# Masa Ngwedi 750kv and 400kv lines (Limpopo and North West Provinces)
# Section D
# Vegetation Input for EMP

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**Indemnity**

This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study. Therefore, the author reserves the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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The Environmental Impact Assessment Regulations (Regulation 17 of Government Notice No. R345 of 2010), requires that certain information is included in specialist reports. The terms of reference, purpose of the report, methodologies, assumptions and limitations, impact assessment and mitigation (where relevant to the scope of work) and summaries of consultations (where applicable) are included within the main report. Other relevant information is set out below:

**Expertise of author:**

- Working in the field of ecology, and in specific vegetation related assessments, since 2007;
- Is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions in the field of ecology (Reg. No. 400019/11); and
- Has been working with plants indigenous to South Africa since 1997.

**Declaration of independence:**

Dimela Eco Consulting in an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by Dimela Eco Consulting is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

**Disclosure:**

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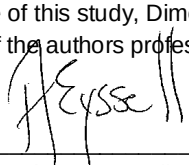
Based on information provided to Dimela Eco Consulting by the client, and in addition to information obtained during the course of this study, Dimela Eco Consulting present the results and conclusion within the associated document to the best of the authors professional judgement and in accordance with best practise.



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SACNASP Reg. No. 400019/11

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# 1. INTRODUCTION

Eskom proposes to construct powerlines (a 750kV and 400kV line) from Masa substation (Limpopo Province) to Ngwedi substation (North West Province). Dimela Eco Consulting was appointed by Mandara Consulting to undertake a walk down of approximately 80km of the proposed powerline routes and provide input with regards to protected plant species and vegetation sensitivities that should be avoided or impacts mitigated during the construction and operation of the powerline route. The servitude width for the two powerlines is 135m i.e. 80m for the 765kV powerline and 55m for the 400kV powerline.

## 1.1 Terms of reference

The terms of reference were as follows:

- Walk down with specific reference to plants of conservation concern that could occur along the proposed powerline route;
- General background to the vegetation observed along the proposed routes;
- A report detailing the pylons in proximity to intact and likely sensitive vegetation as well as measures to aid conservation / rehabilitation of this vegetation along the powerline routes as input into the EMP;
- Localities of plants of conservation concern were access allowed; and
- Estimates of numbers of protected species were access were problematic.

## 1.2 Assumptions and Limitations

The length of the line, number of landowners, game farms; access problems and project timeframes presented great challenges in accessing and walking the entire line. In addition, it was assumed that all specialist will walk the line together. As this was not possible, the specialist accessed what she safely could. Therefore exact localities of protected species are limited to areas that were accessible. However, the specialist gained a good overall impression of what is likely to occur where and the data was extrapolated to the entire length of the line. At the time of the site visits, the corridor for both the 750Kv and 400Kv lines was not known and it was estimated at 100m.

Two field surveys was undertaken, both during November 2013. Ideally vegetation assessments should be carried out in different seasons and over a number of years to adequately assess the diversity and vegetation composition. Limited timeframes did not allow for detailed or long-term investigation and therefore plants not in flower, might have been overlooked.

Additional information may come to light during a later stage of the process, or access could be organised after the completion of the report for which no allowance could have been made at the time of this report. Dimela Consulting retain the right to amend this report, recommendations and/ or conclusions at any stage of the project should significant or additional information comes

to light. This report also relied on the vegetation report done as part of the Environmental Impact Assessment (EIA) phase for additional information regarding plants that was observed to occur (Bathusi Environmental Consulting, 2009). Note that comprehensive vegetation assessments were not undertaken.

### 1.3 Methodology

The assessment entailed a literature review of the existing reports (Bathusi Environmental Consulting, 2009), vegetation information (Mucina & Rutherford, 2006), the short listing plants of conservation concern that could potentially occur along the route alignment, field survey at accessible areas along the powerline routes, analysis of data collected and reporting.

*Literature Review:*
The description of the regional vegetation relied on literature from Mucina & Rutherford (2006). Plant names follow Onderstall, (1996), Van Wyk & Van Wyk (1997), Van Wyk & Malan (1997), Pooley (1998), Henderson (2001), Van Oudtshoorn (2002), van der Walt (2009) and Bromilow (2010).

*Field survey: Walk down*
Two site visit was undertaken on 6$^{th}$ to the 9$^{th}$ of November 2013 and 14$^{th}$ to the 15$^{th}$ of November 2013. During the walk down, accessible areas along the powerline routes were surveyed for protected plant species. Where observed, the localities and numbers of these plants were recorded using a handheld GPS (Garmin Montana 600). In addition, sensitive ecological features such as wetlands and ridges that are essential for the maintenance of ecosystems and ecological processes were noted.

*Data extrapolation*
Due to access difficulties, the entire route was not walked. The presence, frequency and number of protected trees and other species were extrapolated from data recorded between accessible pylons. For example, the number of the protected species between walked pylons were recorded and the population density of the species averaged over the distance between the pylons. The corridor for both the 750Kv and 400Kv lines was estimated at 100m. Soil and changes in the vegetation were also used to inform the presence of the species within a given area.

*Protected plant species identification:*
The report includes a photographic identification table for protected species confirmed and expected to occur within the 100m corridor that the 750Kv and 400Kv lines will be constructed in (Appendix A). This table should form part of the Construction and Operational Environmental Management Plan (EMP) and be available on site during construction. All workers clearing vegetation should be made aware of these species.

# 2. BACKGROUND TO THE STUDY AREA

## 2.1 Locality

The section of the proposed powerlines that was assessed comprised Section D and Section E of the Masa-Ngwedi line and is approximately 80km in length. The powerlines extent from the south-west of the town of Thabazimbi in the north and pass west of the town of Northam and the east of the Spitskop substation. The lines cross the R510 from west to east in the Manamakgoteng-area from where it circumvent a portion of Mogwase before it crosses the R510 again in a south-westerly direction to about 6km west of the town of Chaneng and about 7km south of Sun City. The tower numbers for this assessed portion of the line are as per Table 1.

The first 40km is reported on as Section D (this report) of the powerlines, while the last 40km are assessed in a concurrent report and known as Section E. Section D is situated mostly in the Limpopo Province, with the southern extent situated in the North West Province.

**Table 1: Tower numbers for each line and in which Section the towers are situated in**

| Section | 765Kv line (tower number 259-436) | 400Kv line (tower numbers 253-417) |
|---|---|---|
| ***Section D (this report)*** | *259-340* | *341-436* |
| **Section E** | 253-326 | 327-417 |

## 2.2 Vegetation Type

The study area is situated within the Savanna Biome of South Africa. The savanna includes wooded, shrubby hill slopes and grassy plains with scattered trees or bush-clumps. Diversity in savanna is provided by the variation in soil-type and topography; koppies, river lines and anthills (termitaria) provide localised changes in soil moisture and nutrients which create different habitats for plants and animals. The Savanna Biome comprises different regional vegetation types of which the Dwaalboom Thornveld and Central Sandy Bushveld are present along the powerlines (Table 2; Figure 1).

**Table 2: Vegetation types along the proposed route alignment**

| Tower positions | | Description and Conservation Status (Mucina and Rutherford 2006). |
|---|---|---|
| **750Kv** | **400Kv** | |
| **259 to 321** | **253 to 308** | **1 .Dwaalboom Thornveld**<br><br>Dwaalboom Thornveld occurs on the flats north of the Dwarsberge and mainly west of the Crocodile River The vegetation is open woodland and predominantly comprise microphyllous trees (e.g. *Acacia*-species), as well as shrubs and a few broad-leaved tree species such as *Combretum imberbe, Euclea undulate* and *Ziziphus mucronata.* The herbaceous layer is dominated by grasses. The vegetation support protected trees such as *Acacia erioloba*, *Sclerocarya birrea* subsp *caffra* and *Combretum imberbe,* while *Boscia* |

| Tower positions | | Description and Conservation Status (Mucina and Rutherford 2006). |
|---|---|---|
| 750Kv | 400Kv | |
| | | *albitrunca* may also occur sporadically. The vegetation type is relatively low in plant species diversity and endemism.<br><br>This vegetation type is mainly rooted in black clay soils. Some areas are less clayey, while other include eutrophic red soils. The clay content determines the species composition and in specific that of the *Acacia*-species. Probability of erosion is minimal within the level plains.<br><br>Dwaalboom Thornveld is considered to be Least Threatened and transformation attributed to cultivation and mining and mining related urban sprawl. Due to the numerous game farms in the area, this vegetation is privately conserved as well as about 6% conserved in statutory reserves. |
| **321 to 340** | **308 to 326** | **2. Central Sandy Bushveld**<br><br>The Central Sandy Bushveld occurs in low areas, on sandy plains and between mountains and comprises deciduous *Terminalia sericea* (Silver Cluster Leaf*)* and *Burkea africana* (Wild Seringa) woodland on sandy soils. Where soils are more shallow and rocky, *Combretum* woodland occurs and on less sandy soils *Acaica, Ziziphus* and *Euclea* species can be found The herbaceous layer is grass dominated with a low basal cover. The herbaceous layer is dominated by grasses. The vegetation can support protected trees such as *Sclerocarya birrea* subsp *caffra* and *Combretum imberbe,* while *Boscia albitrunca* may also occur sporadically. The endemic grass species *Mosdenia leptostachys* and herb *Oxygonum dregeanum* subsp*. canescens* var*. dissectum* are present within this unit.<br><br>*Central Sandy Bushveld is classified as Vulnerable.* Although about 70% of this vegetation types is still remaining in a fairly natural state, this type of vegetation is poorly protected in formal reserves. Within the studies area, the Mankwe Wildlife Reserve is situated within this vegetation type. |

### 2.3 Land Use

In Section D, the powerline routes will mainly traverse natural bushveld vegetation used for cattle grazing or game farms. Localised disturbances are present as well as some cultivation. Overgrazing was noted in the vicinity of Spitskop substation. Most of the 40km of the line is situated directly east of existing lines and servitudes.

### 2.4 Hydrology

Three rivers are crossed by the powerline routes. The Bierspruit is situated in the northern extent of the line and is indicated as a perennial river. The Brakspruit is a triburaty to the Bierspruit and are a non-perennial river. The Phufane River is situated in the southern extent of Section D and is a non-perennial river. Most of the watercourses were dry at the time of the assessment (Figure 2).

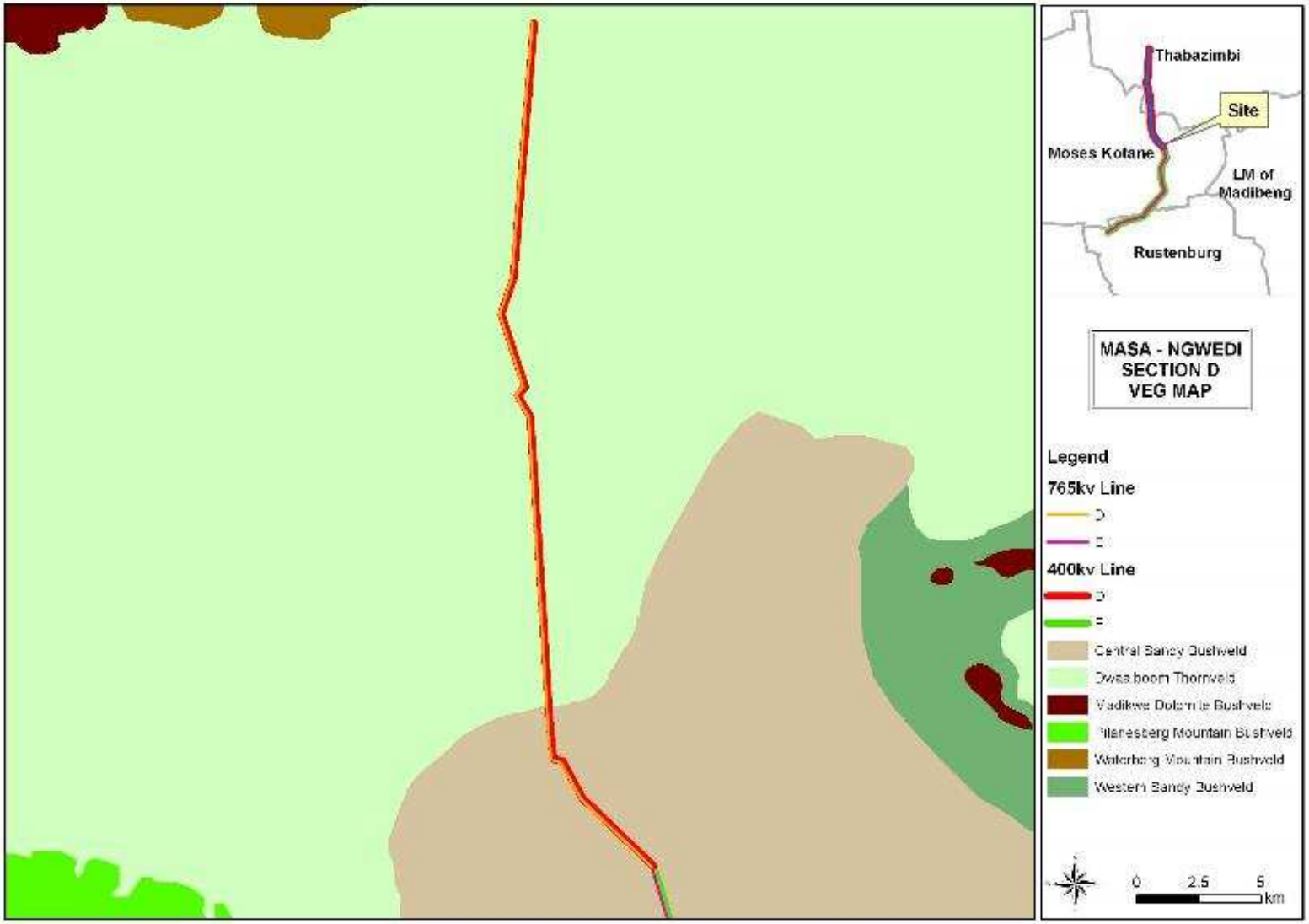



**Figure 1: Nationally described vegetation types along the route**

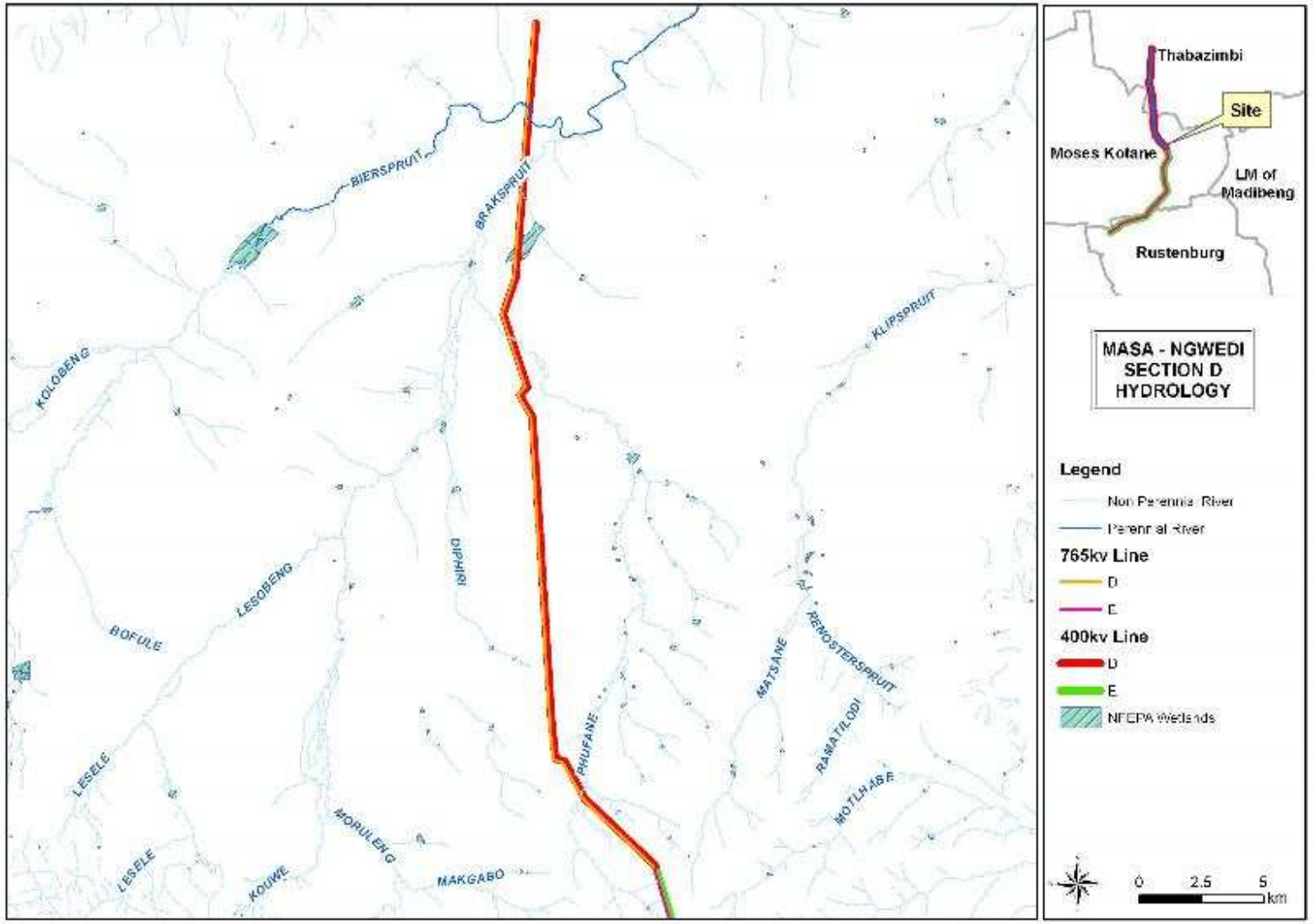



**Figure 2: Hydrology along the line**

## 3. RESULTS OF THE WALK DOWN

### 3.1 Broad vegetation groups

Two broad vegetation groupings was observed:

1. Open to closed woodland; and
2. Riparian vegetation.

#### 3.1.1 Open to closed woodland:

The vegetation along the powerline routes comprised mainly open to closed *Acacia*-dominated woodland with some mixed woodland in the most southern extent of Section D. The density of the vegetation depended on the land use, land management as well as soil variation along the lines corridor. The woodland was subdivided in *Acacia*-dominated woodland and Mixed woodland.

*Acacia woodland*: this vegetation dominated the area and comprised low to medium high, deciduous mircophyllous (small-leaved) trees. The *Acacia* species varied depending on the soil as *Acacia nilotica* and *A. tortillis* dominated the clayey soils along with broad-leaved trees such as *Ziziphus mucronata* (Buffalo-thorn), *Diospyros lycioides* (Bluebush) and *Euclea undulata* (Common Guarrie), as well as a large number of the shrub *Grewia flava* (Raisin Bush). The nationally protected tree, *Sclerocarya birrea* subsp *caffra* (Marula) was conspicuous along the most of the alignment, increasing southward past the Spitskop substation. In very clayey areas, the Marula tree was absent.

Two other nationally protected trees were observed within the *Acacia* woodland: *Acacia erioloba* (Camel Thorn) and *Combretum imberbe* (Leadwood / Hardekool). The occurrence of *Acacia erioloba* increased from the Spitskop substation northwards. This is likely due to increase of sand depth as *A. erioloba* prefers deep sands (Seymour & Milton, 2003): The occurrence along the line is thus not spread evenly but seems to peak around Tower 267 (400Kv) and Tower 276 (765Kv) and become less towards the north and south. *Combretum imberbe,* (a broad-leaved specie) occurred sporadically in the *Acacia*-woodland and its occurrence peaked around Tower 297 (400Kv) and Tower 309 (765Kv) towards the southern portion of Section D. The start of the lines in the northern portion could not be assessed. However an accessible area about 6km north of the start of Section D, included *C imberbe*. The tree occurs at higher densities along river fringes where soils are deeper, finer textured and more eutrophic than coarse dystrophic upland soils and only occasionally occur on heavy clay soils (Herman *et al*, 2003).

**Photograph 1: Open *Acacia*-woodland**

In overgrazed or disturbed areas within the *Acacia* woodland the basel cover was lower and the poisonous bulb, *Ammocharis coranica* (Ground Lily / Seeroogbol) grew abundantly (Photograph 2).

**Photograph 2: Grazed and disturbed woodland with *Ammocahirs coranica* (note this plant is poisonous)**

*Mixed woodland:*

The southern extent of Section D, comprised mixed woodland containing both microphyllous species, as well as broad-leaved species (Figure 4). This area is likely the ecotone between the Dwaalboom Thornveld and the Central Sandy Bushveld. *Acacia*-species were still conspicuous but a larger variety of other species were present and included the protected trees *Sclerocarya birrea* subsp *caffra* and *Combretum imberbe,* as well as *Peltophorum africanum, Searsia leptodictya* (Karee), *Pappea capensis* (Jacketplum), *Grewia* species and the succulent tree *Euphorbia ingens* (Naboom) and *Aloe marlothii* (Mountain Aloe).

The most southern extent was seemingly the most species diverse. Access was only possible at the last tower position (340 and 326 respectively). This portion of the line is therefore considered as under sampled (this area is also situated in a protected areas expansion focus area- see 3.2.4). Various interesting succulents such as *Sansevieria pearsonii, Euphorbia davyi,*

*Kleinia longiflora* and *Ledebouria* species was observed. The southern extent was more densely vegetated but were prone to invasion by *Dichrostachys cinerea* (Sickle Bush). The mixed woodland included the nationally protected trees *Sclerocarya birrea* subsp *caffra* (Marula) and *Combretum imberbe* (Leadwood), while no *Acacia erioloba* was noted here.

**Photograph 3: *Aloe marlothii* and *Euphorbia ingens* in the southern extent of Section D**

3.1.2 Riparian vegetation:

The National Water Act (Act No 36 of 1998) describe a watercourse as *(a)* a river or spring; *(b)* a natural channel in which water flows regularly or intermittently; *(c)* a wetland, lake or dam into which, or from which, water flows; and *(d)* any collection of water which the Minister may, by notice in the *Gazette,* declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks. Two rivers are crossed by the powerline routes. The Bierspruit is situated in the northern extent of the line and is indicated as a perennial river. The Phufane River is situated in the southern extent of Section D and is a non-perennial river. Most of the watercourses were dry at the time of the assessment. Riparian areas include plant communities adjacent to and affected by surface and subsurface hydrological features, such as rivers, streams or drainage lines (DWAFF, 2008). The riparian area represent the interface between aquatic and terrestrial habitats and can have vegetation representative of both habitats. Most of the vegetation associated with watercourses along the line comprise more-or-less the same species diversity as that of the terrestrial habitat, including *Acacia* species, *Combretum* species, *Searsia lancea* and *Gymnosporia* species. However, the trees were generally more vigorous and some additional species such as the tall growing grass *Phragmites autralis* were observed in the riparian vegetation.

**Photograph 4: The Bierspruit in the northern extent of the lines (left) and Phufane River in the southern extent of the line (right)**

Figure 3 below shows the broad vegetation groupings along the powerline. Areas that was cultivated or disturbed in the past were assumed to not contain any significance in terms of biodiversity.

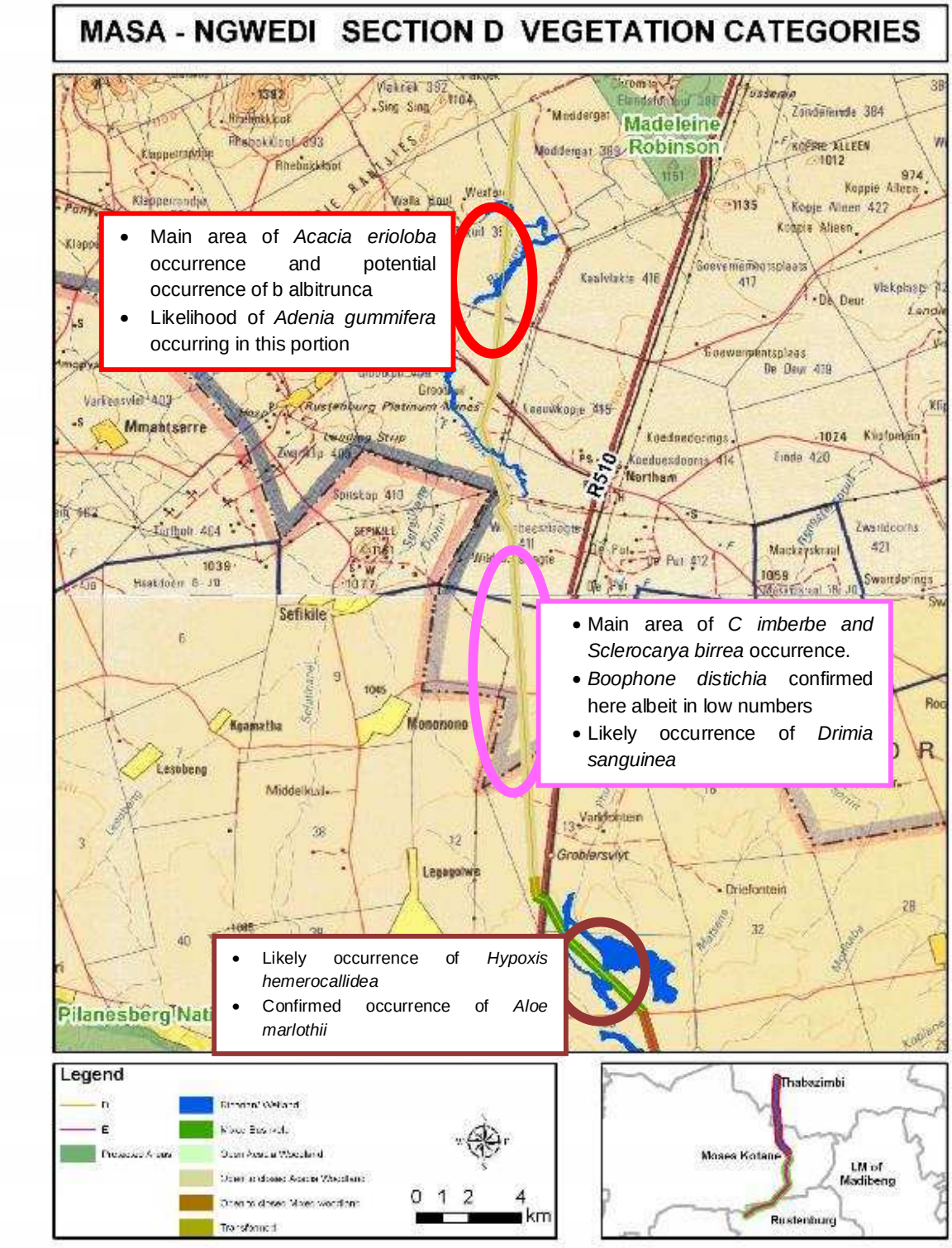
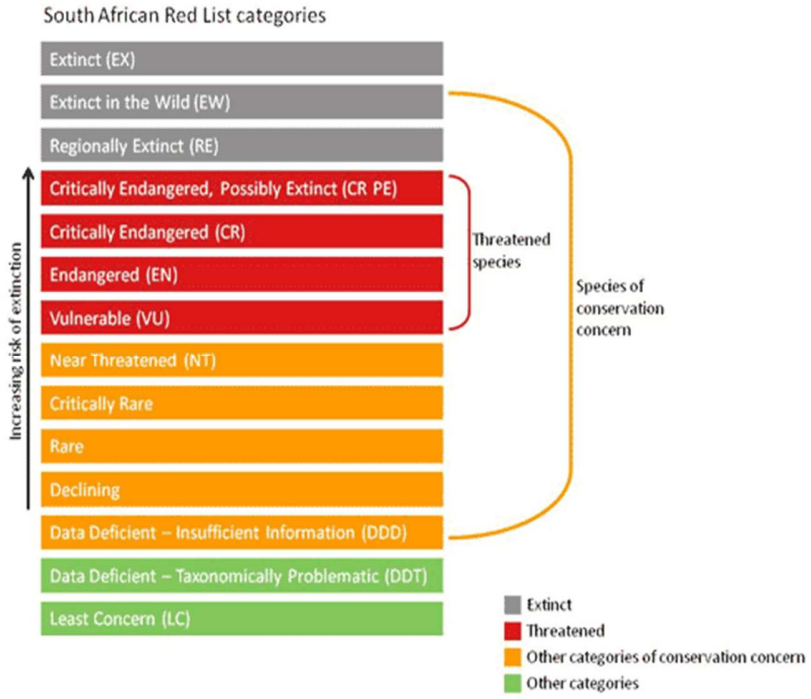



**Figure 3: Broad vegetation groupings and areas where sensitive plants occur**

### 3.2 Plants of Conservation Importance

#### 3.2.1 Nationally Protected Plant (Plants of Conservation Concern)

Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened, Extinct in the wild, Data deficient, Near-threatened, Critically rare, Rare and Declining (Figure 4). Chapter 4, Part 2 of NEMA Biodiversity Act, 2004 (Act No. 10, 2004) provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival.




(Source: http://redlist.sanbi.org/redcat.php)

**Figure 4: Threatened species and species of conservation concern**

A list of plants of conservation concern was compiled using information from the South African National Biodiversity Institute's (SANBI) checklist (SANBI, 2009), Raimondo *et al*, (2009), as well as information from the existing report (Bathusi Environmental Consulting, 2009). A list of ten (10) plants of conservation concern that have a likelihood of occurring along the routes are specified in Table 3. Two of these species were confirmed to occur. The species *Acacia erioloba*, and *Boophone distichia* are classified as declining. Although these plants are not yet threatened, their numbers are declining. It is advised that these species be conserved *in situ* where possible (Raimondo *et al,* 2009). However, where bulbous plants (*Boophone* distichia) will be damaged by construction activities, the plants should be removed during construction

and replanted as part of the rehabilitation process. Additional species that might occur includes *Drimia sanguinea, Hypoxis hemerocallidea* and *Adenia gummifera.*

**Table 3: Plants of conservation concern**

| Species | Conservation status | Habitat notes | Possibility of occurring -also see Figure 3 |
|---|---|---|---|
| *Drimia elata* | Data deficient (Taxonomic problems) | Varied habitat - rocky grassland | Unlikely habitat. The plant is not thought to occur along the lines |
| ***Acacia erioloba*** | **Declining** | **Widespread in the drier areas of the northern provinces of South Africa deep sandy soils and drainage lines** | **Confirmed to occur, especially in the northern extent from T 259-284 (750Kv); and T253-275 (400Kv).** |
| *Adenia gummifera* var. *gummifera* | Declining | Forested ravines forest patches and forest margins | Likely occur in the northern portion (Thabazimbi-area), but not observed at accessible tower positions – see Appendix A |
| ***Boophone disticha*** | **Declining** | **Rocky grasslands or open bushveld** | **Confirmed to occur along the centre portion of the line in Section D. Only one bulbs was observed, but it is highly likely that the plants occur in higher numbers here than what was noted. The confirmed locality was between T 309 and T310(765Kv); and T297-298 (400Kv).<br><br>At: S25 02.036 E27 14.328** |
| *Hypoxis hemerocallidea* | Declining | Occurs in a wide range of habitats, from sandy hills on the margins of dune forests to open rocky grassland; also grows on dry, stony, grassy slopes, mountain slopes and plateaux; appears to be drought and fire tolerant and can tolerate some disturbance. | This plant was recorded in Section E in open woodland. And it can thus likely occur in the southern extent of Section D |
| *Ilex mitis* var. *mitis* | Declining | Along rivers and streams in forest and thickets sometimes in the open. Found from sea level to inland mountain slopes. | Not all river areas could be sampled. This tree is more likely to occur where permanent moisture is available and thus unlikely to occur along the powerline routes |

| Species | Conservation status | Habitat notes | Possibility of occurring -also see Figure 3 |
|---|---|---|---|
| *Drimia sanguinea* | Near threatened | Open veld and scrubby woodland in a variety of soil types. | Likely to occur in open woodland through much of the route alignment. A plant thought to be *D sanguinea* was noted but without flowers it could not be positively identified. The area is: **T 300-316 (750Kv); and T289-304 (400Kv).** See Appendix A |
| *Stenostelma umbelluliferum* | Near Threatened | The inconspicuous nature of this species makes it easy to be overlooked. This plant's habitat is limited to deep black turf mainly near drainage lines on vertic soils with high clay content in grassland or savanna | Access to drainage lines was limited. The plant was not observed in sampled areas, but there is a likelihood that the plant may occur black turf soils –see Appendix A |
| *Jamesbrittenia bergae* | Vulnerable | Mixed bushveld in crevices on ferricrete outcrops with a southern aspect. 1056m-1106m. Known from only one locality near Thabazimbi | The powerline routes in the Thabazimi area is likely at a too low altitude for this plant to occur. In addition, the lines do not traverse outcrops and therefore the line is not likely to impact on this plant species |
| *Ledebouria atrobrunnea* | Vulnerable | Beestekraal, Kroondal and Northam. Foothills of the Magaliesberg on quartzite. Known only from three locations and is potentially threatened in the future by crop cultivation | This plant is likely to occur within the Northam extent of the powerline. However, its known distribution is on the Swartwitpensbokfonteinberg. The powerline does not traverse quartzite foothills and is therefore unlikely to impact on this plant |

### 3.2.2 Provincially Protected Plants

A number of provincially protected plants are listed in the Transvaal Nature Conservation Ordinance Act No. 12 of 1983 as well as the Limpopo Environmental Management Act 2003 (Act 7 of 2003). These plants are not to be removed, damaged, or destroyed without permit the North West Department of Agriculture, Conservation, Environment and Rural Development (NWDARD) or the Limpopo Economic Development Environment and Tourism. Table 4 indicates protected plant species that were confirmed to occur along the proposed powerline route alignment. Additional protected species that could occur include *Gladiolus serceovillosus*.

**Table 4: List of protected plants that was confirmed to occur or could potentially occur**

| Species | Protection per province | Occurrence |
|---|---|---|
| *Gladiolus* species | Both provinces | **Possible** occurrence along the whole route |
| *Aloe marlothii* | North West protected species | **Confirmed** occurrence in southern extent of the line |

### 3.2.3 Nationally Protected Trees

A number of trees indigenous to South Africa are nationally protected under the National Forests Act, 1998 (Act No 84 of 1998). The removal or pruning of these protected trees will require a permit from the Department of Agriculture Forestry and Fisheries. Table 5 lists the tree species confirmed to occur. As large portions of the line could not be accessed, and an estimate of species along the routes are given as well as an average per tower number in areas where the trees occurred abundantly (Table 6). The extrapolation method assumes the data are smooth.

**Table 5: Nationally protected trees occurring along the routes**

| **Species:** *Acacia erioloba* |
|---|
| **Common Name:** Camel Thorn |
| **Occurrence and methodology– if whole servitude is cleared** |
| This tree was common in the northern extent of the line with the highest occurrence between the following towers (see Figure 3):<br>T 268-281 (765kV); and<br>T266-272 (400kV)<br>The population comprised of large and old trees with limited young trees noted.<br><br>An accessible area was walked between towers to determine the average number of trees between consecutive towers in this area. The walk down included 4 consecutive towers and zig-zagged between the two powerlines towers in order to record all the Camel Thorns in the area walked. The area between towers, as well as a buffer of about 10m to either side of the 765kV and 400kV line were walked.<br><br>The following area between towers was assessed: Tower 277 to 280 (765Kv) and Tower 268 to 272 (400Kv). The area was calculated on Garmin BaseCamp to be about 0.14km² = 140000m²=14ha<br>• 22 trees were counted in this area.<br>• Thus the average number of trees per ha is 1.6<br><br>The average area where *Acacia erioloba* are prominent along the corridor of the line was calculated with Garmin Basecamp= 0.67km²=670000m²=67ha<br>• Therefore it is estimated that about 1,6 x 67 = 107* *A erioloba* trees could be impacted on by the corridor.<br><br>*Note that this is an average and are likely overestimated. However, this compensate for areas where *A erioloba* might occur sporadically and were not observed. |

| |
|---|
| **Species:** *Boscia albitrunca* |
| **Common Name:** Shepard's Tree / Witgat |
| **Occurrence and methodology** |
| *Boscia albitrunca* occurred sporadically within the area that the powerlines are situated in. A limited number of the trees were recorded in vicinity to the route, but not within accessible corridors. Therefore it is assumed that this tree may occur within the powerline corridors, especially in sandy, loamy and calcrete soils (Alias & Milton, 2003). This is a deep rooted species therefore favors deep sand. If it occurs, it is likely to share the same area of distribution along the line as *A erioloba* (Figure 3). |
| **Species:** *Combretum imberbe* |
| **Common Name:** Leadwood |
| **Occurrence and methodology – if whole servitude is cleared** |
| *Combretum imberbe* occur in large numbers south of the Spitskop substation. The tree was common within the corridor which included large and old specimens as well as young trees. The areas of highest occurrence were between the following towers:<br>T 305-329 (765kV); and<br>T 294-315 (400kV)<br><br>Due to the high frequency of occurrence, an area comprising two tower positions within the corridor was walked at two different points along the line:<br>T 309 to 310 as well as T317to 318(765kV); and<br>T297to 298 as well as 304 to 305(400kV)<br><br>The combined area walked measured on Garmin Basecamp = 79215m²=8ha<br>• In total 20 trees were counted in this area<br>• Thus the average number of trees per ha = 2,5 trees<br><br>The average area where *C imberbe* is prominent along the corridor of the line was calculated with Garmin Basecamp to be 1.25km²=1250000m²=120ha<br>• Therefore it is estimated that about 2.5 x 120ha = 300* *C imberbe* trees could be impacted on by the corridor.<br><br>*Note that this is an average and are likely overestimated as the average number was calculated in the area where a high frequency was noted. However, this compensates for areas where *C imberbe* might occur sporadically and were not observed. |
| **Species:** *Sclerocarya birrea* subsp *caffra* |
| **Common Name:** Marula |
| **Occurrence and methodology** |
| The frequency of Marula trees along the route is the highest of the protected tree species. A limited number of trees occur in the far northern extent of the powerline route, but the number increases from the Spitskop substation southward for the remainder of the extent of the powerlines. The towers where the trees were the most widespread, were as follows:<br>T 259 to 265 as well as 305 to 340 (765kV); and<br>T 253 to 258 and T 305 to 326 (400kV)<br><br>Due to the high frequency of occurrence, an area comprising two tower positions within the corridor was walked at two different points along the line: |

T 309 to 310 as well as T317 to 318(765kV); and
T297 to 298 as well as 304 to 305(400kV)

The combined area walked measured on Garmin Basecamp = 79215m²=8ha

- In total 18 trees were counted in this area
- Thus the average number of trees per ha = 2,25 trees

The average area where *S birrea* subsp *caffra* is prominent along the corridor of the line was calculated with Garmin Basecamp to be 2 km²=2000000m²=200ha

- Therefore it is estimated that about 2.25 x 200ha = 450* *S birrea* subsp *caffra* trees could be impacted on by the corridor.

*Note that this is an average and are likely overestimated as the average number was calculated in the area where a high frequency was noted. However, this compensate for areas where *S birrea* subsp *caffra* might occur sporadically and were not observed.

**Photograph 5: *Acacia erioloba* (left) and *Sclerocarya birrea* subsp *caffra* (right)**

**Photograph 6: Young *Combretum imberbe* (left) and an older tree coppicing after pruning**

Prior to construction, permit authorisation for the removal / destruction / pruning / translocation of the species confirmed to occur needs to be applied for. Some of the plants occur within the construction footprint, while others may be affected by stringing or construction related activities. A photo identification of these species are given in Appendix A and should be incorporated into the EMP. Contractors removing bush ahead of construction should be familiar with these species and notify the ECO if *Boscia albitrunca* is observed within the construction footprint.

### 3.2.4 Protected Areas Expansion

South Africa's Protected Areas network currently falls far short of sustaining biodiversity and ecological processes and therefore the National Protected Area Expansion Strategy (NPAES) are being implemented (DEA, 2009). The NPAES was commissioned by the Department of Environmental Affairs (DEA), co-ordinated by the South African National Biodiversity Institute (SANBI), and drafted in close collaboration with the South African National Parks (SANParks), other national conservation agencies and the Provincial conservation agencies. A project team comprising SANBI, SANParks and DEAT provided oversight to specialist consultants contracted to draft the strategy. The goal of the NPAES is to achieve cost effective protected area expansion for ecological sustainability and increased resilience to climate change. The NPAES sets targets for PA expansion, provides maps of the most important areas for PA expansion, and makes recommendations on mechanisms for PA expansion. The NPAES uses two factors, importance and urgency, to identify priority areas for PA expansion in the terrestrial environment. Although not currently protected, these areas should be considered as being of high development constraint for infrastructure proposed to be located within or in close proximity to these areas.

About 3km of the Southern extent of the Section D line is situated in an area earmarked for protected area expansion (Figure 5). The area is situated between T334 and T340 (765kV) and T320 and T326 (400kV). Therefore it is advisable that any electrical infrastructure in this area be planned in consultation with the South African National Biodiversity Institute (SANBI) as well as the Department of Environmental Affairs (DEA).

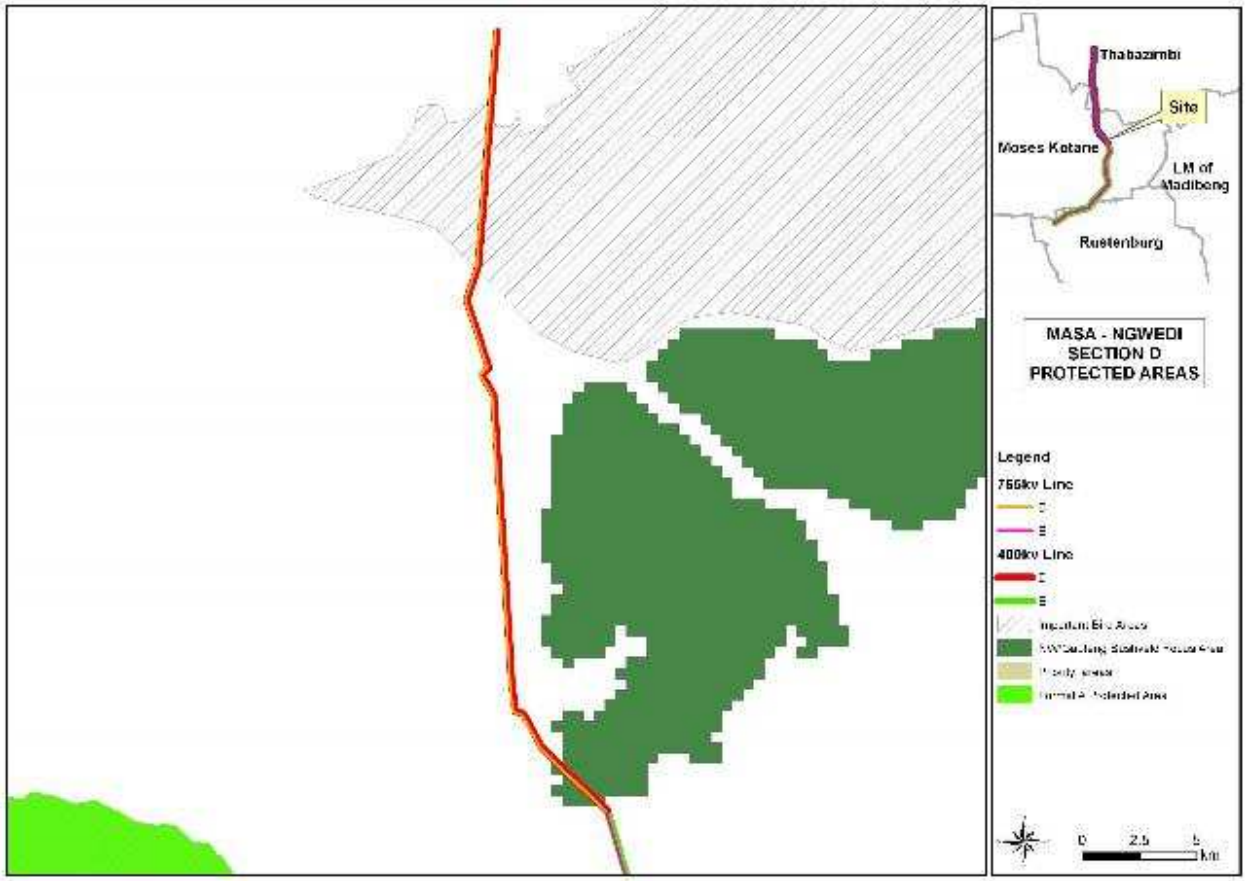



**Figure 5: Tower positions on the south-westerly corner of the NW Gauteng Bushveld protected areas expansion focus**

## 4. INPUT INTO ENVIRONMENTAL MANAGEMENT PLAN

The proposed powerline routes will have an impact on woodland and riparian areas. The woodland vegetation is not considered threatened and therefore not considered to be sensitive to the proposed powerline routes. However, the last 5km of the line, between T328 – 340 (765kV) and T314-326 (400kV), included unique species not observed in the rest of the lines. On the other hand, riparian vegetation should be considered sensitive as the removal of these species could have a damaging impact on the watercourses. Riparian vegetation ensure the health and function of riparian areas and therefore it is recommended that vegetation clearing be kept to a minimum in riparian areas. In addition, three protected tree species occur within the

powerline route alignment and should not be removed without prior consent and a permit from the National Department of Forestry and Fisheries.

General and specific mitigation measures per tower positions where impacts are likely are listed in Table 6.

**Table 6: Tower numbers and proposed management input for construction and operation**

| Tower numbers | Impact and Mitigation |
|---|---|
| ***General mitigation measures*** | |
| All towers | *Pre-construction and construction*<br>• Appoint Environmental Control/ Site Officer. Appointment prior to start of construction, responsibilities should include, but not limited to ensuring adherence to EMP guidelines, guidance of activities, planning, reporting.<br>• The Contractor shall supply a method statement regarding vegetation clearing at the tender stage.<br>• The Contractor must adhere to the bush clearing, erosion control and herbicide use guidelines of Eskom as a minimum.<br>• Demarcate the construction footprint as well as the construction camps.<br>• Prohibit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area.<br>• No open fires are permitted within naturally vegetated areas.<br>• Formalise access roads and make use of existing roads and tracks where feasible, rather than creating new routes through naturally vegetated areas.<br>• Remove and destroy all alien invasive plant species from the route corridors and immediate surroundings.<br>• Provincially protected and 'Declining' bulbous plants must be removed - where possible and feasible - and either used during rehabilitation or be relocated to conserved areas. These plants can only be removed and relocated with permission (permit) from the local conservation authority (LEDET, and NW DEDECT).<br>• Wherever possible, the construction footprint should not infringe on riparian vegetation.<br>• Construction workers may not remove flora and neither may anyone collect seed from the plants without permission from the local authority.<br>• Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005).<br>• Remove only the vegetation where essential for construction and stringing and do not allow any disturbance to the adjoining natural vegetation cover.<br>• Clearance of vegetation should be done in accordance to standards as available in Eskom documentation.<br>• Pruning of indigenous trees is preferred to complete removal. Pruning must be according to set standards as available in Eskom documentation.<br>• All litter should be contained in suitable storage areas and immediately removed to a suitable disposal facility.<br>• The use of fires for cooking purposes or any other purpose may result in accidental spread to adjacent areas. All areas, as a result of high biomass and flammability are regarded prone to the development and spread of |

| Tower numbers | Impact and Mitigation |
|---|---|
| | accidental fires. Although fire is a natural occurrence, any accidental occurrence should be prevented. Other causes include smoking, discarded cigarettes and matches, overheating vehicles or equipment or faulty electrical equipment or wiring, welding and cutting operations. No firewood may be collected.<br><br>*Operational:*<br>• Pruning during maintenance must be according to set standards as available in Eskom documentation.<br>• Maintenance workers should not unnecessary trample vegetation and clear the work area of any surplus materials |
| ***Erosion Control:*** | |
| All Towers | *Pre-construction and construction*<br>• Due to the clayey nature of much of the powerline routes as well as the relative flat topography and dry climate conditions, erosion is likely to be low. However, vegetation clearing, especially in proximity to drainage lines and watercourses could result erosion in the rainy season.<br>• Stockpiled topsoil should not be compacted and should be replaced as the final soil layer once construction is complete.<br>• No vehicles may be allowed access onto the stockpiles after they have been placed.<br>• Stockpiled soil must be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season.<br>• Topsoil obtained from sites with different soil types must not be mixed.<br>• Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste or any other foreign matter, which may inhibit the later growth of vegetation and micro-organisms in the soil.<br>• Soil must not be stockpiled on drainage lines or near watercourses.<br>• Soil must be exposed for the minimum time possible once cleared of invasive vegetation. The timing of clearing and grubbing should be co-ordinated as much as possible to avoid prolonged exposure of soils to wind and water erosion.<br>• If topsoil will be stockpiled for a longer period, it must be either vegetated with indigenous grasses or covered with a suitable fabric to prevent erosion and invasion by weeds.<br>• To limit the introduction of alien species into the area, no soil may be imported onto site without notifying the environmental officer.<br>• Seasonally wet areas and/or turf soils to be avoided during wet and rainy periods or while the soil is drenched. |

| Tower numbers | Impact and Mitigation |
|---|---|
| | *Operational:*<br>• Monitor re-vegetation after construction ceased and ensure that all disturbed soils are colonised by species typical of the area. |
| ***Alien Invasive Vegetation:*** | |
| All Towers | *Pre-construction and construction*<br>• Alien vegetation is mostly associated with the rivers and old agricultural fields and overgrazed areas. All alien vegetation should be removed from the servitude area and immediate surrounds.<br>• Limited alien invasive plants were observed, with *Opuntia* species (Prickly Pear) being the most abundant. Appendix B list the *Opuntia* species as well as others that may become invasive species along the route corridors.<br>• By removing these species, the spread of seeds will be prevented into disturbed soils which could thus have a positive impact on the surrounding natural vegetation.<br>• All alien seedlings and saplings must be removed as they become evident for the duration of construction.<br>• Manual / mechanical removal is preferred to chemical control.<br>• All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO<br>• Appointment of alien plant working group / assign this duty to specific staff.<br>• Ensure that contractors / alien working group can identify the relevant plants and are aware of the removal procedures.<br>• Ensure that only registered and certified person(s) apply herbicides according to manufacturer's instruction. Please note that all person(s) / contractors appointed to apply herbicides should be registered in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947), as amended. Herbicides application shall be done by suitably trained personnel in possession of an appropriate course certificate, or under the direction of a qualified pest control operator, registered under the Fertilizers, Farm Feeds, Agricultural Remedies Act. Registration with the Pest Control Service Industry Board (PCSIB) is also preferred.<br>• Sequence of areas to be cleared of invasive plants as construction progresses.<br>• Accepted removal and treatment methods should be implemented with extreme caution not to contaminate aquatic systems. |

| Tower numbers | Impact and Mitigation |
|---|---|
| | • Herbicide application to be conducted according to manufacturer's label.<br>• Clearance of vegetation should be done in accordance to standards as available in Eskom documentation.<br><br>*Operational:*<br>• The servitude should be monitored at least twice a year for the emergence of alien invasive plant species<br>• Should these species become apparent, the timeous eradication will prevent the plants spreading into natural vegetation.<br>• Mechanical removal is preferred to the use of herbicides, especially in proximity to watercourses. |
| ***Rehabilitation:*** | |
| All Towers | *Pre-construction and construction*<br>• The Contractor shall supply a method statement regarding vegetation clearing and rehabilitation at the tender stage.<br>• The pruning of the woody layer is recommended instead of complete removal of all woody plants. Leaving a significant portion of the woody structure intact will prevent the establishment of an atypical habitat, limiting adverse impacts to a large extent.<br><br>*Operational:*<br>• The disturbed area should be left to rehabilitate from re-growth from trees pruned trees and from seeds in the soil bank and proximate indigenous vegetation. However, the area should be monitored and corrective action taken if alien invasive plant spices or declared bush encroacher species are noted within the servitude.<br>• Re-plant bulbous plants of conservation concern (e.g. *Boophone distichia*) that was removed prior to the construction.<br>• Prevent cattle grazing on the rehabilitated footprint as to ensure rehabilitation success. The rehabilitated areas could be cordoned off for at least two years. As soon as rehabilitation was found to be successful, the cordons could be removed.<br>• Implement an alien invasive plant monitoring and management plan whereby the spread of alien and invasive plant species into the rehabilitated areas are regularly removed and re-infestation monitored for at least two years.<br>• Colonisation of the disturbed areas by plants species from the surrounding natural vegetation must be monitored to ensure that vegetation cover is sufficient within one growing season. |

| Tower numbers | Impact and Mitigation |
|---|---|
| | • Monitoring of the rehabilitation success should take place for at least three years and include corrective follow-up action. |
| ***Bush encroachment:*** | |
| All towers | *Operational:*<br>Bush encroachment is a term used for "stands" of indigenous woody plants that tend to become abnormally abundant when the area is degraded by e.g. overgrazing or inappropriate fire regimes or the complete lack thereof (Agricultural Research Council, 2013). The plants themselves are thus not the problem, but their increased abundance or encroachment into grassland serves as an indicator of poor land management practices or degradation. The natural vegetation could degrade over time if suitable rehabilitation of the disturbed soils does not take place. The invasion by this tree species could lead to the demise of the grassland and loss of grazing potential to the local farmers.<br>• Construction related disturbances can lead to densification of open woodland, resulting in loss of species diversity.<br>• The servitudes should be monitored for densification by species such as *Acacia eurubescens, A nilotica, A tortilis, A. melifera* and *A. karoo*, as well as Asparagus species and *Tarchonanthus camphoratus*.<br>• Delay the re-introduction of livestock (where applicable) to all rehabilitation areas until an acceptable level of re-vegetation has been reached. |
| **Nationally Protected Trees – Pre-construction** | |
| All Towers | *Pre-construction and construction*<br>• The contractors that will be undertaking bush clearing must be able to identify the protected species that occur and are likely to occur.<br>• Once the position of the tower numbers are marked and access established, it is advised that the construction footprints be assessed by the ECO / contractor to determine if all species observed and that must be removed, have permits in place for their removal. |
| T 259-292 (765kV); and T253-282 (400kV) | Nationally Protected *A erioloba* tree species, also classified as Declining:<br>• These trees can only be removed or pruned with a permit from the Department of Forestry and Fishery (DAFF). It is estimated that about a 100 individuals can occur along the route with the highest occurrence between:<br>T 268-281 (765kV); and<br>T266-272 (400kV) (Figure 3) |

| Tower numbers | Impact and Mitigation |
|---|---|
| | • Pruning the trees are preferred to clear felling. Note that all equipment must be disease free.<br>• If the tree is pruned, the tree is able to coppice even from cut stumps and fallen over, partly dead trees (Seymour & Milton, 2003). It can also multiplies by root suckers. However, the coppices out of cut stumps are highly sensitive to browsing by goats /cattle and presumably other browsers, which substantially reduced biomass and hampers regeneration from old tree stumps (Seymour & Milton, 2003).<br>• Prune the trees beyond the goat / cattle browsing line.<br>• If the pruned trees can be protected from browsing or pruned high enough, re-growth can be very successful.<br>• The contractor must be able to identify these trees – see Appendix A.<br>• If the trees must be removed, an offset of planted trees must be considered at 1:1<br><br>**estimate* |
| Likely occurrence:<br>T 259-292 (765kV); and<br>T253-282 (400kV) | *Boscia albitrunca* occurred sporadically within the area that the powerlines are situated in. This is a deep rooted species favors deep sand and although not recorded in accessible areas of the powerline route, it is likely to share the same area of distribution along the line as *A erioloba* (Figure 3).<br>• The ECO and contractor must familiarise themselves with this tree – see Appendix A<br>• If the tree is found within the construction footprint, it can only be removed or pruned with a permit from the Department of Forestry and Fishery (DAFF).<br>• The tree is not expected to occur in great numbers (the tree apparently occurs at lower densities in area of high stocking rates, in response to browsing pressure) and is unlikely to grow higher than 4-7m (Alia & Milton, 2003).<br>• Pruning the trees are preferred to clear felling. Note that all equipment must be disease free. |
| T 305-329 (765kV); and<br>T 294-315 (400kV) | Nationally Protected *Combretum imberbe* tree species;<br>• These trees can only be removed or pruned with a permit from the Department of Forestry and Fishery (DAFF). It is estimated that about 300* individuals can occur along the route.<br>• Pruning the trees are preferred to clear felling.<br>• Coppicing regrowth from harvested stumps in *C. imberbe* is high. The height at which this tree is pruned is important as it influences the coppicing ability. Stump mortality generally results when trees are harvested close to the ground, thereby subjecting coppicing shoots to intensive domestic livestock herbivory and fire damage (Clarke 1997). A harvesting height of **one meter** appears most advantageous to survival and coppicing potential (Herrman *et al,* 2003).<br>• The contractor must be able to identify these trees – see Appendix A. |

| Tower numbers | Impact and Mitigation |
|---|---|
| | **estimate* |
| T 259-265; as well as 305-340 (765kV); and T 253-258; as well as T 305-326 (400kV) | Nationally Protected *Scelrocarya birrea* subsp *caffra* tree species:<br>• These trees can only be removed or pruned with a permit from the Department of Forestry and Fishery (DAFF). It is estimated that about a 450* individuals can occur along the route with the highest occurrence between:<br>T 268-281 (765kV); and<br>T266-272 (400kV) (Figure 5)<br>• Pruning the trees are preferred to clear felling.<br>• If the tree is pruned, the tree is able to coppice even from cut stumps and fallen over, partly dead trees (Seymour & Milton, 2003). It can also multiplies by root suckers. However, the coppices out of cut stumps are highly sensitive to browsing by goats /cattle and presumably other browsers, which substantially reduced biomass and hampers regeneration from old tree stumps (Seymour & Milton, 2003).<br>• Prune the trees beyond the goat / cattle browsing line.<br>• If the pruned trees can be protected from browsing or pruned high enough, re-growth can be very successful.<br>• The contractor must be able to identify these trees – see Appendix A.<br><br>**estimate* |
| ***Plants of conservation concern:*** | |
| All Towers | *Pre-construction and construction*<br>A number of plants of conservation concern not identified at the time of the field survey, has a possibility of occurring along the proposed routes. Some of these plants are easily overlooked when not in flower or dormant.<br>• The contractors and workers should familiarise themselves with the species that could possibly occur (Appendix A).<br>• Conserve the plants *in situ* where possible.<br>• Note that the bulb species are dormant in winter and should be searched for in summer and preferably during the species flowering time.<br>• Prior to site clearing, the area must be surveyed for the occurrence of these species. If the species are found within the construction footprint, it can only be removed or pruned with a permit from the local conservation department.<br>• For the duration of construction and stringing, cordon of the plants with clearly visible markers, prohibiting trampling or access to the plants |

| Tower numbers | Impact and Mitigation |
|---|---|
| | • The persistence of the plant should be monitored by the appointed ECO<br>• Remove cordon after completion of construction and stringing activities<br>• Where the plant is deemed to be under threat from construction activities, the bulb should be relocated to suitable habitat in proximity to its original locality.<br>• A general permit must be obtained from LEDET to be able to remove and relocate these plants if found within the construction footprint.<br>• If any additional species are found for which uncertainty exist (e.g. not a common species along the line), a botanist / ecologist should be contacted for an opinion. The ECO should take photographs (including close ups) of all parts of the plant and send to the specialist for speedy identification. Once identified, the appropriate action should be taken to conserve the species if identified to be of conservation concern.<br>• Once the position of the tower numbers are marked and access established, it is advised that the construction footprints be assessed by the ECO / contractor to determine if all species observed and that must be removed, have permits in place for their removal. |
| Between<br>T 309- T310(765Kv); and<br>T297-298 (400Kv). | The Declining plant species *Boophane distichia* was observed **at: S25 02.036 E27 14.328**<br>Only one individual was observed. However, it is thought that more individuals could occur sporadically along the line.<br>• The contractors and workers must be familiar with this plant (Appendix A).<br>• A general permit must be obtained from LEDET to be able to remove these plants if found within the construction footprint.<br>• Conserve the plants *in situ* where possible.<br>• For the duration of construction and stringing, cordon of the plants with clearly visible markers, prohibiting trampling or access to the plants<br>• The persistence of the plant should be monitored by the appointed ECO<br>• Remove cordon after completion of construction and stringing activities<br>• Where the plant is deemed to be under threat from construction activities, the bulb should be relocated to suitable habitat in proximity to its original locality.<br>• If these plants cannot be preserved in their current locality, they should be removed as part of a rescue and rehabilitation plan.<br>• In addition, general mitigation measures applies |
| ***Riparian Vegetation and vegetation associated with watercourses such as wetlands:*** | |

<table>
<tr><th colspan="2">Tower numbers</th><th>Impact and Mitigation</th></tr>
<tr><td>765kV</td><td>400kV</td><td rowspan="2">Pre-construction and construction:<ul><li>Planning of construction site must include eventual rehabilitation / restoration of indigenous vegetative cover in riparian areas</li><li>No activities should take place in the watercourses and associated buffer zone. Where the above is unavoidable, only a pylon footprint and no access roads can be considered. This is subjected to authorization by means of a water use license.</li><li>Ensure placement of footprints outside 1:100 year floodlines.</li><li>Construction in and around watercourses must be restricted to the dryer winter months.</li><li>Remove as little riparian vegetation as possible.</li><li>A temporary fence or demarcation must be erected around the works area to prevent access to sensitive riparian vegetation. The works areas generally include the servitude, construction camps, areas where material is stored and the actual footprint of the tower/pylon.</li><li>Consider the various methods of stringing and select whichever method(s) that will have the least impact on watercourses e.g. shooting a pilot cable and pull cables with a winch, or flying cables over</li><li>Stringing should preferably not make use of vehicles in watercourses. If unavoidable, plan stringing activities to take place within the drier winter months and use equipment with the smallest possible footprint e.g. quad bikes.</li><li>Plan stringing through watercourses to take place at pre-determined points such as where the wetland width (and thus area to be impacted) is the smallest.</li></ul>Operational:<ul><li>Maintenance activities should not take place within watercourses or buffer zones. Where unavoidable, the footprint needed for maintenance must be kept to a minimum.</li><li>Where possible, maintenance within watercourses must be restricted to the drier winter months.</li><li>Maintenance activities should not impact on rehabilitated or naturally vegetated areas</li></ul></td></tr>
<tr><td>T 266<br>T 267<br>T 273<br>T 274<br>T 275<br>T 287<br>T 288<br>T 331<br>T 335</td><td>T 259<br>T 260<br>T 265<br>T 266<br>T 267<br>T 277<br>T 278<br>T 317<br>T 321</td></tr>
<tr><td colspan="3">Poisonous Plant: Ammocharis corranica:</td></tr>
<tr><td colspan="2">T 292 and T302(765kV); and<br>T282-291 (400kV).</td><td>The bulbous plant Ammocharis corranica (Ground lily / Seeroogbol) occur in great numbers in this portion of the line – Appendix A. The bulbs tends to increase in overgrazed and disturbed areas.<ul><li>All portions of this plant is poisonous</li><li>Contractors must be made aware of the risk and take precautionary action when these plants are handled</li></ul></td></tr>
</table>

| Tower numbers | Impact and Mitigation |
|---|---|
| ***Protected Areas Expansion Focus Area*** | |
| T334 to T340 (765kV)<br>and<br>T320 to T326 (400kV). | *Pre-construction and construction*<br>• Prior to any electrical infrastructure being constructed or vegetation cleared, the South African National Biodiversity Institute (SANBI) as well as the Department of Environmental Affairs (DEA) should be consulted with regards to the proposed powerlines within the NW Gauteng Bushveld Focus Area for protected Areas Expansion. |

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## 6. GLOSSARY

| | |
|---|---|
| **Alien species** | Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity |
| **Conservation concern (**Plants of..) | Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened (see **Threatened**), Extinct in the wild, Data deficient, **Near threatened**, Critically rare, Rare and **Declining**. These plants are nationally protected by the National Environmental Management: Biodiversity Act. Within the context of these reports, plants that are provincially protected are also discussed under this heading. |
| **Conservation status** | An indicator of the likelihood that species remaining extant either in the present day or the near future. Many factors are taken into account when assessing the conservation status of a species: not simply the number remaining, but the overall increase or decrease in the population over time, breeding success rates, known threats, and so on. |
| **Declining** | A taxon is declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Threatened or Near Threatened, but there are threatening processes causing a continuous decline in the population (Raimondo *et al*, 2009). |
| **Habitat** | Type of environment in which plants and animals live |
| **Indigenous** | Any species of plant, shrub or tree that occurs naturally in South Africa |
| **In Situ** | "In the place" In Situ conservation refers to on-site conservation of a plant species where it occurs. It is the process of protecting an endangered plant or animal species in its natural habitat. The plant(s) are not removed, but conserved as they are. Removal and relocation could kill the plant and therefore in situ conservation is preferred/ enforced. |
| **Invasive species** | Naturalised alien plants that have the ability to reproduce, often in large numbers. Aggressive invaders can spread and invade large areas |
| **Mitigation** | The implementation of practical measures to reduce adverse impacts |
| **Protected Plant** | According to Provincial Nature Conservation Ordinances or Acts, no one is allowed to sell, buy, transport, or remove this plant without a permit from the responsible authority. These plants are protected by provincial legislation. |

## APPENDIX A: PLANT ID TABLES

**Table 7: Plants of conservation concern confirmed to occur along the route corridors**

| Scientific Name | Status / protection | Suitable Habitat |
|---|---|---|
| ***Boophane disticha*** **Poison Bulb** | **Declining** | **Open woodland-grassland, often in rocky places** |
| Flowers appear before the leaves in early spring to early summer   | | |
| ***Acacia erioloba*** **Camel Thorn** | **Declining & Nationally protected tree** | **Deep sand, mainly in northern extent of the line** |
| Thorn bases swollen, hard, curved fruit/pod. Greyish leaves   | | |

| | | |
|---|---|---|
| ***Combretum imberbe*** **Leadwood / Hardekool** | **National Protected Tree** | **Open woodland along drainage lines or open veld. Sometimes in heavy clay** |
| Bark cracked into rectangular blocks, young twigs seems spiny, leaves grey green, fruits 4 winged    | | |
| ***Sclerocarya birrea*** **subsp *caffra* Marula** | **National Protected Tee** | **Woodland in sandy loam** |
|   Large, prominent trees, compound leaves with a terminal leaflet and characteristic Marula fruit. Bark flacking | | |
| ***Aloe marlothii*** **Mountain Aloe** | **Provincially protected in the North West** | **Bushveld and mountainous areas. Usually where frost is infrequent.** |
| Single stemmed Aloe, usually 2-4 m tall (occasionally up to 6 m), with old dried leaves remaining on the stem below the upper living leaves. Spines on upper and lower surface of leaves. Inflorescences slanted, carried almost horizontally | | |

**Table 8: Plans of conservation concern that potentially occur**

| Scientific Name | Status / protection | Suitable Habitat |
|---|---|---|
| ***Drimia saguinea*** | **Near threatened** | **Open veld and scrubby woodland in a variety of soil types.** |
| Highly poisonous bulb that has a deep-red colour, a portion visible above ground, whitish-green flowers appear in spring before the leaves.    | | |
| ***Stenostelma umbelluliferum*** | **Near Threatened** | **The inconspicuous nature of this species makes it easy to be overlooked. This plant's habitat is limited to deep black turf mainly near drainage lines on vertic soils with high clay content in grassland or savanna** |
| Large tuberous rootstock, milky latex where when damaged, the fruit is a follicle carried upright, usually solitary in an umbel with longitudinal bands of different shades of green. The seeds are flat and brown and have a white tuft of hairs (coma). | | |

Images from http://www.plantzafrica.com/plantgrs/stenostelumbel.htm

| ***Adenia gummifera* var. *gummifera*** | **Declining** | **Forested ravines forest patches and forest margins** |
|---|---|---|

Bulbous base, succulent. Bark can be pale green with white powder. Grows into trees, red fruits from thick bulbous base

| | | |
|---|---|---|
| ***Hypoxis hemerocallidea*** **African Potato** | **Declining** | **Open woodland, sometimes close to drainage lines and wetlands** |

Typical star formation of leaves as seen from the top, yellow flowers in early spring and summer.

| | | |
|---|---|---|
| ***Boscia albitrunca*** **Shepard' Tree / Witgat** | **National Protected Tree** | **Dry areas with low rainfall, usually on deep sand** |

The tree trunk is distinctly smooth and white or whitish grey with bare stem, rounded evergreen grown, could have a stunted appearance. The fruit ripens to a smooth yellow. Flowers are yellowish green and heavily scented (July-Nov). *Easily confused with Boscia foetida that occurs abundantly in the studies area. The flowers of B foetida are fowl smelling and the tree is usually larger and without the distinct white trunk.*

**Table 9: Poisonous plant, *Ammocharis corranica***

| |
|---|
| This plant occurs in the area around Sptiskop substation and care should be taken when handling the plant as all plant parts are poisonous |
|  |

## APPENDIX B: ALIEN INVASIVE PLANT SPECIES

***Opuntia ficus-indica –confirmed to occur sporadically in woodland vegetation, mainly south of Sptiskop substation***

Sweet Prickly Pear

- Much branched, succulent shrub or trees;
- Dark green, cladodes;
- Red-orange to yellow flowers;
- Pieces should not be carted away and discarded, as this is one of the most common ways in which new infestations begin

**☠Plant sap and fruits of some species are poisonous**

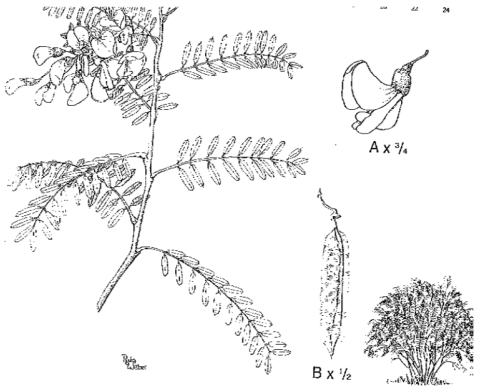
**☠Whole plant is poisonous (some fruit are edible)**

***Sesbania punicea – likely occurrence in al riparian vegetation***

Red Sesbania

- Deciduous shrub or small tree with slender branches
- Dark green, drooping pinnate leaves, ending in tiny, pointed tips
- Red-orange pea-like flowers in September to March
- Brown seed pods, four winged with the tip sharply pointed.

**☠Whole plant is poisonous**




***Argemone mexicana* and *A ochroleuca* – *likely to invade disturbed soils post construction***

Mexican Poppies

- An annual, spiny herb
- Grey or bluish green and spiny leaves with prominent white vein
- Stem exude yello sap when cut
- Flowers yellow to creamy white from Sept –Jan

☠Whole plant and seeds are poisonous, Sap and spines are skin irritants

***Nicotiana glauca* – *likely to occur in riparian vegetation***

Wild Tobacco

- Evergreen, slender shrub or small tree, blue-green all over.
- Blue-green leaves are leathery on long petioles (leave stalk)
- Flowers are tubular yellow to light orange, drooping clusters, all year
- Invades road sides, riverbanks and waste lands

***Sesbania bispinosa* – *likely to colonise disturbed areas in black clay soils***

Spiny Sesbania

- Herb, between 1 and 3m tall and slender
- Compound leaves
- Yellowish flowers with purple/burgundy markings (image)
- Fruit a glaborous pod, thin and constricted between the seeds

## APPENDIX C: CURRICULUM VITAE OF SPECIALIST


| | |
|---|---|
| Specialist consultant and owner: | **ANTOINETTE EYSSELL (Pr Sci Nat)** |
| | **Sole proprietor of Dimela Eco Consulting** |
| Main specialisation: | Vegetation Assessments |
| Professional membership: | South African Council of Natural Scientific Professionals |
| | Registered as Professional Natural Scientist (Ecology) |
| | Registration number 400019/11 |
| Contact details: | (+27)83 6426 295 |
| | Antoinette@dimela-eco.co.za *or* |
| | DimelaEcoConsulting@gmail.com |


### EXPERIENCE AND SPECIALISATION

- Vegetation assessments;
- Vegetation overviews or scans;
- Strategic ecological assessments;
- Mitigation measures to reduce impacts on the natural environment;
- Ecological management plans (including alien vegetation management);
- Specialist input: ecological conditional requirements for Green Star rating;
- Ground-truthing of vegetation related data; and
- Review of ecological reports.

### MEMBERSHIPS IN PROFESSIONAL SOCIETY

- Professional Natural Scientist (*Pr. Sci. Nat.*) with the South African Council for Natural Scientific Professionals (SACNASP)
  Registration number 400019/11

### EDUCATIONAL QUALIFICATIONS

- M.Sc Environmental Science, University of Pretoria (2010)
  Dissertation: *Land cover change and its effect on future land uses*
- B. Sc (Hons) Horticulture, University of Pretoria (1999-2000)
  Dissertation: *Horticultural uses of the indigenous Barleria species*
- B. Sc (Agriculture) Horticulture, University of Pretoria (1993-1996)

### EXAMPLES OF SOME PAST PROJECTS

| PROJECT NAME | INDUSTRY / CLIENT | DATE | ADDITIONAL INFORMATION |
|---|---|---|---|
| Rangeview Section 24 G Rectification: | Mogale City Local Municipality. | April 2009 | Facilitation of the Rectification Process for the unlawful commencement or continuation of the listed activities in terms of |

| PROJECT NAME | INDUSTRY / CLIENT | DATE | ADDITIONAL INFORMATION |
|---|---|---|---|
| Vegetation Assessment | | | section 24G of the National Environmental Management Act (Act no 107 of 2006). The study involved the assessment of vegetation communities in terms of ecological function and conservation value as well as extent of impact due to unlawful activities. |
| ESKOM Hendrina | ESKOM | February 2010 | Ground truth the final route alignment to inform possible amendments and the Environmental Management Plans (EMP) with regards to sensitive areas, plants or faunal species and suitable mitigation measures for construction and operation. |
| Olifantsvlei Cemetery (Gauteng) | Johannesburg City Parks | April 2010 | Vegetation assessment and identification and mapping of a small population of *Kniphofia typhoides* (Near Threatened) |
| Kyalami Gardens | Developer | October 2010 | Verify an outdated report as well as search for plants of conservation concern that might occur on the site. An isolated patch of primary Egoli Granite Grassland was mapped and added as an addendum to the historic report. |
| Nzikazi Ecological Investigation (Nelspruit, Mpumalanga) | Neighbourhood Development Company | July 2010 | The terms of reference were to:<br>• Determine the ecological status quo of the planning area and surrounds, including the pressures threatening the natural environment within the study area;<br>• Highlight potential ecological concerns and no-go areas for development within the planning area;<br>• Gain an understanding of where areas of degradation and interference are located in order to place future development in areas of less ecological function and conservational importance; and<br>• Identify opportunities for improving the ecological status quo of the area. |
| Polokwane SEA (inform Eskom infrastructure expansion) | ESKOM Distribution | September 2010 | Provided a Status Quo of the ecology of the study area and rate the ecological sensitivity and the constraint it poses towards the proposed linear developments according to set criteria. Discussed the potential impacts associated with power line and/or substation construction on the ecology of the study are and provided mitigation and/or recommendations for decreasing the environmental impact of proposed power distribution and generation within the study area. |
| Alien vegetation identification, eradication and monitoring plans | Mooiplaats Colliery | September 2011 | Identify alien invasive species and extent on site and develop an eradication and monitoring plan |
| Vegetation Assessment for Solar Panels | Schmidsdrift, Northern Cape | January 2012 | Delineation of vegetation communities, determine vegetation sensitivities and survey for plants of conservation concern. Report on potential impacts and mitigation measures to limit |

| PROJECT NAME | INDUSTRY / CLIENT | DATE | ADDITIONAL INFORMATION |
|---|---|---|---|
| | | | impacts. |
| Vegetation Assessment: ESKOM powerlines | • Jaguar-Kookfontein (Gauteng)<br>• Powerline deviation around open cast mining (Middelburg) | Feb-May 2012 | Survey the proposed route options and compare the floral assemblages that are expected to occur within the area to the actual vegetation found to be present along the route options. Map the localities of plants of conservation concern that was identified during the field survey or suitable habitat where these plants could potentially occur. Assess impacts and determine route alignment that is likely to have the least impact on sensitive vegetation. |
| Protected tree identification | Kranspoort road upgrade | March 2012 | Identify and record localities, species and numbers of protected trees along an area earmarked for road upgrade. |
| Ground-truth final ESKOM route alignment | Dhuva-Minerva route deviation | March-April 2012 | Walk proposed route alignment and identify sensitive vegetation issues and pylon positions that might need to be moved. |
| Vegetation base line study and input into Biodiversity Action Plan | Kumba Iron Ore (Anglo) | April-May 2012 | Undertake a gap analysis and review of existing information and update by assessing the vegetation during the summer months and suggesting monitoring plots, information to e collected and areas where sensitive vegetation should avoided and managed. |

## EMPLOYMENT HISTORY

**Nov 2011 – current**
**Vegetation specialist and sole proprietor: Dimela Eco Consulting**

**Sep 2007 – Nov 2011**
**Vegetation Specialist at Strategic Environmental Focus (SEF)**

- Undertake ecological assessment and in specific, vegetation assessments.
- Vegetation assessments;
- Vegetation overviews or scans;
- Strategic ecological assessments;
- Mitigation measures to reduce impacts on the natural environment;
- Ecological management plans (including alien vegetation management);
- Specialist input: ecological conditional requirements for Green Star rating;
- Ground-truthing of vegetation related data; and
- Review of ecological reports.

**Aug 2003 – Sep 2007**
**Snr Environmental Education Officer: Environmental Education Centre, Pretoria National Botanical Garden, South African National Biodiversity Institute (SANBI)**

- Plan, Implement and facilitate the Outreach Greening Programme in Tshwane.
- Raise awareness on South African biodiversity in previously disadvantaged communities.
- Develop resources and relevant teaching and learning support materials for the Outreach Greening Programme and for the mentorship of student-interns on the programme.

- Network with authorities, partners, sponsors and funders of the programme.
- Train, assist, manage and support student-interns.
- Manage the Outreach Greening Programme in an effective and accountable manner so as to ensure the sustainability of the various projects.
- Carry out administrative and finance related tasks in support of the programme
- Manage the Tshwane Greening The Nation Project (SANBI).
- National and international presentations on the value and purpose of the SANBI Outreach Greening programme(s).

**Jun – Jul 2003**
**Horticultural Trainer: 17 Shaft Training Centre, Johannesburg**

- Facilitation of practical and theoretical training sessions.
- Development of teaching resources.
- Evaluation and motivation of students.
- Monitoring of the College's hydroponics system for agricultural purposes.
- Assist in structuring the learning programme as the college's horticultural section was then still in its infant stages.

**May 1997 – Mar 2002**
**Horticulturist: Pretoria National Botanical Garden (NBI)**

- Manage nursery staff.
- Research pertaining to the propagation of indigenous plants.
- Accession of plants.
- Growing indigenous plants and maintenance of pant collections.
- Research and grow plants known to be difficult to propagate.
- Manage prorogation- and retail nursery.
- Plant identification and horticultural advice to the public.

## OTHER RELEVANT QUALIFICATIONS / SKILLS

**Courses:**

- 2012: Soil Classification and Wetland Delineation (Terra Soil)
- 2007: ISO 14000 Advanced EMS Auditors Course (SGS & University of Pretoria)
- 2007: Introduction into Forestry Stewardship Council (FSC) (University of Pretoria)
- 2006: Permaculture training course (S.E.E.D)
- 2005: Project Management Course (Wildlife and Environment Society of South Africa (WESSA) Umgeni Valley)
- 2004: Grass and plant identification courses
- 2004: Tsoga 1 (course in speaking Sepedi)
- 1999: Certificate in Seed Science (University of Pretoria)

**Presentations:**

- July 2007: Environmental Education in a changing world, World Environmental Education Conference (WEEC), Durban
- September 2006: Environmental Education, BGCI Conference, Oxford England