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# An evaluation of the vegetation and plant diversity along the proposed route between the Eskom Merensky and Foskor substations

March 2012
Revised and updated February 2017

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# An evaluation of the vegetation and plant diversity along the proposed route between the Eskom Merensky and Foskor substations

Prepared for:

**Nsovo Environmental Consulting**

by

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March 2012
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**DECLARATION OF INDEPENDENCE**

I, George Johannes Bredenkamp, Id 4602105019086, declare that I:

- Hold a DSc in biological sciences, am registered with SACNASP (Reg No 400086/83) as a professional ecological scientist which sanctions me to function independently as a specialist consultant
- Declare that, as per prerequisites of the Natural Scientific Professions Act No. 27 of 2003, this project was my work from its inception, reflects exclusively my observations and unbiased scientific interpretations, and was executed to the best of my ability
- abide by the Code of Ethics of the SACNASP
- Am the owner of Eco-Agent CC, CK 95/37116/23
- Act as an independent specialist consultant in the field of ecology, biodiversity, vegetation science, botany and wetlands
- Am committed to biodiversity conservation but concomitantly recognize the need for economic development
- Am assigned as specialist consultant by Nsovo Environmental Consulting for the proposed project “An evaluation of the vegetation and plant diversity along the proposed route between the Eskom Merensky and Foskor substations” described in this report
- Do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work performed
- Have or 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 client and the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations 2014
- Will provide the client and competent authority with access to all information at my disposal, regarding this project, whether favourable or not.
- Reserve the right to only transfer my intellectual property contained in this report to the client(s), (party or company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, I recognise that written consent from the client(s) will be required for me to release any part of this report to third parties.

GJ Bredenkamp

## EXECUTIVE SUMMARY

During 2016/2017 a re-investigation of the authorised route became necessary, as the voltage of the proposed 275kV line was changed from 275kV to 400kV, and this implies that the new 400 kV line servitude will change from 47 m to 55 m. It also implied that the revised assessments must be in accordance with the EIA Regulations No. R982-985, Department of Environmental Affairs, 4 December 2014 emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

The vegetation of all four alternatives was investigated. From the desktop study, confirmed by the field survey, option 3, which runs from Burgersfort to Ohrigstad along the R555, was eliminated. This is because the route along the R555 runs for most of the way in a narrow valley, with the Mabitsana River and the tarred R555 in this valley. The line will have to run for most of the way on the sensitive mountain foot slopes and cross the river and road several times. Furthermore, many irrigated agricultural enterprises occur in the Ohrigstad area, stretching all the way to Marapeng. This mosaic of narrow river valley, river, mountain slopes and agriculture where-ever the valley is a bit broader, causes the route to be unsuitable. From an ecological perspective both the riverine vegetation and the vegetation of the mountain slopes have a high ecological sensitivity. Therefore this entire valley forms an ecologically sensitive ecosystem. This is also a much longer route.

Furthermore, from the desktop study, confirmed by the field survey, option 4, was eliminated. The line of this option runs through nine vegetation types, and over very high and steep mountains of Sekhukhune Mountain Bushveld and Ohrigstad Mountain Bushveld with two endangered ecosystems (Sekhukhune Mountainlands and Sekhukhune Norite Bushveld, SANBI & DEAT 2009), Poung Dolomite Mountain Bushveld with endangered Malmani Karstland (SANBI & DEAT 2009), the vulnerable Northern Escarpment Quartzite Sourveld (Mucina & Rutherford (2006), Northern Mistbelt Forest area and the vulnerable Tzaneen Sour Bushveld (SANBI & DEAT 2009). Especially the Great Escarpment area consists of very rugged and high mountains, resulting in a very difficult route with several threatened ecosystems.

Alternative Routes 1 and 2, and part of Alternative 1 that changed to Alternative 5 were further investigated in more detail by field surveys. Alternative 5 would affect less people. The vegetation along these routes was assessed in more detail, including the protected and red data species. Medicinal plants and aliens and weeds are indicated.

From an ecological perspective, Alternative 1 is the preferred route, with the Alternative 5 replacing part of Alternative 1. This eventually became the authorised route.

The most difficult part of the route is from the Merensky substation through Ohrigstad Mountain Bushveld which is an extremely mountainous area with sensitive vegetation. This part of the line transects quite sensitive vegetation and it is suggested that a walkthrough in this area is essential.

The most serious limitation of the wider servitude on the Lowveld plains where the line transects the Granite Lowveld vegetation type, is the abundance of the protected tree *Sclerocarya birrea,* and to a lesser degree other protected tree and plant species. It is certain that several of these trees will be in the way of the transect.

Locally are also many river and spruit crossings. No river or spruit is very wide, so the lines can easily cross these rivers or spruits systems. Care should be taken to place pylons adequately away from river or spruit banks, avoiding any damage to the banks or water courses. Erosion should be avoided at all times. The new 2014 Regulations emanating from the Water Act may have an effect on authorisation in terms of requirement of Water Use Licences. This aspect falls outside the scope of this report.

Another factor in this area is that large properties are game farms and lodges. These areas are effectively conserved by the owners, and it is realised that the public participation is an important issue. After finalisation of the exact transect, a walkthrough will have to confirm any issues regarding vegetation.

## THE PROPOSED DEVELOPMENT

Eskom initially proposed four and later five alternatives for the development of a new 275 kV power line from the Merensky substation near Steelpoort to the Foskor substation near Phalaborwa. This power line is more than 120 km long. The Department of Environmental Affairs (DEA) authorised one route, consisting of a combination of Alternatives 1 and 5. During January 2017 EcoAgent CC was informed by Nsovo Environmental Consulting that this authorised powerline must be upgraded to 400 kV and widening of the servitude from 47 m to 55 m. This implies that the a width of 8 m is added to the entire length of the proposed powerline, where vegetation could be cleared, and particularly trees be removed. This upgrade necessitates a revision of the Environmental Impact Assessment, including the impacts that the upgraded powerline will have on vegetation and flora. The revised assessments must also be in accordance with the EIA Regulations No. R982-985, Department of Environmental Affairs and Tourism, 4 December 2014 emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

## 2. ASSIGNMENT AND SCOPE

EcoAgent Ecological Consultants CC was appointed by Nsovo Environmental Consulting to re-assess the report and incorporate changes, if needed, on vegetation and flora for the authorised 400 kV powerline route. This report is in accordance with the EIA Regulations No. R982-985, Department of Environmental Affairs and Tourism, 4 December 2014 emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as well as the National Water Act 1998 (Act 36 of 1998) and other relevant legislation.

In accordance with The Natural Scientific Professions Act (Act 27 of 2003) only a person registered with the South African Council for Natural Scientific Professions may practice in a consulting capacity. Prof GJ Bredenkamp (SACNASP Reg No 400086/83) undertook an independent assessment of the vegetation of the site. The original field survey was conducted during 2012, and the revision was done during February 2017.

The scope is interpreted as follows: Compile a study of the vegetation and flora of the authorised 400 kV powerline route, with emphasis on Red Data or Protected plant species that occur or may occur along the route. In order to compile this, the following had to be done:

**2.1. Initial preparations:**

- Obtain relevant maps and information on the natural environment of the concerned area.
- This includes information on Red Data plant species that may occur in the area.
- Obtain the Vegetation Types (Mucina & Rutherford, 2006) along the routes.

**2.2. Vegetation and habitat survey:**

- Use the Vegetation Types as basis for ecosystem delimitation.
- List the plant species (trees, shrubs, grasses and herbaceous species) present in the ecosystems recognised.
- Identify potential red data plant species, alien plant species, and medicinal plants.

**2.3. Plant community delimitation and description**

- Describe the habitat and vegetation.
- Determine the sensitivity of the site for biodiversity, veld condition and presence of rare or protected species.

**2.4. General**

- Identify and describe particular ecologically sensitive areas.
- Identify problem areas in need of special treatment or management, e.g. bush encroachment, erosion, water pollution, degraded areas, reclamation areas.
- This includes information on Red Data plant species that may occur in the area.

## 3. RATIONALE

It is widely recognised that it is of utmost importance to conserve natural resources in order to maintain ecological processes and life support systems for plants, animals and humans. To ensure that sustainable development takes place, it is therefore important that the environment is considered before relevant authorities approve any development. This led to legislation protecting the natural environment. The Environmental Conservation Act (Act 73 of 1989), the National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998), the National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004) and the National Water Act 1998 (Act 36 of 1998) ensure the protection of ecological processes, natural systems and natural beauty as well as the preservation of water resources and biotic diversity in the natural environment. It also ensures the protection of the environment against disturbance, deterioration, defacement or destruction as a result of man-made structures, installations, processes or products or human activities. A draft list of Threatened Ecosystems was published (Government Gazette 2009) as part of the National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004). Details of these Threatened Ecosystems have been described by SANBI & DEAT (2009) and a list of Threatened or Protected Species (TOPS) regulations is also available (NEMBA Notice 388 of 2013). International and national Red Data lists have also been produced for various threatened plant and animal taxa.

All components of the ecosystems (physical environment, including water resources, vegetation, animals) of a site are interrelated and interdependent. A holistic approach is therefore imperative to effectively include the development, utilisation and, where necessary, conservation of the given natural resources in an integrated development plan, which will address all the needs of the modern human population (Bredenkamp & Brown 2001).

In order to evaluate the vegetation it is necessary to make a thorough inventory of the ecosystems along the transect of the proposed 400 kV powerline. This inventory should then serve as a scientific and ecological basis for the planning exercises.

### Definitions and Legal Framework

Authoritative legislation that lists impacts and activities on vegetation and biodiversity including wetlands and riparian areas that requires authorisation includes:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996),
- The Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983),
- The Environmental Conservation Act, 1989 (Act No. 73 of 1989),
- The National Environment Management Act, 1998 (Act No. 107 of 1998) as amended in 2010 and 2014,
- The National Environmental Management Biodiversity Act, 2004. (Act 10 of 2004),

- The National Environmental Management Biodiversity Act, 2004. (Act 10 of 2004), Draft List of Threatened Ecosystems. Government Gazette RSA Vol. 1477, 32689, Cape Town, 6 Nov 2009,
- The National Environmental Management: Waste Act [NEM:WA] (Act 59 of 2008),
- The National Forests Act, 2006 (Act 84 of 1998 as amended in 2006),
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999),
- The National Environmental Management: Protected Areas Act (Act 57 0f 2003),
- The Mineral and Petroleum Resources Development Act 28 of 2002,
- The National Water Act, 1998 (Act No. 36 of 1998), and
- The Environmental Impact Assessment Regulations Notice 733 of 2014.

## 4. HISTORY AND APPROACH TO THIS REPORT

In order to put the investigation in perspective, the approach that was followed in this report is:

- Briefly describe the original (2012) investigation on the vegetation and flora to provide information about the study area, including the original five alternative routes.
- Provide the conclusions and recommendation of the original investigation.
- Relate the current (2017) study to the results of the 2012 study.
- Indicate the possible impacts that the new 400 kV powerline will have on the vegetation and flora.

## 5. STUDY AREA

The original four different options suggested for the Merensky - Foskor Eskom power line are indicated in Figure 1a. A map of all five Alternatives (Figure 2) also indicates that in the northern parts of the study site, all five Alternatives will traverse through conservation areas. All options start at the Merensky substation near Steelpoort. As the area is very large, many spruit systems are found along the routes (Figure 3). A few larger rivers or spruits are mentioned, but the numerous smaller spruit systems will have to be identified during a walk-down.

Option 1 (the preferred option) will run along the Steelpoort – Burgersfort road (R555) but before reaching Burgersfort it will turn north-eastwards and cross the rugged mountainous area towards the Strydom tunnel on the R36. It will then cross the mountains east of the Strydom tunnel and run towards Mica and from there towards the Foskor substation south of Phalaborwa. Option 5 is simply a deviation of the northernmost parts of Option 1, running north of Option 1, from Mica to Phalaborwa, as this will affect less people. The authorised transect is a combination of Option 1 and Option 5 (Figure 1b)

Option 2 will follow the same route as option 1 up to the Mica area, but will then turn more east to run south and east of option 1, in the direction of Hoedspruit, and then turn northwards to the Foskor substation.

Option 3 will initially also follow the same route as option 1 for a short distance, but at Burgersfort it will turn eastwards and follow the R555 to Ohrigstad and further on to the Strydom tunnel. From here on the route is similar to that of option 1.

Option 4 will run northwards from the Merensky substation, over undulating and mountainous area towards Penge and then over the rugged mountains over the great escarpment to cross the R36 between Trichardsdal and Diputhi and then run through the Kapama / Madrid Nature Reserve area toward Phalaborwa.

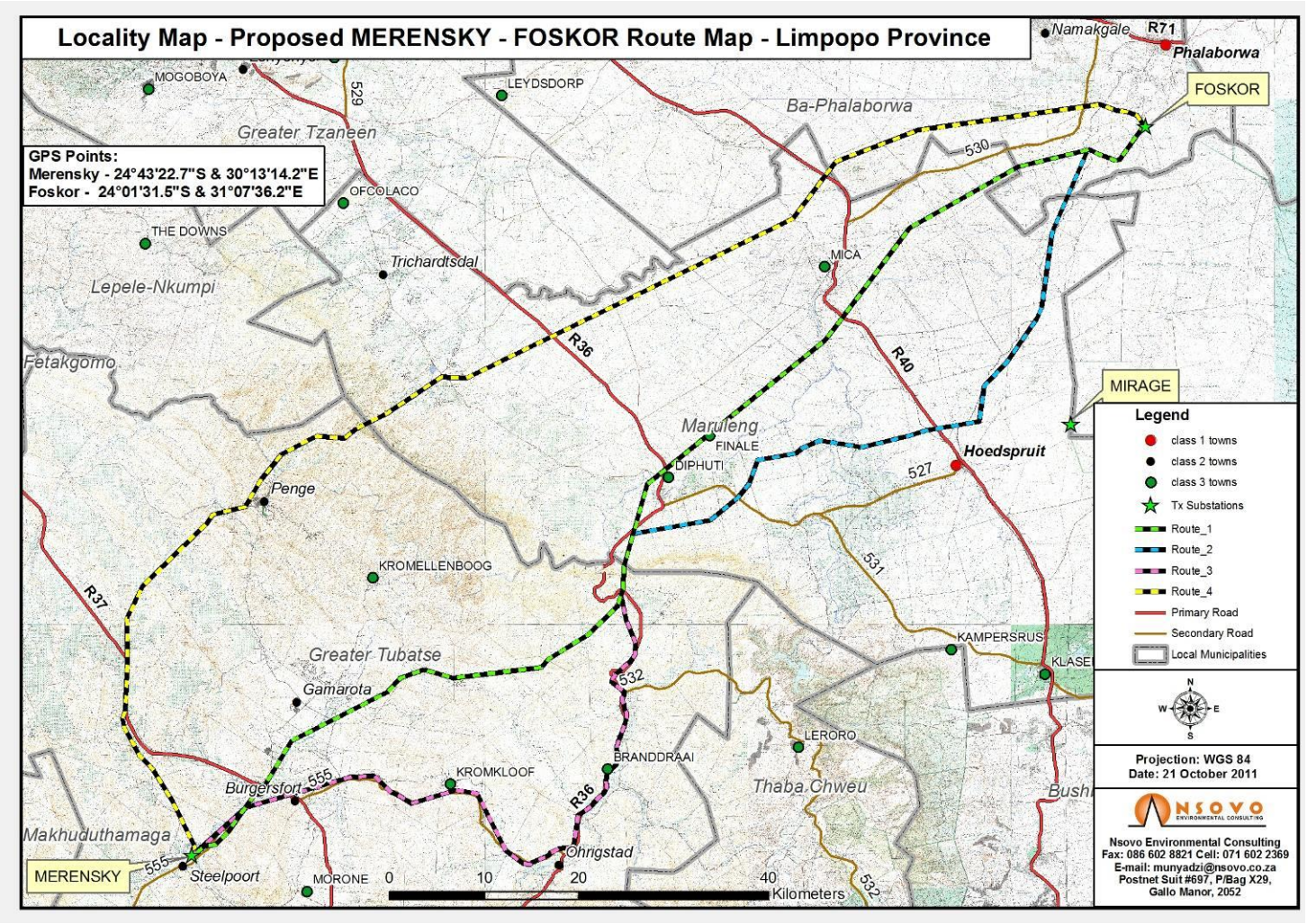


Figure 1a: A locality map showing the original four different options for the Merensky Foskor Eskom power line

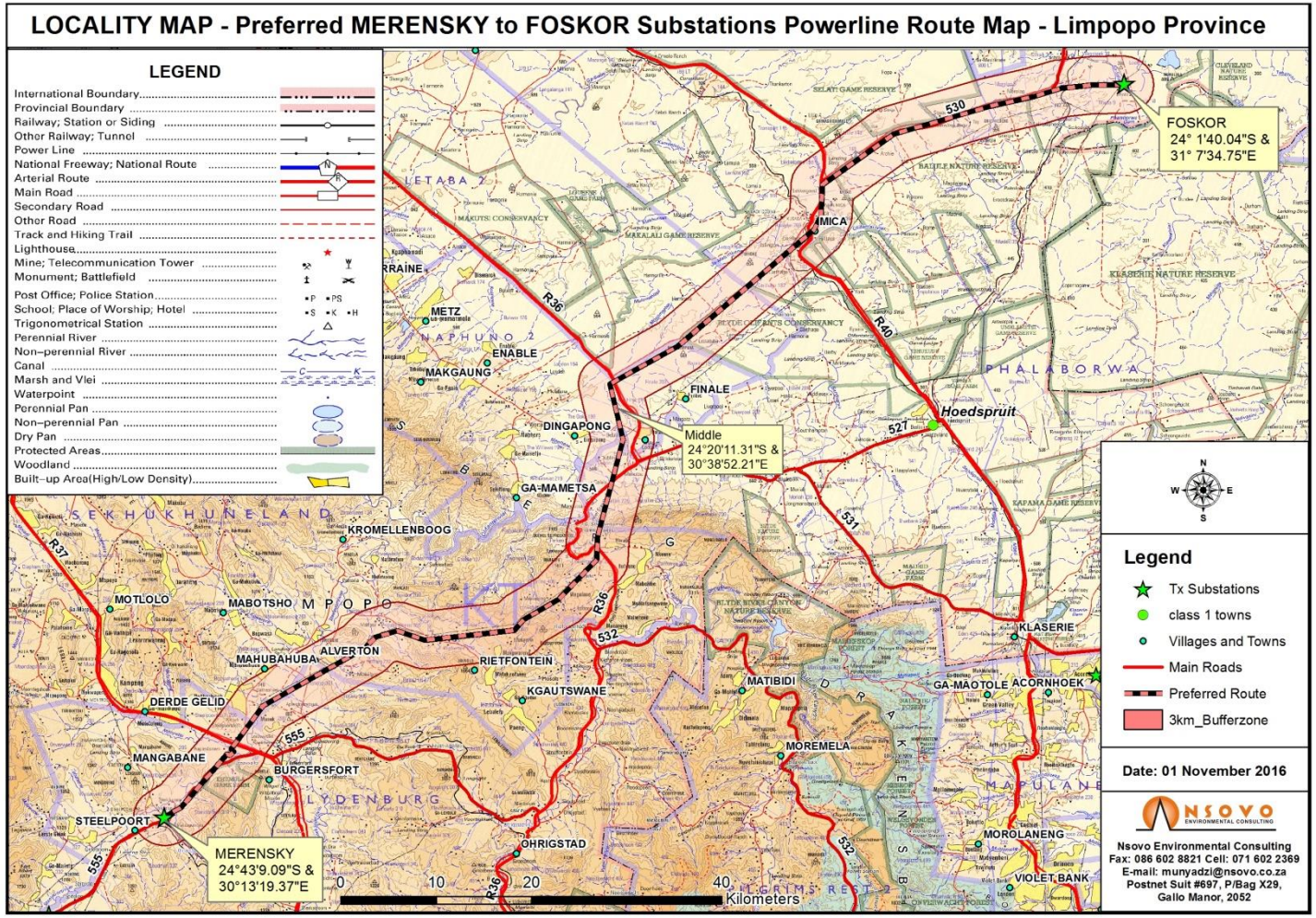


Figure 1b: A locality map showing the authorised route to be upgraded to 400 kV powerline and 55 m wide servitude

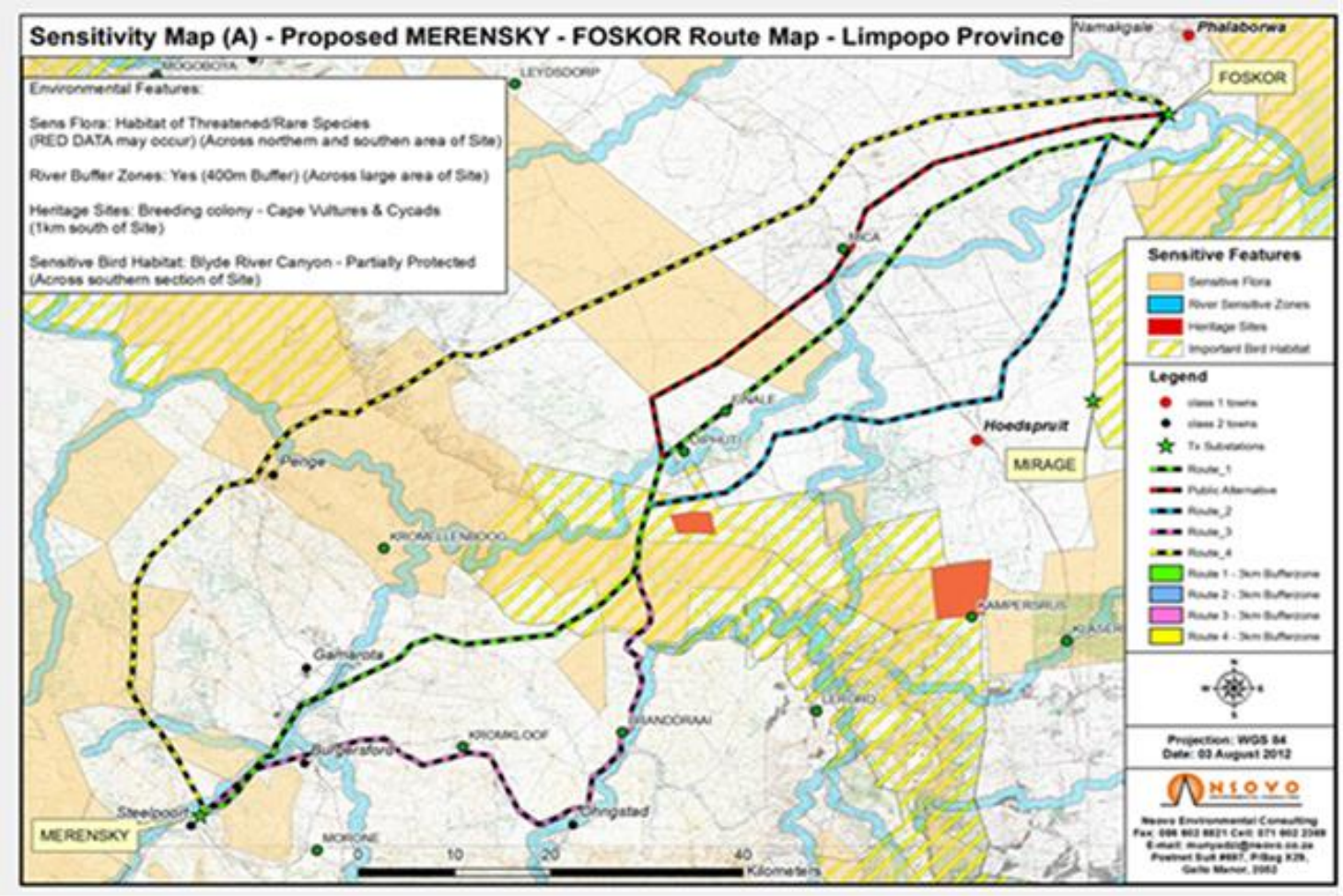


Figure 2: A locality map showing the all five different Alternatives for the Merensky Foskor Eskom power line with conservation and sensitive areas

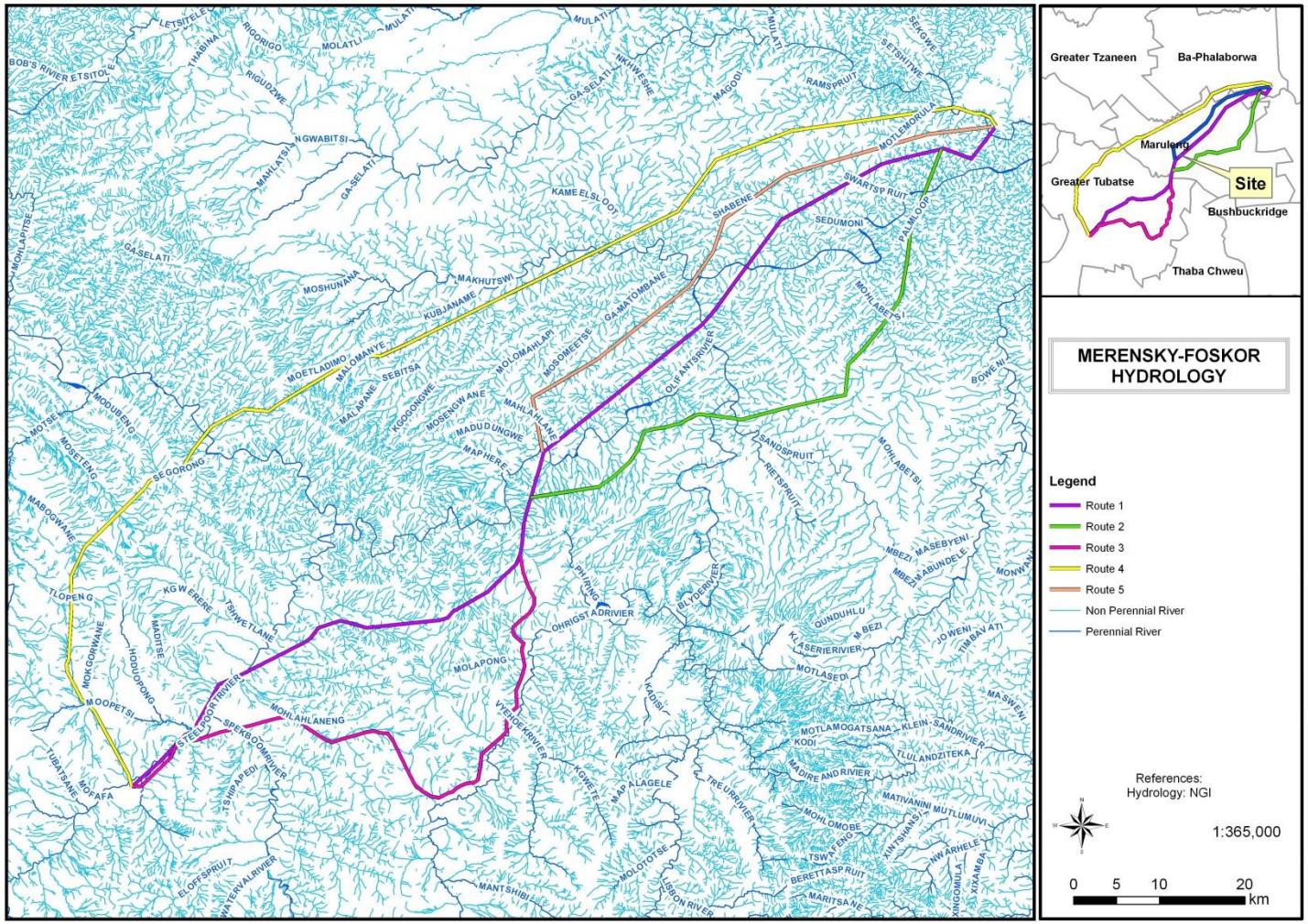


Figure 3: The hydrology of the area showing major river systems and numerous smaller spruits along all five the route Alternatives

# 6. METHODS

## 6.1 Vegetation and habitat survey

A desktop study was made on the vegetation and flora fauna and general ecology and ecological sensitivity of the area along all options suggested for this power line. A site visit followed the desktop study.

The routes were driven on 24 and 25 October 2011 by Prof G.J. Bredenkamp, a delegation of Nsovo Environmental Consulting and also a delegation of Eskom. Staff members of Eskom gave guidance in the field on the location of the various options. Parts of the route, especially the south-western mountainous parts, were again visited during February 2012. For the 2017 upgrade, all the relevant information and data were reviewed, and the report compiled.

The vegetation of the route was stratified into relatively homogeneous units based on Vegetation Type Units (Mucina & Rutherford 2006). Regular stops were made in each vegetation unit identified, to record vegetation and plant species present and also on the conservation status, sensitivity and condition of the vegetation. Special features were identified as major river crossings, wetlands, rocky ridges or any other features considered to be of importance for the biodiversity assessment.

The general vegetation of the unit was described using both the desktop study and the field observations. For the particular vegetation type a description of the dominant and characteristic species was made at several sites within each Vegetation Type unit. These descriptions were based on total floristic composition, following established vegetation survey techniques (Mueller-Dombois & Ellenberg 1974; Westhoff & Van der Maarel 1978). Data recorded included a list of the plant species present, including trees, shrubs, grasses and forbs. Comprehensive species lists were therefore derived for each plant community / ecosystem present on the site. These vegetation survey methods have been used as the basis of a national vegetation survey of South Africa (Mucina *et al*. 2000) and are considered to be an efficient method of describing vegetation and capturing species information. Notes were additionally made of any other features that might have an ecological influence.

The identified systems are not only described in terms of their plant species composition, but also evaluated in terms of the potential habitat for red data plant species.

Threatened ecosystems are in accordance with SANBI & DEAT (2009), and SANBI 2011).

Red data plant species for the area were obtained from the SANBI data bases, with updated threatened status, (Raimondo *et al* 2009). These lists were then evaluated in terms of habitat available on the site, and also in terms of the present development and presence of man in the area.

Critically Endangered, Endangered, Vulnerable and Protected Species (NEMBA species, TOPS species) are evaluated against the list published in Department of Environmental Affairs and Tourism Notice No. 2007 (National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)).

Protected trees are identified in accordance with the list of nationally protected trees published in Government Notice No. 29062 3 (2006) (National Forests Act, 1998 (Act No. 84 0f 1998), as Amended (Department of Water Affairs Notice No 897, 2006).

Alien invasive species, according to the Conservation of Agricultural Resources Act (Act No.43 of 1983) as listed in Henderson (2001) and other weeds in Bromilov (2010) are indicated.

Medicinal plants are indicated according to Van Wyk, Van Oudthoorn & Gericke (1997), these are mentioned in the species lists.

### 6.2 Conservation Priority

The following **conservation priority** / **ecological sensitivity** categories were used for each site:

**High**: Ecologically sensitive and valuable land with high species richness and/or sensitive ecosystems or red data species that should be

conserved and no developed allowed.

**Medium-high**: Land where sections are disturbed but which is in general ecologically sensitive to development/disturbances.

**Medium**: Land on which low impact development with limited impact on the vegetation / ecosystem could be considered for development. It is recommended that certain portions of the natural vegetation be maintained as open space.

**Medium-low**: Land of which small sections could be considered to conserve but where the area in general has little conservation value.

**Low**: Land that has little conservation value and that could be considered for developed with little to no impact on the vegetation.

**Species status**

Plant species recorded in each plant community with an indication of the status of the species by using the following symbols:

A = Alien woody species
D = Dominant
d = subdominant
G = Garden or Garden Escape
M = Medicinal plant species
P = Protected trees species
p = provincially protected species
RD = Red data listed plant
W = weed

The field observations were supplemented by literature studies from the area (Bredenkamp 1982, Gertenbach 1983a, 1983b, Mathews 1991, Siebert 2001, Siebert *et al.* 2002a, 2002b, 2002c, 2002d 2002e and 2003).

## 6.3 Ecological Sensitivity

It has been clearly demonstrated that vegetation not only forms the basis of the trophic pyramid in an ecosystem, but also plays a crucial role in providing the physical habitat within which organisms complete their life cycles (Kent & Coker

1992). Therefore, the vegetation of an area will largely determine the ecological sensitivity thereof.

The vegetation sensitivity assessment aims to identify whether the vegetation within the study area is of conservation concern and thus sensitive to development:

In order to determine the sensitivity of the vegetation (ecosystem) on the site, weighting scores are calculated per plant community. The following six criteria are used and each allocated a value of 1-3.

- Conservation status of a regional vegetation unit;
- Listed ecosystem (e.g. wetlands, hills and ridges etc)
- Legislative protection (e.g. threatened ecosystems ,SANBI & DEAT 2009)
- Plant species of conservation concern (e.g. red listed, nationally or provincially protected plant species, habitat or potential habitat to plants species of conservation concern, protected plants or protected trees);
- Situated within ecologically functionally important features (e.g. wetlands or riparian areas; important habitat for rare fauna species)
- Conservation importance (e.g. untransformed and un-fragmented natural vegetation, high plant species richness, important habitat for rare fauna species).

Sensitivity is calculated as the sum the values of the criteria. The vegetation with the lowest score represents the vegetation that has the least / limited sensitivity. A maximum score of 18 can be obtained, a score of 15-18 indicated high sensitivity (Table 1):

**Table 1: Weighting scores.**

| **Scoring** | 15-18 | 12-14 | 9-11 | 6-8 | 0-5 |
|---|---|---|---|---|---|
| **Sensitivity** | High | Medium-High | Medium | Medium-Low | Low |

Development on vegetation that has High sensitivity will normally not be supported, except that specific circumstances may still lead to support of the proposed development.

Portions of vegetation with Medium-High or Medium sensitivity should be conserved**.**

Development may be supported on vegetation considered to have Medium-Low or Low sensitivity.

## 7. RESULTS:

### 7.1 Vegetation Classification

According to the new vegetation map of South Africa (Mucina & Rutherford 2006) the routes transect the following vegetation types, Threatened Ecosystem Status is according to SANBI & DEAT (2009):

The vegetation types along all routes are shown in Figure 4a, while the ecological sensitivity of the vegetation along the preferred route is shown in Figure 4b.

| Vegetation Type | Route | Conservation status (Mucina & Rutherford 2006) | Threatened Ecosystems (SANBI & DEAT 2009) | Threatened Status |
|---|---|---|---|---|
| | | | | |
| 1. Sekhukhune Plains Bushveld | 1, 3, 4 | Vulnerable | | |
| 2. Sekhukhune Mountain Bushveld | 4 | Least Threatened | Sekhukhune Mountainlands<br>Sekhukhune Norite Bushveld | Endangered<br>Endangered |
| 3. Ohrigstad Mountain Bushveld | 1, 3, 4 | Least Threatened | Sekhukhune Mountainlands | Endangered |
| 4. Lydenburg Thornveld | 1 | Vulnerable | | |
| 5. Poung Dolomite Mountain Bushveld | 1, 3, 4 | Least Threatened | Malmani Karstlands | Endangered |
| 6. Northern Escarpment Quartzite Sourveld | 4 | Vulnerable | | |
| 7. Northern Mistbelt Forest | 4 | Least Threatened | | |
| 8. Tzaneen Sour Bushveld | 4 (1, 2) | Least Threatened | Tzaneen Sour Bushveld | Vulnerable |
| 9. Granite Bushveld | 1, 2, 4 | Least Threatened | | |
| 10. Lowveld Rugged Mopaneveld | 1, 2 | Least Threatened | | |
| 11. Phalaborwa-Timbavati Mopaneveld | 1, 4 | Least Threatened | | |
| 12. River Crossings | all | | | |

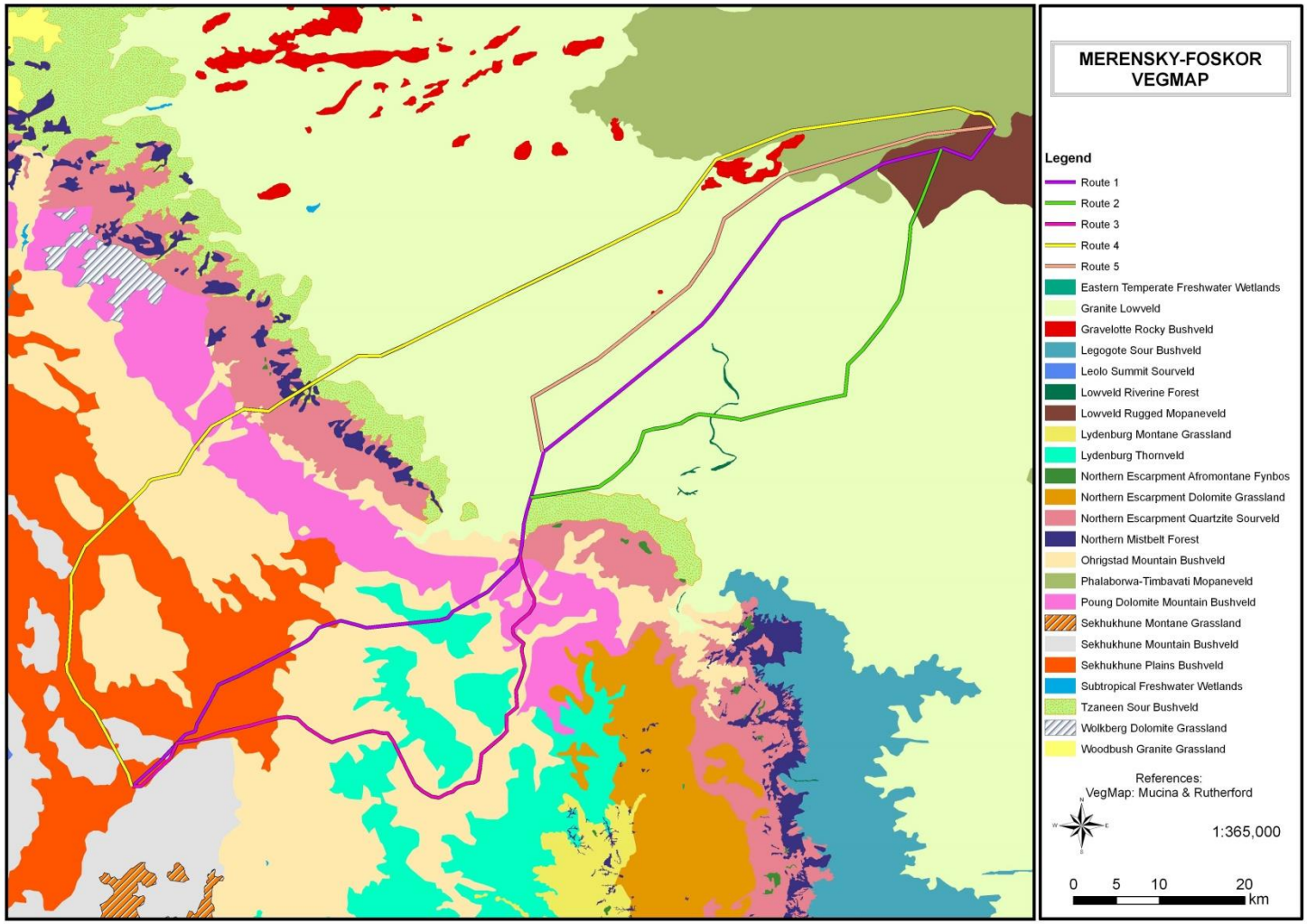


Figure 4a: The vegetation types (Mucina & Rutherford 2006) along all the optional routes

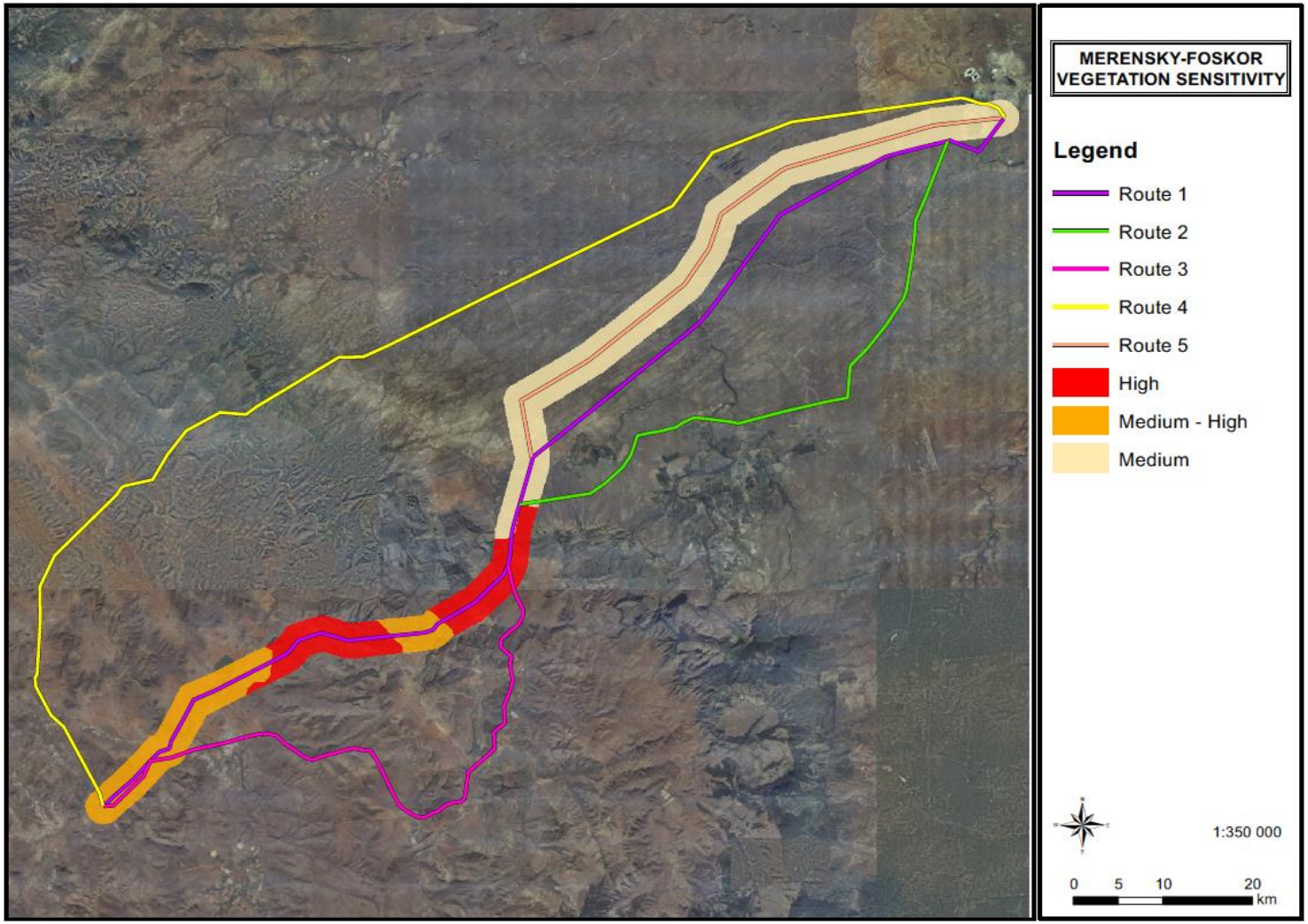


Figure 4b: Vegetation sensitivity along the preferred Option 1 combined with Option 5.

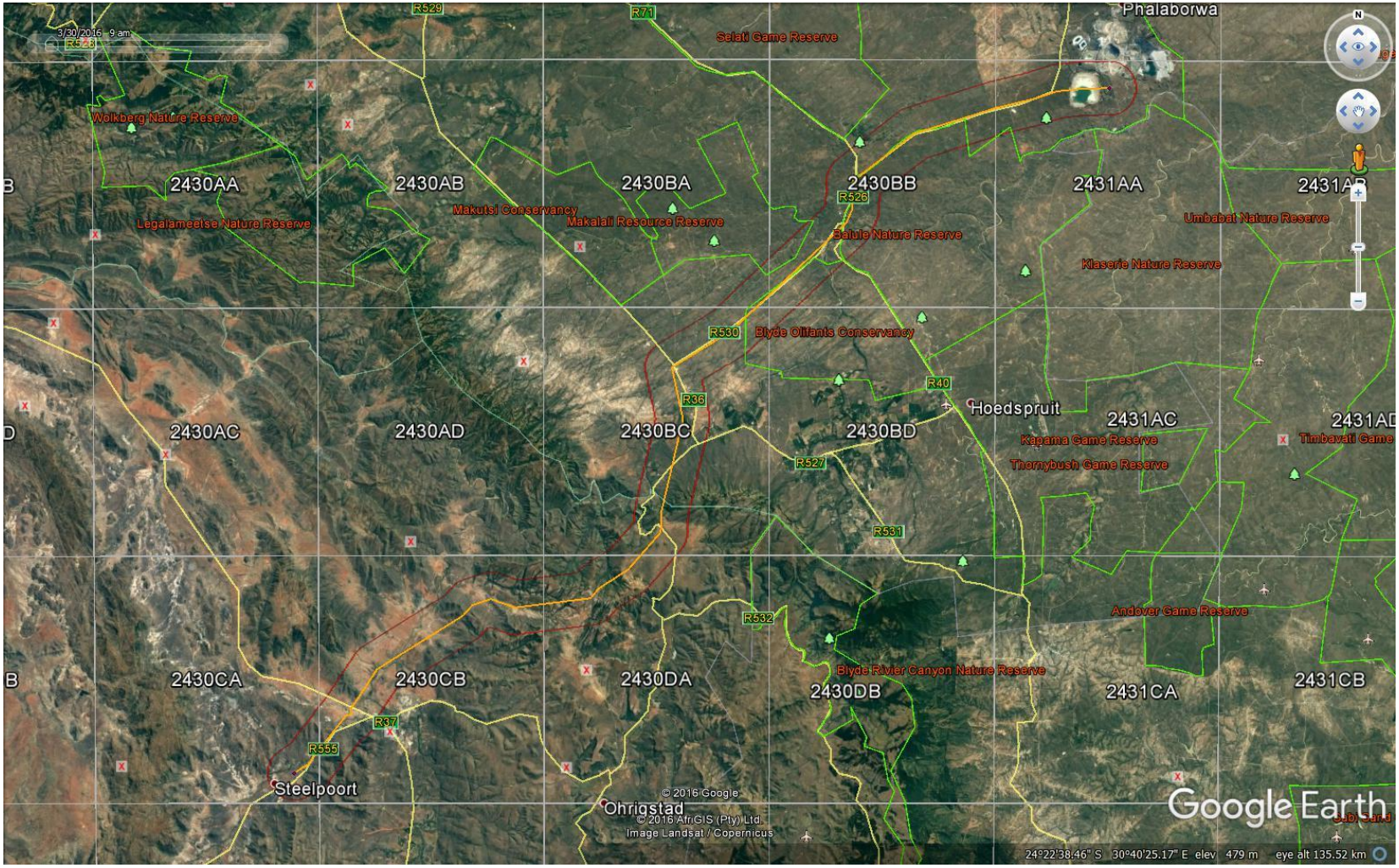


Figure 4a: Google Earth map to show the locality and topography of the preferred route (Options 1 & 5)

From the desktop study, confirmed by the field survey, Option 3, which runs from Burgersfort to Ohrigstad along the R555, was eliminated. This is because the route along the R555 runs for most of the way in a narrow valley, with the Mabitsana River and the tarred R555 in this valley. The line will have to run for most of the way on the sensitive mountain foot slopes and cross the river and road several times. Furthermore, many irrigated agricultural enterprises occur in the Ohrigstad area, stretching all the way to Marapeng. This mosaic of narrow river valley, river, mountain slopes and agriculture where-ever the valley is a bit broader, causes the route to be unsuitable. From an ecological perspective both the riverine vegetation and the vegetation of the mountain slopes have a high ecological sensitivity. Therefore this entire valley forms an ecologically sensitive ecosystem. This is also a much longer route.

Furthermore, from the desktop study, confirmed by the field survey, Option 4, was eliminated. The line of this option runs through nine vegetation types, and over very high and steep mountains of Sekhukhune Mountain Bushveld and Ohrigstad Mountain Bushveld with two endangered ecosystems (Sekhukhune Mountainlands and Sekhukhune Norite Bushveld, SANBI & DEAT 2009), Poung Dolomite Mountain Bushveld with endangered Malmani Karstland (SANBI & DEAT 2009), the vulnerable Northern Escarpment Quartzite Sourveld (Mucina & Rutherford (2006), Northern Mistbelt Forest area and the vulnerable Tzaneen Sour Bushveld (SANBI & DEAT 2009). Especially the Great Escarpment area consists of very rugged and high mountains, resulting in a very difficult route with several threatened ecosystems.

As the Option 1 seemed to be the most suitable for the powerline route, emphasis was given to this route. Options 3 and 5 are deviations of Option 1, in the northern part of the study area. Eventually, DEA authorised the transect route of Option 1, but in the northern parts the Option 5 deviation was the preferred route. The following descriptions concentrate on the vegetation along the preferred and authorised route.

### 7.2 Description of the vegetation types

#### Sekhukhune Plains Bushveld (Vulnerable)

The Merensky substation is located in the Sekhukhune Plains Bushveld. Although the vegetation of these plains falls within the Sekhukhune Centre of plant endemism

(Siebert 2001, Siebert *et al.* 2002a-e) this area is highly transformed by many villages and their agricultural fields. Within the study area this bushveld is restricted to the valley floors of the rivers that dissect the mountains. These areas are heavily grazed and often not in prime condition. This resulted in Mucina & Rutherford (2006) labelling the conservation status of this vegetation as Vulnerable.

Large parts of these plains are dominated by *Dichrostachys cinerea, Acacia tortilis, Acacia mellifera* and *Acacia nilotica.* Other plant species found here include the trees *Boscia foetida, Euclea linearis, Searsia batophylla* (along spruits and dongas) with the forbs *Felicia clavipilosa, Hermannia odorata, Gisekia africana, Melhania rehmannii* and the grasses *Aristida congesta, Enneapogon cenchroides, Urochloa mosambicensis.* Alien plant species are often found close to villages or along roads and tracks.

The following species were listed for this plant community:

**TREES AND SHRUBS**

| | | | |
|---|---|---|---|
| *Acacia gerrardii* | | *Grewia bicolor* | |
| *Acacia mellifera* | d | *Grewia flava* | |
| *Acacia nilotica* | d | *Lantana camara* | A |
| *Acacia tortilis* | D | *Melia azedarach* | A |
| *Agave americana* | A | *Rhigozum obovatum* | |
| *Aloe castanea* | p | *Sarcostemma viminale* | |
| *Aloe cryptopoda* | p | *Schotia latifolia* | RD |
| *Aloe globuligemma* | p | *Sclerocarya birrea* | P |
| *Balanites maughamii* | P | *Searsia batophylla* | RD |
| *Boscia foetida* | | *Searsia engleri* | |
| *Dichrostachys cinerea* | D | *Tinnea rhodesiana* | |
| *Ehretia rigida* | | *Triaspis glaucophylla* | |
| *Euphorbia tirucalli* | | *Ziziphus mucronata* | M |

**GRASSES**

| | |
|---|---|
| *Aristida adscensionis* | *Chloris virgata* |
| *Aristida congesta s. barbicollis* | *Dactyloctenium aegyptium* |
| *Cenchrus ciliaris* | *Enneapogon cenchroides* |

| | |
|---|---|
| *Enneapogon scoparius* | *Panicum maximum* |
| *Eragrostis heteromera* | *Sporobolus ioclados* |
| *Eragrostis lehmanniana* | *Stipagrostis hirtigluma* |
| *Eragrostis superba* | *Themeda triandra* |
| *Fingerhuthia africana* | *Tragus berteronianus* |
| *Melinis repens s. repens* | *Urochloa mosambicensis* |

**FORBS**

| | | | |
|---|---|---|---|
| *Abutilon angulatum* | | *Kohautia cynanchica* | |
| *Acalypha indica* | | *Lantana rugosa* | |
| *Achyranthes aspera v. sicula* | | *Kleinia longiflora* | |
| *Asparagus suaveolens* | | *Leonotis ocymifolia* | |
| *Bidens bipinnata* | W | *Melhania acuminata* | |
| *Blepharis integrifolia* | | *Melhania rehmannii* | |
| *Clerodendrum ternatum* | | *Monechma divaricatum* | |
| *Corchorus asplenifolius* | | *Ocimum americanum* | |
| *Datura stramonium* | WM | *Pavonia burchellii* | |
| *Felicia clavipilosa* | | *Phyllanthus maderaspatensis* | |
| *Flaveria bidentis* | W | *Pollichia campestris* | |
| *Galenia sarcophylla* | | *Schkuhria pinnata* | W |
| *Geigeria burkei* | | *Seddera fruticosa* | |
| *Gossypium herbaceum* | | *Sesamum triphyllum* | W |
| *Hermannia modesta* | | *Sesbania bispinosa* | |
| *Hermbstaedtia odorata* | | *Sida alba* | |
| *Hibiscus caesius* | | *Solanum panduriforme* | W |
| *Hibiscus micranthus* | | *Tephrosia purpurea* | |
| *Jamesbrittenia atropurpurea* | | *Tribulus terrestris* | W |
| *Jatropha latifolia* | | *Vernonia poskeana* | |
| *Justicia flava* | | *Waltheria indica* | W |
| *Justicia protracta s. rhodesiana* | | *Zinnia peruviana* | W |

| Sekhukhune Plains Bushveld | | | |
|---|---|---|---|
| **Status** | Dense to Disturbed plains bushveld | | |
| **Soil** | Clay-loam | **Rockiness %** | 5-25 |
| **Conservation priority:** | Medium | **Sensitivity:** | High |
| **Agricultural potential:** | Medium-Low | **Need for rehabilitation** | Medium |
| **Dominant spp.** | *Acacia tortilis, Acacia mellifera, Dichrostachys cinerea, Euclea linearis* | | |

**Species of Conservation Concern**

A list of Species of Conservation Concern for the Grid 2627BB was obtained from the database on the SANBI website. Threatened species are those that are facing high risk of extinction, indicated by the categories Critically Endangered (CE), Endangered (EN) and Vulnerable (VU). Species of Conservation Concern include the Threatened Species, but additionally have the categories Near Threatened (NT), Data Deficient (DD), Critically Rare (CR), Rare (R) and Declining (D). This is in accordance with the new Red List for South African Plants (Raimondo *et al*. 2009).

The following species of conservation concern were previously recorded from the Grid 2430CA (SANBI, POSA website):

| Species | Status |
|---|---|
| *Dicliptera fruticosa* K.Balkwill | NT |
| *Elaeodendron transvaalense* (Burtt Davy) R.H.Archer | NT |
| *Lydenburgia cassinoides* N.Robson | NT |
| *Adenia fruticosa* Burtt Davy subsp. *fruticosa* | NT |
| *Searsia sekhukhuniensis* (Moffett) Moffett | Rare |
| *Combretum petrophilum* Retief | Rare |
| *Euphorbia sekukuniensis* R.A.Dyer | Rare |
| *Searsia batophylla* (Codd) Moffett | VU |
| *Zantedeschia jucunda* Letty | VU |
| *Gladiolus sekukuniensis* P.J.D.Winter | VU |
| *Acacia sekhukhuniensis* P.J.H.Hurter | CR |

| | |
|---|---|
| *Delosperma rileyi* L.Bolus | DDD |
| *Asparagus intricatus* (Oberm.) Fellingham & N.L.Mey. | DDT |
| *Acalypha caperonioides* Baill. var. *caperonioides* | DDT |
| *Myrothamnus flabellifolius* Welw. | DDT |
| *Ilex mitis* (L.) Radlk. var. *mitis* | Declining |
| *Drimia altissima* (L.f.) Ker Gawl. | Declining |
| *Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall. | Declining |
| *Eulophia speciosa* (R.Br. ex Lindl.) Bolus | Declining |

*Searsia batophylla, Hypoxis hemerocallidea* and *Eulophia speciosa* were observed within the transect area. For most of the other species the plains habitat is not suitable, they are present on the mountain areas of Sekhukhuneland.

*Balanites maughamii* and *Sclerocarya birrea* are nationally protected trees observed along the route while the *Aloe* species are all provincially protected.

**Conclusion**

The vegetation within on the plains are quite disturbed, there are often villages, roads, tracks and current or old agricultural fields present. As the pylons of the power line will have a relatively small footprint, **the impact on the vegetation will be small**. However, due to the presence of red data and possibly protected plant species, a walkthrough is recommended for this area, to ensure that sensitive areas are excluded for construction of pylons.

Figure 5: Sekhukhune Plains Bushveld in the foreground and Sekhukhune Mountain Bushveld in the Background

## 2. Sekhukhune Mountain Bushveld

This Open Mountain Bushveld occurs patchy throughout the area, the soils contain high concentrations of heavy metals and the area is often prone to mining operations. In this study very small part of this Bushveld is affected, the largest piece is just north of Steelpoort along route option 4, which was already eliminated. This vegetation is not really affected by the current preferred Option 1. However, being a very sensitive ecosystem, due to several endemic and threatened species, the description is included.

### Trees and Shrubs

| | | | |
|---|---|---|---|
| *Acacia ataxacantha,* | | *Elephantorrhiza praetermissa* | |
| *Acacia gerrardii* | | *Elaeodendron transvaalense* | RD |
| *Acacia mellifera s. detinens* | | *Euclea linearis* | |
| *Acacia nigrescens,* | | *Euclea undulata* | M |
| *Acacia nilotica* | | *Grewia flava* | |
| *Acacia senegal v. leiorhachis* | | *Grewia vernicosa* | |
| *Acacia senegal v. rostrata* | | *Hippobromus pauciflorus* | |
| *Acacia tortilis s. heteracantha* | | *Kirkia wilmsii* | |
| *Aloe arborescens* | p | *Maerua cafra* | |
| *Aloe castanea* | p | *Maytenus undata* | |
| *Aloe cryptopoda* | p | *Lydenburgia cassinoides* | RDP |
| *Boscia foetida* | | *Ormocarpum trichocarpum* | |
| *Brachylaena ilicifolia* | | *Ozoroa sphaerocarpa* | |
| *Carissa bispinosa* | | *Rhoicissus sekhukhuniensis* | |
| *Celtis africana* | | *Sclerocarya birrea* | P |
| *Combretum apiculatum* | | *Searsia keetii* | |
| *Combretum hereroense* | | *Searsia sekhukhuniensis* | RD |
| *Combretum molle* | | *Searsia wilmsii* | |
| *Combretum petrophilum* | RD | *Terminalia prunioides* | |
| *Commiphora mollis* | | *Tinnea rhodesiana* | |
| *Croton gratissimus* | | *Vitex obovata subsp wilmsii* | |
| *Cussonia transvaalensis* | | | |
| *Dichrostachys cinerea* | | | |

**Grasses**

| | | | |
|---|---|---|---|
| *Aristida canescens* | | *Eragrostis lehmanniana* | |
| *Aristida canescens,* | | *Eragrostis superba* | |
| *Aristida transvaalensis* | | *Fingerhuthia africana* | |
| *Bothriochloa insculpta* | | *Heteropogon contortus* | |
| *Brachiaria eruciformis* | | *Loudetia simplex* | |
| *Digitaria eriantha* | | *Melinis repens* | |
| *Diheteropogon amplectens* | | *Panicum deustum* | |
| *Elionurus muticus* | | *Sporobolus ioclados* | |
| *Enneapogon scoparius* | | *Themeda triandra* | |

**Forbs**

| | | | |
|---|---|---|---|
| *Abutilon angulatum* | | *Kohautia cynanchica* | |
| *Adenia fruticosa* | RD | *Kyphocarpa angustifolia* | |
| *Asparagus cooperi* | | *Melhania rehmannii* | |
| *Asparagus suaveolens* | | *Merwilla plumbea* | RD |
| *Barleria kaloxytona* | | *Monechma divaricatum* | |
| *Barleria saxatilis* | | *Myrothamnus flabellifolius* | RD |
| *Berkheya insignis* | | *Ocimum americanum* | |
| *Blepharis aspera* | | *Phyllanthus glaucophyllus* | |
| *Blepharis integrifolia* | | *Polygala hottentotta* | |
| *Clerodendrum ternatum* | | *Ptycholobium plicatum* | |
| *Commelina africana* | | *Rhynchosia minima* | |
| *Corchorus asplenifolius* | | *Sansevieria hyacinthoides* | |
| *Crabbea angustifolia* | | *Seddera capensis* | |
| *Cyphostemma coddii* | | *Senna italica* | |
| *Ectadiopsis oblongifolia* | | *Stylochiton natalensis* | |
| *Euphorbia enormis* | | *Stylochiton* sp | |
| *Euphorbia schinzii* | | *Syncolostemon concinnus* | |
| *Evolvulus alsinoides* | | *Tephrosia purpurea* | |
| *Geigeria burkei* | | *Tetradenia brevispicata,* | |
| *Gerbera jamesonii* | | *Tragia dioica* | |
| *Hibiscus aethiopicus* | | *Waltheria indica* | W |
| *Hypoestes forskaolii* | | *Xerophyta retinervis* | |

| Sekhukhune Mountain Bushveld | | | |
|---|---|---|---|
| **Status** | Dense to Disturbed mountain bushveld | | |
| **Soil** | Clay-loam | **Rockiness %** | 5-25 |
| **Conservation priority:** | High | **Sensitivity:** | High |
| **Agricultural potential:** | Low | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Combretum apiculatum, Grewia vernicosa, Dichrostachys cinerea, Euclea linearis* and *Euclea undulata* | | |

**Species of Conservation Concern**

A Threatened species and Species of Conservation Concern list for the Grid 2627BB was obtained from the POSA database on the SANBI website. Threatened species are those that are facing high risk of extinction, indicated by the categories Critically Endangered (CE), Endangered (EN) and Vulnerable (VU). Species of Conservation Concern include the Threatened Species, but additionally have the categories Near Threatened (NT), Data Deficient (DD), Critically Rare (CR), Rare (R) and Declining (D). This is in accordance with the new Red List for South African Plants (Raimondo *et al*. 2009).

The following species of conservation concern were previously recorded from the Grid 2430CA (SANBI, POSA website):

| Species | Status |
|---|---|
| *Dicliptera fruticosa* K.Balkwill | NT |
| *Elaeodendron transvaalense* (Burtt Davy) R.H.Archer | NT |
| *Lydenburgia cassinoides* N.Robson | NT |
| *Adenia fruticosa* Burtt Davy subsp. *fruticosa* | NT |
| *Searsia sekhukhuniensis* (Moffett) Moffett | Rare |
| *Combretum petrophilum* Retief | Rare |
| *Euphorbia sekukuniensis* R.A.Dyer | Rare |
| *Searsia batophylla* (Codd) Moffett | VU |
| *Zantedeschia jucunda* Letty | VU |
| *Gladiolus sekukuniensis* P.J.D.Winter | VU |

| | |
|---|---|
| *Acacia sekhukhuniensis* P.J.H.Hurter | CR |
| *Delosperma rileyi* L.Bolus | DDD |
| *Asparagus intricatus* (Oberm.) Fellingham & N.L.Mey. | DDT |
| *Acalypha caperonioides* Baill. var. *caperonioides* | DDT |
| *Myrothamnus flabellifolius* Welw. | DDT |
| *Ilex mitis* (L.) Radlk. var. *mitis* | Declining |
| *Drimia altissima* (L.f.) Ker Gawl. | Declining |
| *Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall. | Declining |
| *Eulophia speciosa* (R.Br. ex Lindl.) Bolus | Declining |

*Elaeodendron transvaalense, Combretum petrophilum*, *Lydenburgia cassinoides*, *Adenia fruticosa, Myrothamnus flabellifolius* and *Searsia sekhukhuniensis* were observed close to the transect area. *Merwilla plumbea,* not listed above, was also seen. The habitat is also suitable for most of the other threatened species listed.

The protected trees *Lydenburgia cassinoides* and *Sclerocarya birrea* are present.

**Conclusion**

The vegetation on the mountains contains several red data and protected plant species, where-ever possible the mountain areas of Sekhukhuneland should be avoided. It seems that although this type of Bushveld is prominent between Steelpoort and Burgersfort, the proposed Option 1 powerline will not or maybe seldom transect these mountains. However, should any line cross this vegetation type, a walkthrough is recommended for this area, to ensure that sensitive areas are excluded for construction of pylons.

**3. Ohrigstad Mountain Bushveld**

Ohrigstad Mountain Bushveld is present in the Burgersfort – Ohrigstad and Penge areas. (relevant for Options 1, 3 and 4). This Mountain Bushveld also has, as the Sekhukhune Mountain Bushveld, high species diversity and several plant species of conservation concern. However, this area consists of mountains and valleys, both being important for this survey (Figure 4a). Option 3 runs for most of the way in a prominent valley, containing plains bushveld, but often has to run over the footslopes of the mountains.

Option 3, which runs from Burgersfort to Ohrigstad along the R555, was eliminated. This is because the route along the R555 runs for most of the way in a narrow valley, with the Mabitsana River and the tarred R555 in this valley. The line will have to run for most of the way on the sensitive mountain foot slopes and cross the river and road several times. Furthermore, many irrigated agricultural enterprises occur in the Ohrigstad area, stretching all the way to Marapeng. This mosaic of narrow river valley, river, mountain slopes and agriculture where-ever the valley is a bit broader, causes the route to be unsuitable. From an ecological perspective both the riverine vegetation and the vegetation of the mountain slopes have a high ecological sensitivity. Therefore this entire valley forms an ecologically sensitive ecosystem. This is also a much longer route. Clearly the vegetation along the preferred and authorised Option 1 is still quite sensitive and little problematic, therefore a walkdown as soon as the route is pegged and marked, is highly advisable, to enable the avoidance, as far as possible, of the more sensitive protected tree species.

The two main plant communities found in this area are: a) The Plains Bushveld in the Valleys and b) the Mountain slope Bushveld. These are described separately.

**a. Plains Bushveld**

The Dense Plains Bushveld is restricted to the Ohrigstad valley, the route of Option 3. This is degraded to pristine bushveld with a dense woody cover. The vegetation is dominated by *Acacia tortilis, Dichrostachys cinerea, Combretum apiculatum, Euclea linearis* and *Euclea undulata*, while *Eragrostis rigidior, Enneapogon scoparius* and *Themeda triandra* are prominent in the grass layer.

The following plant species were recorded from this plant community:

**Trees and Shrubs**

| | | | |
|---|---|---|---|
| *Acacia tortilis* | d | *Euclea linearis* | d |
| *Aloe castanea* | p | *Euclea undulata* | dM |
| *Aloe marlothii* | p | *Euphorbia cooperi* | |
| *Berchemia zeyheri* | M | *Euphorbia tirucalli* | M |
| *Combretum apiculatum* | M | *Grewia monticola* | |
| *Dichrostachys cinerea* | d | *Gymnosporia senegalensis* | M |
| *Ehretia rigida* | M | *Hexalobus monopetalus* | |

| | | | |
|---|---|---|---|
| *Karomia speciosa* | | *Sclerocarya birrea* | PM |
| *Mundulea sericea* | M | *Searsia leptodictya* | |
| *Ormocarpum trichocarpum* | | *Tarchonanthus camphoratus* | M |
| *Peltophorum africanum* | M | *Ximenia americana* | M |
| *Ptaeroxylon obliquum* | M | *Ziziphus mucronata* | M |
| *Rhoicissus tridentata* | M | | |

**Grasses**

| | | | |
|---|---|---|---|
| *Aristida congesta* | | *Eragrostis superba* | |
| *Aristida congesta* subsp *barbicollis* | | *Heteropogon contortus* | d |
| *Bothriochloa insculpta* | | *Melinis repens* | |
| *Brachiaria nigropedata* | | *Panicum maximum* | |
| *Cymbopogon excavatus* | | *Pogonarthria squarrosa* | |
| *Digitaria eriantha* | | *Setaria sphacelata* | |
| *Enneapogon scoparius* | d | *Themeda triandra* | d |
| *Eragrostis rigidior* | d | *Urochloa mosambicensis* | |

**Forbs**

| | | | |
|---|---|---|---|
| *Abutilon austroafricanum* | | *Hypoestes aristata* | M |
| *Aloe cryptopoda* | p | *Ipomoea magnusiana* | |
| *Aloe fosteri* | p | *Kyphocarpa angustifolia* | |
| *Barleria cf guenzii* | | *Pentarrhinum insipidum* | M |
| *Chascanum hederaceum* | | *Senecio tamoides* | M |
| *Commelina africana* | M | *Solanum incanum* | M |
| *Cucumis zeyheri* | M | *Solanum nigrum* | WM |
| *Datura stramonium* | WM | *Solanum panduriforme* | M |
| *Evolvulus alsinoides* | M | *Tephrosia* sp | |
| *Hibiscus micrantha* | | | |
| *Hibiscus trionum* | | | |

| Ohrigstad Mountain Bushveld: Plains Bushveld | | | |
|---|---|---|---|
| **Status** | Dense to Disturbed plains bushveld | | |
| **Soil** | sandy-loam | **Rockiness %** | 1 |
| **Conservation priority:** | High | **Sensitivity:** | High |
| **Agricultural potential:** | Medium to High (irrigation) | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Acacia tortilis, Combretum apiculatum, Dichrostachys cinerea, Euclea linearis* and *Euclea undulata* | | |

Figure 6**:** The Dense Plains Bushveld of the area

**b. Mountain Slope Bushveld**

The mountain slopes, facing in all directions, as the valley curves through the mountains are covered with dense Mountain Slope Bushveld. This is often pristine mountain bushveld with a dense woody cover, though the herbaceous layer is poorly developed due to the dense woody layer. Many woody species occur in this plant community, with *Combretum apiculatum* and *Tarchonanthus camphoratus* prominent. *Aristida congesta* subsp *barbicollis, Eragrostis rigidior, Eragrostis lehmanniana* and *Enneapogon scoparius* are the most conspicuous grass species in the scanty herbaceous layer.

The following plant species were recorded from this plant community:

**Trees and Shrubs**

| | | | |
|---|---|---|---|
| *Acacia exuvialis* | | *Gymnosporia senegalensis* | M |
| *Acacia tortilis* | d | *Hexalobus monopetalus* | |
| *Berchemia zeyheri* | M | *Karomia speciosa* | |
| *Combretum apiculatum* | DM | *Mundulea sericea* | M |
| *Crotalaria monteiroi* | | *Opuntia ficus-indica* | A |
| *Dichrostachys cinerea* | | *Ormocarpum trichocarpum* | |
| *Ehretia rigida* | M | *Pappea capensis* | |
| *Elaeodendron transvaalense* | PM | *Peltophorum africanum* | M |
| *Euclea linearis* | d | *Phyllanthus reticulatus* | |
| *Euclea natalensis* | M | *Ptaeroxylon obliquum* | M |
| *Euclea undulata* | dM | *Rhoicissus tridentata* | M |
| *Euphorbia ingens* | | *Sclerocarya birrea* | P |
| *Euphorbia tirucalli* | M | *Searsia leptodictya* | |
| *Flueggea virosa* | M | *Tarchonanthus camphoratus* | dM |
| *Grewia bicolor* | | *Ximenia americana* | M |
| *Grewia monticola* | | *Ziziphus mucronata* | M |

**Grasses**

| | | | |
|---|---|---|---|
| *Aristida congesta* subsp *barbicollis* | d | *Eragrostis rigidior* | d |
| *Digitaria eriantha* | | *Heteropogon contortus* | |
| *Enneapogon scoparius* | d | *Panicum maximum* | |
| *Eragrostis lehmanniana* | d | *Sporobolus fimbriatus* | |

**Forbs**

| | | | |
|---|---|---|---|
| *Abutilon austroafricanum* | | *Kalanchoe paniculata* | M |
| *Aloe cryptopoda* | p | *Kyphocarpa angustifolia* | |
| *Aloe fosteri* | p | *Melhania prostrata* | |
| *Asparagus* sp | | *Pentarrhinum insipidum* | M |
| *Barleria cf guenzii* | | *Solanum incanum* | M |
| *Commelina africana* | M | *Stylosanthes fruticosa* | |
| *Evolvulus alsinoides* | M | *Waltheria indica* | W |
| *Hibiscus micrantha* | | | |

| **Ohrigstad Mountain Bushveld: Mountain Slope Bushveld** | | | |
|---|---|---|---|
| **Status** | Pristine mountain bushveld | | |
| **Soil** | Rocky shallow sandy | **Rockiness %** | 5-20 |
| **Conservation priority:** | High | **Sensitivity:** | High |
| **Agricultural potential:** | Low | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Combretum apiculatum, Euclea linearis, Euclea undulata, Tarchonanthus camphoratus* | | |

**Species of Conservation Concern**

A Threatened species and Species of Conservation Concern list for the Grid 3325DB was obtained from the POSA database on the SANBI website. Threatened species are those that are facing high risk of extinction, indicated by the categories Critically Endangered, Endangered and Vulnerable. Species of Conservation Concern include the Threatened Species, but additionally have the categories Near Threatened, Data Deficient, Critically Rare, Rare and Declining. This is in accordance with the new Red List for South African Plants (Raimondo *et al*. 2009).

The following species of conservation concern were previously recorded from the Grid 2430DA (SANBI, POSA website April 2011):

| Species | Status |
|---|---|
| *Adenia fruticosa* Burtt Davy subsp. *fruticosa* | NT |
| *Aloe fouriei* D.S.Hardy & Glen | DDT |
| *Ansellia africana* Lindl. | Declining |
| *Ceropegia distincta* N.E.Br. subsp. *verruculosa* R.A.Dyer | DDD |
| *Combretum petrophilum* Retief | Rare |
| *Dicliptera fruticosa* K.Balkwill | NT |
| *Dracaena transvaalensis* Baker | Rare |
| *Eulophia speciosa* (R.Br. ex Lindl.) Bolus | Declining |
| *Euphorbia sekukuniensis* R.A.Dyer | Rare |
| *Gladiolus macneilii* Oberm. | CR |
| *Gladiolus pavonia* Goldblatt & J.C.Manning | CR |
| *Indigofera leendertziae* N.E.Br. | DDT |
| *Jamesbrittenia macrantha* (Codd) Hilliard | NT |
| *Khadia alticola* Chess. & H.E.K.Hartmann | Rare |
| *Lydenburgia cassinoides* N.Robson | NT |
| *Ocimum tubiforme* (R.D.Good) A.J.Paton | CR |
| *Orbea gerstneri* (Letty) Bruyns subsp. *gerstneri* | Rare |
| *Pentatrichia alata* S.Moore | DDD |
| *Rhoicissus laetans* Retief | Rare |
| *Searsia batophylla* (Codd) Moffett | VU |
| *Thesium davidsonae* Brenan | VU |

*Lydenburgia cassinoides* was found during the field visit in this area. There is suitable habitat for several of the threatened plant species along the transect of this Option of the power line, especially for *Adenia fruticosa* subsp. *fruticosa, Ocimum tubiforme, Orbea gerstneri* subsp. *gerstneri* and *Combretum petrophilum,* but none of these species were found on the site during the field visit.

**Conclusion**

This plant community is high in species richness with several red data species. A few individuals of the protected *Elaeodendron transvaalensis, Sclerocarya birrea, Aloe fosteri* and *Aloe cryptopoda* are found in this vegetation. The conservation value and sensitivity are regarded as being high, due to biodiversity and also due to the ecological function of the mountains and the valley as a dispersal corridor for plants and animals. There is also abundant farming activities in the valley, including irrigated crops. There will be several turning points for alternative route 3 line, as the road winds through the valley, and from an ecological viewpoint this route is not

desirable. Although the ecology along the alternative 1 route is also considered to be highly sensitive, this is a much shorter route and preferred to the alternative 3 route.

Figure 7: Cleared Open Plains Bushveld in the foreground, Open Plains Bushveld in the middle and Mountain Slope Bushveld in the background

**4. Lydenburg Thornveld**

The Option 1 route crosses a small section of the Lydenburg Thornveld on the undulating mountain plateau area above the Strydom tunnel. This area is a wooded grassland, quite cold with frost during winter. Species such as the frost hardy *Acacia karroo, Acacia caffra, Cussonia paniculata Diospyros lycioides* and *Euclea crispa* are prominent.

The following plant species were recorded from this plant community:

**Trees and Shrubs**

| | | |
|---|---|---|
| *Acacia caffra* | d | *Acacia robusta* |
| *Acacia karroo* | dM | *Cussonia paniculata* |

| | | | |
|---|---|---|---|
| *Diospyros lycioides* | | *Mundulea sericea* | M |
| *Euclea crispa* | M | *Rhoicissus tridentata* | M |
| *Dombeya rotundifolia* | | *Searsia leptodictya* | |
| *Rubus transvaalensis* | | *Searsia pyroides* | |
| *Ehretia rigida* | M | *Ziziphus mucronata* | M |
| *Gymnosporia buxifolia* | M | | |

**Grasses**

| | | | |
|---|---|---|---|
| *Aristida congesta* | | *Melinis repens* | |
| *Aristida congesta* subsp *barbicollis* | | *Microchloa caffra* | |
| *Aristida diffusa* | | *Monocymbium ceresiiforme* | |
| *Bewsia biflora* | | *Panicum maximum* | |
| *Brachiaria serrata* | | *Panicum natalense* | |
| *Cymbopogon excavatus* | | *Pogonarthria squarrosa* | |
| *Digitaria eriantha* | | *Schizachyrium sanguineum* | |
| *Diheteropogon amplectens* | | *Setaria sphacelata* | |
| *Eragrostis superba* | | *Themeda triandra* | d |
| *Heteropogon contortus* | d | *Tristachya leucothrix* | |

**Forbs**

| | | | |
|---|---|---|---|
| *Anthospermum rigidum* | | *Lippia javanica* | |
| *Commelina africana* | M | *Pentarrhinum insipidum* | M |
| *Dicoma anomala* | | *Schistostephium crataegifolium* | |
| *Elephantorrhiza elephantina* | M | *Senecio coronatus* | |
| *Euphorbia clavarioides* | | *Senecio microglossus* | |
| *Evolvulus alsinoides* | M | *Senecio tamoides* | M |
| *Helichrysum cephaloideum* | | *Solanum incanum* | M |
| *Helichrysum rugulosum* | | *Solanum panduriforme* | M |
| *Hibiscus trionum* | | *Tephrosia* sp | |
| *Kohautia amatymbica* | | *Vernonia oligocephala* | |

| Lydenburg Thornveld | | | |
|---|---|---|---|
| **Status** | Open wooded grassland | | |
| **Soil** | sandy-loam | **Rockiness %** | 1 |
| **Conservation priority:** | Medium | **Sensitivity:** | Medium |
| **Agricultural potential:** | Medium | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Acacia karroo, Acacia caffra, Euclea crispa* | | |

**Species of Conservation Concern**

A Threatened species and Species of Conservation Concern list for the Grid 2430CB was obtained from the POSA database on the SANBI website. Threatened species are those that are facing high risk of extinction, indicated by the categories Critically Endangered, Endangered and Vulnerable. Species of Conservation Concern include the Threatened Species, but additionally have the categories Near Threatened, Data Deficient, Critically Rare, Rare and Declining. This is in accordance with the new Red List for South African Plants (Raimondo *et al*. 2009).

The following species of conservation concern were previously recorded from the Grid 2430DA (SANBI, POSA website April 2011):

| Species | Status |
|---|---|
| *Adenia fruticosa* Burtt Davy subsp. *fruticosa* | NT |
| *Aloe fouriei* D.S.Hardy & Glen | DDT |
| *Ansellia africana* Lindl. | Declining |
| *Ceropegia distincta* N.E.Br. subsp. *verruculosa* R.A.Dyer | DDD |
| *Combretum petrophilum* Retief | Rare |
| *Dicliptera fruticosa* K.Balkwill | NT |
| *Dracaena transvaalensis* Baker | Rare |
| *Eulophia speciosa* (R.Br. ex Lindl.) Bolus | Declining |
| *Euphorbia sekukuniensis* R.A.Dyer | Rare |

| | |
|---|---|
| *Gladiolus macneilii* Oberm. | CR |
| *Gladiolus pavonia* Goldblatt & J.C.Manning | CR |
| *Indigofera leendertziae* N.E.Br. | DDT |
| *Jamesbrittenia macrantha* (Codd) Hilliard | NT |
| *Khadia alticola* Chess. & H.E.K.Hartmann | Rare |
| *Lydenburgia cassinoides* N.Robson | NT |
| *Ocimum tubiforme* (R.D.Good) A.J.Paton | CR |
| *Orbea gerstneri* (Letty) Bruyns subsp. *gerstneri* | Rare |
| *Pentatrichia alata* S.Moore | DDD |
| *Rhoicissus laetans* Retief | Rare |
| *Searsia batophylla* (Codd) Moffett | VU |
| *Thesium davidsonae* Brenan | VU |

None of these species occur in this plant community as the habitat is not suitable for any of them.

**Conclusion**

This plant community is fairly high in species richness with no red data species or protected species found in the survey. It is also a very small area that will be crossed by the preferred Option 1 powerline. The construction of the line can be supported.

### 5. Poung Dolomite Mountain Bushveld

This is a narrow band of bushveld on dolomite, in the vicinity of the Strydom tunnel. It is situated along the western drier part of the Escarpment. The vegetation is woodland with a dense shrub layer. It occurs on the low and high mountain slopes in the area. The geology is dolomite and the shallow, rocky soils are of the Mispah soil Form. A very small, almost negligible part of this vegetation is crossed by Options 1, 3 and 4.

| **Poung Dolomite Mountain Bushveld** | | | |
|---|---|---|---|
| **Status** | Open to dense bushveld | | |
| **Soil** | sandy-loam | **Rockiness %** | 1 |
| **Conservation priority:** | High | **Sensitivity:** | High |
| **Agricultural potential:** | Low | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Acacia nigrescens, Acacia nilotica, Combretum apiculatum* | | |

The vegetation is dominated by the woody layer with several woody species present.

**Trees and Shrubs**

| | | | |
|---|---|---|---|
| *Acacia ataxacantha,* | | *Combretum molle* | |
| *Acacia gerrardii* | | *Croton gratissimus* | |
| *Acacia nigrescens* | d | *Cussonia spicata* | |
| *Acacia nilotica* | d | *Dichrostachys cinerea* | |
| *Acacia tortilis* | | *Dombeya rotundifolia* | |
| *Aloe cryptopoda* | p | *Euclea crispa* | M |
| *Boscia albitrunca* | M | *Euclea undulata* | M |
| *Brachylaena ilicifolia* | | *Euphorbia tirucalli* | M |
| *Carissa bispinosa* | | *Grewia bicolor* | |
| *Celtis africana* | | *Grewia flava* | |
| *Combretum apiculatum* | d | *Gymnosporia senegalensis* | M |
| *Combretum hereroense* | | *Hippobromus pauciflorus* | |

*Kirkia wilmsii*
*Ozoroa albicans*
*Pouzolzia mixta*
*Rhoicissus tridentata*
*Searsia leptodictya*
*Senna petersiana*
*Tecoma capensis*
*Vitex obovata subsp wilmsii*

**Grasses**

*Aristida canescens*
*Aristida congesta*
*Aristida transvaalensis*
*Bewsia biflora*
*Bothriochloa insculpta*
*Brachiaria serrata*
*Digitaria eriantha*
*Diheteropogon amplectens*
*Elionurus muticus*
*Enneapogon scoparius*
*Eragrostis lehmanniana*
*Eragrostis superba*
*Heteropogon contortus*
*Loudetia simplex*
*Melinis nerviglume*
*Melinis repens s. repens*
*Panicum deustum*
*Panicum maximum*
*Themeda triandra*

**Forbs**

*Abutilon angulatum*
*Asparagus intricatus*
*Asparagus suaveolens*
*Barleria saxatilis*
*Blepharis integrifolia*
*Cheilanthes dolomitica*
*Clerodendrum ternatum*
*Commelina africana* M
*Corchorus asplenifolius*
*Euphorbia schinzii*
*Evolvulus alsinoides*
*Geigeria burkei*
*Hibiscus aethiopicus*
*Hypoestes forskaolii*
*Kohautia cynanchica*
*Kyphocarpa angustifolia*
*Ocimum americanum*
*Phyllanthus glaucophyllus*
*Polygala hottentotta*
*Rhynchosia nitens*
*Sansevieria hyacinthoides*
*Stylochiton natalensis*
*Tephrosia purpurea*
*Tetradenia brevispicata,*
*Tragia dioica*
*Waltheria indica* W
*Xerophyta retinervis*

### Species of Conservation Concern

Although Matthews (1991), Van Wyk & Smith (2001) and Mucina & Rutherford (2006) mention that several endemic plant species occur on this dolomite area, the area crossed by the lines is so small that none of these species were recorded.

### Conclusion

As far as vegetation is concerned, the development of the power line can be supported in this area.

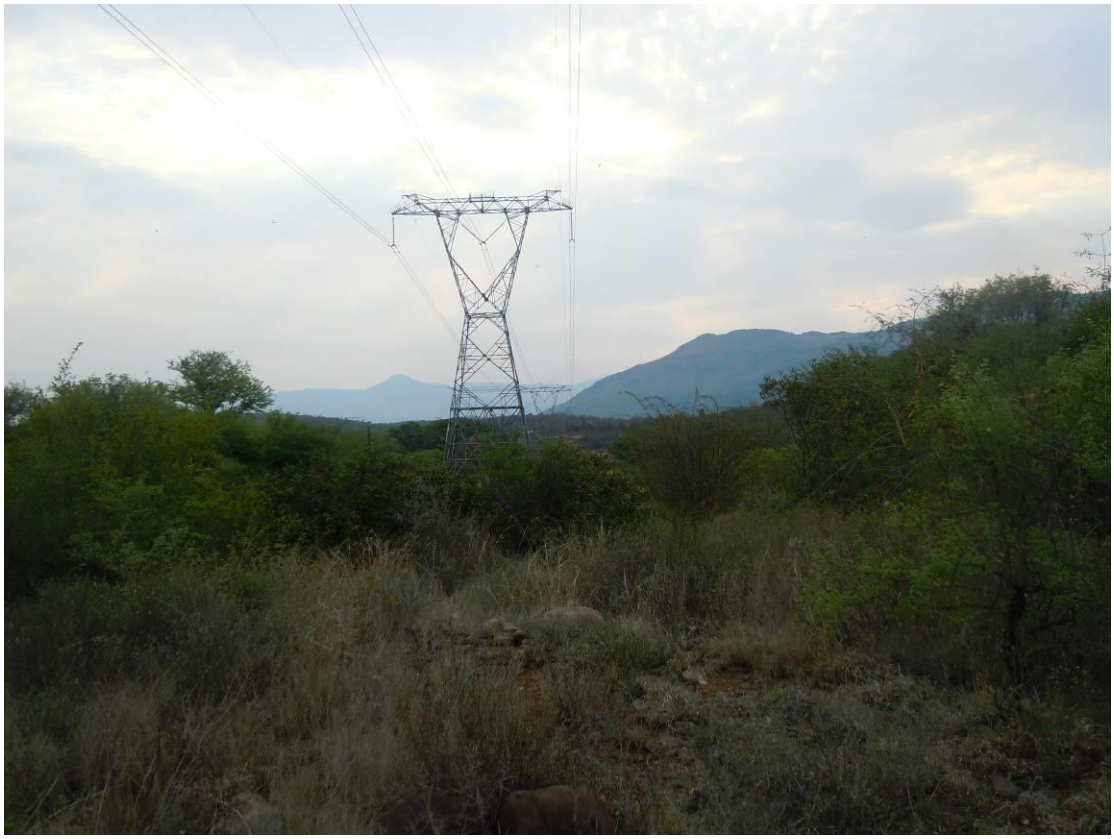

Figure 8: Poung Dolomite Mountain Bushveld

### 6. Northern Escarpment Quartzite Sourveld

A very small part of this veld type is close to the proposed route of Route 1, though it is so small that this vegetation is not discussed further.

### 7. Northern Mistbelt Forest

The proposed lines cannot go through indigenous forest. The proposed Route 4 seems to cross a patch of forest, but this will not be allowed by the authorities. This is one of the reasons why Route 4 was eliminated as an option. This vegetation is not discussed further.



**8. Tzaneen Sour Bushveld**

This vegetation stretches in a narrow band on the plains and all along the lower footslopes and hills of the escarpment. The vegetation is tall open bushveld with a tall grass layer. The geological substrate is gneiss and granite and the soils are shallow sandy and rocky lithosols. This is very dense, often tall bushveld, merging into forest-like vegetation. Only the route of Option 4 transects this vegetation, albeit a very narrow band. This vegetation contains many large trees and also has a very high species richness. Large *Ficus* trees (various species) together with several other large trees are prominent. Several threatened species occur in this vegetation.

The preferred Option 1 will run alongside this vegetation and should not have a great effect.

The following species are present:

**Trees and shrubs**

| | | | |
|---|---|---|---|
| *Acacia davyi* | | *Ficus sansibarica* | |
| *Acacia polyacantha* | | *Heteropyxis natalensis* | |
| *Acacia sieberiana* | | *Parinari curatellifolia* | |
| *Albizia versicolor* | | *Peltophorum africanum* | |
| *Antidesma venosum* | | *Piliostigma thonningii* | |
| *Bauhinia galpinii* | | *Pterocarpus angolensis* | P |
| *Catha edulis* | M | *Pterocarpus rotundifolius* | |
| *Faurea rochetiana* | | *Sclerocarya birrea* | P |
| *Faurea saligna* | | *Searsia pentheri* | |
| *Ficus burkei* | | *Terminalia sericea* | |
| *Ficus petersii* | | *Trichilia emetica* | |

**Grasses**

| | |
|---|---|
| *Alloteropsis semialata* | *Heteropogon contortus* |
| *Andropogon schirensis* | *Hyparrhenia cymbaria* |
| *Aristida congesta* | *Hyperthelia dissoluta* |
| *Bothriochloa bladhii* | *Setaria nigrirostris* |
| *Cymbopogon caesius* | *Setaria sphacelata* |
| *Cynodon dactylon* | *Themeda triandra* |
| *Diheteropogon amplectens* | |



**Forbs**

Some forb species occur scattered in the grassy layer, and these are not abundant:

*Agathisanthemum bojeri*
*Barleria elegans*
*Dicliptera clinopodia*
*Polygala producta*

**Species of Conservation Concern**

| Species | Status |
|---|---|
| *Aloe hardyi* H.F.Glen | Rare |
| *Combretum petrophilum* Retief | Rare |
| *Dracaena transvaalensis* Baker | Rare |
| *Encephalartos brevifoliolatus* Vorster | EW |
| *Encephalartos cupidus* R.A.Dyer | CR |
| *Encephalartos paucidentatus* Stapf & Burtt Davy | VU |
| *Gladiolus macneilii* Oberm. | CR |
| *Helichrysum junodii* Moeser | Rare |
| *Thesium davidsonae* Brenan | VU |

Several species of conservation concern are present in this dense vegetation. Although none of these were recorded during the field survey, possibly due to the very narrow band of this vegetation, but also due to the inaccessibility, it is certain that some of them will occur on the route. This is one of the reasons why Route 4 is eliminated as an option.

**Conclusion**

Due to the dense vegetation, species richness and possible presence of threatened species, it is suggested to avoid this route, therefore Option 1 is a suitable choise..



Figure 9: Dense Tzaneen Sour Bushveld

**9. Granite Bushveld**

The granite bushveld on the granite Lowveld plains cover the largest part of all the transects in the study site. This large granite plain is covered with the “typical” Lowveld bushveld, well know, for example, from large parts of the Kruger National Park.

Prominent species are *Combretum apiculatum* on the sandy or gravelly upland sites, while *Acacia nigrescens* and other *Acacia* species are prominent on the more clayey bottomland sites. Many species could be recorded, as this area is often close to roads and accessible. There is no difference in the vegetation of Options 1, 2 and 5.

The following plant species were recorded in this plant community:

**Trees and shrubs**

| | | | |
|---|---|---|---|
| *Acacia exuvialis* | | *Dodonaea angustifolia* | M |
| *Acacia gerrardii* | | *Dombeya rotundifolia* | M |
| *Acacia nigrescens* | d | *Ehretia amoena* | |
| *Acacia nilotica* | | *Ehretia rigida* | m |
| *Acacia sieberiana* | M | *Erythrina lysistemon* | |
| *Acacia tortilis* | d | *Euclea divinorum* | M |
| *Agave sisalana* | A | *Euclea natalensis* | |
| *Albizia harveyi* | d | *Ficus stuhlmanni* | |
| *Bolusanthus speciosa* | | *Flueggea virosa* | |
| *Capparis tomentosa* | | *Gardenia volkensii* | |
| *Cassia abbreviata* | | *Grewia bicolor* | |
| *Combretum apiculatum* | D | *Grewia flava* | |
| *Combretum collinum* | | *Grewia flavescens* | |
| *Combretum hereroense* | | *Grewia monticola* | |
| *Combretum imberbe* | P | *Gymnosporia senegalensis* | M |
| *Combretum zeyheri* | M | *Lannea discolor* | |
| *Commiphora africana* | | *Lannea schweinfurthii* | |
| *Cordia ovalis* | | *Lantana camara* | A |
| *Dalbergia melanoxylon* | | *Ozoroa engleri* | |
| *Dichrostachys cinerea* | dM | *Pappea capensis* | |

| | | | | |
|---|---|---|---|---|
| *Pavetta schumanniana* | | | *Searsia guenzii* | |
| *Pavetta schumanniana* | M | | *Searsia leptodictya* | |
| *Peltophorum africanum* | M | | *Senna didymobotrya* | A |
| *Philenoptera violacea* | PM | | *Senna petersiana* | DM |
| *Pterocarpus angolensis* | PM | | *Spirostachys africana* | p |
| *Pterocarpus rotundifolius* | | | *Terminalia prunoides* | |
| *Schotia brachypetala* | | | *Terminalia sericea* | DM |
| *Schotia capitata* | | | *Xeromphis obovata* | |
| *Sclerocarya birrea* | PM | | *Ziziphus mucronata* | M |

**Grasses**

| | | | | |
|---|---|---|---|---|
| *Aristida adscensionis* | | | *Hyperthelia dissoluta* | |
| *Aristida congesta* | | | *Melinis repens* | |
| *Aristida diffusa* | | | *Panicum maximum* | |
| *Bothriochloa insculpta* | | | *Perotis patens* | |
| *Brachiaria nigropedata* | | | *Pogonarthria squarrosa* | |
| *Cenchrus ciliaris* | | | *Sporobolus africanus* | |
| *Digitaria eriantha* | | | *Sporobolus ioclados* | |
| *Enneapogon cenchroides* | | | *Tricholaena monachne* | |
| *Enneapogon scoparius* | | | *Trichoneura grandiglumis* | |
| *Eragrostis rigidior* | | | *Urochloa mosambicensis* | d |
| *Heteropogon contortus* | | | | |

**Forbs**

| | | | | |
|---|---|---|---|---|
| *Achyranthes aspera* | | | *Geigeria burkei* | |
| *Acrotome inflata* | | | *Gomphrena celosioides* | W |
| *Agathisanthemum bojeri* | | | *Helichrysum* sp | |
| *Aspilia mossambicensis* | | | *Heliotropium steudneri* | |
| *Becium filamentosum* | | | *Heliotropium strigosum* | |
| *Bidens pilosa* | W | | *Hermannia* sp | |
| *Bulbostylis hispidula* | | | *Hermannia tomentosa* | |
| *Chamaecrista absus* | | | *Hermbstaedtia odorata* | |
| *Commelina benghalensis* | | | *Hibiscus cannabinus* | |
| *Commelina erecta* | | | *Hibiscus* sp | |
| *Cyperus esculentus* | W | | *Indigofera filipes* | |
| *Dicerocaryum zanguebarium* | | M | *Kohautia virgata* | |
| *Evolvulus alsinoides* | M | | *Kyphocarpa angustifolia* | |

| | | | |
|---|---|---|---|
| *Leucas glabrata* | | *Solanum panduriforme* | W |
| *Ocimum americanum* | | *Tagetes minuta* | W |
| *Phyllanthus maderaspatensis* | | *Tephrosia grandiflora* | |
| *Rhynchosia totta* | | *Waltheria indica* | W |
| *Richardia braziliensis* | W | *Zornia milneana* | |
| *Schkruhria pinnata* | WM | | |

**Species of Conservation Concern**

| Species | Status |
|---|---|
| *Aloe hardyi* H.F.Glen | Rare |
| *Aloe thompsoniae* Groenew. | Rare |
| *Brachystelma parvulum* R.A.Dyer | VU |
| *Combretum petrophilum* Retief | Rare |
| *Elaeodendron transvaalense* (Burtt Davy) R.H.Archer | NT |
| *Encephalartos dyerianus* Lavranos & D.L.Goode | CR |
| *Encephalartos lebomboensis* I.Verd. | EN |
| *Protea laetans* L.E.Davidson | VU |
| *Prunus africana* (Hook.f.) Kalkman | VU |
| *Searsia batophylla* (Codd) Moffett | VU |

None of these species were recorded during the field survey. The flat granite plains are not suitable habitat for these species, which are all nich specialists, or occur on the mountain areas to the west of the granite plains.

| **Granite Bushveld** | | | |
|---|---|---|---|
| **Status** | Open to dense bushveld | | |
| **Soil** | sandy-loam | **Rockiness %** | 1 |
| **Conservation priority:** | Medium-High | **Sensitivity:** | Medium |
| **Agricultural potential:** | Low | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Acacia nigrescens, Acacia nilotica, Combretum apiculatum* | | |

**Conclusion**

Several game farms and cattle farms are found in this area.

Special care will be needed in the crossing of the spruit systems within this area. The construction of the line can be supported. The combination of Options 1 and 5 is quite suitable.

Figure 10:Typical Granite Lowveld vegetation

**10. Lowveld Rugged Mopaneveld**

Only Routes 1 and 2 will transect this vegetation type in the north-eastern extreme of the study area. The Foskor substation is located on the northern boundary of this vegetation type. This is the rugged hilly area of the Olifants River valley, south of Phalaborwa. The landscape is irregular plains and rocky hills, with moderate to steep slopes. *Colophospermum mopane* is often restricted to valleys, while the hills are dominated by *Acacia nigrescens* with *Combretum apiculatum* also present.

The following plant species were recorded in this plant community:

**Trees and shrubs**

| | | | |
|---|---|---|---|
| *Acacia exuvialis* | | *Gardenia volkensii* | |
| *Acacia nigrescens* | | *Grewia bicolor* | |
| *Acacia nilotica* | | *Grewia flavescens* | |
| *Berchemia discolor* | | *Grewia hexamita* | |
| *Boscia albitrunca* | P | *Grewia monticola* | |
| *Colophospermum mopane* | D | *Grewia villosa* | |
| *Combretum apiculatum* | | *Gymnosporia senegalensis* | M |
| *Combretum hereroense* | | *Hexalobus monopetalus* | |
| *Combretum imberbe* | P | *Kirkia wilmsii* | |
| *Combretum zeyheri* | M | *Lannea discolor* | |
| *Commiphora africana* | | *Manilkara mochisia* | |
| *Commiphora mollis* | | *Ozoroa engleri* | |
| *Dalbergia melanoxylon* | | *Pappea capensis* | |
| *Dichrostachys cinerea* | M | *Pavetta schumanniana* | M |
| *Dodonaea angustifolia* | M | *Peltophorum africanum* | M |
| *Dombeya rotundifolia* | M | *Philenoptera violacea* | PM |
| *Ehretia amoena* | | *Pterocarpus rotundifolius* | |
| *Ehretia rigida* | M | *Rhigozum zambesiacum* | |
| *Erythrina lysistemon* | | *Sclerocarya birrea* | PM |
| *Euclea natalensis* | | *Terminalia prunoides* | |
| *Ficus abutilifolia* | | *Terminalia sericea* | DM |
| *Flueggea virosa* | | | |

**Grasses**

| | |
|---|---|
| *Aristida adscensionis* | *Aristida congesta* |

*Bothriochloa radicans*
*Cenchrus ciliaris*
*Digitaria eriantha*
*Enneapogon cenchroides*
*Enneapogon scoparius*
*Eragrostis rigidior*
*Fingerhuthia africana*
*Heteropogon contortus*
*Melinis repens*
*Panicum maximum*
*Pogonarthria squarrosa*
*Sporobolus panicoides*
*Tricholaena monachne*
*Trichoneura grandiglumis*
*Urochloa mosambicensis* d

**Forbs**

*Achyranthes aspera*
*Agathisanthemum bojeri*
*Aspilia mossambicensis*
*Chamaecrista mimosoides*
*Commelina benghalensis*
*Commelina erecta*
*Crabbea velutina*
*Evolvulus alsinoides*
*Geigeria burkei*
*Gomphrena celosioides*
*Gossypium africanum*
*Heliotropium steudneri*
*Heliotropium strigosum*
*Hemizygia elliottii*
*Hermannia tomentosa*
*Hermbstaedtia odorata*
*Hibiscus sidiformis*
*Kohautia virgata*
*Kyphocarpa angustifolia*
*Leucas glabrata*
*Melhania forbesii*
*Melhania rehmannii*
*Ocimum americanum*
*Phyllanthus asperulatus*
*Solanum panduriforme*
*Waltheria indica*
*Xerophyta retinervis*
*Zornia milneana*

**Species of Conservation Concern**

| Species | Status |
|---|---|
| *Ansellia africana* Lindl. | Declining |

This epiphytic orchid is often found growing on threes within this plant community.

| **Lowveld Rugged Mopaneveld** | | | |
|---|---|---|---|
| **Status** | Open to dense bushveld | | |
| **Soil** | sandy-loam, shallow | **Rockiness %** | 1-30 |
| **Conservation priority:** | Medium-High | **Sensitivity:** | Medium |
| **Agricultural potential:** | Low | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Colophospermum mopane, Terminalia sericea* | | |

**Conclusion**

Game farming is a special feature in this area.

Special care will be needed in the crossing of spruit systems.

The construction of the line can be supported.

Figure 11: Lowveld Rugged Mopaneveld in the background

**11. Phalaborwa-Timbavati Mopaneveld**

Only Routes 1 (small part) and 4 will transect this vegetation type in the north-eastern extreme of the study area. The Foskor substation is located on the southern boundary of this vegetation type. This is the flat plains west of Phalaborwa. The landscape is an undulating plain with *Colophospermum mopane* and *Acacia nigrescens* in the lower lying areas, while *Combretum apiculatum* and *Terminalia sericea* becomes more prominent on upland sites.

The following plant species were recorded in this plant community:

**Trees and shrubs**

| | | | |
|---|---|---|---|
| *Acacia exuvialis* | | *Cissus cornifolia* | |
| *Acacia nigrescens* | | *Colophospermum mopane* | D |
| *Acacia tortilis* | | *Combretum apiculatum* | d |
| *Albizia harveyi* | | *Combretum hereroense* | |
| *Boscia albitrunca* | P | *Combretum imberbe* | P |
| *Cassia abbreviata* | | *Combretum zeyheri* | M |

| | | | |
|---|---|---|---|
| *Commiphora africana* | | *Grewia villosa* | |
| *Commiphora mollis* | | *Gymnosporia senegalensis* | M |
| *Dalbergia melanoxylon* | | *Lannea discolor* | |
| *Dichrostachys cinerea* | M | *Maerua parvifolia* | |
| *Ehretia amoena* | | *Ozoroa engleri* | |
| *Ehretia rigida* | | *Pappea capensis* | |
| *Euclea divinorum* | | *Pavetta schumanniana* | M |
| *Flueggea virosa* | | *Peltophorum africanum* | M |
| *Gardenia volkensii* | | *Philenoptera violacea* | PM |
| *Grewia bicolor* | | *Sclerocarya birrea* | PM |
| *Grewia flavescens* | | *Strychnos madagascariensis* | |
| *Grewia hexamita* | | *Terminalia prunoides* | |
| *Grewia monticola* | | *Terminalia sericea* | dM |

**Grasses**

| | | | |
|---|---|---|---|
| *Aristida adscensionis* | | *Melinis repens* | |
| *Aristida congesta* | | *Panicum maximum* | |
| *Bothriochloa radicans* | | *Perotis patens* | |
| *Brachiaria nigropedata* | | *Pogonarthria squarrosa* | |
| *Cenchrus ciliaris* | | *Schmidtia pappophoroides* | |
| *Digitaria eriantha* | | *Themeda triandra* | |
| *Andropogon gayanus* | | *Tricholaena monachne* | |
| *Fingerhuthia africana* | | *Trichoneura grandiglumis* | |
| *Enneapogon scoparius* | | *Urochloa mosambicensis* | d |
| *Eragrostis rigidior* | | | |
| *Heteropogon contortus* | | | |

**Forbs**

| | | | |
|---|---|---|---|
| *Achyranthes aspera* | | *Gomphrena celosioides* | |
| *Acrotome inflata* | | *Heliotropium steudneri* | |
| *Agathisanthemum bojeri* | | *Heliotropium strigosum* | |
| *Aspilia mossambicensis* | | *Hemizygia elliottii* | |
| *Chamaecrista mimosoides* | | *Hermannia glanduligera* | |
| *Clerodendrum ternatum* | | *Hermannia tomentosa* | |
| *Commelina benghalensis* | | *Hermbstaedtia odorata* | |
| *Commelina erecta* | | *Ipomoea magnusiana* | |
| *Evolvulus alsinoides* | | *Kohautia virgata* | |

*Kyphocarpa angustifolia*
*Leucas glabrata*
*Melhania forbesii*
*Ocimum americanum*
*Solanum panduriforme*
*Tephrosia polystachya*
*Waltheria indica*
*Zornia milneana*

**Species of Conservation Concern**

| Species | Status |
|---|---|
| *Aloe thompsoniae* Groenew. | Rare |
| *Encephalartos dyerianus* Lavranos & D.L.Goode | CR |
| *Encephalartos lebomboensis* I.Verd. | EN |

None of these species were found during the field survey.

**Conclusion**

Game farming is a special feature in this area.

Special care will be needed in the crossing of spruit systems.

The construction of the line can be supported.

| **Phalaborwa-Timbavati Mopaneveld** | | | |
|---|---|---|---|
| **Status** | Open to dense bushveld | | |
| **Soil** | sandy-loam | **Rockiness %** | 1 |
| **Conservation priority:** | Medium-High | **Sensitivity:** | Medium |
| **Agricultural potential:** | Low | **Need for rehabilitation** | Low |
| **Dominant spp.** | *Colophospermum mopane, Combretum apiculatum* | | |

Figure 12: Game farming in the Lowveld areas.

## 12 River and Spruit Systems

Several River or spruit crossings occur along the transect routes. At the smaller spruits no riparian zone is present, the vegetation is continuous with the adjacent bushveld vegetation. However, the larger rivers have a distinct riparian zone, with large trees for example *Faidherbia albida, Acacia galpinii, Acacia robusta* and *Philenoptera violacea.*

The following species were recorded at a larger river:

**Woody species**

| | | | |
|---|---|---|---|
| *Acacia galpinii* | | *Diospyros mespiliformis* | |
| *Acacia robusta* | | *Faidherbia albida* | D |
| *Acacia tortilis* | | *Ficus sycomorus* | |
| *Combretum apiculatum* | | *Grewia bicolor* | |
| *Combretum imberbe* | P | *Grewia monticola* | |
| *Combretum microphyllum* | | *Peltophorum africanum* | |
| *Dichrostachys cinerea* | | *Philenoptera violacea* | P |

| | | | |
|---|---|---|---|
| *Phoenix reclinata* | | *Terminalia sericea* | |
| *Sclerocarya birrea* | MP | *Ziziphus mucronata* | M |

**Grasses**

| | | | |
|---|---|---|---|
| *Aristida congesta* | | *Eragrostis superba* | |
| *Cynodon dactylon* | | *Heteropogon contortus* | *D* |
| *Dactyloctenium aegyptium* | | *Melinis repens* | |
| *Digitaria eriantha* | | *Pogonarthria squarrosa* | *d* |
| *Eragrostis heteromera* | | *Tricholaena monachne* | |
| *Eragrostis rigidior* | *d* | *Trichoneura grandiglumis* | |

**Forbs**

| | | | |
|---|---|---|---|
| *Agathisanthemum bojeri* | | *Melanthera scandens* | |
| *Ageratum conyzoides* | W | *Solanum incanum* | W |
| *Cyperus sexangularis* | | *Solanum panduriforme* | W |
| *Lippia rehmannii* | | *Xanthium strumarium* | W |
| *Schkruhria pinnata* | W | | |

| **River and Spruit crossings** | | | |
|---|---|---|---|
| **Status** | River and spruit linear wetlands | | |
| **Soil** | Sandy or clayey | Rockiness | 0% |
| **Conservation priority:** | High | Sensitivity: | High |
| **Agricultural potential:** | Low | Need for rehabilitation | Low |
| **Dominant spp.** | *Combretum imberbe, Faidherbia albida, Acacia galpinii, Diospyros mespiliformis, Ficus sycomorus, Acacia robusta, Philenoptera violacea, Phoenix reclinata* | | |

**Conclusion**

No river or spruit is very wide, so the lines can easily cross these river or spruit systems. Care should however be taken to place pylons adequately away from river or spruit banks, avoiding any damage to the banks or water courses. Erosion should be avoided at all times.

## 7.2 Vegetation importance and Ecological sensitivity

The results of the ecological sensitivity assessment of the vegetation types recognized are indicated in the Table below:

| Vegetation | Conservation Status of regional Vegetation unit | Listed Ecosystem | Legislated Protection | Plants species of conservation concern | Ecological Function | Conservation Importance | Total Score out of max of 18 | Not relevant for Options 1 and 5 |
|---|---|---|---|---|---|---|---|---|
| 1. Sekhukhune Plains Bushveld | 3 | 2 | 1 | 3 | 2 | 2 | **13 Medium-High** | |
| 2. Sekhukhune Mountain Bushveld | **3** | **3** | **3** | **3** | **3** | **3** | **18 High** | **X** |
| 3. Ohrigstad Mountain Bushveld | **3** | **3** | **3** | **3** | **3** | **3** | **18 High** | |
| 4. Lydenburg Thornveld | **2** | **2** | **1** | **3** | **3** | **2** | **13 Medium-High** | |
| 5. Poung Dolomite Mountain Bushveld | **3** | **3** | **3** | **3** | **3** | **3** | **18 High** | |
| 6. Northern Escarpment Quartzite Sourveld | **3** | **1** | **1** | **2** | **2** | **1** | **10 Medium-** | **X** |
| 7. Northern Mistbelt Forest | **3** | **3** | **3** | **3** | **3** | **3** | **18 High** | **X** |
| 8. Tzaneen Sour Bushveld | **3** | **3** | **3** | **3** | **3** | **3** | **18 High** | |
| 9. Granite Bushveld | **2** | **1** | **1** | **3** | **3** | **2** | **12 Medium** | |
| 10. Lowveld Rugged Mopaneveld | **2** | **1** | **1** | **3** | **3** | **2** | **12 Medium** | |
| 11. Phalaborwa-Timbavati Mopaneveld | **2** | **1** | **1** | **3** | **3** | **2** | **12 Medium** | |
| 12. River Crossings | **3** | **3** | **3** | **3** | **3** | **3** | **18 High** | |

**Table: Scoring of Vegetation Types to determine Ecological Sensitivity.**

## 8. IMPACT ASSESSMENT

### 8.1 Methods

The methods and format of the impact tables used in this chapter are in accordance to the requirements of the 2014 Regulations.

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.

» The **probability (P)** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

» The **duration (D)**, wherein it will be indicated whether:

- the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
- the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
- medium-term (5–15 years) – assigned a score of 3;
- long term (> 15 years) - assigned a score of 4; or
- permanent - assigned a score of 5;

» The **extent (E)**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):

» The **magnitude (M)**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

» the **significance (S)**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, moderate or high;

- the significance rating is calculated by the following formula:

**S (significance) = (D + E + M) x (P)**

» the **status**, which will be described as either positive, negative or neutral.

» the degree to which the impact can be reversed.

» the degree to which the impact may cause irreplaceable loss of resources.

» the *degree* to which the impact can be *mitigated.*

Impacts should be identified for the construction and operational phases of the proposed development. Proposed mitigation measures should be practical and feasible such that they can be realistically implemented by the applicant.

### 8.2 Impacts on the vegetation and flora

The impacts of the powerline development are limited to impacts on vegetation and flora during the construction phase. During the operational phase taller woody plant species may be controlled to avoid contact with powerlines. A track for access by vehicles may be maintained during the operational phase. It is clear that the greatest impact is during the construction phase. As the voltage of the proposed 275kV line was changed from 275kV to 400kV, this implies that the new 400 kV line servitude width will change from 47 m to 55 m. This implies that the servitude will be 8 m wider over the length of the proposed powerline. The impacts are basically similar to those that were expected for the 47 m wide servitude, though more vegetation, particularly taller trees, will be affected.

Based on the results of the ecological sensitivity assessment above, impacts on vegetation are discussed on the following groups:

- Higher Altitude Plains Vegetation, including
    - Sekhukhune Plains Bushveld (Vegetation Type 1)
    - Lydenburg Thornveld (Vegetation Type 4)
- Mountain Bushveld including
    - Ohrigstad Mountain Bushveld (egetation Type 3)
    - Poung Dolomite Mountain Bushveld (Vegetation Type 5)
    - Tzaneen Sour Bushveld (Vegetation Type 8)
- Lowveld Bushveld
    - Granite Bushveld (Vegetation Type 9)
    - Lowveld Rugged Mopaneveld (Vegetation Type 10)
    - Phalaborwa-Timbavati Mopaneveld (Vegetation Type 11)
- River Crossings (Vegetation Type 12)

Note that the proposed route (combination of alternatives 1 and 5) will not transect Vegetation Types 2, 6 and 7.

### Higher Altitude Plains Vegetation

**Table 8.1: Loss of Higher Altitude Plains Vegetation due to due to clearing of servitude.**

***Nature:*** The area of the footprint for every pylon will be cleared of vegetation, while woody vegetation will be cleared all along the line. This will result in the loss of indigenous plant species, especially woody species, disturbance of plant species and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion.

| | **Without mitigation** | | **With mitigation** | |
|---|---|---|---|---|
| **CONSTRUCTION PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Short-term | 2 | Short-term | 2 |
| ***Extent*** | Regional (all along the line) | 3 | Regional (all along the line) | 3 |
| ***Magnitude*** | Moderate | 7 | Moderate | 5 |
| ***Significance*** | **High** | **60** | **Moderate** | **50** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| **OPERATIONAL PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Permanent | 5 | Permanent | 5 |
| ***Extent*** | Regional (all along the line) | 3 | Regional (all along the line) | 3 |
| ***Magnitude*** | Moderate | 3 | Low | 2 |
| ***Significance*** | **Moderate** | **55** | **Moderate** | **50** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| | | | | |
| ***Reversibility*** | Medium | | High | |
| ***Irreplaceable loss of resources?*** | Moderate | | Low | |
| ***Can impacts be mitigated?*** | Yes | | | |

***Mitigation:***

- The clearing of vegetation must be kept to a minimum and remain within the footprint of the pylon;
- Disturbed areas must be rehabilitated immediately after construction has been completed in that area by sowing appropriate indigenous grass species;
- During the construction phase workers must be limited to areas under construction and access to the undeveloped areas must be strictly controlled;
- Woody plants should only be cut shorter if absolutely necessary;
- Protected trees should be avoided by slight deviation of the powerline within the

| |
|---|
| servitude;<br><br>• Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas. |
| ***Cumulative impacts:*** Expected to reduce and fragment the natural grassland in the area to a medium extent. |
| ***Residual Risks:*** None anticipated provided that the mitigation measures are implemented correctly. |

**Mountain Bushveld**

**Table 8.2: Loss of Mountain Bushveld vegetation due to due to clearing of servitude.**

***Nature:*** All these Mountain Bushveld types are considered to be threatened (Sanbi & DEAT 2009), and are therefore also assessed to be ecologically sensitive. The area of the footprint for every pylon will be cleared of vegetation, while woody vegetation will be cleared all along the line. This will result in the loss of indigenous plant species, especially woody species, including nationally protected trees, disturbance of plant species and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion.

| | **Without mitigation** | | **With mitigation** | |
|---|---|---|---|---|
| **CONSTRUCTION PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Short-term | 2 | Short-term | 2 |
| ***Extent*** | Regional (all along the line) | 3 | Regional (all along the line) | 3 |
| ***Magnitude*** | Moderate | 7 | Moderate | 5 |
| ***Significance*** | **High** | **60** | **Medium** | **50** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| **OPERATIONAL PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Permanent | 5 | Permanent | 5 |
| ***Extent*** | Regional (all along the line) | 3 | Regional (all along the line) | 3 |
| ***Magnitude*** | Moderate | 3 | Low | 2 |
| ***Significance*** | **Medium** | **55** | **Medium** | **50** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| | | | | |
| ***Reversibility*** | Medium | | High | |
| ***Irreplaceable loss of resources?*** | Moderate | | Low | |

| | |
|---|---|
| ***Can impacts be mitigated?*** | Yes |

***Mitigation:***

- The clearing of vegetation must be kept to a minimum and remain within the footprint of the pylon;
- Disturbed areas must be rehabilitated immediately after construction has been completed in that area by sowing appropriate indigenous grass species;
- During the construction phase workers must be limited to areas under construction and access to the undeveloped areas must be strictly controlled;
- Woody plants should only be cut shorter if absolutely necessary;
- Protected trees should be avoided by slight deviation of the powerline within the servitude;
- Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas.
- A definite walkdown to identify protected trees and other protected plant species and also red data plant species or other plant species of conservation concern.

***Cumulative impacts:*** Expected to reduce and fragment the natural grassland in the area to a medium extent.

***Residual Risks:*** None anticipated provided that the mitigation measures are implemented correctly.

**Lowveld Bushveld**

**Table 8.3: Loss of Lowveld Bushveld vegetation due to due to clearing of servitude.**

***Nature:*** The Lowveld Bushveld types are considered to be least threatened (Mucina & Rutherford 2006) and are therefore also assessed to be ecologically medium sensitive, mainly due to the presence of protected trees. The area of the footprint for every pylon will be cleared of vegetation, while woody vegetation will be cleared all along the line. This will result in the loss of indigenous plant species, especially woody species, including nationally protected trees, disturbance of plant species and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion.

| | **Without mitigation** | | **With mitigation** | |
|---|---|---|---|---|
| **CONSTRUCTION PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Short-term | 2 | Short-term | 2 |
| ***Extent*** | Regional (all along the line) | 3 | Regional (all along the line) | 3 |
| ***Magnitude*** | Moderate | 5 | Moderate | 5 |

| | | | | |
|---|---|---|---|---|
| ***Significance*** | **High** | **50** | **Moderate** | **50** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| **OPERATIONAL PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Permanent | 5 | Permanent | 5 |
| ***Extent*** | Regional (all along the line) | 3 | Regional (all along the line) | 3 |
| ***Magnitude*** | Moderate | 3 | Low | 2 |
| ***Significance*** | **Moderate** | **55** | **Moderate** | **50** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| | | | | |
| ***Reversibility*** | Medium | | High | |
| ***Irreplaceable loss of resources?*** | Moderate | | Low | |
| ***Can impacts be mitigated?*** | Yes | | | |

***Mitigation:***

- The clearing of vegetation must be kept to a minimum and remain within the footprint of the pylon;
- Disturbed areas must be rehabilitated immediately after construction has been completed in that area by sowing appropriate indigenous grass species;
- During the construction phase workers must be limited to areas under construction and access to the undeveloped areas must be strictly controlled;
- Woody plants should only be cut shorter if absolutely necessary;
- Protected trees should be avoided by slight deviation of the powerline within the servitude;
- Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas.
- A walkdown to identify protected trees and other protected plant species and also red data plant species or other plant species of conservation concern.

***Cumulative impacts:*** Expected to reduce and fragment the natural grassland in the area to a medium extent.

***Residual Risks:*** None anticipated provided that the mitigation measures are implemented correctly.

## River and Spruit Crossings

**Table 8.4: Loss of vegetation at river and spruit crossings due to due to clearing of servitude.**

***Nature:*** Spruits and wetlands will be crossed by the powerlines. The positions of the pylons are not known yet. It is assumed that the distance between pylons will be adequately long that so spruits and wetland can easily be crossed without damaging any of them. Therefore it is envisaged that the powerline and pylons will have very little impact on spruits and wetlands.

| | **Without mitigation** | | **With mitigation** | |
|---|---|---|---|---|
| **CONSTRUCTION PHASE** | | | | |
| ***Probability*** | Very improbable | 1 | Very improbable | 1 |
| ***Duration*** | Short term | 2 | Short term | 2 |
| ***Extent*** | Regional | 5 | Regional | 5 |
| ***Magnitude*** | Minor | 2 | No effect | 0 |
| ***Significance*** | **Low (negligible)** | **9** | **Low (negligible)** | **7** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| **OPERATIONAL PHASE** | | | | |
| ***Probability*** | Very improbable | 1 | Very improbable | 1 |
| ***Duration*** | Permanent | 5 | Permanent | 5 |
| ***Extent*** | Regional | 5 | Regional | 5 |
| ***Magnitude*** | Low | 4 | Minor | 2 |
| ***Significance*** | **Low (negligible)** | **14** | **Low (negligible)** | **12** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| | | | | |
| ***Reversibility*** | Low | | Medium | |
| ***Irreplaceable loss of resources?*** | Low | | Low | |
| ***Can impacts be mitigated?*** | Yes | | | |

***Mitigation:***

- Limit disturbance close to spruit and wetland to a minimum.
- Rehabilitate disturbances close to spruits ;and wetland immediately
- Do not remove any spruit or wetland vegetation putting up the lines;
- Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas
- Remove and control all alien woody plant species that may appear during construction and operational phases
- Avoid erosion at spruits at all times

| |
|---|
| ***Cumulative impacts:*** Expected that very little accumulative effects will occur at spruits and wetland. . |
| ***Residual Risks:*** . None is anticipated provided that the mitigation measures are implemented correctly. |

**Table 8.5: Increase of alien invasive plant species**

| ***Nature:*** Alien invasive plant species will encroach into all disturbed areas in all vegetation types. It is expected that extensive area will be disturbed, natural vegetation totally destroyed. | | | | |
|---|---|---|---|---|
| | **Without mitigation** | | **With mitigation** | |
| **CONSTRUCTION PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Permanent | 5 | Permanent | 5 |
| ***Extent*** | Regional | 5 | Regional | 5 |
| ***Magnitude*** | High | 10 | High | 6 |
| ***Significance*** | **High** | **100** | **High** | **80** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| **OPERATIONAL PHASE** | | | | |
| ***Probability*** | Definite | 5 | Definite | 5 |
| ***Duration*** | Permanent | 5 | Permanent | 5 |
| ***Extent*** | Regional | 5 | Regional | 5 |
| ***Magnitude*** | High | 10 | High | 10 |
| ***Significance*** | **Moderate** | **100** | **Low** | **80** |
| ***Status (positive or negative)*** | Negative | | Negative | |
| | | | | |
| ***Reversibility*** | Low | | Low | |
| ***Irreplaceable loss of resources?*** | High | | High | |
| ***Can impacts be mitigated?*** | Yes, by alien plant control measures | | | |
| ***Mitigation:***<br>• An alien invasive management programme must be incorporated into the Environmental Management Programme;<br>• Ongoing alien plant control must be undertaken;<br>• Areas which have been disturbed will be quickly colonised by invasive alien species. An ongoing management plan **must** be implemented for the clearing/eradication of alien species.<br>• Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge.<br>• Avoid planting of exotic plant species in public areas or home gardens, use indigenous species. | | | | |
| ***Cumulative impacts:*** **High** , With other mining activities in the region, it is expected that there will be considerable cumulative impacts on vegetation, as these activities are all extensive and totally destructive on vegetation and flora. | | | | |
| ***Residual Risks:*** Not currently known | | | | |

## 9 DISCUSSION

During 2016/2017 a re-investigation of the authorised route became necessary, as the voltage of the proposed 275kV line was changed from 275kV to 400kV, and this implies that the new 400 kV line servitude will change from 47 m to 55 m. A width of 8 m is added to the entire length of the proposed powerline, where vegetation could be cleared, and particularly trees be removed. Although the impacts on vegetation in the widened servitude for the 400 kV powerline, are similar to those for the narrower servitude for the 275 kV powerline, the area along the entire powerline is much larger and the likelihood of affecting plant species of conservation concern is therefore also larger.

The results of the investigation can be summarised as follows:
The vegetation of all five alternatives was initially investigated. From the desktop study, confirmed by the field survey, option 3, which runs from Burgersfort to Ohrigstad along the R555, was eliminated. This is because the route along the R555 runs for most of the way in a narrow valley, with the Mabitsana River and the tarred R555 in this valley. The line will have to run for most of the way on the sensitive mountain foot slopes and cross the river and road several times. Furthermore, many irrigated agricultural enterprises occur in the Ohrigstad area, stretching all the way to Marapeng. This mosaic of narrow river valley, river, mountain slopes and agriculture where-ever the valley is a bit broader, causes the route to be unsuitable. From an ecological perspective both the riverine vegetation and the vegetation of the mountain slopes have a high ecological sensitivity. Therefore this entire valley forms an ecologically sensitive ecosystem. This is also a much longer route.

Furthermore, from the desktop study, confirmed by the field survey, option 4, was eliminated. The line of this option runs through nine vegetation types, and over very high and steep mountains of Sekhukhune Mountain Bushveld and Ohrigstad Mountain Bushveld with two endangered ecosystems (Sekhukhune Mountainlands and Sekhukhune Norite Bushveld, SANBI & DEAT 2009), Poung Dolomite Mountain Bushveld with endangered Malmani Karstland (SANBI & DEAT 2009), the vulnerable Northern Escarpment Quartzite Sourveld (Mucina & Rutherford (2006), Northern Mistbelt Forest area and the vulnerable Tzaneen Sour Bushveld (SANBI & DEAT 2009). Especially the Great Escarpment area consists of very rugged and high mountains, resulting in a very difficult route with several threatened ecosystems.

Alternative Routes 1 and 2, and part of Alternative 1 that changed to Alternative 5 were further investigated in more detail by field surveys. Alternative 5 would affect less people. The vegetation along these routes was assessed in more detail, including the protected and red data species. Medicinal plants and aliens and weeds are indicated.

From an ecological perspective, Alternative 1 is the preferred route, with the Alternative 5 replacing part of Alternative 1. This eventually became the authorised route.

The most difficult part of the route is from the Merensky substation through Ohrigstad Mountain Bushveld, the Poung Dolomite Mountain Bushveld and the Tzaneen Sour Bushveld, which are mountainous areas with very sensitive and threatened ecosystems (SANBI & DEAT 2009) vegetation. The significance of the impact on vegetation during the construction phase of the powerline is high, particularly on protected trees, but also on other protected or threatened plant species. It is suggested that a walkthrough in this area is essential.

The most serious limitation of the wider servitude on the Lowveld Bushveld, particularly where the line transects the Granite Lowveld vegetation type, is the abundance of the protected tree *Sclerocarya birrea,* and to a lesser degree other protected tree and plant species. It is certain that several of these trees will be in the way of the transect.

Locally are also many river and spruit crossings. No river or spruit is very wide, so the lines can easily cross these rivers or spruits systems. Care should be taken to place pylons adequately away from river or spruit banks, avoiding any damage to the banks or water courses. Erosion should be avoided at all times. The new 2014 Regulations emanating from the Water Act may have an effect on authorisation in terms of requirement of Water Use Licences. This aspect falls outside the scope of this report.

Another factor in this area is that large properties are game farms and lodges. These areas are effectively conserved by the owners, and it is realised that the public participation is an important issue. After finalisation of the exact transect, a walkthrough will have to confirm any issues regarding vegetation.

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**Qualifications**:
1963 Matriculation Certificate, Kemptonpark High School
1967 B.Sc. University of Pretoria, Botany and Zoology as majors,
1968 B.Sc. Hons. (cum laude) University of Pretoria, Botany.
1969 T.H.E.D. (cum laude) Pretoria Teachers Training College.
1975 M.Sc. University of Pretoria, Plant Ecology .
1982 D.Sc. (Ph.D.) University of Pretoria, Plant Ecology.

**Theses**: (M.Sc. and D.Sc.) on plant community ecology and wildlife management in nature reserves in South African grassland and savanna.

**Professional titles**:
• MSAIE South African Institute of Ecologists and Environmental Scientists
- 1989-1990 Council member
• MGSSA Grassland Society of Southern Africa
- 1986 Elected as Sub-editor for the Journal
- 1986-1989 Serve on the Editorial Board of the Journal
- - 1990 Organising Committee: International Conference: Meeting Rangeland challenges in Southern Africa
- 1993 Elected as professional member
• PrSciNat. South African Council for Natural Scientific Professions **Registration Number 400086/83**
- 1993-1997 **Chairman** of the Professional Advisory Committee: Botanical Sciences
- 1993-1997: **Council** Member
- 1992-1994: Publicity Committee
- 1994-1997: Professional Registration Committee

**Professional career:**
- Teacher in Biology 1970-1973 in Transvaal Schools
- Lecturer and senior lecturer in Botany 1974-1983 at University of the North
- Associate professor in Plant Ecology 1984-1988 at Potchefstroom University for CHE
- Professor in Plant Ecology 1988-2008 at University of Pretoria.
- 2009 – current Professor Extra-ordinary in the Dept of Plant Science, University of Pretoria

- • Founder and owner of the Professional Ecological Consultancy firms Ecotrust Environmental Services CC and Eco-Agent CC, 1988-present.

**Academic career:**

• Students:

- Completed post graduate students: M.Sc. 53; Ph.D. 14.
- Presently enrolled post-graduate students: M.Sc. 4; Ph.D. 2.

• Author of:

- 175 scientific papers in refereed journals
- >150 papers at national and international congresses
- >250 scientific (unpublished) reports on environment and natural resources
- 17 popular scientific papers.
- 39 contributions in books

• Editorial Committee of

- South African Journal of Botany,
- Journal Grassland Society of Southern Africa,
- Bulletin of the South African Institute of Ecologists.
- Journal of Applied Vegetation Science.( Sweden)
- Phytocoenologia (Germany)
-

• FRD evaluation category: C2 (=leader in South Africa in the field of Vegetation Science/Plant Ecology)

**Membership:**

• International Association of Vegetation Science.
• British Ecological Society
• International Society for Ecology (Intecol)
• Association for the Taxonomic study of the Flora of Tropical Africa (AETFAT).
• South African Association of Botanists (SAAB)

1988-1993 Elected to the **Council** of SAAB.
1989-1990 Elected as **Chairman** of the Northern Transvaal Branch
1990 Elected to the Executive Council as **Vice-President**
1990- Sub-editor Editorial Board of the Journal
1991-1992 Elected as **President** (2-year period)
1993 **Vice-President** and Outgoing President

• Wildlife Management Society of Southern Africa
• Suid-Afrikaanse Akademie vir Wetenskap en Kuns
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• Wildlife Society of Southern Africa

1975 - 1988: Member
1975 - 1983: Committee member, Pietersburg Centre
1981 - 1982: **Chairman**, Pietersburg Centre

• Dendrological Society of Southern Africa

1984 - present: Member
1984 - 1988: Committee member, Western Transvaal Branch
1986 - 1988: **Chairman**, Western Transvaal Branch
1987 - 1989: Member, Central Committee (National level)
1990 - 2000: Examination Committee

• Succulent Society of South Africa

1987 - 2000

• Botanical Society of South Africa

2000 – present: Member
2001- 2008: Chairman, Pretoria Branch

2002 – 2006: Chairman, Northern Region Conservation Committee
2002- 2007: Member of Council

**Special committees**:
• Member of 10 special committees re ecology, botany, rangeland science in South Africa.
• Member of the International Code for Syntaxonomical Nomenclature 1993-present.

**Merit awards and research grants**:
1968 Post graduate merit bursary, CSIR, Pretoria.
1977-1979 Research Grant, Committee re Research Development, Dept. of Co-operation and Development, Pretoria.
1984-1989 Research Grant, Foundation for Research Development, CSIR, Pretoria.
1986-1987 Research Grant, Dept. of Agriculture and Water Supply, Potchefstroom.
1990-1997 Research Grant, Dept. of Environmental Affairs & Tourism, Pretoria.
1991-present Research Grant, National Research Foundation , Pretoria.
1991-1993 Research Grant, Water Research Commission.
1999-2003 Research Grant, Water Research Commission.
2006 South African Association of Botanists Silver Medal for outstanding contributions to South African Botany

**Abroad**:
1986 Travel Grant, Potchefstroom University for Christian Higher Education, Potchefstroom
Visits to Israel, Italy, Germany, United Kingdom, Portugal.
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Visits to Germany, Switzerland, Austria, The Netherlands, United Kingdom.
1990 Travel Grant, FRD.
Visit to Japan, Taiwan, Hong-Kong.
1991 Travel Grant, FRD.
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1993 Travel Grant, University of Pretoria.
Visits to the USA, Costa Rica, Czech Republic, Austria.
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1996 Travel Grant, University of Pretoria
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1997 Travel Grant University of Pretoria, Visit Czech Republic, Bulgaria
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2001 Travel Grant, NRF, Visit Brazil
2006 German Grant Invited lecture in Rinteln, Germany

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Founder and owner of Ecotrust Environmental Services CC and Eco-Agent CC
Since 1988 **>250** reports as consultant on environmental matters, including:
- Game Farm and Nature Reserve planning,
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- Environmental Management Programme Reports,
- Vegetation Surveys,
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