bushveld	Vulnerable	Not Protected
Stella Bushveld	Vulnerable	Not Protected

- Mafikeng Bushveld

This vegetation unit covers a slightly larger portion of the route compared to the Stella Bushveld vegetation unit. The Mafikeng Bushveld is vulnerable with about 25% already transformed mainly by cultivation and urban development (Mucina and Rutherford, 2006; SANBI Biodiversity GIS, 2007). Dorminat species include: *Acacia erioloba*, A. *karroo*, *Ziziphus mucronata*, *Terminalia sericea*, *Dichrostachys cinerea*, *Grewia flava*, *Rhus tenuinervis* and *Acacia hebeclada* subsp. *Hebeclada*. (Mucina and Rutherford, 2006)

- Stella Bushveld

This vegetation unit also covers a relatively large section of the route. The Stella Bushveld vegetation unit is vulnerable and not protected. Up to 21% has been transformed by cultivation (Mucina and Rutherford, 2006). Dorminant species include: *Acacia erioloba, A. tortillis*, *A. hebeclada*, *Dichrostachys cinerea*, *Grewia flava* and *Tarchonanthus camphorates* (Mucina and Rutherford, 2006).

Acacia erioloba was noted along both alternatives in this section of the route.

According to SANBI Biodiversity GIS, (2007) the status of the terrestrial ecosystem along the two alternatives in this section of the route varies from Vulnerable in some portions, to least threatened in others, while in other areas, no natural habitat remains. Almost the entire northern half of this section of the route falls under a vulnerable ecosystem (SANBI Biodiversity GIS, 2007)

It is important to note that there are no protected areas along this section of the route.

- Faunal habitat provision and faunal species of concern

As mentioned above, although a large part of this section is transformed, a few portions exhibit dense vegetation which could potentially house a number of faunal species. Common Duiker *Sylvicapra grimmia* which is listed as least concern potentially occurs in areas which have not been severely impacted by cultivation and grazing activities. Furthermore, amphibian species as

listed above potentially occur in the damp areas or wetland areas recorded throughout the study area. In addition, common reptile species would be found throughout the area.

- Implications for development

Although large areas along the route are transformed, portions of relatively natural vegetation were observed. No Red Data floral species were identified during sampling however habitat is present for faunal species in terms of bushveld and wetland areas.

As indicated above, while some sides of the road along the route presented denser and relatively intact vegetation, others exhibited sparse vegetation. Therefore during construction, the alighnment can be routed in already transformed portions and areas that show intact vegetation can be avoided. This will reduce further vegetation loss and hence preserve habitats for faunal species.

4.1.4 Kalplats to Edwards Dam Biodiversity Section

This section encompasses the portion from Kalplats substation to the existing Edwards dam substation, alternative 1 (red alignment) and the portion from Kalplats substation to the existing Edwards dam substation, alternative 3 (orange alignment) (Figure 21).

Figure 21: Kalplats to Edwards Dam Biodiversity Section

- General land use description

Land use in this section is mainly vacant/ unspecified and cultivated land. The area of the proposed kalplats substation is mainly pasture land (

Figure 22) and almost 50% of alternative 1 runs along and existing dirt road. Also, the alignment passes cattle and game farming activities with several homesteads in the area. The route follows cadastral boundaries for the most part and sticks to existing infrastructure. The route follows the existing powerline servitude into the Edwards Dam Substation and even though there is already a level of transformation present due to this line, the area is characterised by intact natural vegetation surrounding this line, Several Camethorn trees were noted in this area. (Figure 23)

Figure 22: Pasture land in the area of the kalplats substation

Figure 23: Portion along the alternative 1 exhibiting transformed land with existing power lines. The alternative is proposed to run in close proximity to these power lines.

Alternative 3 follows the R377 for the most part. Farming dominates this section of the route with several homesteads along the route in this area.

- Vegetation type and dominant species

The area falls under the Mafikeng Bushveld vegetation type. This vegetation unit covers a slightly larger portion of the route compared to the Stella Bushveld vegetation unit. The Mafikeng Bushveld is vulnerable with about 25% already transformed mainly by cultivation and urban development (Mucina and Rutherford, 2006; SANBI Biodiversity GIS, 2007). Dorminat species include: *Acacia erioloba*, *A. karroo*, *Ziziphus mucronata*, *Terminalia sericea*, *Dichrostachys cinerea*, *Grewia flava*, *Rhus tenuinervis* and *Acacia hebeclada* subsp. *Hebeclada* (Mucina and Rutherford, 2006).

Acacia erioloba was observed along the alternatives.

- Faunal habitat provision and faunal species of concern

Limited habitat for faunal species is present in this section of the route due to the large scale transformation that has taken place due to cultivation and grazing activities. This is evident along both alternatives. Mammal species that are likely to be present would be limited to small mammal species.

Amphibian species would be limited to the small wetland areas recorded in the study area (SANBI Biodiversity GIS, 2007). No Red Data species are likely to be present in this section of the route.

Several reptile species are likely to be present throughout the section of the alignment but No Red Data species are likely to be present and none were observed.

- Implications for development

This section of the route is heavily transformed by anthropogenic activities moreover even areas with less agricultural activities show sparse vegetation. Towers can be placed in already transformed to avoid loss of vegetation. Furthermore, because the alternatives mostly follow exiting roads in some portions and powerlines in others, the proposed development is not

anticipated to contribute to much more transformation than whats already been observed in the area.

4.2 Sensitive Areas

There are limited sensitive areas identified along the route. Apart from a few rivers and wetlands (Figure 24), most of which are small, there are no other highly sensitive area along the route. A river has been identified in the Vryburg area and small wetlands are scattered throught the study area. Rivers and wetlands not only provide important habitat for several species but also form natural corridors for the movement of species. The Southern African Python (*Python natalensis*), a Vulnerable species potentially occurs in riverine areas in the Vryburg.

The remainder of the study area can be viewed as lower sensitivity areas however these areas still require the strict implementation of mitigation measures to ensure that further transformation does not occur.

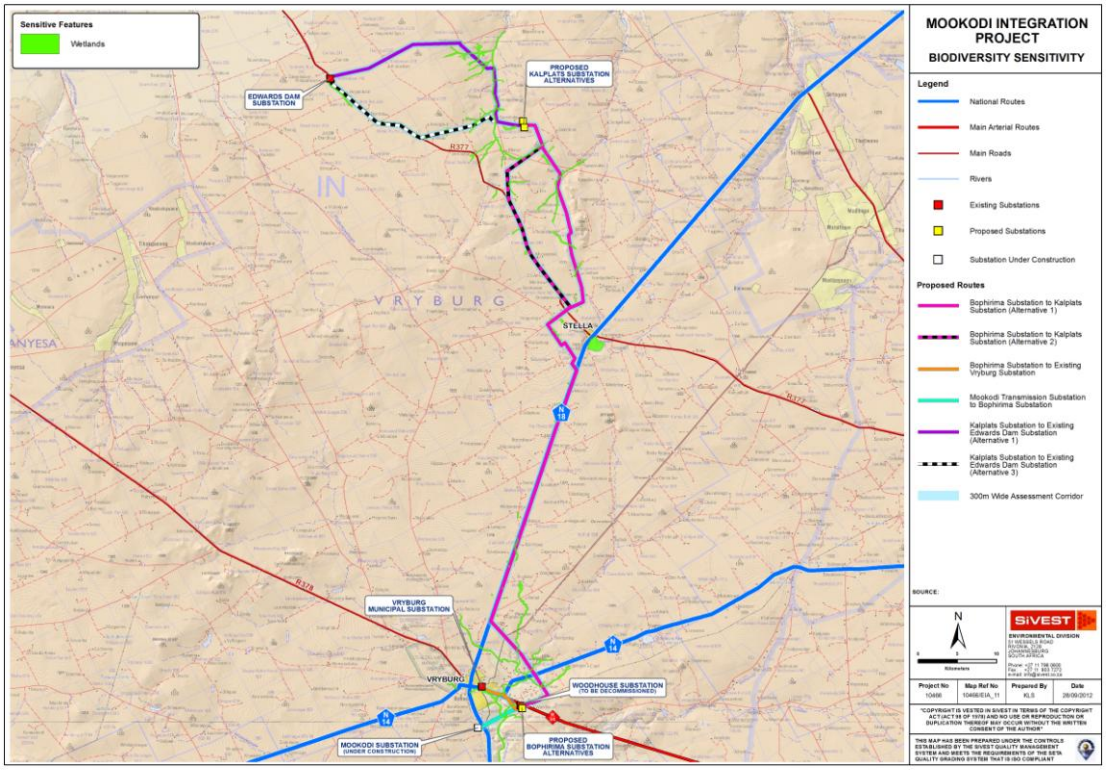


Figure 24: Senstive Areas Map

5 ALTERNATIVES ASSESSMENT

Alternatives have been assessed as part of the process and the table below indicates a comparative assessment from a biodiversity perspective.

Table 10: Alternatives Assessment

Alternative	Discussion	Preferred alternative
Bophirima Substation to Kalplats Substation alternative 1	A large amount of transformation has taken place however areas of natural vegetation are present. Suitable mitigation measures can be implemented to reduce impacts. Furthermore, a section of the route runs along an existing road and another section along an existing powerline.	Alternative 1
Bophirima Substation to Kalplats Substation alternative 2	Tansformation observed but like alternative 1, areas of natural vegetation are present. In addition based on SANBI Biodiversity GIS, (2007), the route is aligned close to a slightly larger wetland compared to those available in other parts of the route. Suitable mitigation measures can be implemented to reduce impacts. This alternative also route runs along an existing road (R377) but then turns north eastwards traversing cultivated land and a few patches of relatively intact vegetation.	
Kalplats Substation to Existing Edwards Dam Substation alternative 1	This section of the corridor illustrates a large degree of transformation from the natural state. Portions of the route in this section follow existing powerlines. Moreover majority of vegetated areas present sparse vegetation. These are relatively natural vegetation in character.	Alternative 3
Kalplats Substation to Existing Edwards Dam Substation alternative 3	A portion of this alternative crosses cultivated lands and a few uncultivated lands but exhibiting sparse vegetation.	

Alternative	Discussion	Preferred alternative
	Furthermore, about 50% of alternative 3 runs along R377 and also crosses cultivated land and sparsely vegetated areas.	

No fatal flaws have been identified across the corridors however strict mitigation measures will be required to ensure identified impacts do not occur. These are discussed at length below.

6 POTENTIAL IMPACTS ON BIODIVERSITY AND BIOPHYSICAL FEATURES

The potential impacts of the proposed power lines mainly related to loss of habitat for red data and general species; potential loss of species richness, edge effect, transformation and erosion. The impact of the proposed development will be limited to the assigned alignment. Vegetation outside the alignment will remain intact and will not be impacted upon. As such, the impact is localised and if the mitigation measures are implemented, the overall impact can be reduced.

6.1 Construction Phase

During the construction phase the following impacts are predicted in terms of each of the biodiversity groupings.

6.1.1 Flora

The impacts associated with the floral environment relate to the removal of vegetation and associated loss of habitat for endemic and Red Data species. In addition the transformation of sensitive vegetation is of concern particularly those vegetation types which have already been transformed by anthropogenic activities. This could result in loss of species richness and increase the edge effect. The edge effect implies an increase of alien species into the study area thus affecting the local species.

None of the vegetation units within the study area is protected therefore sections of relatively natural vegetation observed along the route should be preserved as much as possible in order to avoid further impacts in these sections.

6.1.2 Mammals

The impact associated with the mammal population on site relates to the loss of habitat and disturbance during construction. Although a large portion of the study area has been transformed as a result of anthropogenic activities, portions of potential mammal habitat still exist. However the available habitat is mainly for small mammals. This is because the habitat for large mammal species (e.g. Brown Hyaena (*Hyaena brunnea*), Honey Badger (*Mellivora capensis*), Roan Antelope (*Hippotragus equinus*), African Wild Dog (*Lycaon pictus*) and Black Rhinoceros (*Diceros*

bicornis)) has been transformed. Large mammals are restricted to protected areas. Moreover there are no protected areas in the study area (SANBI Biodiversity GIS, 2007). The present mammal species will move into surrounding habitat during construction. Furthermore, relevant mitigation measures during construction will reduce the impact of the proposed development on mammals

6.1.3 Reptiles

The main reptile species of concern include the Southern African Python which is listed as Vulnerable and the Blunt-tailed Worm Lizard. These potentially occur in the Vryburg area therefore the construction of the power lines might affect their habitats. The Southern African Python is particulary found in rocky areas and riverine scrub (Branch, 1998). Strict mitigation measures are proposed for the Vryburg area in order to avoid affecting the habitat for the Southern African Python and the Blunt-tailed Worm Lizard.

6.1.4 Amphibians

Amphibians are present throughout the study area especially near drainage lines and small wetlands. If appropriate mitigation measures (such as avoiding species habitats) are implemented, amphibian species present in the study area are unlikely to be affected by the proposed development. All drainage areas will be spanned by the power lines and the surface water assessment ensures that access through these areas is limited to existing crossings. This will limit the impact on the sensitive species suchas the Giant Bullfrog.

6.1.5 Invertebrates

The site presents a remarkable invertebrate diversity. Invertebrates are fairly mobile and will be able to move away during construction to the surrounding habitat.

6.2 Operation Impacts

Potential impacts of the proposed development mainly related:

6.2.1 Edge effect

The removal or clearing of vegetation results in providing habitat for invasive alien plant species. This in turn reduces plant species richness and diversity in an area as invasive alien plants take over and dominate the area.

Without suitable rehabilitation and implementation of recommended mitigation measures this remains a major concern during operation of the project.

6.2.2 Erosion

Clearing of vegetation results in the exposure of soils sensitive to erosion caused by stormwater run off. Rehabilitation of areas affected by construction is essential to ensure that exposed surfaces are stabilized and erosion does occur. This is of particular concern near rivers and wetlands as this can result in siltation pollution of the rivers.

6.2.3 Poor maintenance

In addition to the power lines having an effect on the biodiversity, vegetation can also have an effect on the power lines. Without suitable maintenance of the servitude, vegetation could grow up and affect the operation of the power line. Vegetation across the study area exhibits a fairly low canopy in most parts however regular inspections will be required to monitor the vegetation given the mitigation measures that have been recommended in this report i.e. limited vegetation clearance.

6.3 Rating of impacts

6.3.1 Potential Impacts During the Construction Phase

- Loss of habitat for general species

Table 11: Rating of Related to Loss of Habitat for General Species during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Loss of habitat for red data / general species
Extent	The impact is only expected to affect the site.
Probability	The impact may occur (Between a 25% to 50% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of resources	The impact will result in marginal loss of resources.
Duration	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
Cumulative effect	The impact would result in insignificant cumulative effects
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
Significance Rating	**Prior to mitigation measures:** There will be a negative low impact i.e. the anticipated impact will have negligible negative effects and will require little to no mitigation.

IMPACT TABLE		
	After mitigation measures: After mitigation measures, the negative low impact is persists.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-22 (low negative)	-6 (low negative)
Mitigation measures	▪ Maintain footprint strictly during construction ▪ Appoint Environmental Control Officer (ECO) for the duration of construction. ▪ Conduct construction walk down prior to construction to conduct a search and rescue exercise. ▪ Existing indigenous vegetation must be retained where possible. ▪ Remove and relocate any plants of botanical or ecological significance (these must be indicated by the ECO) ▪ Vegetation to be removed as it becomes necessary ▪ No vegetation to be used for firewood. ▪ Demarcation of sensitive areas prior to construction activities starting.	

- Edge effect

Table 12: Rating of Impacts Related to Edge Effect during the Construction Phase

IMPACT TABLE		
Environmental Parameter	Biodiversity	
Issue/Impact/Environmental Effect/Nature	Edge effect	
Extent	The impact is only expected to affect the site.	
Probability	Impact will certainly occur (Greater than a 75% chance of occurrence).	
Reversibility	The impact is partly reversible but more intense mitigation measures are required.	
Irreplaceable loss of resources	The impact will result in significant loss of resources.	
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).	
Cumulative effect	The impact would result in insignificant cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative medium impact i.e. the anticipated impact will have moderate negative effects and will require moderate mitigation measures. **After mitigation measures:** After mitigation measures, the negative low impact is achieved.	
	Pre-mitigation impact rating	Post mitigation impact rating

IMPACT TABLE		
Extent	1	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	3	1
Duration	3	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-30 (Medium negative)	-7 (low negative)
Mitigation measures	▪ The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. ▪ The spread of exotic species occurring throughout the site should be controlled. ▪ All exotic vegetation must be removed from the site (if present). ▪ Rehabilitation must take place as soon as construction is complete to avoid the edge effect, the infiltration of alien species and soil erosion around the study area.	

- Transformation

Table 13: Rating of Impacts Related to Transformation during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Transformation
Extent	The impact is only expected to affect the site.
Probability	The impact may occur (Between a 25% to 50% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of	The impact will result in marginal loss of resources.

IMPACT TABLE		
resources		
Duration	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	
Cumulative effect	The impact would result in insignificant cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	Prior to mitigation measures: There will be a negative low impact i.e. the anticipated impact will have negligible negative effects and will require little to no mitigation. After mitigation measures: After mitigation measures, the negative low impact is persists.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-22 (low negative)	-6 (low negative)
Mitigation measures	▪ Existing indigenous vegetation must be retained where possible. ▪ Demarcation of sensitive areas prior to construction activities starting. ▪ The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining	

IMPACT TABLE	
	stockpiles to prevent weed invasion. ▪ The spread of exotic species occurring throughout the site should be controlled. ▪ Rehabilitation must take place as soon as construction is complete. ▪ Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding.

- Erosion

Table 14: Rating of Impacts Related to Erosion during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Erosion
Extent	The impact is only expected to affect the site.
Probability	Impact will certainly occur (Greater than a 75% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of resources	The impact will result in marginal loss of resources.
Duration	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
Cumulative effect	The impact would result in insignificant cumulative effects
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).

IMPACT TABLE		
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-7 (low negative
Mitigation measures	▪ Rehabilitation must take place as soon as construction is complete to avoid soil erosion around the study area.	

- Loss of Red Data species

Table 15: Rating of Impacts Related to Loss of Red Data Species during the Construction Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Loss of Red Data species
Extent	The impact will only affect the site
Probability	The impact will likely occur (Between a 50% to 75% chance of occurrence).

IMPACT TABLE		
Reversibility	The impact is partly reversible but more intense mitigation measures are required.	
Irreplaceable loss of resources	The impact will result in marginal loss of resources.	
Duration	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	
Cumulative effect	The impact would result in insignificant cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-24 (low negative)	-6 (low negative)
Mitigation measures	▪ Demarcation of sensitive areas prior to construction activities starting as per the sensitivity map. ▪ Use of appropriate construction methods in the sensitive area.	

IMPACT TABLE	
	▪ Intensive environmental audits (frequently in sensitive areas) by an independent party during this construction period. ▪ A copy of the Environmental Management Programme and the specialist studies must be present at the construction site for easy reference to specialist recommendations in sensitive areas. ▪ It is recommended that the construction crew be educated about the sensitivities involved in these areas as well as the potential species they could encounter. A poster of sensitive species (compiled by a qualified specialist) should be kept on the construction site for easy reference.

6.3.2 Potential Impacts During the Operation Phase

- Edge effect

Table 16: Rating of Related to Edge Effect during the Operation Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Edge effect
Extent	The impact is only expected to affect the site.
Probability	The impact will likely occur (Between a 50% to 75% chance of occurrence).
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of resources	The impact will result in significant loss of resources.
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct

IMPACT TABLE		
	human action or by natural processes thereafter (10 – 50 years).	
Cumulative effect	The impact would result in insignificant cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	3	1
Duration	3	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-28 (medium negative)	-6 (low negative)
Mitigation measures	▪ Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase. ▪ Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided. ▪ Constant maintenance of the area to ensure re-colonisation of floral species. ▪ Regular removal of alien species which may jeopardise the proliferation of indigenous species.	

IMPACT TABLE	

- Erosion

Table 17: Rating of Impacts Related to Erosion during the Operation Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Erosion
Extent	The impact is only expected to affect the site.
Probability	The impact will likely occur (Between a 50% to 75% chance of occurrence).
Reversibility	The impact is reversible with implementation of minor mitigation measures
Irreplaceable loss of resources	The impact will result in marginal loss of resources.
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
Cumulative effect	The impact would result in negligible to no cumulative effects
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented.

IMPACT TABLE		
	After mitigation measures: After mitigation measures, the negative low impact persists	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	1	1
Intensity/magnitude	2	1
Significance rating	-22 (low negative)	-6 (low negative
Mitigation measures	▪ Monitoring must be undertaken to ensure that no erosion is taking place as a result of the development. ▪ Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion are avoided.	

- Poor maintenance

Table 18: Rating of Impacts Related to Poor Maintenance during the Operation Phase

IMPACT TABLE	
Environmental Parameter	Biodiversity
Issue/Impact/Environmental Effect/Nature	Poor Maintenance
Extent	The impact will only affect the site
Probability	The impact may occur (Between a 25% to 50% chance of occurrence).
Reversibility	The impact is reversible with implementation of minor mitigation measures

IMPACT TABLE		
Irreplaceable loss of resources	The impact will result in marginal loss of resources.	
Duration	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).	
Cumulative effect	The impact would result in insignificant cumulative effects	
Intensity/magnitude	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	
Significance Rating	**Prior to mitigation measures:** There will be a negative Low impact i.e. the anticipated impact will have negligible negative effects however mitigation measures must be implemented. **After mitigation measures:** After mitigation measures, the negative low impact persists	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-22 (low negative)	-6 (low negative
Mitigation measures	▪ Constant monitoring of vegetation height by Eskom.	

6.3.3 Cumulative Impacts

- Construction

Because the pylons occupy limited areas along the route, cumulative impacts are anticipated to be low during construction.

- Operation

If mitigation measures (e.g. rehabilitation, Constant maintenance among others) are implemented, cumulative impacts during the operation phase are expected to be negligible. However should these not be implemented, cumulative impacts as a result of the power lines could result in further impacts on biodiversity in the long term. The implementation of the recommended

6.3.4 Residual Impacts

If rehabilitation of the study area is undertaken efficiently and according to the Environmental Management Plan, no residual impacts on biodiversity are anticipated.

7 MITIGATION MEASURES

The following mitigation measures are proposed during construction and operation.

7.1 Construction Phase

Once tower locations are available prior to construction, a detailed walkdown to each tower must be undertaken to refine the mitigation measures stipulated below. This will ensure that any sensitive faunal or floral species are not affected by the location of the tower. Should this walk down reveal site specific sensitivities, tower locations may need to be moved based on these findings.

It is critical that all surface water features i.e. rivers and wetlands are spanned by the power lines and that towers are located out of their buffer zones as assigned by the wetland assessment. This is particularly important for drainage areas in the Vryburg area due to the potential presence of the Southern Africa Python.

Clearing must be limited in areas of intact vegetation. Areas of intact vegetation should be spanned where possible. Existing access roads must be utilised as much as possible. If access is required across natural vegetation, this must be limited to a two lane access track with no major clearing.

More detailed mitigation measures are listed below.

7.1.1 Construction Site Specific Mitigation Measures

The following mitigation measures are recommended for the sensitive areas which have been identified in the study area:

- A walkdown of the route by a specialist should take place when tower locations and access requirements are finalised.
- A construction EMP must be compiled based on the walkdowns and tower locations adjusted accordingly.
- A reptile specialist must be on site when construction is undertaken in the study area to conduct a search for Southern African Python specimens.
- The walkdown must determine the presence of any protected tree species that will be affected such as Camel thorn *Acacia erioloba*. Should they need to be destroyed, the correct permits must be applied for by Eskom with the Department of Agriculture, Forestry and Fisheries (DAFF).
- The ECO must be in possession of all tower locations and these must be overlayed with sensitivity information and visited prior to construction to ensure suitable mitigation measures and construction methodologies are implemented.
- An on-site ecologist should be present when excavation takes place to ensure that any uncovered species are protected from destruction (It is important to remember that even though these species have not been encountered, they could be in a dormant stage and suddenly arise during construction due to more favourable conditions).
- Demarcation of sensitive areas prior to construction activities starting as per the sensitivity map.
- Intensive environmental audits (frequently in sensitive areas) by an independent party during this construction period.
- A copy of the Environmental Management Programme as well as the specialist studies must be present at the construction site for easy reference to specialist recommendations in sensitive areas.
- It is recommended that the construction crew be educated about the sensitivities involved in these areas as well as the potential species they could encounter. A poster of sensitive

species (compiled by a qualified specialist) should be kept on the construction site for easy reference.

- Where possible, construction should take place during winter i.e. the dormant stage to minimise impacts on vegetation during the growing season.
- Only vegetation within the footprint must be removed.
- Vegetation removal must be phased in order to reduce impact of construction.
- Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.
- All natural areas impacted during construction must be rehabilitated with locally indigenous species.
- Construction areas must be well demarcated and these areas strictly adhered to.
- Rehabilitation must take place as soon as construction is complete to avoid the edge effect, the infiltration of invasive alien species and soil erosion around the study area.
- Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding.
- The use of pesticides and herbicides in the study area must be discouraged as these impact on important pollinator species of indigenous vegetation.
- Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.
- Access must be limited in natural areas to existing tracks or two lane tracks which can be used during operation for maintenance.

7.2 Operation Phase

7.2.1 Operation Site Specific Mitigation Measures

The following mitigation measures are recommended for the sensitive areas which have been identified in the study area

- Monthly monitoring of these sensitive areas should take place during the first year after construction to ensure that rehabilitation is successful.
- These monitoring exercises must ensure that no erosion is taking place as a result of the development.
- Six monthly checks of the area should take place for the emergence of invasive species.

- Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase.
- Correct rehabilitation with species which are locally indigenous.
- Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided.
- Constant maintenance of the area to ensure re-colonisation of floral species.
- Regular removal of alien species which may jeopardise the proliferation of indigenous species.
- Monitoring of height of vegetation.

7.3 Achievability of Mitigation Measures

Mitigation measures included within this report are feasible and will be easy to achieve. Several of the mitigation measures included here are generic in nature and have been implemented successfully on several different construction sites. The unique mitigation measures stated in this report are also achievable and it is essential that these are taken into account when the proposed development is constructed.

7.4 Management and Monitoring

It is recommended that a formal monitoring and reporting strategy/ protocol be developed for monitoring the impact on the vegetation in the area during construction. This will ensure that the mitigation measures stipulated for the construction are well enforced and the identified impacts minimised as much as possible.

Specific areas of concern that require strict monitoring include:

- Containment of construction to the demarcated areas
- Reduction in vegetation clearance
- Erosion control
- Emergence of alien species
- Rehabilitation of the site
- Containment of construction near sensitive areas
- Protection of wetlands and ecological linkage

If Red Data and/or protected species are located in the identified sensitive areas, the relevant permits must be applied for from the relevant authorities. No listed plants may be removed without these permits. It will be the responsibility of the ECO to ensure that these permits are in place where necessary.

The precautionary principle should be applied during the construction of the power lines and care taken to implement the recommended mitigation measures. This is especially relevant in identified sensitive areas.

7.5 Rehabilitation

Once the proposed development has been constructed, rehabilitation needs to take place. This needs to take place timeously to ensure that alien plant emergence and erosion do not occur.

The first stage of rehabilitation will be the reinstatement of top soil. The top soil must be exposed for the shortest possible time so that it is not lost through wind and run off erosion. The top soil layer is likely to carry a natural seed bank of the local species which will aid in re- establishing the vegetation layer. It is also likely to contain weed and alien species seed bank. For this reason, regular maintenance of the site will be required until the indigenous species have established themselves and risk of alien infestation and erosion is decreased.

In addition to the seed bank present within the top soil, it is recommended that the site be hydro-seeded with locally indigenous plant species where required.

8 CONCLUSIONS AND RECOMMENDATIONS

Several sensitivities relating to both the faunal and floral environment have been identified within the corridors. The proposed project could result in detrimental effects on these environments as discussed. However, power lines do not result in large scale clearing and suitable mitigation measures can be implemented to reduce the identified impacts. It is thus essential that these are implemented which emphasises the importance of the EMP which will be utilised on site to ensure this.

Mitigation measures provided will ensure that any available ecological linkages between sensitive areas are not affected negatively. The servitudes can also provide a potential positive impact by not allowing further development within these areas. It is critical that operations are limited to the required footprint only.

A walkdown will be conducted to ensure that tower locations are strategically positioned and access to these locations is appropriately planned.

It is essential that biodiversity specialists are on the project team during construction to ensure that the issues identified in this report are prioritised.

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Appendix 1

Red data floral species in the study area (LC= Least Concern; NT= Near Threatened; VU = Vulnerable; DD= Date Deficient)

Plant species	Category (SANBI 2006)
Acacia hebeclada DC. subsp. hebeclada	LC
Acacia hereroensis Engl.	LC
Acacia karroo Hayne	LC
Acacia luederitzii Engl. var. luederitzii	LC
Acacia robusta Burch. subsp. robusta	LC
Acalypha segetalis Müll.Arg.	LC
Acanthospermum glabratum (DC.) Wild	
Achyranthes aspera L. var. aspera	
Actiniopteris radiata (J.König ex Sw.) Link	LC
Adenia repanda (Burch.) Engl.	LC
Aerva leucura Moq.	LC
Albuca fastigiata Dryand. var. fastigiata	LC
Aloe grandidentata Salm-Dyck	LC
Aloe zebrina Baker	LC
Alternanthera nodiflora R.Br.	
Alternanthera pungens Kunth	
Andropogon schirensis Hochst. ex A.Rich.	LC
Anthephora pubescens Nees	LC
Anthospermum rigidum Eckl. & Zeyh. subsp. pumilum (Sond.) Puff	LC
Anthospermum rigidum Eckl. & Zeyh. subsp. rigidum	LC
Antizoma angustifolia (Burch.) Miers ex Harv.	LC
Aponogeton rehmannii Oliv.	LC
Aptosimum albomarginatum Marloth & Engl.	LC
Aptosimum elongatum Engl.	LC
Arctotis arctotoides (L.f.) O.Hoffm.	LC
Arctotis venusta Norl.	LC
Aristida adscensionis L.	LC
Aristida bipartita (Nees) Trin. & Rupr.	LC
Aristida congesta Roem. & Schult. subsp. barbicollis (Trin. & Rupr.) De Winter	LC
Aristida congesta Roem. & Schult. subsp. congesta	LC

Plant species	Category (SANBI 2006)
Aristida diffusa Trin. subsp. burkei (Stapf) Melderis	LC
Aristida meridionalis Henrard	LC
Aristida mollissima Pilg. subsp. mollissima	LC
Aristida scabrivalvis Hack. subsp. scabrivalvis	LC
Aristida spectabilis Hack.	LC
Aristida stipitata Hack. subsp. graciliflora (Pilg.) Melderis	LC
Aristida stipitata Hack. subsp. spicata (De Winter) Melderis	LC
Aristida stipitata Hack. subsp. stipitata	LC
Aristida vestita Thunb. var. vestita	LC
Asparagus bechuanicus Baker	LC
Asparagus laricinus Burch.	LC
Asparagus nodulosus (Oberm.) J.-P.Lebrun & Stork	LC
Asparagus setaceus (Kunth) Jessop	LC
Asparagus suaveolens Burch.	LC
Aster squamatus (Spreng.) Hieron.	
Atriplex semibaccata R.Br. var. appendiculata Aellen	LC
Babiana bainesii Baker	LC
Barleria macrostegia Nees	LC
Bauhinia petersiana Bolle subsp. macrantha (Oliv.) Brummitt & J.H.Ross	LC
Bergia anagalloides E.Mey. ex Fenzl	LC
Bergia pentheriana Keissl.	LC
Berkheya carlinopsis Welw. ex O.Hoffm. subsp. magalismontana (Bolus) Roessler	LC
Berkheya discolor (DC.) O.Hoffm. & Muschl.	LC
Berkheya pinnatifida (Thunb.) Thell. subsp. pinnatifida	LC
Berula thunbergii (DC.) H.Wolff	
Bewsia biflora (Hack.) Gooss.	LC
Bidens bipinnata L.	
Blepharis integrifolia (L.f.) E.Mey. ex Schinz var. integrifolia	LC
Blumea dregeanoides Sch.Bip. ex A.Rich.	LC
Bobartia gracilis Baker	LC
Bolusia acuminata (DC.) Polhill	
Bonatea antennifera Rolfe	
Boscia foetida Schinz subsp. minima Toelken	LC
Brachiaria brizantha (A.Rich.) Stapf	LC
Brachiaria deflexa (Schumach.) C.E.Hubb. ex Robyns	LC
Brachiaria marlothii (Hack.) Stent	LC
Brachiaria nigropedata (Ficalho & Hiern) Stapf	LC
Brachystelma dimorphum R.A.Dyer subsp. dimorphum	LC
Brachystelma foetidum Schltr.	LC
Bulbine abyssinica A.Rich.	LC
Bulbine narcissifolia Salm-Dyck	LC
Bulbostylis burchellii (Ficalho & Hiern) C.B.Clarke	LC

Plant species	Category (SANBI 2006)
Bulbostylis hispidula (Vahl) R.W.Haines subsp. pyriformis (Lye) R.W.Haines	LC
Bulbostylis pusilla (A.Rich.) C.B.Clarke	LC
Cenchrus ciliaris L.	LC
Centella asiatica (L.) Urb.	LC
Ceropegia crassifolia Schltr. var. crassifolia	LC
Chaenostoma patrioticum (Hiern) Kornhall	LC
Chamaecrista biensis (Steyaert) Lock	LC
Chamaecrista mimosoides (L.) Greene	LC
Chascanum hederaceum (Sond.) Moldenke var. hederaceum	LC
Cheilanthes dolomiticola (Schelpe) Schelpe & N.C.Anthony	LC
Cheilanthes hirta Sw. var. hirta	LC
Chloris virgata Sw.	LC
Chlorophytum fasciculatum (Baker) Kativu	LC
Chlorophytum recurvifolium (Baker) C.Archer & Kativu	LC
Chrysocoma ciliata L.	LC
Chrysocoma obtusata (Thunb.) Ehr.Bayer	LC
Cineraria vallis-pacis Dinter ex Merxm.	LC
Cleome angustifolia Forssk. subsp. petersiana (Klotzsch ex Sond.) Kers	LC
Cleome monophylla L.	LC
Cleome rubella Burch.	LC
Coccinia sessilifolia (Sond.) Cogn.	LC
Colchicum melanthoides (Willd.) J.C.Manning & Vinn. subsp. melanthoides	LC
Commelina africana L. var. barberae (C.B.Clarke) C.B.Clarke	LC
Commelina africana L. var. krebsiana (Kunth) C.B.Clarke	LC
Commelina africana L. var. lancispatha C.B.Clarke	LC
Commelina benghalensis L.	LC
Commelina livingstonii C.B.Clarke	LC
Commicarpus pentandrus (Burch.) Heimerl	LC
Commiphora pyracanthoides Engl.	LC
Convolvulus multifidus Thunb.	LC
Convolvulus ocellatus Hook.f. var. ocellatus	LC
Convolvulus sagittatus Thunb.	LC
Conyza bonariensis (L.) Cronquist	
Conyza sumatrensis (Retz.) E.Walker var. sumatrensis	
Corchorus asplenifolius Burch.	LC
Coronopus integrifolius (DC.) Spreng.	
Crabbea angustifolia Nees	LC
Crotalaria barkae Schweinf. subsp. barkae	LC
Crotalaria distans Benth. subsp. distans	LC
Crotalaria griquensis L.Bolus	LC
Crotalaria lotoides Benth.	LC
Crotalaria spartioides DC.	LC
Crotalaria sphaerocarpa Perr. ex DC. subsp. sphaerocarpa	LC

Plant species	Category (SANBI 2006)
Cucumis myriocarpus Naudin subsp. myriocarpus	LC
Cullen tomentosum (Thunb.) J.W.Grimes	LC
Cyanotis speciosa (L.f.) Hassk.	LC
Cyclospermum leptophyllum Sprague ex Britton & P.Wilson	
Cymbopogon pospischilii (K.Schum.) C.E.Hubb.	
Cymbopogon prolixus (Stapf) E.Phillips	LC
Cynodon dactylon (L.) Pers.	LC
Cynodon incompletus Nees	LC
Cynodon polevansii Stent	DDT
Cyperus bellus Kunth	LC
Cyperus difformis L.	LC
Cyperus esculentus L. var. esculentus	LC
Cyperus fastigiatus Rottb.	LC
Cyperus fulgens C.B.Clarke var. contractus Kük.	LC
Cyperus fulgens C.B.Clarke var. fulgens	LC
Cyperus indecorus Kunth var. decurvatus (C.B.Clarke) Kük.	LC
Cyperus indecorus Kunth var. namaquensis Kük.	LC
Cyperus longus L. var. tenuiflorus (Rottb.) Boeck.	LC
Cyperus margaritaceus Vahl var. margaritaceus	LC
Cyperus marginatus Thunb.	LC
Cyperus marlothii Boeck.	LC
Cyperus obtusiflorus Vahl var. obtusiflorus	LC
Cyperus rubicundus Vahl	LC
Cyperus sexangularis Nees	LC
Cyperus sphaerospermus Schrad.	LC
Cyperus squarrosus L.	LC
Cyperus usitatus Burch.	LC
Dactyloctenium aegyptium (L.) Willd.	LC
Datura inoxia Mill.	
Deverra burchellii (DC.) Eckl. & Zeyh.	LC
Diandrochloa namaquensis (Nees) De Winter	LC
Diandrochloa pusilla (Hack.) De Winter	LC
Dianthus micropetalus Ser.	LC
Dicerocaryum senecioides (Klotzsch) Abels	LC
Dichanthium annulatum (Forssk.) Stapf var. papillosum (A.Rich.) de Wet & Harlan	LC
Dichrostachys cinerea (L.) Wight & Arn. subsp. africana Brenan & Brummitt var. setulosa (Welw. ex Oliv.) Brenan & Brummitt	LC
Diclis petiolaris Benth.	LC
Dicoma anomala Sond. subsp. anomala	LC
Dicoma anomala Sond. subsp. gerrardii (Harv. ex F.C.Wilson) S.Ortíz & Rodr.Oubiña	LC
Dicoma macrocephala DC.	LC

Plant species	Category (SANBI 2006)
Dicoma schinzii O.Hoffm.	LC
Didymodon tophaceus (Brid.) Lisa	
Digitaria argyrograpta (Nees) Stapf	LC
Digitaria brazzae (Franch.) Stapf	LC
Digitaria eriantha Steud.	LC
Digitaria sanguinalis (L.) Scop.	
Diheteropogon amplectens (Nees) Clayton var. amplectens	LC
Dimorphotheca cuneata (Thunb.) Less.	LC
Diospyros lycioides Desf. subsp. lycioides	LC
Dipcadi marlothii Engl.	LC
Dipcadi viride (L.) Moench	LC
Duthieastrum linifolium (E.Phillips) M.P.de Vos	LC
Dyschoriste pseuderecta Mildbr.	LC
Dyschoriste transvaalensis C.B.Clarke	LC
Echinochloa colona (L.) Link	LC
Echinochloa holubii (Stapf) Stapf	LC
Ehretia alba Retief & A.E.van Wyk	LC
Ehretia rigida (Thunb.) Druce subsp. rigida	LC
Elionurus muticus (Spreng.) Kunth	LC
Enneapogon cenchroides (Licht. ex Roem. & Schult.) C.E.Hubb.	LC
Enneapogon scoparius Stapf	LC
Eragrostis barbinodis Hack.	LC
Eragrostis barrelieri Daveau	
Eragrostis bicolor Nees	LC
Eragrostis biflora Hack. ex Schinz	LC
Eragrostis chloromelas Steud.	LC
Eragrostis cilianensis (All.) Vignolo ex Janch.	LC
Eragrostis curvula (Schrad.) Nees	LC
Eragrostis echinochloidea Stapf	LC
Eragrostis gummiflua Nees	LC
Eragrostis lehmanniana Nees var. lehmanniana	LC
Eragrostis micrantha Hack.	LC
Eragrostis nindensis Ficalho & Hiern	LC
Eragrostis pallens Hack.	LC
Eragrostis rigidior Pilg.	LC
Eragrostis rotifer Rendle	LC
Eragrostis superba Peyr.	LC
Eragrostis trichophora Coss. & Durieu	LC
Eragrostis viscosa (Retz.) Trin.	LC
Eragrostis x pseud-obtusa De Winter	
Eriospermum mackenii (Hook.f.) Baker subsp. galpinii (Schinz) P.L.Perry	
Eriospermum schinzii Baker	LC
Erlangea misera (Oliv. & Hiern) S.Moore	LC

Plant species	Category (SANBI 2006)
Euphorbia duseimata R.A.Dyer	LC
Euphorbia inaequilatera Sond. var. inaequilatera	LC
Euphorbia pseudoduseimata A.C.White, R.A.Dyer & B.Sloane	LC
Euphorbia rhombifolia Boiss.	LC
Eustachys paspaloides (Vahl) Lanza & Mattei	LC
Evolvulus alsinoides (L.) L.	LC
Falkia oblonga Bernh. ex C.Krauss	LC
Felicia clavipilosa Grau subsp. clavipilosa	LC
Felicia muricata (Thunb.) Nees subsp. cinerascens Grau	LC
Fingerhuthia africana Lehm.	LC
Flaveria bidentis (L.) Kuntze	
Fockea angustifolia K.Schum.	LC
Gazania krebsiana Less. subsp. serrulata (DC.) Roessler	LC
Geigeria brevifolia (DC.) Harv.	LC
Geigeria burkei Harv. subsp. burkei var. zeyheri (Harv.) Merxm.	LC
Geigeria filifolia Mattf.	LC
Geigeria obtusifolia L.Bolus	LC
Geigeria ornativa O.Hoffm.	LC
Geigeria pectidea (DC.) Harv.	LC
Gisekia pharnacioides L. var. pharnacioides	LC
Gladiolus permeabilis D.Delaroche subsp. edulis (Burch. ex Ker Gawl.) Oberm.	LC
Gnaphalium filagopsis Hilliard & B.L.Burtt	LC
Gnidia sericocephala (Meisn.) Gilg ex Engl.	LC
Gomphocarpus tomentosus Burch. subsp. tomentosus	LC
Gomphrena celosioides Mart.	
Grewia retinervis Burret	LC
Grewia retinervis Burret	LC
Gymnosporia buxifolia (L.) Szyszyl.	LC
Gymnosporia tenuispina (Sond.) Szyszyl.	LC
Harpagophytum procumbens (Burch.) DC. ex Meisn. subsp. procumbens	LC
Helichrysum argyrosphaerum DC.	LC
Helichrysum caespititium (DC.) Harv.	LC
Helichrysum cerastioides DC. var. cerastioides	LC
Helichrysum dregeanum Sond. & Harv.	LC
Helichrysum lineare DC.	LC
Helichrysum nudifolium (L.) Less. var. nudifolium	LC
Helichrysum paronychioides DC.	LC
Helichrysum rugulosum Less.	LC
Helichrysum zeyheri Less.	LC
Heliotropium ciliatum Kaplan	LC
Heliotropium ovalifolium Forssk.	LC
Heliotropium strigosum Willd.	LC
Hermannia boraginiflora Hook.	LC

Plant species	Category (SANBI 2006)
Hermannia erodioides (Burch. ex DC.) Kuntze	LC
Hermannia quartiniana A.Rich.	LC
Hermannia stellulata (Harv.) K.Schum.	LC
Hermannia tomentosa (Turcz.) Schinz ex Engl.	LC
Hermbstaedtia fleckii (Schinz) Baker & C.B.Clarke	LC
Hermbstaedtia odorata (Burch.) T.Cooke var. albi-rosea Suess.	LC
Hermbstaedtia odorata (Burch.) T.Cooke var. aurantiaca (Suess.) C.C.Towns.	LC
Hermbstaedtia odorata (Burch.) T.Cooke var. odorata	LC
Heteropogon contortus (L.) Roem. & Schult.	LC
Hibiscus engleri K.Schum.	LC
Hibiscus pusillus Thunb.	LC
Hibiscus trionum L.	
Hirpicium bechuanense (S.Moore) Roessler	LC
Hoodia pilifera (L.f.) Plowes subsp. annulata (N.E.Br.) Bruyns	LC
Hyparrhenia hirta (L.) Stapf	LC
Hypertelis bowkeriana Sond.	LC
Hypertelis salsoloides (Burch.) Adamson var. salsoloides	LC
Hypoxis iridifolia Baker	LC
Indigastrum argyraeum (Eckl. & Zeyh.) Schrire	LC
Indigastrum costatum (Guill. & Perr.) Schrire subsp. macrum (E.Mey.) Schrire	LC
Indigofera alternans DC. var. alternans	LC
Indigofera cryptantha Benth. ex Harv. var. cryptantha	LC
Indigofera daleoides Benth. ex Harv. var. daleoides	LC
Indigofera filipes Benth. ex Harv.	LC
Indigofera heterotricha DC.	LC
Indigofera hololeuca Benth. ex Harv.	LC
Indigofera holubii N.E.Br.	LC
Indigofera rhytidocarpa Benth. ex Harv. subsp. rhytidocarpa	LC
Indigofera sessilifolia DC.	LC
Indigofera vicioides Jaub. & Spach var. vicioides	LC
Ipomoea bolusiana Schinz	LC
Ipomoea oblongata E.Mey. ex Choisy	LC
Ipomoea obscura (L.) Ker Gawl. var. obscura	LC
Ipomoea oenotherae (Vatke) Hallier f. var. oenotherae	LC
Ipomoea oenotheroides (L.f.) Raf. ex Hallier f.	LC
Ipomoea sinensis (Desr.) Choisy subsp. blepharosepala (Hochst. ex A.Rich.) Verdc. ex A.Meeuse	LC
Isolepis diabolica (Steud.) Schrad.	LC
Juncus effusus L.	LC
Juncus exsertus Buchenau	LC
Juncus rigidus Desf.	LC
Kalanchoe paniculata Harv.	LC
Kohautia cynanchica DC.	LC

Plant species	Category (SANBI 2006)
Kyllinga alba Nees	LC
Kyllinga erecta Schumach. var. erecta	LC
Kyphocarpa angustifolia (Moq.) Lopr.	LC
Lactuca inermis Forssk.	LC
Laggera decurrens (Vahl) Hepper & J.R.I.Wood	LC
Lantana mearnsii Moldenke var. latibracteolata Moldenke	LC
Lantana rugosa Thunb.	LC
Lapeirousia sandersonii Baker	LC
Lasiopogon muscoides (Desf.) DC.	LC
Leptochloa fusca (L.) Kunth	LC
Lessertia pauciflora Harv. var. pauciflora	LC
Leucas capensis (Benth.) Engl.	LC
Limeum sulcatum (Klotzsch) Hutch. var. sulcatum	LC
Limeum viscosum (J.Gay) Fenzl subsp. transvaalense Friedrich	LC
Limeum viscosum (J.Gay) Fenzl subsp. viscosum var. viscosum	LC
Lippia scaberrima Sond.	LC
Lithops lesliei (N.E.Br.) N.E.Br. subsp. lesliei	NT
Lithospermum cinereum A.DC.	LC
Litogyne gariepina (DC.) Anderb.	LC
Lobelia angolensis Engl. & Diels	LC
Lobelia erinus L.	LC
Lotononis crumanina Burch. ex Benth.	LC
Lotononis curtii Harms	LC
Lotononis listii Polhill	LC
Lycium horridum Thunb.	LC
Lycium pilifolium C.H.Wright	LC
Malva parviflora L. var. parviflora	
Malva pusilla Sm.	
Massonia jasminiflora Burch. ex Baker	LC
Maytenus acuminata (L.f.) Loes. var. acuminata	LC
Melhania prostrata DC.	LC
Melhania prostrata DC.	LC
Melhania virescens (K.Schum.) K.Schum.	LC
Melinis repens (Willd.) Zizka subsp. grandiflora (Hochst.) Zizka	LC
Melinis repens (Willd.) Zizka subsp. repens	LC
Melolobium candicans (E.Mey.) Eckl. & Zeyh.	LC
Melolobium canescens Benth.	LC
Merremia verecunda Rendle	LC
Mestoklema arboriforme (Burch.) N.E.Br. ex Glen	LC
Mollugo cerviana (L.) Ser. ex DC. var. cerviana	LC
Momordica balsamina L.	LC
Monechma divaricatum (Nees) C.B.Clarke	LC
Monsonia angustifolia E.Mey. ex A.Rich.	LC

Plant species	Category (SANBI 2006)
Monsonia burkeana Planch. ex Harv.	LC
Moraea cookii (L.Bolus) Goldblatt	LC
Moraea elliotii Baker	LC
Moraea pallida (Baker) Goldblatt	LC
Moraea polystachya (Thunb.) Ker Gawl.	LC
Moraea simulans Baker	LC
Mundulea sericea (Willd.) A.Chev. subsp. sericea	LC
Nerine frithii L.Bolus	LC
Nerine hesseoides L.Bolus	LC
Nerine laticoma (Ker Gawl.) T.Durand & Schinz	LC
Nidorella hottentotica DC.	LC
Nidorella resedifolia DC. subsp. resedifolia	LC
Nolletia ciliaris (DC.) Steetz	LC
Ochna pretoriensis E.Phillips	LC
Odyssea paucinervis (Nees) Stapf	LC
Ophioglossum polyphyllum A.Braun	LC
Ornithogalum tenuifolium F.Delaroche subsp. tenuifolium	LC
Ornithoglossum vulgare B.Nord.	LC
Osteospermum muricatum E.Mey. ex DC. subsp. muricatum	LC
Otoptera burchellii DC.	LC
Oxalis depressa Eckl. & Zeyh.	LC
Oxygonum alatum Burch. var. alatum	LC
Oxygonum dregeanum Meisn. subsp. canescens (Sond.) Germish. var. canescens	LC
Ozoroa paniculosa (Sond.) R.& A.Fern. var. paniculosa	LC
Ozoroa paniculosa (Sond.) R.& A.Fern. var. salicina (Sond.) R.& A.Fern.	LC
Panicum coloratum L. var. coloratum	LC
Panicum kalaharense Mez	LC
Panicum maximum Jacq.	LC
Panicum schinzii Hack.	LC
Panicum stapfianum Fourc.	LC
Pavetta zeyheri Sond. subsp. zeyheri	LC
Pelargonium sidoides DC.	Declining
Peliostomum leucorrhizum E.Mey. ex Benth.	LC
Pellaea calomelanos (Sw.) Link var. calomelanos	LC
Pentarrhinum insipidum E.Mey.	LC
Pentzia calcarea Kies	LC
Pentzia globosa Less.	LC
Perotis patens Gand.	LC
Phyllanthus incurvus Thunb.	LC
Phyllanthus maderaspatensis L.	LC
Phyllanthus parvulus Sond. var. garipensis (E.Mey. ex Drège) Radcl.-Sm.	LC
Phyllanthus parvulus Sond. var. parvulus	LC

Plant species	Category (SANBI 2006)
Plinthus sericeus Pax	LC
Plumbago zeylanica L.	
Pogonarthria squarrosa (Roem. & Schult.) Pilg.	LC
Pollichia campestris Aiton	LC
Polygala leptophylla Burch. var. leptophylla	LC
Polygonum plebeium R.Br.	LC
Polypogon monspeliensis (L.) Desf.	
Pomaria burchellii (DC.) B.B.Simpson & G.P.Lewis subsp. burchellii	
Portulaca hereroensis Schinz	LC
Potamogeton pectinatus L.	LC
Prosopis glandulosa Torr. var. glandulosa	
Prosopis velutina Wooton	
Pseudocrossidium porphyreoneurum (Müll.Hal.) R.H.Zander	
Pseudognaphalium luteo-album (L.) Hilliard & B.L.Burtt	
Pterodiscus speciosus Hook.	LC
Pycreus betschuanus (Boeck.) C.B.Clarke	LC
Pygmaeothamnus zeyheri (Sond.) Robyns var. zeyheri	LC
Ranunculus multifidus Forssk.	
Raphionacme velutina Schltr.	LC
Rennera stellata P.P.J.Herman	VU
Requienia sphaerosperma DC.	LC
Rhynchosia adenodes Eckl. & Zeyh.	LC
Rhynchosia confusa Burtt Davy	LC
Rhynchosia holosericea Schinz	LC
Rhynchosia minima (L.) DC. var. prostrata (Harv.) Meikle	LC
Rhynchosia totta (Thunb.) DC. var. totta	LC
Riccia albolimbata S.W.Arnell	
Riccia argenteolimbata O.H.Volk & Perold	
Rotheca uncinata (Schinz) P.P.J.Herman & Retief	LC
Ruellia patula Jacq.	LC
Ruelliopsis setosa (Nees) C.B.Clarke	LC
Ruschia hamata (L.Bolus) Schwantes	LC
Salsola kali L.	
Salvia coccinea Etl.	
Salvia disermas L.	LC
Salvia runcinata L.f.	LC
Salvia stenophylla Burch. ex Benth.	
Scabiosa columbaria L.	LC
Schizachyrium sanguineum (Retz.) Alston	LC
Schizocarphus nervosus (Burch.) Van der Merwe	LC
Schkuhria pinnata (Lam.) Kuntze ex Thell.	
Schmidtia pappophoroides Steud.	LC
Schoenoplectus corymbosus (Roth ex Roem. & Schult.) J.Raynal	LC

Plant species	Category (SANBI 2006)
Schoenoplectus leucanthus (Boeck.) J.Raynal	LC
Schoenoplectus muricinux (C.B.Clarke) J.Raynal	LC
Scirpoides dioecus (Kunth) Browning	LC
Searsia lancea (L.f.) F.A.Barkley	LC
Searsia leptodictya (Diels) T.S.Yi, A.J.Mill. & J.Wen forma leptodictya	
Searsia magalismontana (Sond.) Moffett subsp. magalismontana	LC
Searsia pyroides (Burch.) Moffett var. pyroides	LC
Searsia tenuinervis (Engl.) Moffett	LC
Sebaea exigua (Oliv.) Schinz	LC
Sebaea pentandra E.Mey. var. pentandra	LC
Seddera capensis (E.Mey. ex Choisy) Hallier f.	LC
Seddera suffruticosa (Schinz) Hallier f.	LC
Selago albomarginata Hilliard	LC
Selago densiflora Rolfe	LC
Selago mixta Hilliard	LC
Selago welwitschii Rolfe var. australis Hilliard	LC
Senecio arenarius Thunb.	LC
Senna italica Mill. subsp. arachoides (Burch.) Lock	LC
Sericocoma avolans Fenzl	LC
Sericorema remotiflora (Hook.f.) Lopr.	LC
Sesamum triphyllum Welw. ex Asch. var. triphyllum	LC
Sesbania notialis J.B.Gillett	LC
Setaria nigrirostris (Nees) T.Durand & Schinz	LC
Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. sphacelata	LC
Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. torta (Stapf) Clayton	LC
Sida chrysantha Ulbr.	LC
Sida cordifolia L. subsp. cordifolia	LC
Silene undulata Aiton	LC
Sisymbrium turczaninowii Sond.	LC
Solanum burchellii Dunal	LC
Solanum catombelense Peyr.	LC
Solanum nigrum L.	
Solanum panduriforme E.Mey.	LC
Solanum supinum Dunal var. supinum	LC
Sonchus oleraceus L.	
Sphedamnocarpus pruriens (A.Juss.) Szyszyl. subsp. pruriens	LC
Sporobolus albicans (Nees ex Trin.) Nees	LC
Sporobolus fimbriatus (Trin.) Nees	LC
Sporobolus ioclados (Trin.) Nees	LC
Stipagrostis ciliata (Desf.) De Winter var. capensis (Trin. & Rupr.) De Winter	LC
Stipagrostis uniplumis (Licht.) De Winter var. neesii (Trin. & Rupr.) De Winter	LC
Stipagrostis uniplumis (Licht.) De Winter var. uniplumis	LC

Plant species	Category (SANBI 2006)
Striga gesnerioides (Willd.) Vatke	LC
Syntrichia ammonsiana (H.A.Crum & L.E.Anderson) Ochyra	
Tagetes minuta L.	
Tamarix ramosissima Ledeb.	
Tarchonanthus camphoratus L.	LC
Tephrosia burchellii Burtt Davy	LC
Tephrosia longipes Meisn. subsp. longipes var. longipes	LC
Terminalia sericea Burch. ex DC.	LC
Teucrium trifidum Retz.	LC
Themeda triandra Forssk.	LC
Tortella xanthocarpa (Schimp. ex Müll.Hal.) Broth.	
Trachyandra burkei (Baker) Oberm.	LC
Trachyandra laxa (N.E.Br.) Oberm. var. rigida (Suess.) Roessler	LC
Trachyandra saltii (Baker) Oberm. var. saltii	LC
Tragia dioica Sond.	LC
Tragus berteronianus Schult.	LC
Tragus koelerioides Asch.	LC
Tragus racemosus (L.) All.	LC
Trianthema salsoloides Fenzl ex Oliv. var. transvaalensis (Schinz) Adamson	LC
Tribulus terrestris L.	LC
Tricholaena monachne (Trin.) Stapf & C.E.Hubb.	LC
Trichoneura grandiglumis (Nees) Ekman	LC
Tripteris aghillana DC. var. aghillana	LC
Triraphis andropogonoides (Steud.) E.Phillips	LC
Triraphis purpurea Hack.	LC
Triraphis schinzii Hack.	LC
Tulbaghia leucantha Baker	LC
Urochloa brachyura (Hack.) Stapf	LC
Urochloa mosambicensis (Hack.) Dandy	LC
Urochloa panicoides P.Beauv.	
Vangueria infausta Burch. subsp. infausta	LC
Verbena officinalis L.	
Verbesina encelioides (Cav.) Benth. & Hook. var. encelioides	
Veronica anagallis-aquatica L.	LC
Viscum rotundifolium L.f.	LC
Wahlenbergia denticulata (Burch.) A.DC. var. denticulata	LC
Wahlenbergia denticulata (Burch.) A.DC. var. transvaalensis (Adamson) W.G.Welman	LC
Wahlenbergia undulata (L.f.) A.DC.	LC
Waltheria indica L.	LC
Withania somnifera (L.) Dunal	LC
Xanthium spinosum L.	

Plant species	Category (SANBI 2006)
Xenostegia tridentata (L.) D.F.Austin & Staples subsp. angustifolia (Jacq.) Lejoly & Lisowski	LC
Ziziphus mucronata Willd. subsp. mucronata	LC
Ziziphus zeyheriana Sond.	LC
Zornia linearis E.Mey.	LC
Zornia milneana Mohlenbr.	LC

Appendix 2

Red data faunal species potentially occurring in the Study area

Mammals

Common name	Scientific name	Category
Red Hartebeest	*Alcelaphus buselaphus*	Least Concern
Springbok	*AntidorcasMarsupialis*	Least Concern
White Rhinoceros	*Ceratotherium simum*	Least Concern
Black Wildebeest	*Connochaetes gnou*	Least Concern
Blue Wildebeest	*Connochaetes taurinus taurinus*	Least Concern
Blesbok	*Damaliscus pygargus phillipsi*	Least Concern
Black Rhinoceros	*Diceros bicomis bicomis*	Critically Endangered
Plains Zebra	*Equus burchellii*	Least Concern
Giraffe	*Giraffa camelopardalis*	Least Concern
Roan Antelope	*Hippotragus equinus*	Vulnerable
Klipsringer	*Oreotragus oreotragus*	Least Concern
Gemsbok	*Oryx gazella*	Least Concern
Steenbok	*Raphicerus campestris*	Least Concern
Common Duiker	*Sylvicapra grimmia*	Least Concern
Eland	*Taurotragus oryx*	Least Concern
Kudu	*Tragelaphus strepsiceros*	Least Concern
Rock Hyrax	*Procavia capensis*	Least Concern
Cape Clawless Otter	*Aonyx capensis*	Least Concern
Water Mongoose	*Atilax paludinosus*	Least Concern
Black-backed Jackal	*Canis mesomelas*	Least Concern
Caracal	*Caracal caracal*	Least Concern
Yellow Mongoose	*Cynictis penicillata*	Least Concern
Black-footed Cat	*Felis nigripes*	Least Concern
African Wild Cat	*Felis silvestris*	Least Concern
Slender Mongoose	*Galerella sanguinea*	Least Concern
Small-spotted Genet	*Genetta genetta*	Least Concern
Large-spotted Genet	*Genetta tigrina*	Least Concern
Brown Hyaena	*Hyaena brunnea*	Near Threatened
Striped Polecat	*Ictonyx striatus*	Least Concern
African Wild Dog	*Lycaon pictus*	Endangered
Honey Badger	*Mellivora capensis*	Near Threatened

Common name	Scientific name	Category
Bat-eared Fox	*Otocyon megalotis*	Least Concern
Leopard	*Panthera pardus*	Least Concern
African Weasel	*Poecilogale albinucha*	Data deficient
Aardwolf	*Proteles cristatus*	Least Concern
Suricate	*Suricata suricatta*	Least Concern
Cape Fox	*Vulpes chama*	Least Concern
Schreiber's Long-fingered Bat	*Miniopterus schreibersii*	Near Threatened
Cape Serotine Bat	*Neoromicia capensis*	Least Concern
Egyptian Slit-faced Bat	*Nycteris thebaica*	Least Concern
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*	Near Threatened
Darling's Horseshore Bat	*Rhinolophus darling*	Near Threatened
Egyptian Free-tailed Bat	*Tadarida aegyptiaca*	Least Concern
South African Hedgehog	*Atelerix frontalis*	Near Threatened
Reddish-grey Musk Shrew	*Crocidura cyanea*	Data deficient
Tiny Musk Shrew	*Crocidura fuscomurina*	Data deficient
Lesser Red Musk Shrew	*Crocidura hirta*	Data deficient
Cape Hare/ Desert Hare	*Lepus capensis*	Least Concern
Scrub hare	*Lepus saxatilis*	Least Concern
Vervet Monkey	*Cercopithecus aethiops pygerythus*	Least Concern
Chacma Baboon	*Papio ursinus*	Least Concern
Red Veld Rat	*Aethomys chrysophilus*	Least Concern
Namaqua Rock Mouse	*Aethomys namaquensis*	Least Concern
Common Mole-rat	*Cryptomys hottentotus*	Least Concern
Grey Climbing Mouse	*Dendromus melanotis*	Least Concern
Short-tailed Gerbil	*Desmodillus auricularis*	Least Concern
Hairy-footed Gerbil	*Gerbillurus paeba*	Least Concern
Woodland Dormouse	*Graphiurus murinus*	Least Concern
Porcupine	*Hystrix africaeaustralis*	Least Concern
Single-striped Mouse	*Lemniscmys rosalia*	Data deficient
Large-eared Mouse	*Malacothrix typica*	Least Concern
Multimammate Mouse	*Mastomys coucha*	Least Concern
Desert Pygmy Mouse	*Mus indutus*	Least Concern
White-tailed Rat	*Mystromys albicaudatus*	Endagered
Angoni Vlei Rat	*Otomys angoniensis*	Least Concern
Vlei Rat	*Otomys irroratus*	Least Concern
Springhare	*Pedetes capensis*	Least Concern
Striped Mouse	*Rhabdomys pumilio*	Least Concern
Pouched Mouse	*Saccostomus campestris*	Least Concern
Kreb's Fat Mouse	*Steatomys krebsii*	Least Concern
Highveld Gerbil	*Tatera brantsii*	Least Concern
Bushveld Gerbil	*tatera leucogaster*	Data deficient
Tree Rat	*Thallomys paedulcus*	Least Concern

Common name	Scientific name	Category
Cape Ground Squirrel	*Xerus inauris*	Least Concern
Rock Elephant-shrew	*Elephantulus myurus*	Least Concern
Aardvark	*Orycteropus afer*	Least Concern

Amphibians

Common name	**Scientific name**	**Category (Minter *et al*., 2004)**	**Habitat**
Eastern Olive Toad	*Bufo garmani*	Least Concern	Bushveld vegetation types (Savanna biome)
Guttural Toad	*Bufo gutturalis*	Least Concern	Savanna, Grassland, and Thicket biomes
Bubbling Kassina	*Kassina senegalensis*	Least Concern	Savanna and Grassland biomes
Bushveld Rain Frog	*Breviceps adspersus*	Least Concern	Semi-arid habitats with Sandy to sandy-loam soils (Savanna biome)
Banded Rubber Frog	*Phrynomantis bifasciatus*	Least Concern	Bushveld vegetation types (Savanna biome)
Boettger's Caco	*Cacosternum boettgeri*	Least Concern	Savanna, Grassland, Nama Karoo, Fynbos and Thicket biomes
Common Platanna	*Xenopus laevis*	Least Concern	Natural water bodies, Farm dams and ponds
Giant Bullfrog	*Pyxicephalus adspersus*	Near Threatened	Savanna, Grassland, Nama Karoo and Thicket biomes
Tremolo Sand Frog	*Tomopterna cryptotis*	Least Concern	Savanna and Grassland biomes

Reptiles

Common Name	**Scientific Name**	**Red Data Status**
Southern African Python	*Python natalensis*	Vulnerable
Blunt-tailed Worm-lizard	*Dalaphia pistillum*	Peripheral

Lepidoptera species

Common name	**Scientific name**	**IUCN category**	**Habitat**
Machequena Acraea	*Acraea machequena Grose*	undefined	Bushveld, unknown
Mite Sandman	*Spialia paula*	No information	Bushveld, unknown
Highveld Blue	*Lepidochrysops praeterita*	No information	Grassveld, Becium grandiforum, Camponotus sp
Maseru Copper	*Aloeides dentalis*	No information	Grassveld, Hermannia jacobeifolia, lepisiota capensis
Dolomite Hopper	*Platylesches*	No information	Grassveld, Parinari sp

Common name	Scientific name	IUCN category	Habitat
	dolomitica		
Morant's Blue	*Lepidochrysops hypopolia*	No information	Grassveld, unknown
Marsh Sylph	*Metisella meninx* (Trimen)	undefined	Riparian, Leersia hexandra
Marsh Hottentot Skipper	*Gegenes hottentota* (Latreille)	No information	Riparian, Poaceae
Griqua Pied Blue	*Tuxentius melaena griqua*	No information	Riparian, Zizphus mucronata

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