Specialist Basic Assessment report:

Proposed Letaba/Makutswi project

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Introduction

This report is to discuss the biological survey (excluding the avifaunal component) conducted for the project. During the survey, a 100m corridor was investigated for the proposed power line (Figure 1).

Project Description

The brief for the project supplied by Nzumbululo Heritage Solutions was:

- The 132kV power line will connect the new Letaba substation (Alternative 1) and the existing Makutswi.
- Three alternatives were investigated.

Project locality

The project is located between Nkowankowa and Ofcolaco (Limpopo Province) (Figure 1).

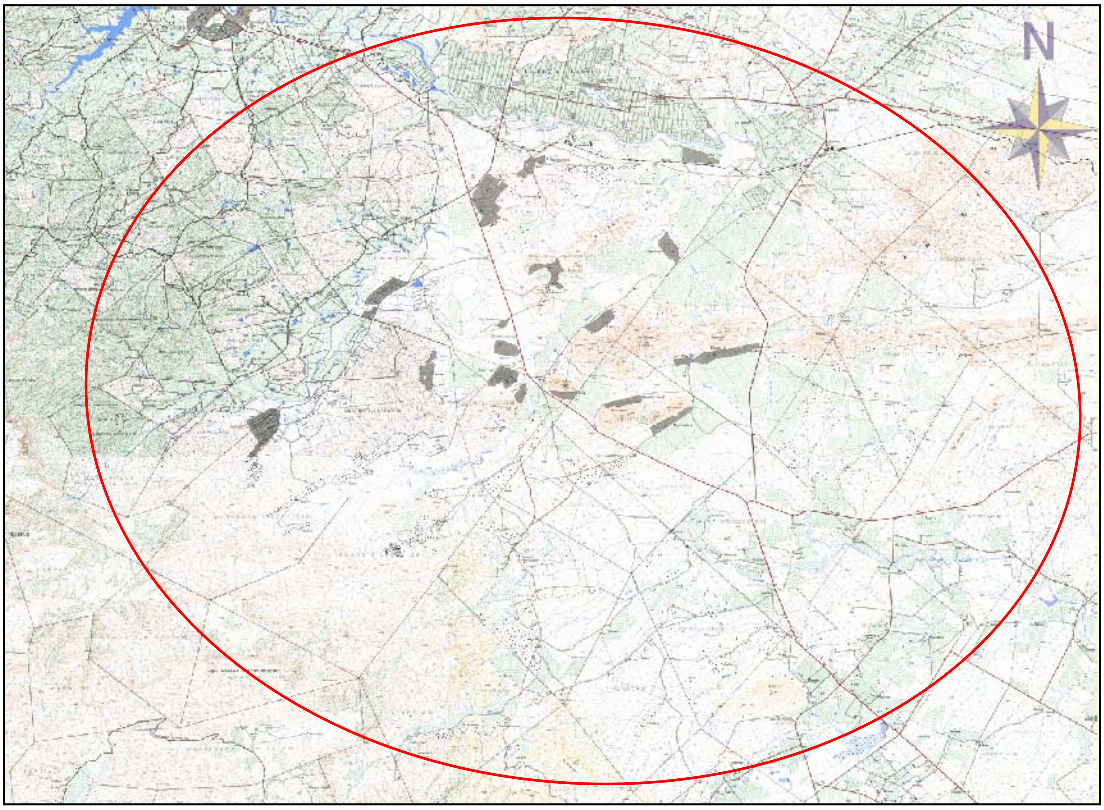

Figure 1: Approximate study site for the new power line.

Addendum 1 is a summary of impacts, mitigation and management action suggested. Addendum 2 is a summary of possible mammals in the area, with the probability of encountering them on a permanent basis (i.e. not moving through) on the study site. Addendum 3 is the list of red data species from the SANBI Précis Lists (¼° squares).

Assumptions and limitations

Availability of baseline information

Baseline information about the plant community of the site was obtained from Mucina and Rutherford (2006). For the animal study, the State of the Environment Report of the Limpopo Province (2004) and Skinner and Chimimba (2005) were consulted. The desktop survey provided adequate baseline information for the area and therefore this was not a constraint.

Constraints

The survey was conducted during daytime only. All the different habitats at the site was investigated and it was therefore possible to complete a rapid survey and obtain information on the biological community (excluding avifaunal) that are present and the site, or that are likely to occur there.

Bio-physical constraints

Weather conditions during the period were warm with a light wind blowing. It seems that the region has received some rainfall prior to the site visit as the vegetation was green and lush. There was no standing water present and this will have obvious implications on the biodiversity that are likely to occur in the area. Nevertheless, the conditions during the survey were ideal for a survey of this nature.

Confidentially constraints

There were no confidentially constraints.

Implications for the study

Apart from the prevailing weather conditions at the site, there were no other significant constraints that would negatively impact upon the study. There is sufficient good quality data available in the literature that partially negates the negative effect that the type of survey had on the quality of the assessment.

Methods

Desktop study

Prior to the site visit and field survey, information of the study site was available. The appropriate 1:50 000 maps were used to identify the major habitat features such as roads, railways, drainage channels, old cultivated fields, wooded areas, wetlands, koppies etc in the area. Prior to the site visit, a desk top study was conducted to generate lists of species historically recorded at or near the site, or that are likely to occur at the site.

Field survey

The field survey was planned to include all the different habitat types and to target threatened species that may occur in the area, to determine the likelihood of their presence and how the proposed activities will impact upon them.

During the survey, a walk-about was conducted to investigate the current vegetation and animal status in the proposed corridor for the new power line. All activity of animals was noted and a general plant list was completed. Photographs of important features were taken and will be included in the report. Thirty four red data species (SANBI, 2012) occur in the ¼ degree for the study site, but due to its habitat requirements. Eight protected tree occur in the veld type namely *Combretum imberbe, Philenoptera violacea, Breonadia salicina, Sclerocarya birrea, Warburgia salutaris, Pterocarpus angolensis, Podocarpus latifolius* and possibly *Adansonia digitata*.

Vegetation

Six vegetation units are present in the study area (Fig 3 and 4). The first three, Granite Lowveld (SVl 3), the Gravelotte Rocky Bushveld (SVl 7) and the Tzaneen Sour Bushveld (SVl 8) falls within the Savanna Biome (SV) and the units form part of the Lowveld (l) vegetation units (Mucina and Rutherford, 2006). The Northern Escarpment Quartzite Sourveld (Gm 23) is part of the Grassland Biome (G) and is part of the Mesic Highveld Grassland (m). The Subtropical Freshwater Wetlands (AZf 6) is a part of the Inland Azonal Vegetation (AZ) and the freshwater wetlands (vegetation unit).

The Northern Mistbelt Forest (FOz 4) is part of the Forest Biome and the vegetation unit group referred to as the zonal and intrazonal units (Mucina and Rutherford, 2006).

The Granite Lowveld (SVl 3) was known as the Arid Lowveld (Acocks, 1953) or Mixed Lowveld Bushveld (Low and Rebelo, 1996) while the Gravelotte Rocky Bushveld (SVl 7) was referred to as the Arid Lowveld (Acocks, 1953) and the Mixed Lowveld Bushveld (Low and Rebelo, 1996). The Tzaneen Sour Bushveld was previously known as the Lowveld Sour Bushveld (Acocks, 1953) or Sour Lowveld Bushveld (Low and Rebelo, 1996).

The Granite Lowveld is found in the Limpopo and Mpumalanga provinces and extends into Swaziland with the altitude ranging between 250 – 700 m. In general the vegetation varies from tall shrubland with a few trees to moderately dense low woodlands on the deep sandy soils in the higher areas. In the lower lying areas dense thickets to open savanna is dominating (Mucina and Rutherford, 2006).

The Gravelotte Rocky Bushveld is only found in the Limpopo Province and the altitude varies between 450 and 950m. It is known for its open deciduous to semi-deciduous woodlands and the inselbergs, and rocky slopes are in stark contrast to the surrounding plains (Mucina and Rutherford, 2006).

The Tzaneen Sour Bushveld extends in a band along the foot slopes of the northeastern escarp, from the Soutpansberg to the Transvaal Drakensberg and the altitude range between 600 and 1 000 m. this veld type is found on the lower slopes of the escarpment with undulating plains dominating along the low to high mountains. The tall grass layer is known for the well developed open parkland bushveld (Mucina and Rutherford, 2006).

Northern Escarpment Quartzite Sourveld (Gm 23) was previously known as the North-eastern Mountain Sourveld (Acocks, 1953) or the Sour Lowveld Bushveld (Low and Rebelo, 1996). It is found in the Limpopo and Mpumalanga Provinces occurring on the high crests of the northern escarpment with the altitude ranging between 1 000 and 1 740m. The rugged steep cliffs are common features and is dominates by closed grassland, forbs and scattered trees and shrubs (Mucina and Rutherford, 2006).

The Subtropical Freshwater Wetlands (AZf 6) are in most of the northern and central provinces and the altitude range between 0 and 1 400m. In most cases the flat landscape supports the streambeds dominated by reeds, sedges, rushes and grass in waterlogged areas (Mucina and Rutherford, 2006).

The Northern Mistbelt Forest (FOz 4) occurs in Limpopo and Mpumalanga Provinces and is associated with the higher mountain ranges (1 050 – 1 650m). The vegetation is known for its tall, evergreen forests, mostly in east-facing fire refugia, where the wet micro climate protect the large trees (Mucina and Rutherford, 2006).

Geology and soils

The Granite Lowveld is found from north to south the Swazian Goudplaats Gneiss, Mukhutswi Gneiss, Nelspruit Suite and Mpuluzi Granites form the main geological features. The granites and gneiss weathered into sandy soils in the higher areas with clay soils high in sodium in the lower areas (Mucina and Rutherford, 2006).

The Gravelotte Rocky Bushveld is known for its varied geology dominated by schist and amphibolites (Gravelotte and Giyani Groups) with some granite and quartzite hills present. The soils are mostly shallow and Mispah and Glenrosa very common (Mucina and Rutherford, 2006).

In the case of the Tzaneen Sour Bushveld, the potassium-poor gneiss of the Goudplaats gneiss and Archaean granite dykes underlie most of the area. Soils are dominated by Hutton, Mispah and Glenrosa and vary from shallow to deep, sandy to gravel and are mostly well drained (Mucina and Rutherford, 2006).

Northern Escarpment Quartzite Sourveld geology is dominated by the Black Reef Group and Wolkberg Quartzite covered by shallow Mispah soils (Mucina and Rutherford, 2006).

The geology of the Subtropical Freshwater Wetlands varies and the soils are mostly from the Arcadia and Champagne forms with rich organic deposits (Mucina and Rutherford, 2006).

The geology for the Northern Mistbelt Forest is highly weathered, clayey soils of the Hutton and Avalon forms which are derived from the shales (Pretoria Group), quartzite (Black Reef Formation), dolomites (Chuniespoort Group), granite (Nelspruit Basement) and diabase (Mokolian intrusives) (Mucina and Rutherford, 2006).

Climate

The Granite Lowveld falls in a summer rainfall area with dry winters and an annual MAP of 450 mm on the eastern flats to 900 mm near the escarp. Frost is infrequent but may occur occasionally at the higher altitudes near the escarp. The mean maximum and minimum temperatures vary between 39.5° C and -0.1° C across the vegetation type (Mucina and Rutherford, 2006).

Gravelotte Rocky Bushveld is associated with the summer rainfall areas with dry winters and the rainfall in the study area is approximately 550mm per annum. Frost in the lower areas is infrequent but can increase at higher altitudes. The temperatures vary between 36.4° C and 3.9° C (Mucina and Rutherford, 2006).

The Tzaneen Sour Bushveld falls within the summer rainfall area with dry to very dry winters. The annual MAP varies between 550 and 1 000 mm and frost is infrequent but may occur occasionally at the higher altitudes of the escarp. The mean maximum and minimum temperatures vary between 36.4° C and 5.7° C across the study area (Mucina and Rutherford, 2006).

Although the Northern Escarpment Quartzite Sourveld is part of the summer rainfall region, the orographic features ensures a higher rainfall (average of 1 176mm) with a high incidence of mist. The temperate climate average 16.6° C and frost is not a common feature in the landscape (Mucina and Rutherford, 2006).

The climate in the Subtropical Freshwater Wetlands is associated with the larger landscape and in the northern areas, seasonal and summer rainfall dominates (Mucina and Rutherford, 2006).

Conservation

Although the Granite Lowveld is an extensive veld type, it is considered to be vulnerable and 17% of the targeted 19% has formal protection. About 20% is transformed, mainly by cultivation and settlements and erosion potential is low to moderate (Mucina and Rutherford, 2006).

Gravelotte Rocky Bushveld is considered as endangered with less than 1% conserved and the threats are forestry, mining and agriculture. Alien vegetation includes *Solanum mauritianum, Melia azedarach* and *Caesalpinia decapetala* with *Chromolaena odorata, Lantana camara* and *Psidium guajava* problematic in the more subtropical areas. Erosion is low to high, depending on the slopes (Mucina and Rutherford, 2006).

The Tzaneen Sour Bushveld is considered as endangered by Mucina and Rutherford (1996) and as less as 3% of the targeted 19% is formerly conserved. About 41% is transformed with 9% under exotic plantations and 29% under cultivation. Exotics that impact severely include *Solanum mauritianum, Melia azedarach* and *Caesalpinia decapetala* with *Chromolaena odorata, Lantana camara* and *Psidium guajava* problematic in the more subtropical areas (Mucina and Rutherford, 2006).

Erosion is variable and range from low to high across the study area and this apply especially to the steeper slopes associated with the undulating landscape.

With regards to its conservation, the Northern Escarpment Quartzite Sourveld is considered to be vulnerable with about 15% conserved. The main impacts are plantations with some agricultural activities playing a small role and erosion varies from very low to moderate depending on the slopes (Mucina and Rutherford, 2006).

For the Subtropical Freshwater Wetlands conservation varies and impacts are related to mining, agriculture and urban development. The alien invasive includes *Melia azedarach*, *Chromolaena odorata, Lantana camara, Pistia stratoides, Salvinia molesta* and *Eichhornia crassipes* (Mucina and Rutherford, 2006).

Northern Mistbelt Forest is regarded as least threatened with more than 10% conserved in reserves. Aliens that are problematic include *Solanum mauritianum, Caesalpinia decapetala, Acacia mearnsii* and *Lantana camara* (Mucina and Rutherford, 2006).

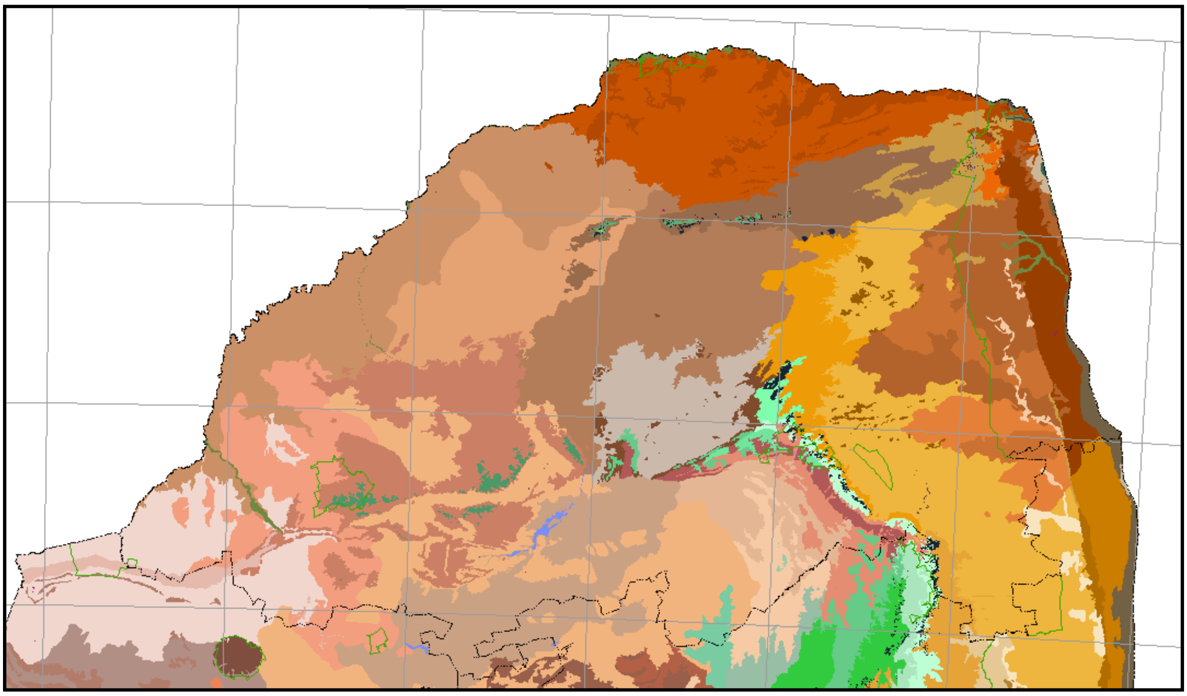

Figure 2: Regional vegetation map: vegetation map in the Limpopo Province according to Mucina and Rutherford (2006).

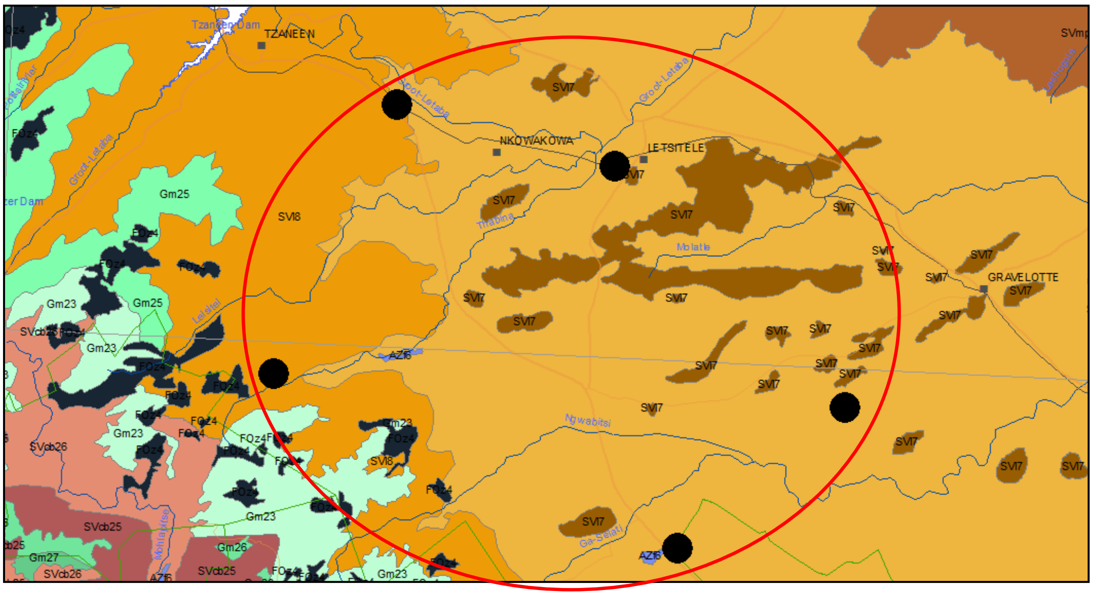

Figure 3: Vegetation types found in areas of the proposed project (circled in red).

Results

Three alternatives where investigated for a possible route between the new Letaba substation (Alternative 1) and the existing Makutswi substation (Figure 4 and 5).

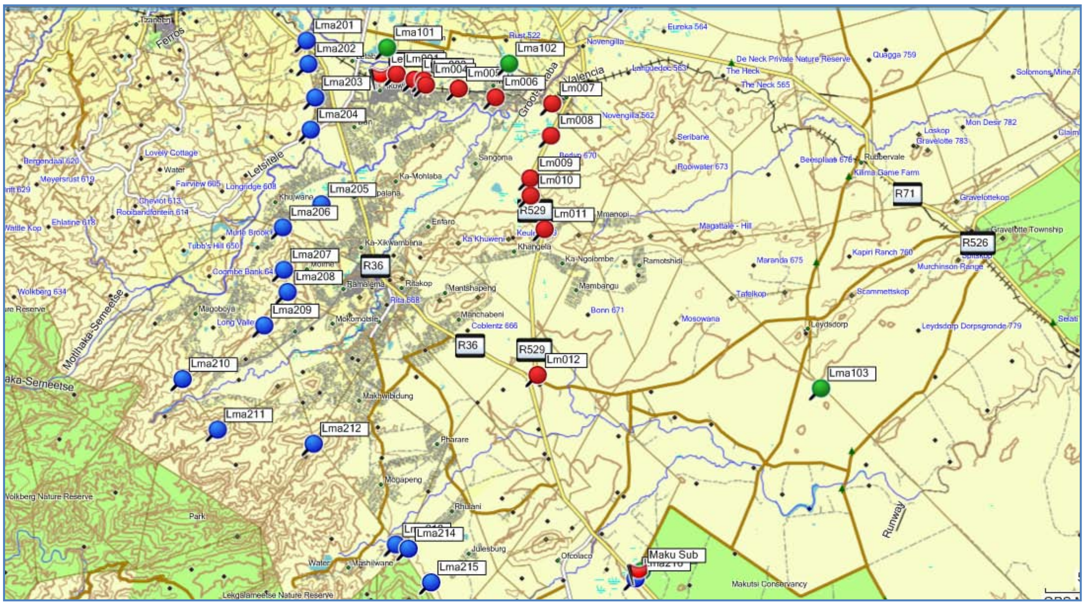

Figure 4: General corridor for the new power line between the new Letaba and existing Makutswi substations. Alternative 1 in red, Alternative 2 in green and Alternative 3 in blue.

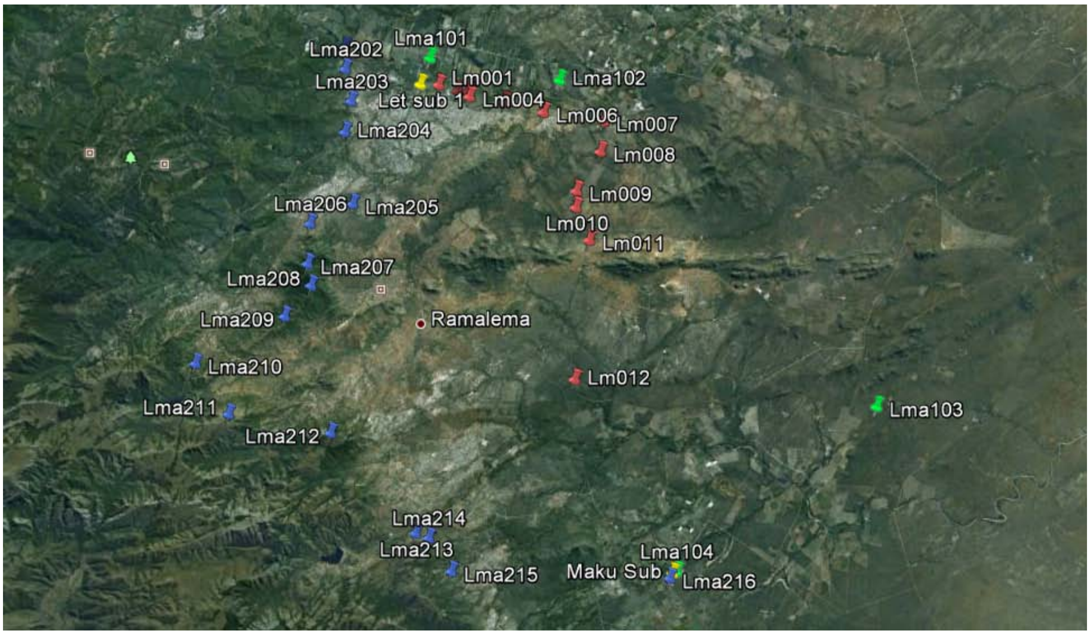

Figure 5: Aerial view of the three alternatives investigated.

Alternative 1:

The route from the proposed Letaba substation (Alternative 1) exits to the east. At the R529, it swings south to follow the road to the R36. It then follows the road to the existing Makutswi substation (6 and 7).

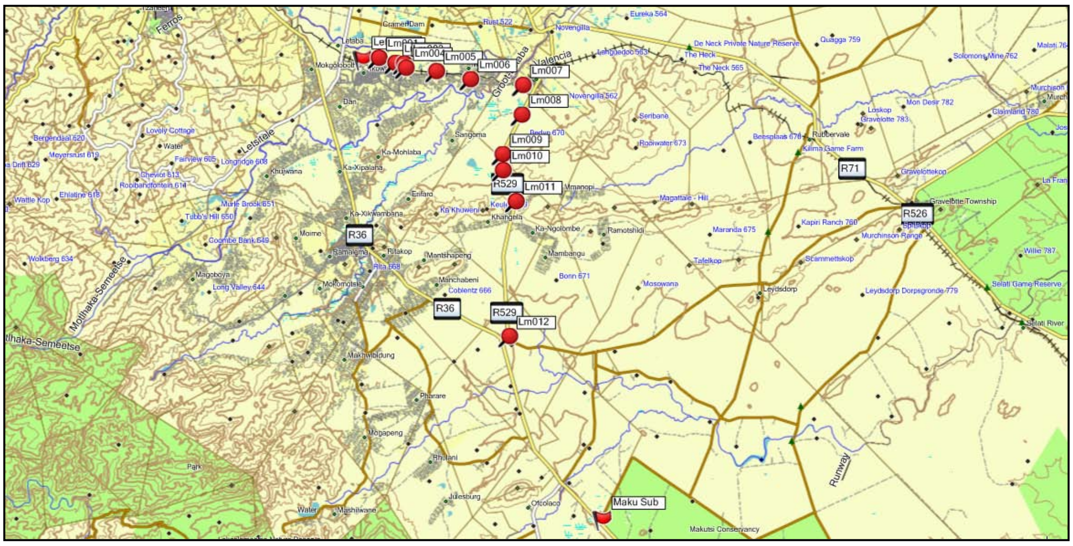

Figure 6: General corridor for the power line (Alternative 1) from the Letaba to Makutswi substation.

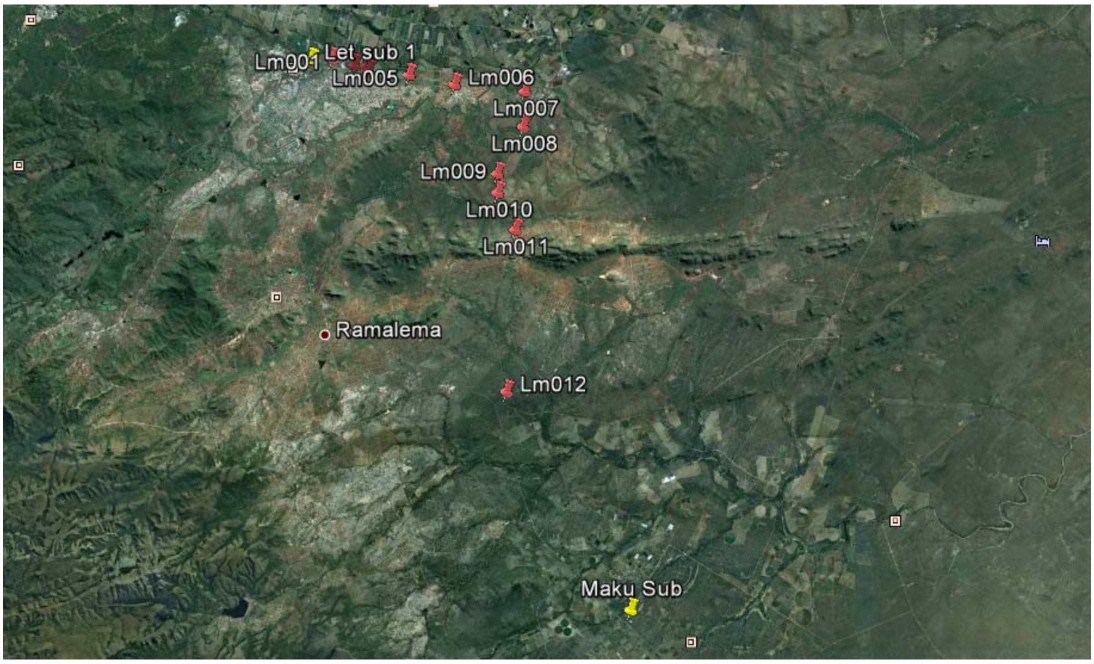

Figure 7: Aerial view of the corridor (Alternative 1).

The vegetation at the proposed new Letaba substation is modified and currently used for cultivation of cash crops (Figure 8 - 10). There are some orchards present and the natural vegetation is severely modified, but a few large trees are present (e.g. *Sclerocarya birrea*). The Nkowankowa Cemetery is situated to the east of the site and although no decision was made, the power line can follow a route to the south of it (Figure 11 – 13 and Figure 8).

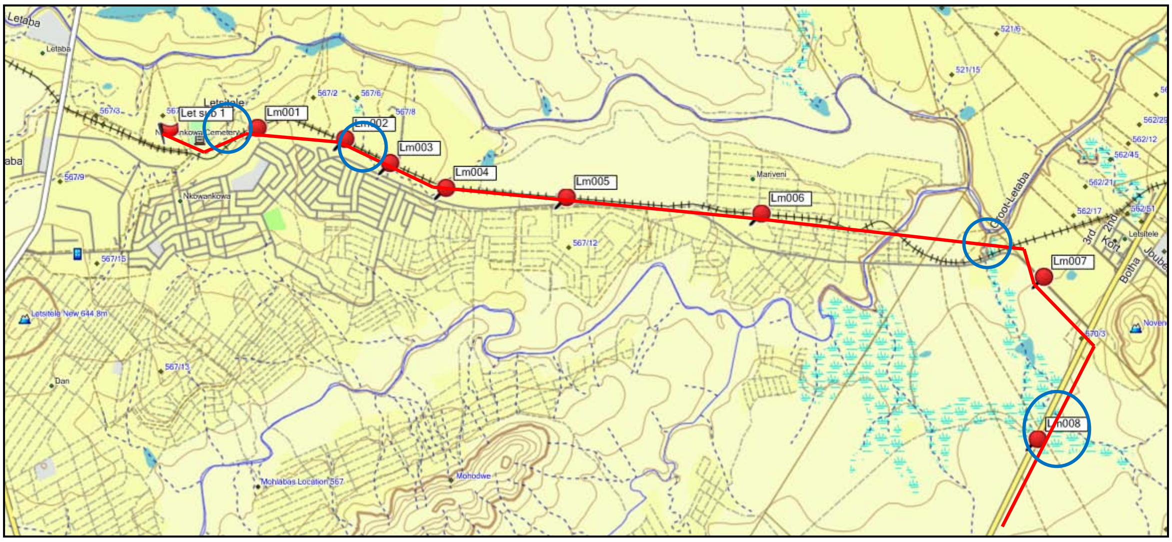

Figure 8: First sector of the power line to the east of the new Letaba substation.

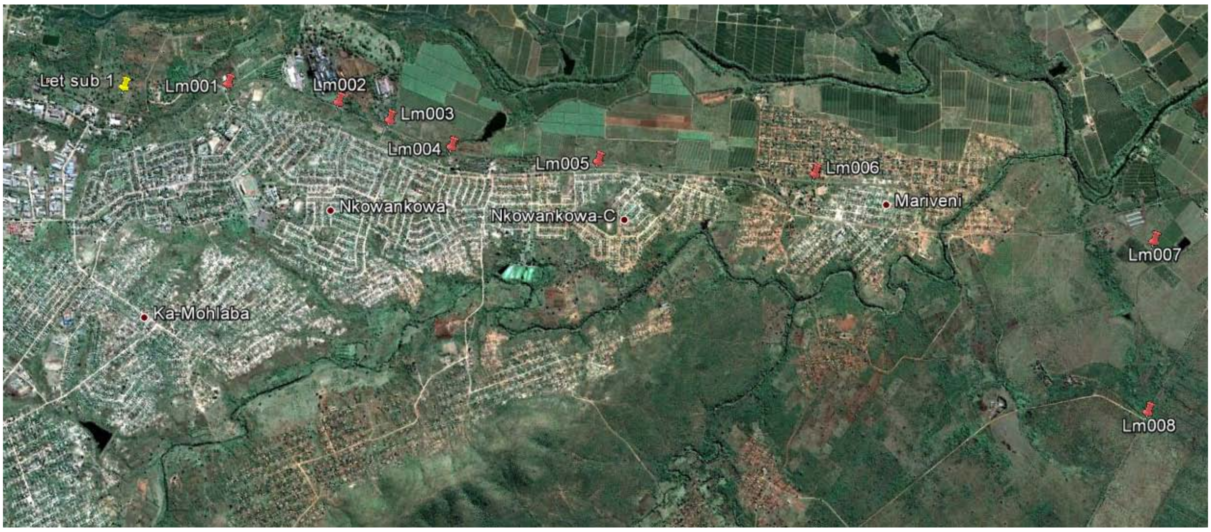

Figure 9: Aerial view of the sector.

Figure 10: View of substation site – large *Sclerocarya birrea* present.

Figure 11: The corridor to the north of the cemetery.

Figure 12: The corridor to the south of the cemetery.

Figure 13: The Nkowankowa cemetery to the east of the proposed Letaba substation site.

To the east of the cemetery, the corridor crosses as small stream (Figure 14). The pylons must be placed at least 50m from the edge of the outer edge of the riparian zone to prevent any damage to the stream banks. In this stream, some *Breonadia salicina*, a protected tree was observed. No crossing through the stream during construction or maintenance is allowed, unless at a proposer road or bridge. To the east the natural vegetation is modified due to town development, roads, railway lines and wood collection by inhabitants of the nearby residential area. The corridor follows a route to the north of the residential area (next to the railway line). The natural vegetation is modified due to small businesses, agricultural activities, town developments and wood collection (Figure 15 - 18).

Figure 14: View of the stream with *Breonadia salicina* present.

Figure 15: View from railway crossing towards the substation site.

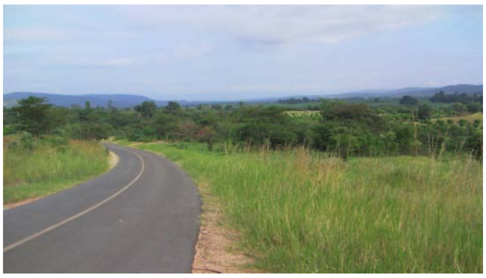

Figure 16: Informal houses in the corridor area.

Figure 17: Vegetation clearing, crops and wood collection impacting the natural vegetation.

Figure 18: Small businesses further impacting in the area.

The proposed corridor follows the railway line to the Mariveni area. This section is severely modified due to roads, town infrastructure, small business development and even cultivation of crops along the roads and railway line (Figure 19 – 21).

Figure 19: Impacts along the corridor.

Figure 20: Natural vegetation severely modified.

Figure 21: Corridor next to orchards and railway line.

To the east of Mariveni, the corridor crosses the Letsitele River and some of its tributaries. This is considered as sensitive areas and pylons must be placed 50m from the streams and outside the 1:100 year flood line of the Letsitele River. The power line follows the road to the R529, where it swings to the south to follow the road. Trees in the area include *Breonadia salicina, Sclerocarya birrea, Lannea schweinfurthii, Acacia caffra, A. sieberiana, Dichrostachys sericea, Ziziphus mucronata, Diospyros mespiliformis, Ficus sur, F. sycomorus, Philenoptera violacea* and *Combretum imberbe*.

The last section to the R529 follows a corridor next to the Nkowankowa road and here agricultural impacts are prominent. Activities include grazing, cultivation of cash crops, orchards and poultry houses. The power line will cross a few small streams, tributaries of the Letsitele and Groot Letaba Rivers (Figure 22 – 25).

Figure 22: Crossing of the Letsitele River.

Figure 23: Areas cleared of natural vegetation for cultivation – areas fallow.

Figure 24: Small industries along the corridor.

Figure 25: Modified natural vegetation at the turn-off on the R529.

The proposed corridor swings to the south following the R529. The natural vegetation in some areas is less disturbed, but encroachment due to changes in the natural vegetation is present. Along the small stream at the road junction the trees are tall and include *Ficus sur, F. sycomorus, Acacia karroo, A. caffra, A. sieberiana, A. nigrescens, Lannea schweinfurthii, Combretum imberbe, C. apiculatum* and *Philenoptera violacea*. To the south, the route enters the mountains and crosses the Rigorigo River. The undulating landscape is prone to erosion and care must be taken to ensure that rehabilitation is effective during and after construction to ensure no damage to the servitude occur (Figure 26 – 31).

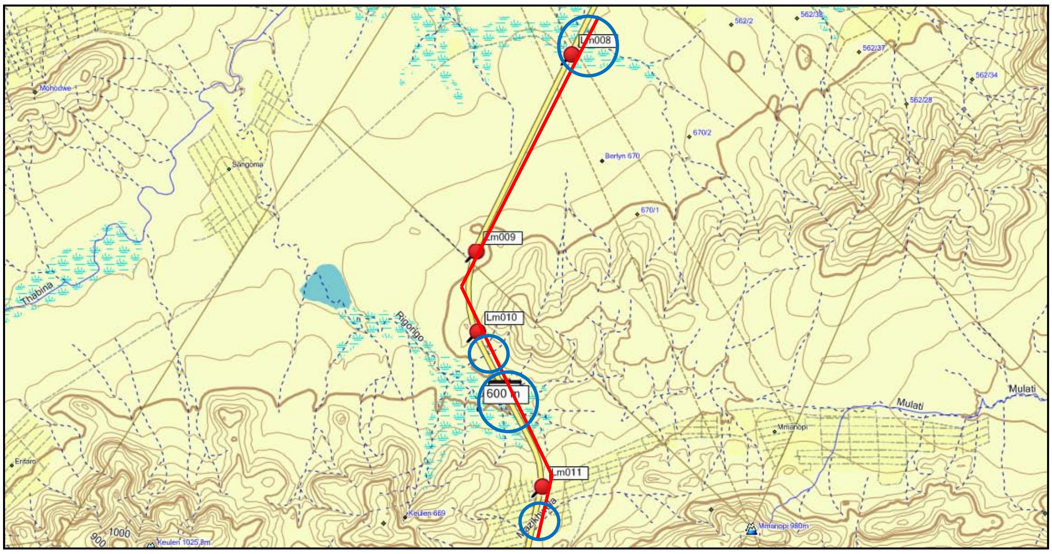

Figure 26: Sector on the R529 after the turnoff from Nkowankowa, Stream crossings are circled in blue and note mountainous terrain to the south.

Figure 27: Aerial view of the area.

Trees along the route include *Combretum apiculatum, C. imberbe, C. collinum, Ficus sycomorus, Acacia nigrescens, Lannea schweinfurthii* and *Philenoptera violacea*. Some exotics such as *Melia azedarach, Jacaranda mimosifolia* and *Lantana camara* are present.

Figure 28: Undulating terrain along the corridor.

Figure 29: Mountainous terrain susceptible to erosion.

Figure 30: Some stream crossings are encountered – sensitive habitat.

Figure 31: Dense natural vegetation in the stream valleys.

On the mountain area the route passes the villages and rocky outcrops before descending into the valley towards the R36. The natural vegetation is modified and impacts are related to grazing, wood collection, sand mining, cultivation, town development and poor infrastructure maintenance. The corridor will pass to the west of the koppie in the village and also cross a few streams. These features are sensitive areas and act as refugia for biota. The existing road (R529) can be used as access road during construction and this will lower the need to clear natural vegetation and increase the risk for erosion (Figure 32 – 37).

Figure 32: Sector passing through the village on the mountain – streams circled in blue and the koppie in brown.

Figure 33: Aerial view of sector with koppie visible to the east of the R529.

Figure 34: Point where line exits the valley into the village.

Figure 35: Koppie to the east of the R529.

Figure 36: Natural vegetation to the south in a fair condition.

Figure 37: Stream crossings in the sector – sensitive areas act as migration corridors for biota.

Just before the junction with the R36, the corridor passes through a farm with the vegetation in a modified state (encroachment) due to overgrazing and cultivation. The corridor then follows the R36 to the Makutswi substation. A few stream crossings are encountered and are regarded as sensitive areas. Birds and animals use these streams and the associated riparian vegetation as migration corridor and it is important feeding and resting areas. The R36 must be used as the main access road during construction. This will lower the need to clear natural vegetation and this will lower the risk of erosion during and after construction. The trees include *Acacia karroo, A. sieberiana, A. caffra, A. nigrescens, Combretum apiculatum, C. imberbe, C. collinum, C. zeyheri, Lannea schweinfurthii, Sclerocarya birrea, Philenoptera violacea, Breonadia salicina, Ficus sur, F. sycomorus, F. stuhlmannii, Cassia abbreviata, Peltophorum africanum* and *Ekebergia capensis* (Figure 38 – 46).

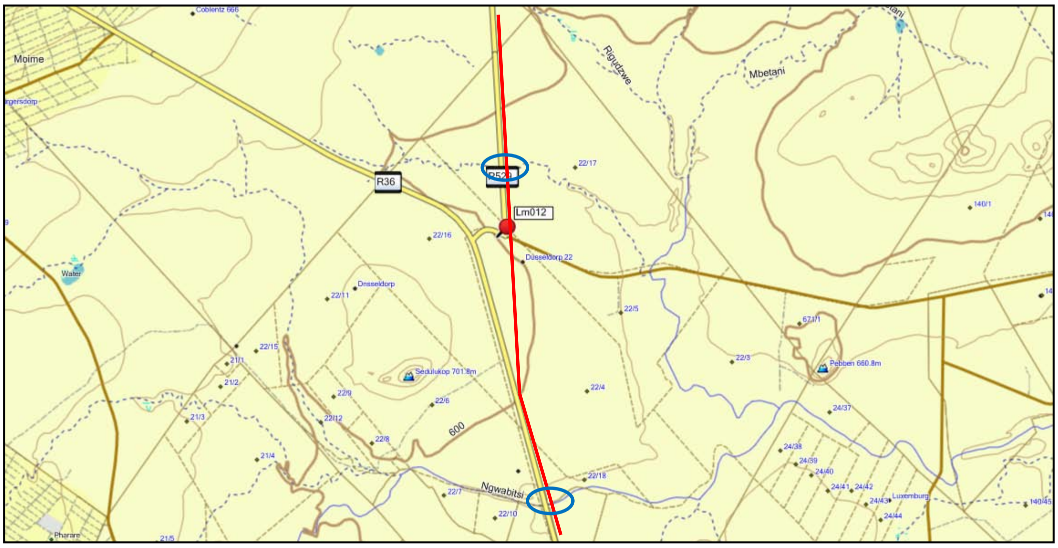

Figure 38: Corridor crossing from the R529 to the R36.

Figure 39: Aerial view of sector joining the R36.

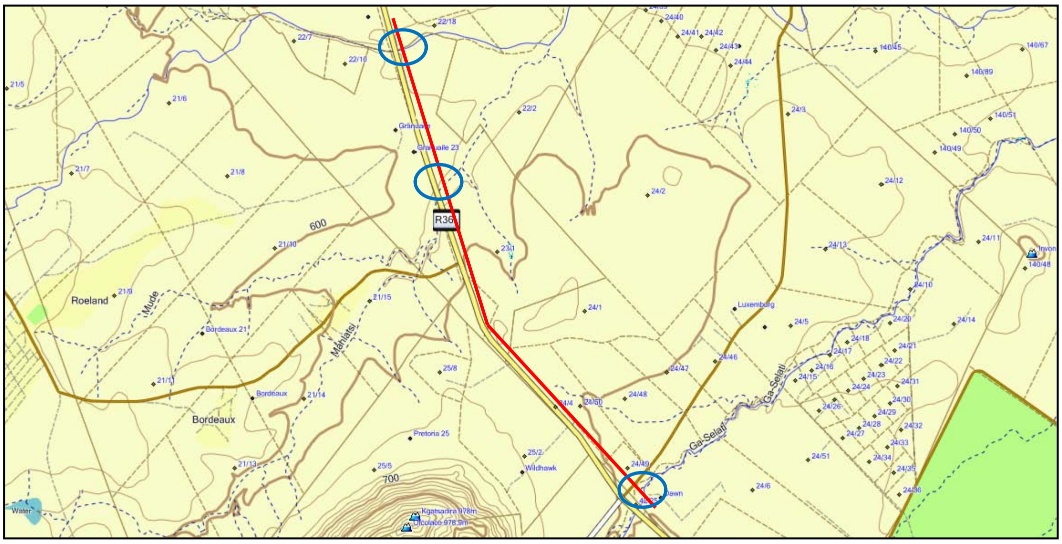

Figure 40: Sector between the Ngwabitsi and Ga-Selati Rivers.

Figure 41: Aerial view of the section between the rivers.

Figure 42: Dense vegetation in section between the R529 and R36.

Figure 43: Crossing of the Ngwabitsi River.

Figure 44: Cultivation an important activity along the sector.

Figure 45: Intensive farming on the banks of the Ga-Selati River.

Figure 46: River crossing of the Ga-Selati River.

To the southeast of the Ga-Selati River, cultivation and grazing are the main impacts on the natural vegetation. The riparian vegetation along the streams and rivers are in a good condition and once the final route is identified, a walk down study of the whole route is needed to map (GPS) all protected trees. This information is needed to apply for permits for the cutting, trimming and removal of any of the protected tree species. These permits must be acquired before the clearing of the servitude can commence.

Trees in this area include *Breonadia salicina, Ficus sycomorus, F. sur, Sclerocarya birrea, Lannea schweinfurthii, Philenoptera violacea, Combretum apiculatum, C. imberbe, C. zeyheri, Ekebergia capensis, Grewia flava, F. flavescens, Bauhinia galpinii, Acacia caffra, Gymnosporia senegalensis, Nuxia oppositifolia, Piliostigma thonningii, Syzygium cordatum* and *Ziziphus mucronata* (Figure 47 – 52). The natural vegetation around the substation in modified due to current construction and historic agricultural activities.

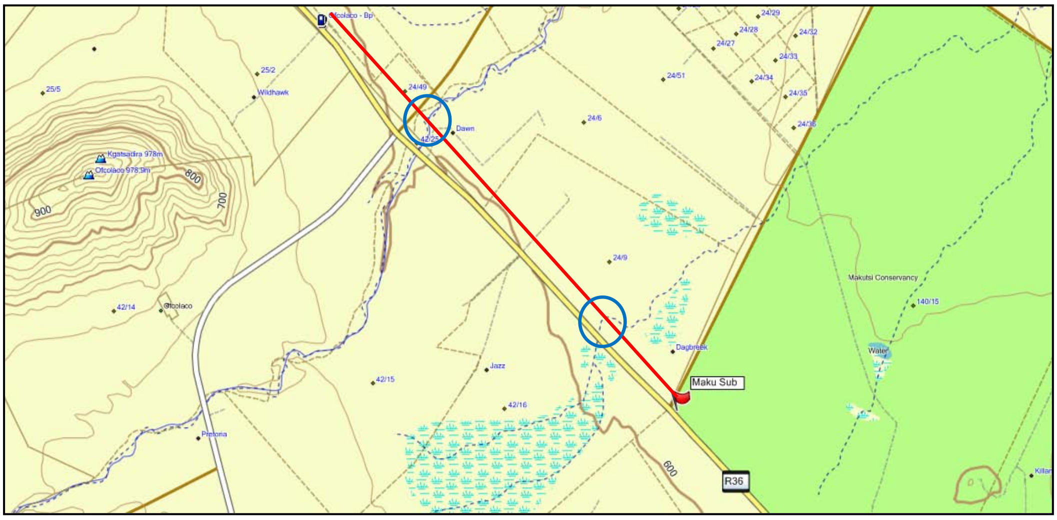

Figure 47: Last section of the corridor for the power line (Alternative 1) from the new Letaba substation (Alternative 1) to the existing Makutswi substation.

Figure 48: Aerial view of the last section of the power line (Alternative 1).

Figure 49: Some encroachment along corridor due to poor land use practices.

Figure 50: Grazing and cultivation modified the natural vegetation.

Figure 51: Vegetation around the Makutswi substation modified.

Figure 52: Makutswi substation.

Alternative 2:

This alternative follows a westerly corridor between the Letaba substation (Alternative 1) and the existing Makutswi substation (Figure 53 and 54).

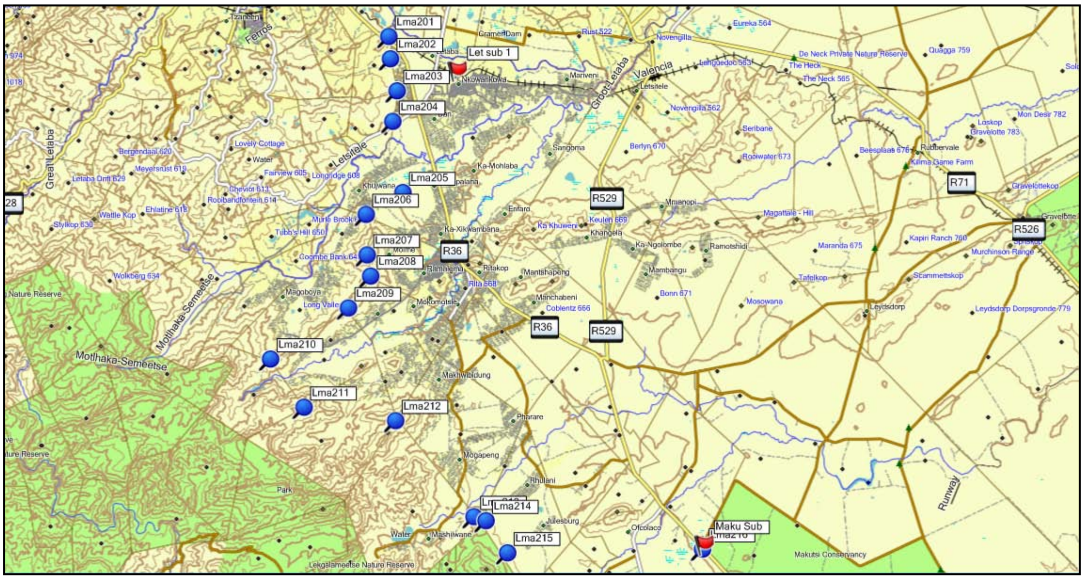

Figure 53: View of the proposed route (Alternative 2) for the Letaba/Makutswi power line.

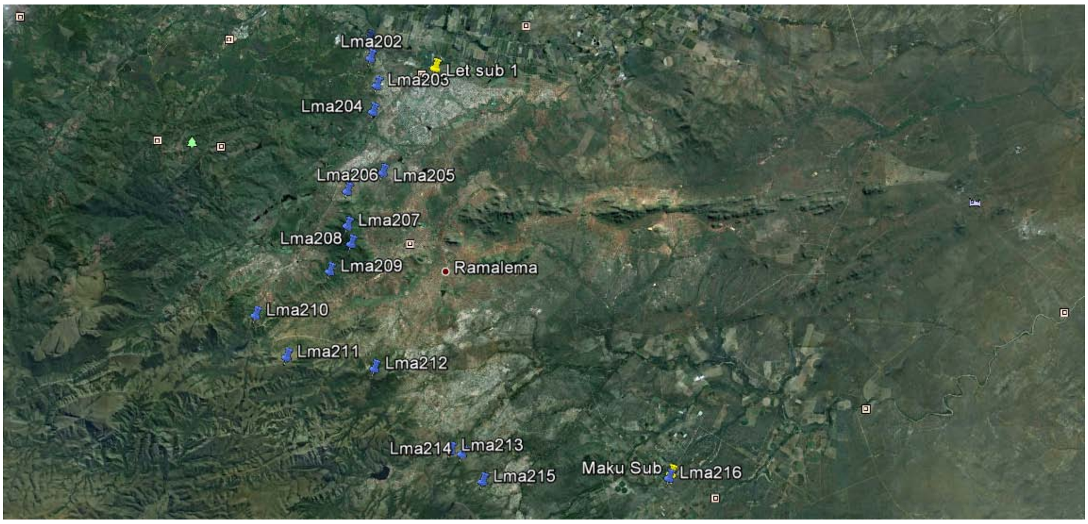

Figure 54: Aerial view of Alternative 2.

From the Letaba substation (Alternative 1) the proposed power line follows a westerly route to the R36, before swinging south towards Lenyenye area. It crosses the R36 to the west and follows a route to the west of the villages next to the road. The area is very undulating and the natural vegetation is in a poor to fair condition. The section from the substation to the R36 follows the Groot Letaba River and railway line. The corridor is severely modified by town development, informal housing, wood collection, industries and dumping of refuse. Trees in the sector include *Breonadia salicina, Ficus sycomorus, F. sur, Combretum collinum, C. imberbe, C. apiculatum, Sclerocarya birrea, Diospyros mespiliformis, Peltophorum africanum, Terminalia sericea, Acacia caffra, A. sieberiana, A. karroo, Bauhinia galpinii* and *Ziziphus mucronata* (Figure 55 – 60).

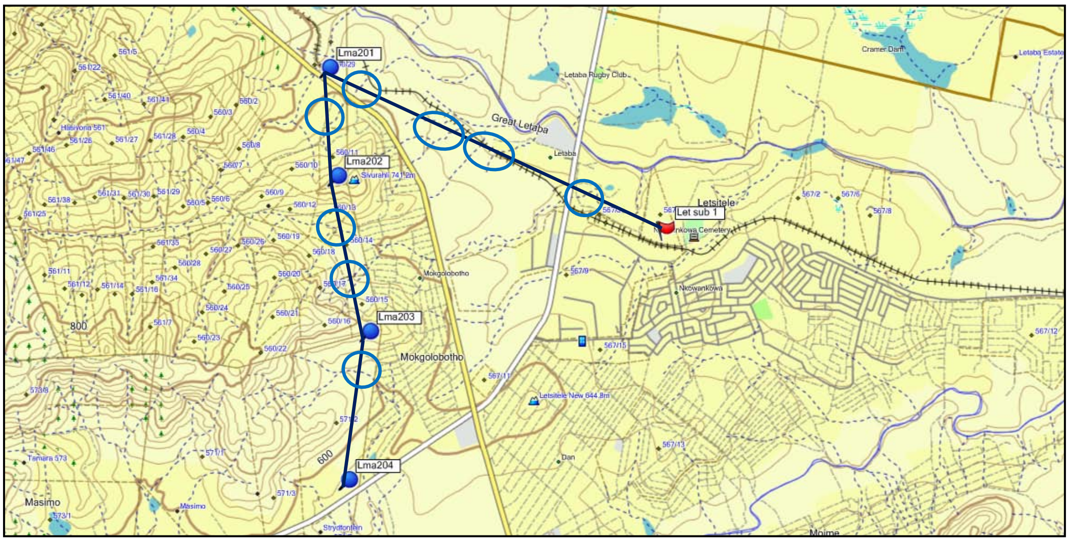

Figure 55: First sector of Alternative 2 to the Makutswi substation.

The landscape south of the R36 is dominated by low hills and although there are villages in the area, access to the proposed corridor in not available. Roads and river crossings must be constructed before the building of the power line can commence.

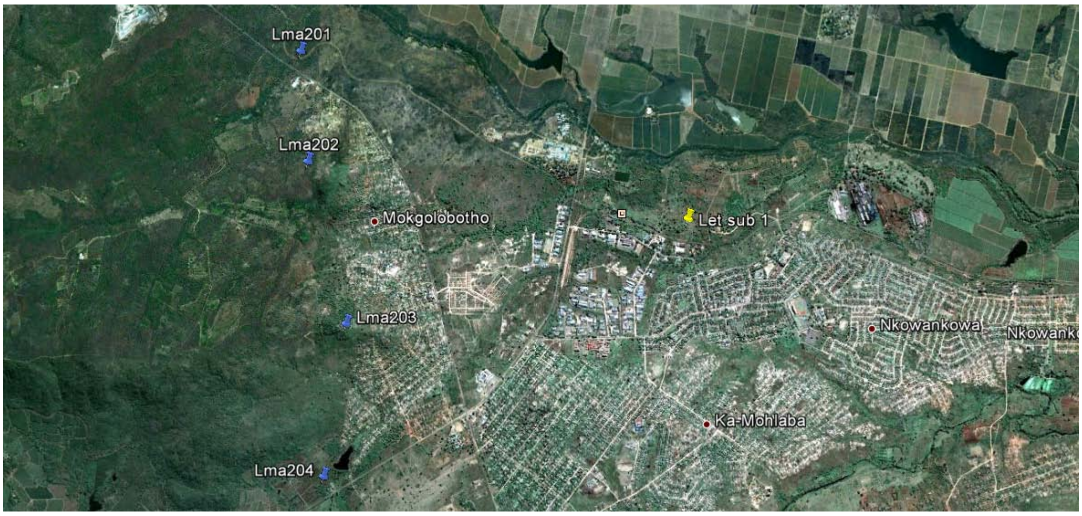

Figure 56: Aerial view of the first sector – note undulating landscape south of the R36.

Figure 57: Industrial areas around the first part of the route.

Figure 58: Corridor to the west impacted by cultivation along the river.

Figure 59: Impacts related to informal housing, wood collection and cultivation modified natural vegetation to the south of the R36.

Figure 60: Undulating landscape south of the R36 – poor access for construction.

The proposed corridor then crosses the Nkowankowa/Letsitele Valley road and follows a route to the Khujwana and then to the west of Lenyenye into the Letsitele Valley. The first part of the route follows the valley floor and here the natural vegetation is modified due to the large number of residential areas, cultivation and grazing done by the inhabitants, poor infrastructure development and maintenance, wood collection and dumping of refuse. This all contribute to erosion, poor state of the natural vegetation and high incidences of alien plant infestations. The route crosses the Letsitele River and a number of its tributaries. The crossings are sensitive areas and vehicles cannot cross it along the servitude, unless on official roads and bridges. These streams are important migration corridors for biota and are sensitive to erosion and habitat destruction (Figure 61 – 68).

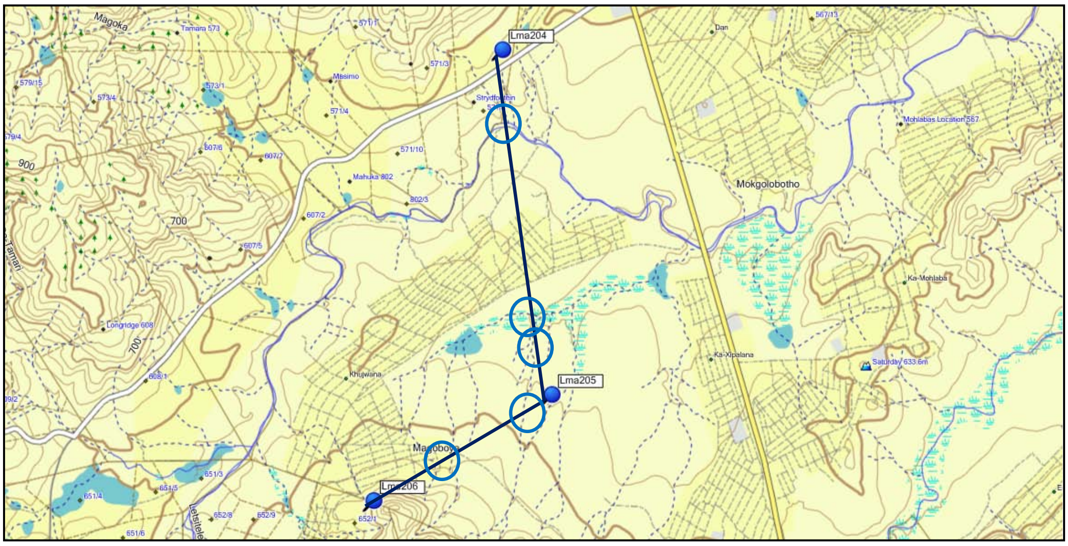

Figure 61: Corridor of the route south of the Nkowankowa/Letsitele Valley road.

Figure 62: Vegetation north of the Letsitele River in a fair condition.

Figure 63: View of the Letsitele River – possible crossing.

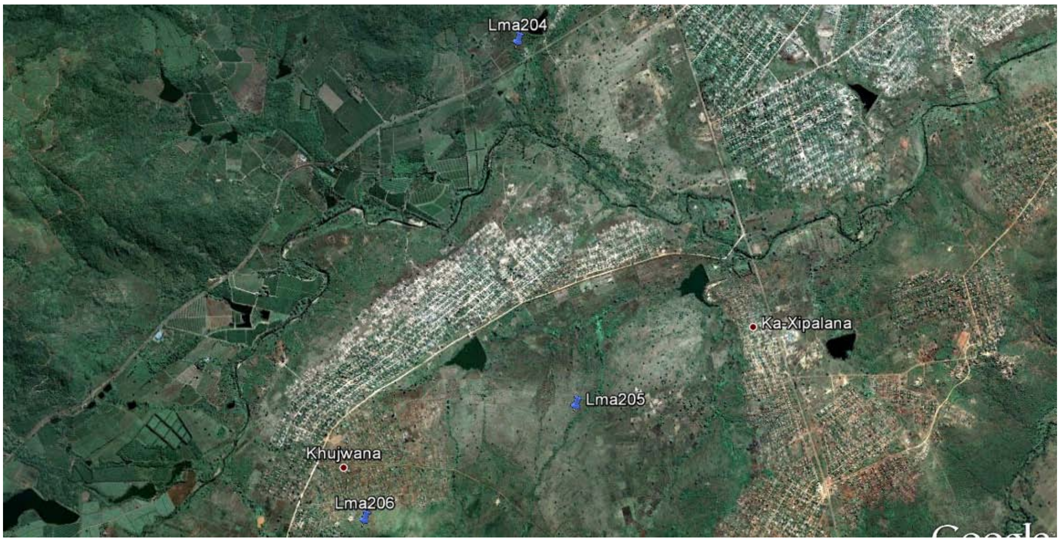

Figure 64: Aerial view of the sector south of the road and the Letsitele River crossing.

Figure 65: Natural vegetation modified south of Khujwana.

Figure 66: Cultivation an impact in the area.

To the south of this area the terrain in mountainous and the corridor follows a route along these peaks (Figure 67 -74).

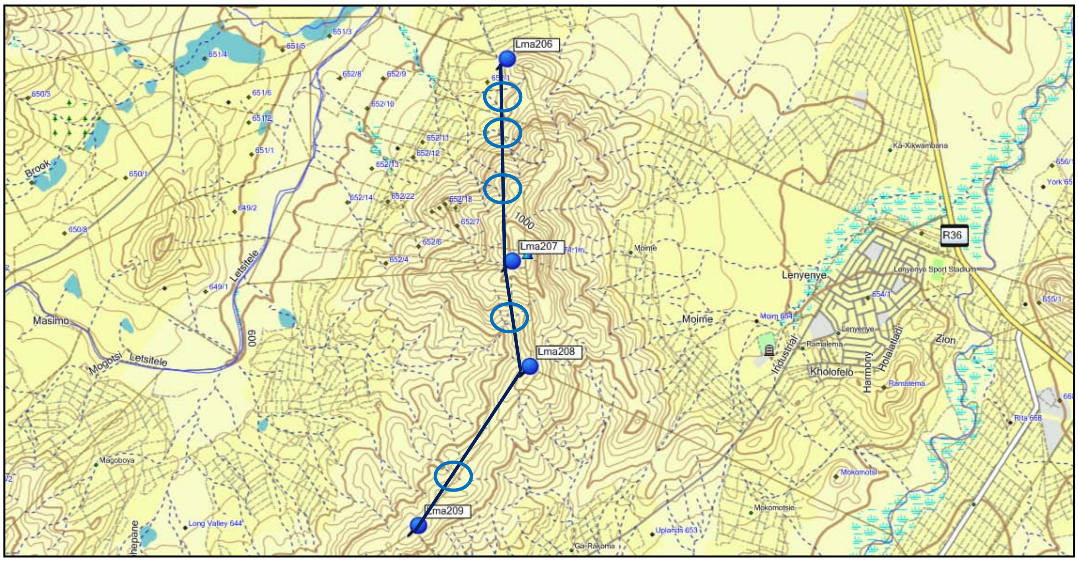

Figure 67: Corridor enters the mountain areas.

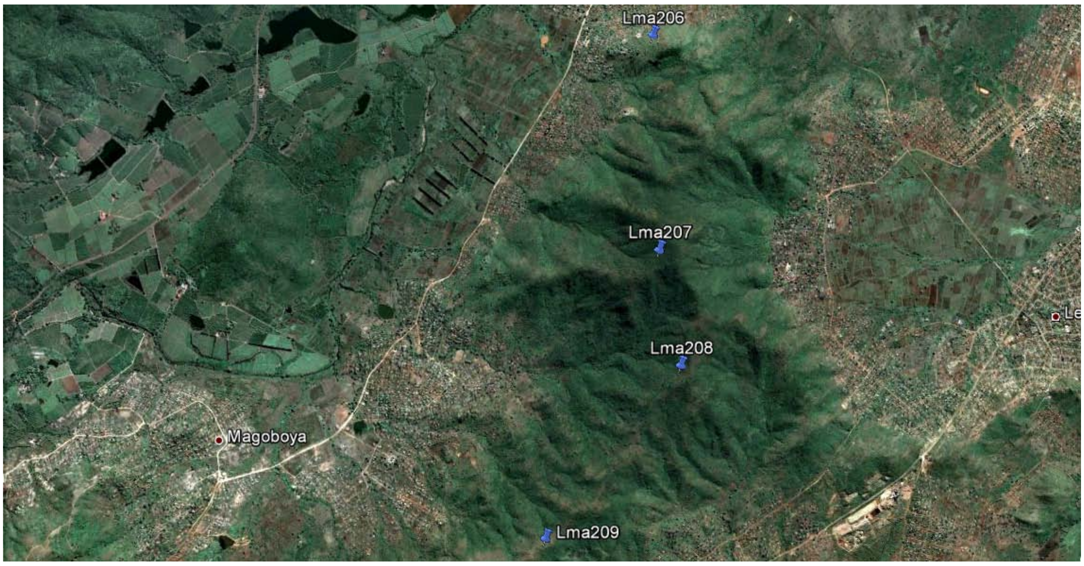

Figure 68: Aerial view of mountainous area.

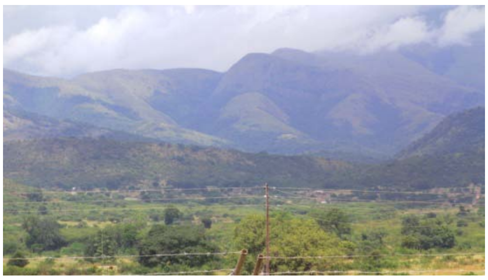

Figure 69: The mountain terrain the proposed corridor must follow.

Figure 70: Lower foothills of the mountains.

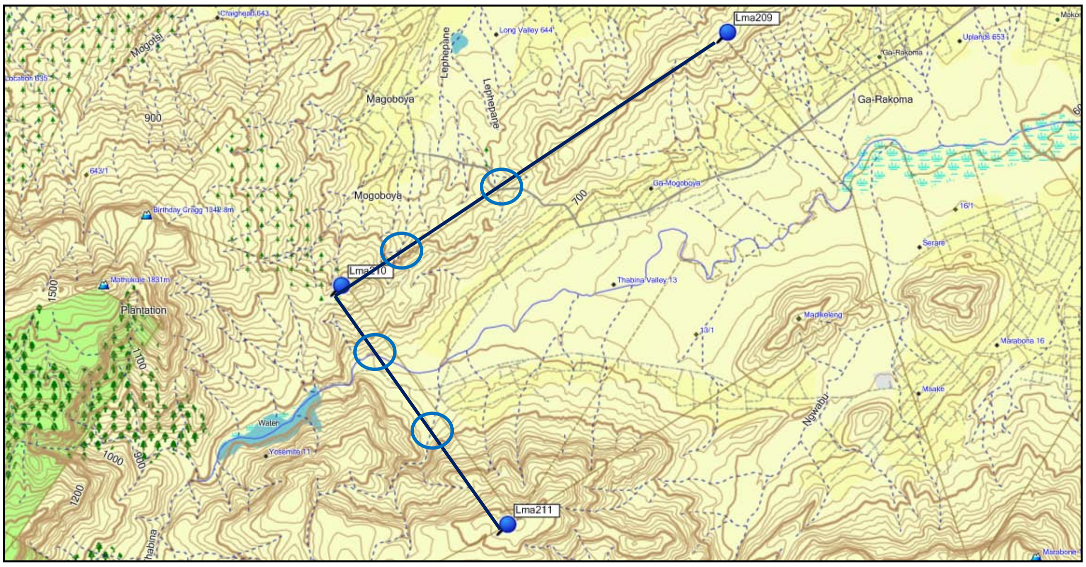

Figure 71: Sector of the route in the mountains and the crossing of the Thabina River.

Figure 72: Aerial view of the route in the mountains.

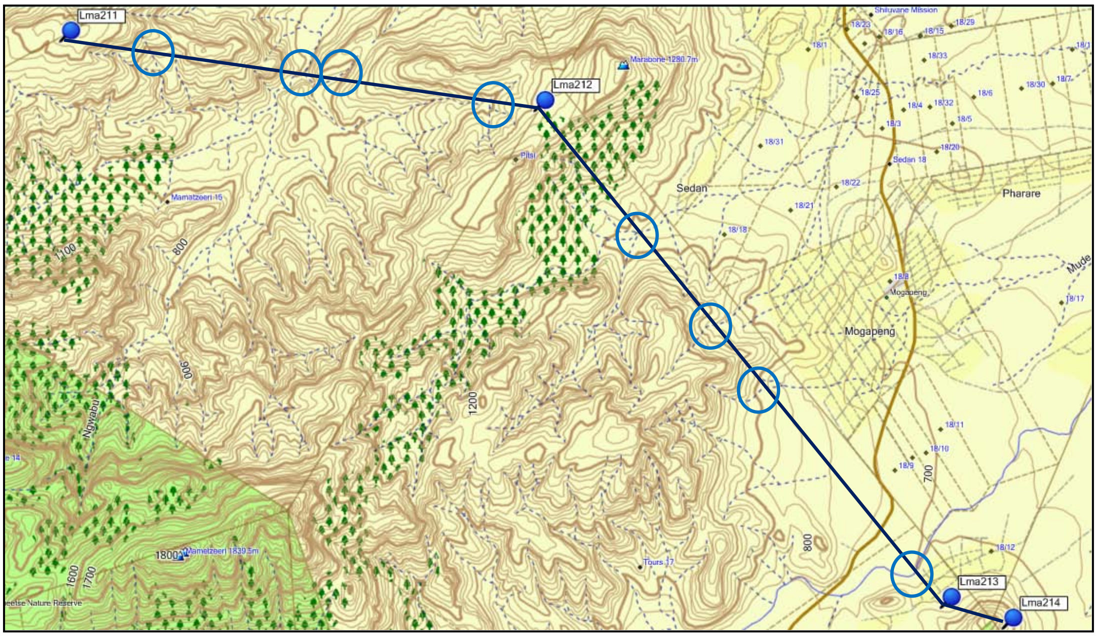

Figure 73: The corridor to the southeast, still following a route on the high mountain peaks.

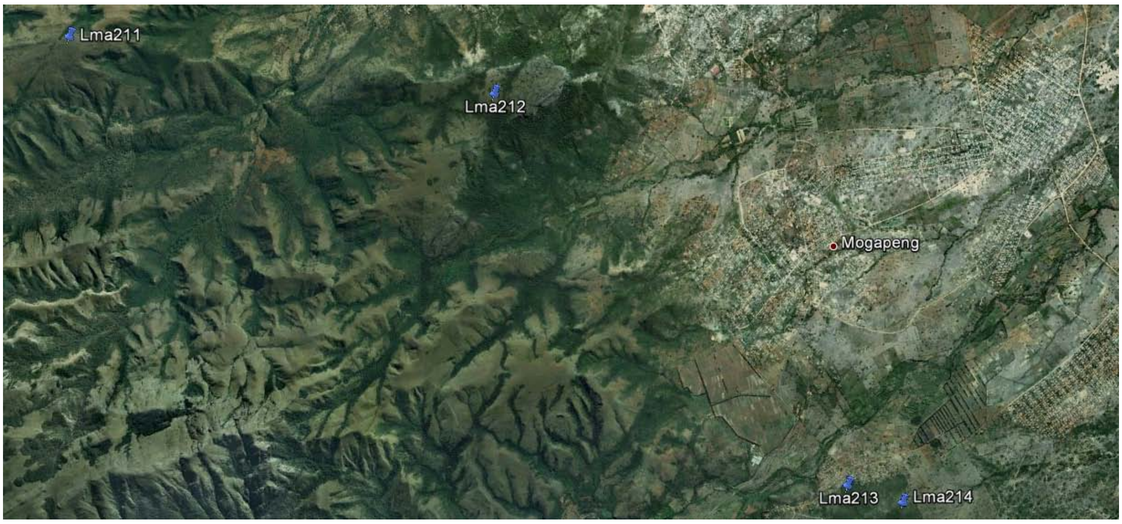

Figure 74: Aerial view of the corridor in the mountains west of Mogapeng.

The last sector of the corridor exits the mountains to the west of Julesburg, swinging to the east to the existing Makutswi substation. On the flat landscape, the residential developments, forestry, cultivation of crops and orchards, grazing, wood collection, poor infrastructure development and maintenance and dumping of refuse have a negative impact on the natural vegetation. All these impacts results in erosion in the area (Figure 75 – 81).

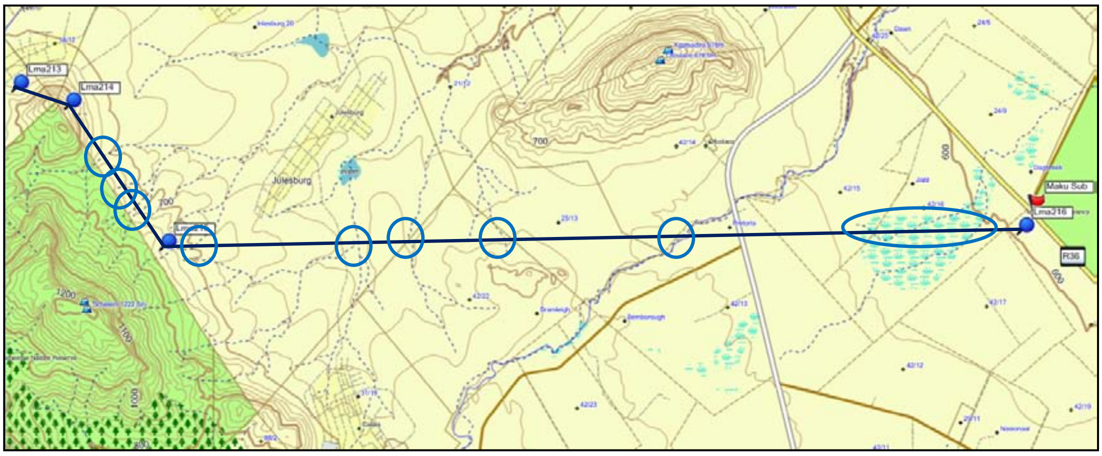

Figure 75: Last sector of the proposed power line from the Letaba substation (Alternative 1) to the existing Makutswi substation. Stream and river crossings are circled in blue and note the large impoundment west of the substation next to the R36.

Figure 76: Aerial view of the last section of Alternative 2.

The large impoundment to the west of the substation will be difficult to cross as it covers a large distance. All stream and river crossings (Ga-Selati – Figure 75 and 76) are considered as sensitive areas and act as migration corridors for biota. The pylons must be at least 50m from all stream crossings and outside the 1:100 year flood line for the Ga-Selati, Ngwabitsi, Thabina and Letsitele rivers along this route.

Tress in the area between the mountains and the substation include *Breonadia salicina, Syzygium cordatum, Acacia karroo, A. caffra, A. sieberiana, Combretum imberbe, C. apiculatum, C. collinum, Terminalia sericea, Burkea africana, Sclerocarya birrea, Peltophorum africanum, Bauhinia galpinii, Piliostigma thonningii, Diospyros* *mespiliformis, Ficus sur, F. ingens, F. craterostoma, F. glumosa, Berchemia discolor, B. zeyheri, Ekebergia capensis, Harpephyllum caffrum, Gymnosporia buxifolia, G. senegalensis, Hyphaene coriacea, Nuxia oppositifolia* and *Philenoptera violacea* (Figure 77 – 88).

Figure 77: Water abstraction for road construction from the Mahlatsi River – a tributary of the Ga-Selati River.

Figure 78: Many orchards in the foothills to the east of the high mountains.

Figure 79: Natural vegetation in a fair to good condition in the foothills and low slopes of the mountains.

Figure 80: Construction having a negative impact on natural vegetation and streams – erosion severe.

Figure 81: Natural vegetation (proposed corridor) to the west of the residential in a good condition.

Figure 82: Poor infrastructure planning, development and maintenance contribute to degradation of the habitat and landscape.

Figure 83: Erosion a result for poor land use practices and maintenance of infrastructure.

Figure 84: Illegal sand mining in all streams having a negative impact on the environment.

Figure 85: Large areas cleared of natural vegetation – some large trees left.

Figure 86: Example of stream and river crossings along the corridor – sensitive to erosion.

Figure 87: Crossing of the Ga-Selati.

Figure 88: Crossing of the R36 to the Makutswi substation.

Alternative 3:

This route between the Letaba substation (Alternative 1) and the Makutswi substation follow an easterly corridor (89 and 90).

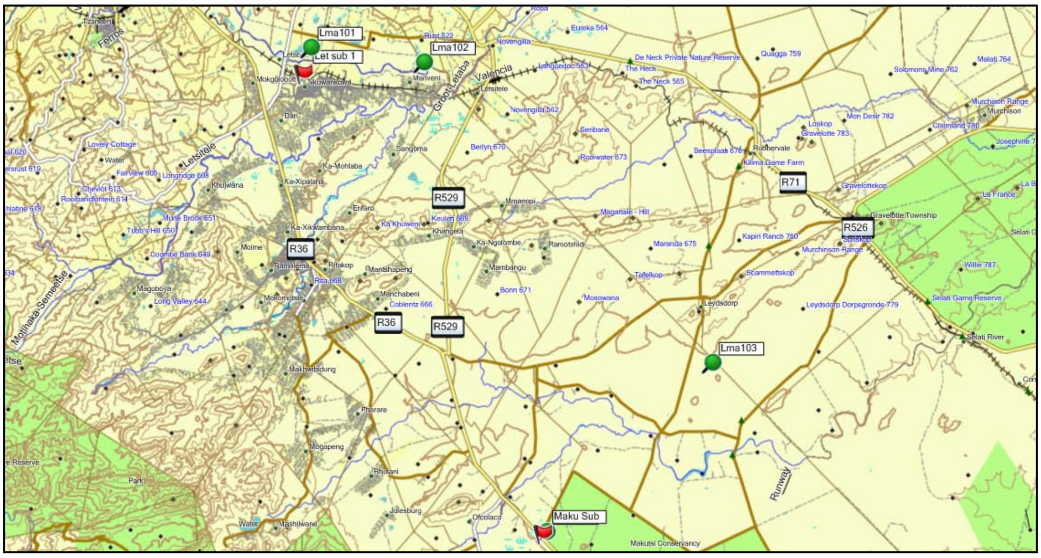

Figure 89: Approximate corridor investigated for Alternative 3.

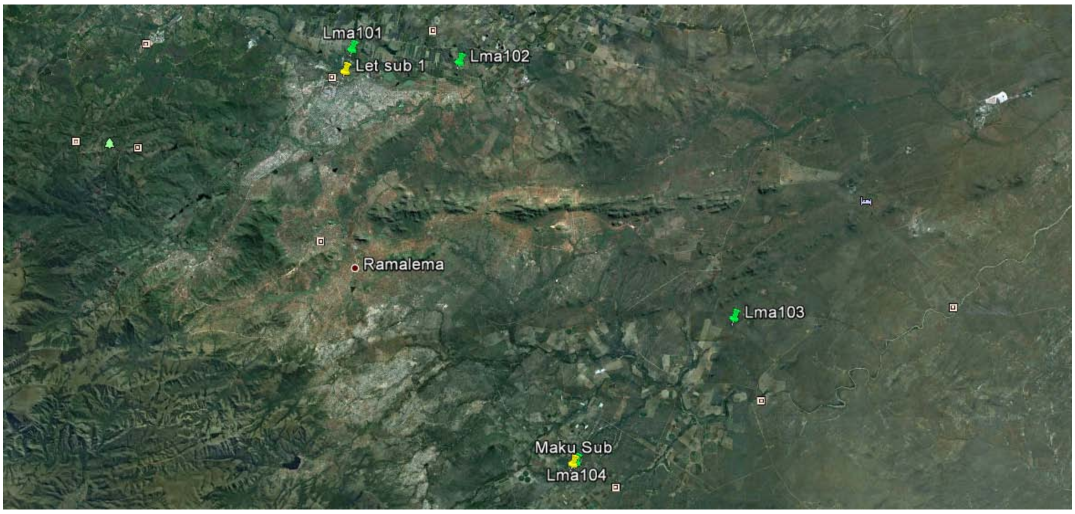

Figure 90: Aerial view of Alternative 3.

The route for this alternative exits the Letaba substation (Alternative 1) to the north, crosses the Groot Letaba River and then swings to the east. To the north of Mariveni, the route turns southeast to the Leydsdorp area where the power line will turn southwest to the Makutswi substation.

The corridor to the south of the Groot Letaba River passes through orchards and the natural vegetation is totally modified. The crossing over the river is considered to be a sensitive area and pylons for the power line must be placed outside the 1:100 year flood line of the river (Figure 91 – 94).

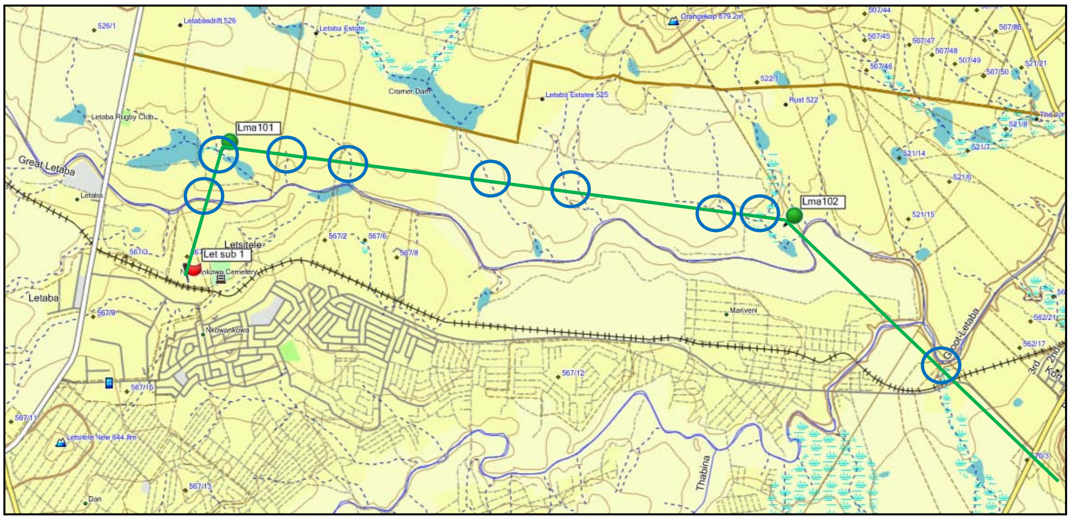

Figure 91: First sector of the corridor from the Letaba substation site.

Figure 92: Aerial view of the sector indicating the orchards to the north of the Groot Letaba River.

Figure 93: View from the substation site towards the river and the orchards in the background.

Figure 94: Example of orchards to the north of the Groot Letaba River.

Along the river there are *Breonadia salicina, Acacia caffra, A. sieberiana, Ficus sur, Philenoptera violacea* and *Diospyros mespiliformis*. The corridor crosses the Groot Letaba and Letsitele Rivers when it swings to the southwest. It passes to the south of Letsitele and crosses the R529. The area to the east of the R529 is dominated by rugged mountainous terrain with the natural vegetation in a fair to good condition (Figure 95 – 98).

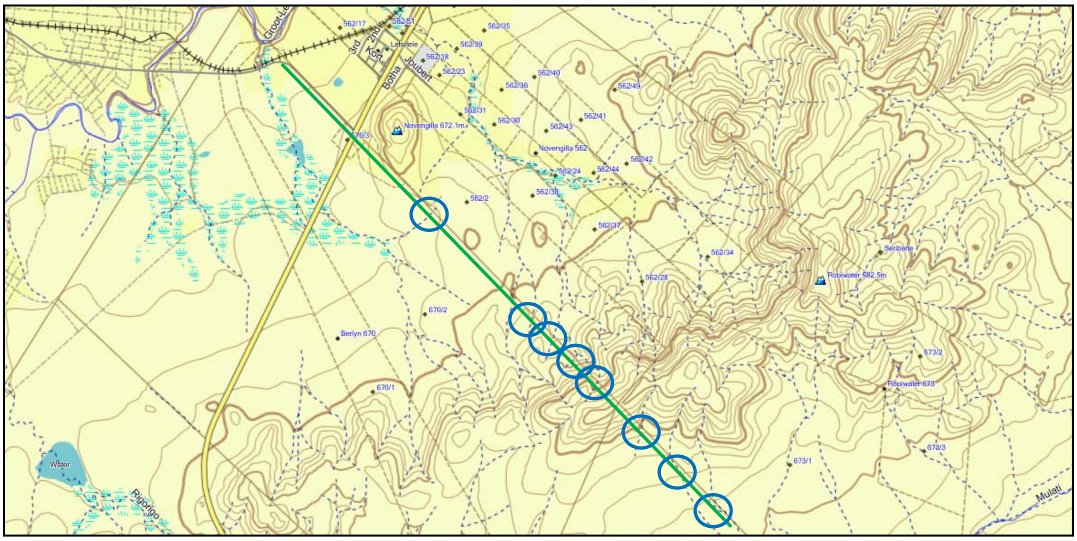

Figure 95: Corridor to the east of the R529.

Figure 96: Aerial view of sector to the south of Letsitele.

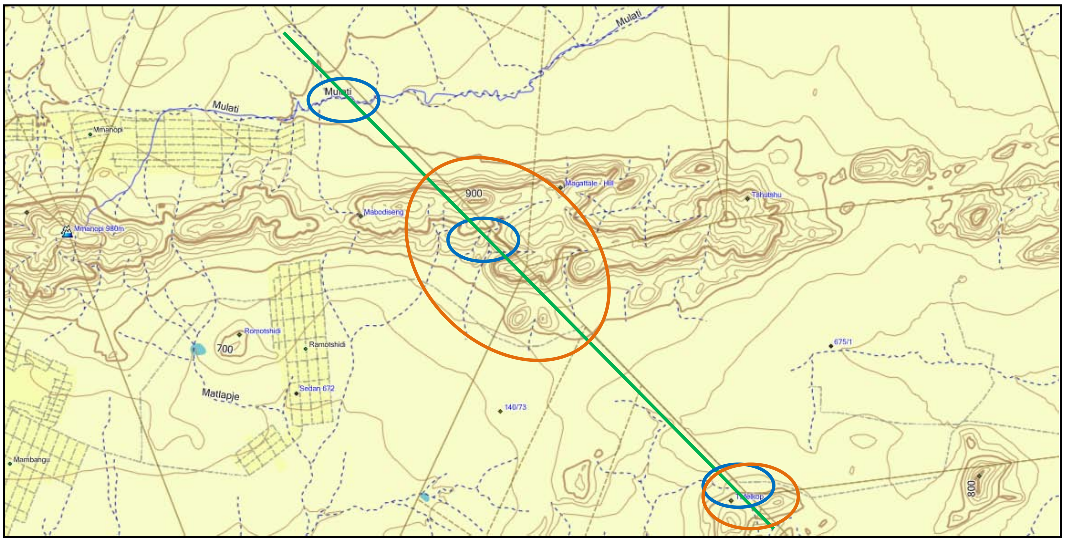

Figure 97: Sector crossing the Mulati River with some residential areas between the mountain ranges.

Figure 98: Aerial view of the sector.

The valleys between the mountains are inhabited and the impacts include residential developments, wood collection, cultivation and grazing. The soils are erodible and many stream crossings are present. The trees along this sector include *Philenoptera violacea, Burkea africana, Combretum imberbe, C. apiculatum, C. zeyheri, C. collinum, Ficus sur, Acacia nilotica, A. nigrescens, A. karroo, Dombeya rotundifolia, Ziziphus mucronata, Peltophorum africanum, Dichrostachys cinerea* and *Lannea schweinfurthii* (Figure 99 – 102).

Figure 99: Impacts in valleys modify natural vegetation.

Figure 100: Erosion a high risk.

Figure 101: Grazing and cultivation modify the landscape.

Figure 102: Riparian vegetation at most stream in a fair to good condition.

The next section of the sector crosses a few low outcrop and hills and the main activities in the area is game and cattle farming with some cultivation of crops (Figure

103 and 104). The streams and outcrops are considered as sensitive and it is important refugia and migration corridors for biota.

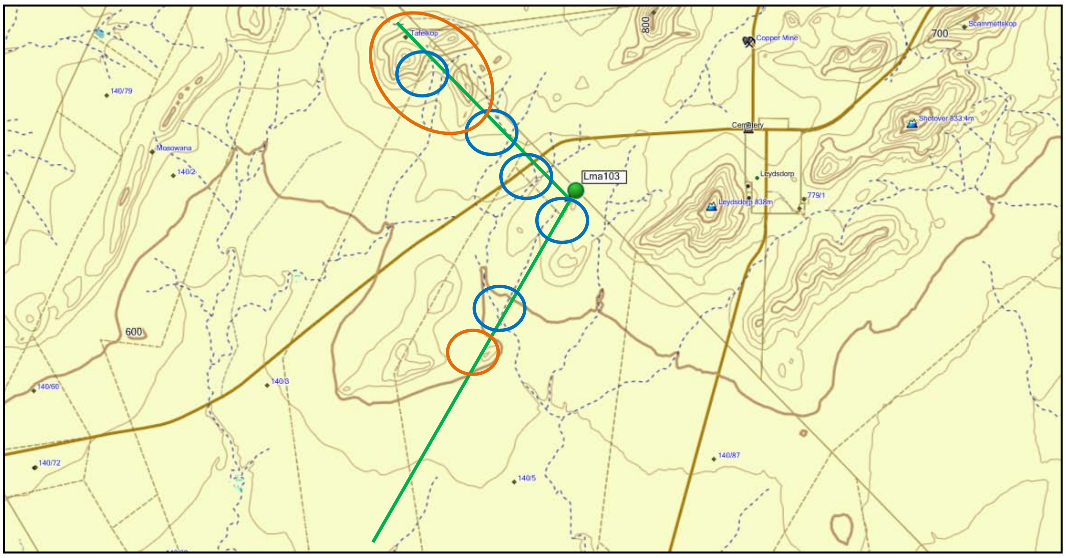

Figure 103: Next sector entering the commercial farming area – stream crossings circled in blue and the outcrops and low mountains in brown.

Figure 104: Aerial view of sector – natural vegetation in a fair to good condition.

The trees in the area include *Philenoptera violacea, Burkea africana, Terminalia sericea, Acacia karroo, A. polyacantha, A. davyi, A. caffra, A. nigrescens, Combretum apiculatum, C. imberbe, C. collinum, C. molle, C. zeyheri, Ziziphus mucronata, Peltophorum africanum, Dombeya rotundifolia* and *Dichrostachys cinerea*.

The proposed corridor then swings to the southwest towards the Makutswi substation. The corridor crosses farms, the Ngwabitsi and Ga-Selati Rivers and follows the existing power line corridor to the substation (Figure 105 – 114).

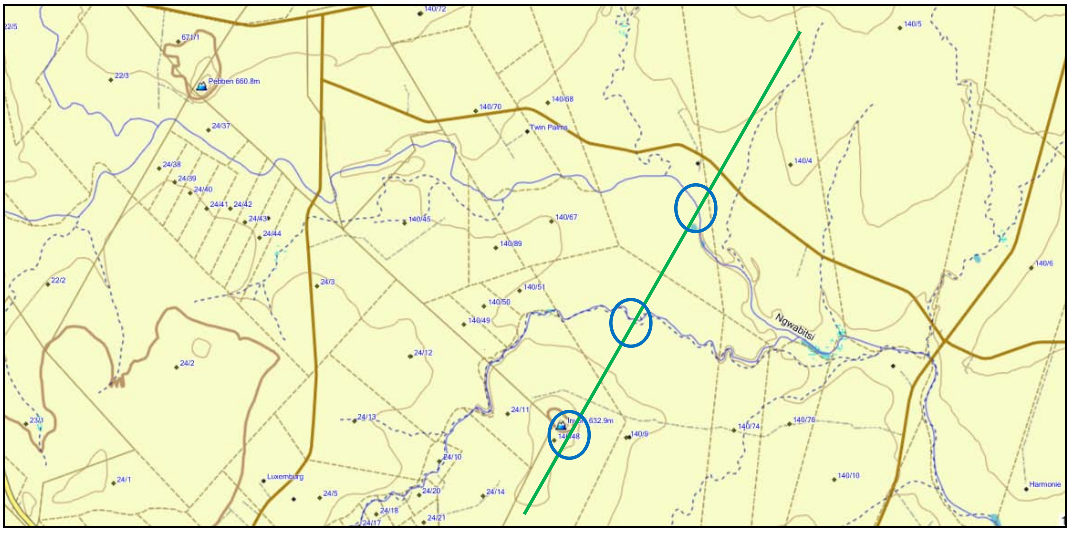

Figure 105: Sector crossing the Ngwabitsi and Ga-Selati Rivers.

Figure 106: Aerial view of sector crossing the rivers.

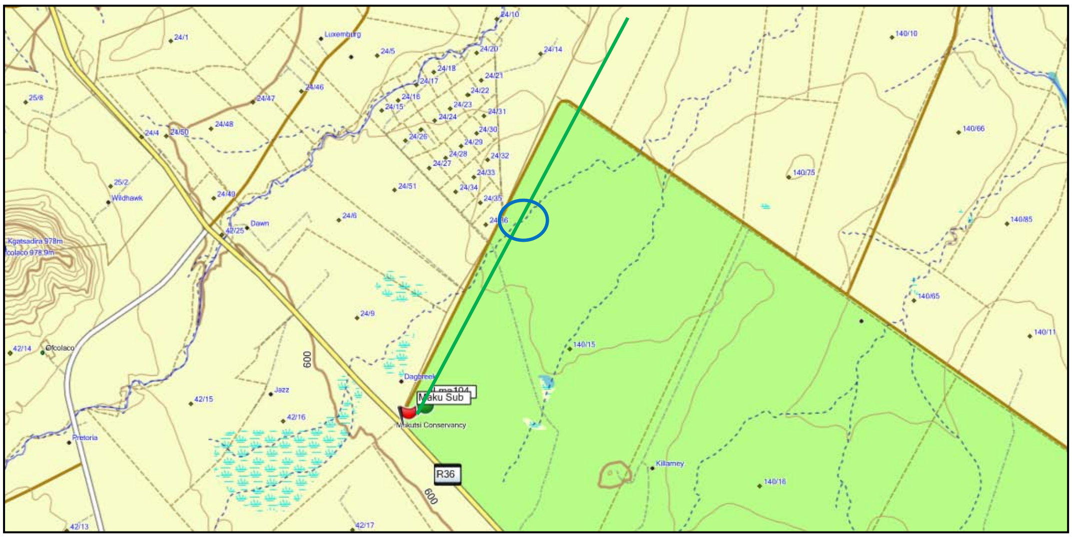

Figure 107: Last sector of the power line (Alternative 3) between the Letaba (Alternative 1) and Makutswi substations.

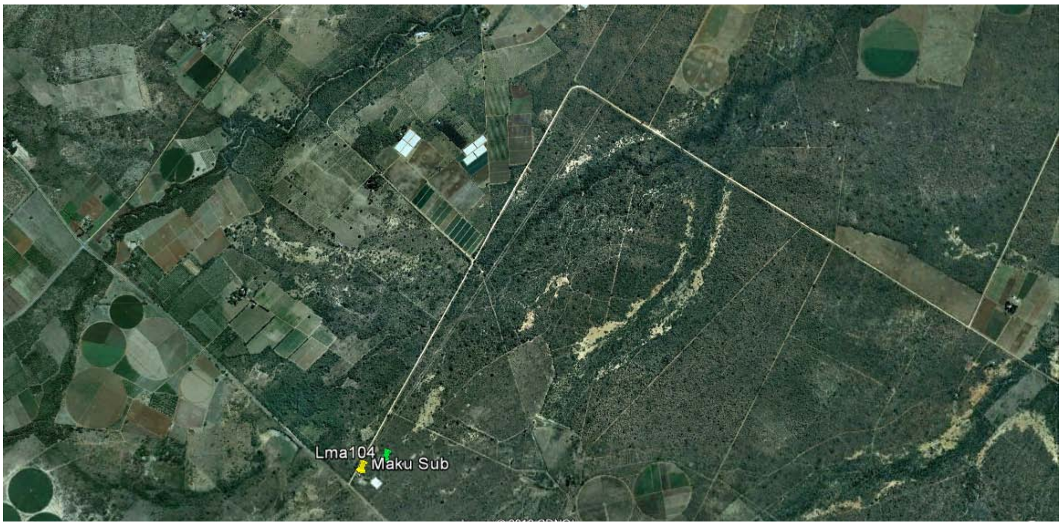

Figure 108: Aerial view of the last sector of the power line.

Figure 109: Some areas encroached due to over grazing.

Figure 110: Vegetation in a fair to good condition in game and cattle farming areas.

Figure 111: Outcrops are sensitive areas – refugia and migration corridors for biota.

Figure 112: Example of riparian vegetation in a good condition at Ga-Selati River.

Figure 113: River crossing of the Ngwabitsi River.

Figure 114: New power line will follow existing servitude.

Summary

Power line – Letaba to Makutswi substations:

Alternative 1:

- From an ecological perspective, this corridor for the proposed new power line is preferred. The corridor follows a route where the natural vegetation is in a poor state for the largest part.
- The route crosses a mountainous area (Figure 26 and 27; 32 and 33) and here erosion can be a problem. Access through the existing roads will lower the impacts during construction.
- The stream crossings and the mountains are considered as sensitive, as erosion is a problem. A rehabilitation plan must be formulated to address all erosion problems on a daily basis.
- The mountains and streams are further important refuge areas for plants and animals. It is used a migration routes and habitat for foraging and living.
- The koppie in Mmanopi/Khangela is also a sensitive area and it is suggested that the route follows a corridor to the west of the road (Figure 32 and 33).
- The following protected tree species were seen on the site: *Sclerocarya birrea, Breonadia salicina, Combretum imberbe, Philenoptera violacea* and possibly *Adansonia digitata*. *Pterocarpus angolensis* is listed but no specimens where seen during the field survey. A "walk down" inspection must be carried out once the final servitude corridor is known. During the process, all protected trees must be marked (GPS) and permits for cutting and trimming must be applied for, before any clearing of vegetation can take place.
- Ten red book data plant species is recorded for the route. The species listed (Addendum 3) occur in habitats with low presence along the corridor. Any presence or absence must be confirmed once the final route is selected.
- Although some rare mammals can occur in the area (suitable habitat), no records on the property is found.
- A large number of stream and river crossing was found along the corridor. Limited traffic during construction must be allowed.
- With regard to biodiversity patterns, little if any impacts will occur. The mountainous areas are an area where impacts can be higher.

- The vegetation type occurs over a very large area and the narrow corridor for the power line will have no large-scale negative impact on it.
- Ten red data plant species are listed and habitat for one species is absent. Due to the high impacts to the environment, their presence may be very limited but it can be confirmed during the walk down study. A number of the protected tree species are present– low impact if well planned (High confidence).
- Many drainage lines, streams and rivers occur. In the mountain areas, access is limited (high impact) but for large sections the existing servitude of power lines and roads can be used and this will lower impacts (high confidence).
- There were alien plant infestations observed along the corridor. Clearing of soil can always lead to some infestations and infestations from existing sources can cause a spread of alien plants. It is suggested that the “maintenance plan” of the site must include regular inspections to ensure no alien or exotic plants establish itself on site.
- Currently the corridor is in a poor state (most of the corridor), but the mountainous area is in a fair condition. Many land use practices have had impacts and include mining and sand mining, grazing, cultivation, forestry, town developments, wood harvesting, roads and the existing power lines. Many area show signs of overgrazing and this resulted in encroachment. Current erosion is a large problem along the entire corridor and can increase in future.
- The activity (construction of the power line) will have small impact on biodiversity processes. The only possible impact can be oil or fuel spillages that can occur during construction or the installation and maintenance of the transformers. It is always suggested that fuel and oil must not be stored on site during the construction phase and that containment dams or berms are constructed around transformers. In addition, a clear plan how to manage accidental spills must be included in the EMP for the site.
- As stated, the impact on the system is low and this development will have a limited negative impact on the region with regard to plants, plant communities, water courses if well managed (regional perspective).

Alternative 2:

- From an ecological perspective, this corridor for the proposed new power line is not preferred. The corridor follows a route where the natural vegetation is in a good state and crosses some mountains with very poor accessibility compared to Alternative 1.
- The route crosses large mountains (Figure 67 and 68; 71 - 76) and here erosion can be a problem. Access roads are limited and will be very difficult to construct. The route will cross over high peaks and this makes the route not suitable.
- The stream and river crossings in the mountains are considered as sensitive, as erosion is a problem.
- The mountains and streams are further important refuge areas for plants and animals. It is used a migration routes and habitat for foraging and living.
- The following protected tree species were seen on the site: *Sclerocarya birrea, Breonadia salicina, Combretum imberbe* and *Philenoptera violacea*. *Pterocarpus angolensis* is listed but no specimens where seen during the field survey. A "walk down" inspection must be carried out once the final servitude corridor is known. During the process, all protected trees must be marked (GPS) and permits for cutting and trimming must be applied for, before any clearing of vegetation can take place.
- Thirty-four red book data plant species is recorded for the route. Some habitat in the high mountains may be suitable for the species listed (Addendum 3). This makes it not a viable alternative for the power line.
- Although some rare mammals can occur in the area (suitable habitat), no records on the property is found.
- A large number of stream and river crossing was found along the corridor. Limited traffic during construction must be allowed.
- With regard to biodiversity patterns, little if any impacts will occur. The mountainous areas are areas where impacts can be higher.
    - The vegetation type occurs over a large area and the narrow corridor for the power line will have large-scale negative impact on it.
    - Thirty-four red data plant species are listed. A number of the protected tree species are present– high impact (High confidence).

- Many drainage lines, streams and rivers occur. In the mountain areas, access is limited (high impact) (high confidence).
- There were alien plant infestations observed along the corridor. Clearing of soil can always lead to some infestations and infestations from existing sources can cause a spread of alien plants. It is suggested that the "maintenance plan" of the site must include regular inspections to ensure no alien or exotic plants establish itself on site.
- Currently the corridor is in a fair to good state and the mountainous area good condition. Many land use practices have had impacts and include sand mining, grazing, cultivation, forestry, town developments, wood harvesting, roads and the existing power lines. Many area show signs of overgrazing and this resulted in encroachment. Current erosion is a large problem along the entire corridor and can increase in future.
- The activity (construction of the power line) will have impact on biodiversity processes. Additional possible impacts can be oil or fuel spillages that can occur during construction or the installation and maintenance of the transformers. It is always suggested that fuel and oil must not be stored on site during the construction phase and that containment dams or berms are constructed around transformers. In addition, a clear plan how to manage accidental spills must be included in the EMP for the site.
- As stated, the impact on the system is moderate to high and this development will have a negative impact on the region with regard to plants, plant communities, water courses (regional perspective).

Alternative 3:

- From an ecological perspective, this corridor for the proposed new power line is not preferred. The corridor follows a route where the natural vegetation to the east of the Letaba substation is in a poor state, but to the east of the Groot Letaba River it is in a fair to good state. It then crosses some mountains where the natural vegetation is in a good condition.
- In the northern part of the route, the natural vegetation is severely modified, but the route crosses a few outcrops and mountains and these are sensitive areas (refugia for biota) (Figure 95 – 98; 103 and 104) and here erosion can be a problem. Access roads are limited and careful planning is needed to lower the impacts during construction.
- To the east of the Groot Letaba River, the game farms are present. Here the natural vegetation is in a good condition and many game species are present, including *Panthera leo, Syncerus caffer* and *Hippotragus niger*. A rehabilitation plan must be formulated to address all erosion problems on a daily basis.
- The mountains and streams are further important refuge areas for plants and animals. It is used a migration routes and habitat for foraging and living.
- The following protected tree species were seen on the site: *Sclerocarya birrea, Breonadia salicina, Combretum imberbe, Philenoptera violacea* and *Adansonia digitata*. *Pterocarpus angolensis* is listed but no specimens where seen during the field survey. A "walk down" inspection must be carried out once the final servitude corridor is known. During the process, all protected trees must be marked (GPS) and permits for cutting and trimming must be applied for, before any clearing of vegetation can take place.
- Ten red book data plant species is recorded for the route. Some habitat in the high mountains may be suitable for the species listed (Addendum 3).
- Although some rare mammals can occur in the area (suitable habitat). There are records of Lion, Buffalo and Sable antelope present.
- A large number of stream and river crossing was found along the corridor. Limited traffic during construction must be allowed.
- With regard to biodiversity patterns, some impacts in the mountain areas will occur.

- o The vegetation type occurs over a very large area and the narrow corridor for the power line will have some negative impact on it.
- o Ten red data plant species are listed and the available habitat may be suitable. Due to the high impacts to the environment, some may not occur anymore, but it can be confirmed during the walk down study. A number of the protected tree species are present– low impact if well planned (High confidence).
- o Many drainage lines, streams and rivers occur. In the mountain areas, access is limited (high impact) but for large sections the existing servitude of power lines and roads can be used and this will lower impacts (high confidence).
- o There were alien plant infestations observed along the corridor. Clearing of soil can always lead to some infestations and infestations from existing sources can cause a spread of alien plants. It is suggested that the “maintenance plan” of the site must include regular inspections to ensure no alien or exotic plants establish itself on site.
- o Currently the corridor is in a poor state (west of the Groot Letaba River), but the mountainous area to the east is in a fair to good condition. Many land use practices have had impacts and include sand mining, grazing, cultivation, town developments, wood harvesting, roads and the existing power lines. Some areas show signs of overgrazing and this resulted in encroachment. Current erosion is a large problem along the entire corridor and can increase in future.
- o The activity (construction of the power line) will have an impact on biodiversity processes. The impact of erosion in the mountains and oil or fuel spillages that can occur during construction or the installation and maintenance of the transformers is a problem. It is always suggested that fuel and oil must not be stored on site during the construction phase and that containment dams or berms are constructed around transformers. In addition, a clear plan how to manage accidental spills must be included in the EMP for the site.

- As stated, the impact on the system is low and this development will have a limited negative impact on the region with regard to plants, plant communities, water courses if well managed (regional perspective).

Addendum 1 is a summary of the potential impacts related to the project (construction of the power line) and some mitigating and management suggestions are listed in the table.

Addendum 2 is a summary of mammals that historically occurred in the area. It also indicates habitat availability and possibility of occurrence on the site.

From the SANBI database, 34 species is listed as red data species, some likely to occur as habitat are present (Addendum 3).

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Addendum 1: Impacts and mitigating recommendations.

Letaba/Makutswi project		
Theme	Natural environment	
Nature of issue	Erosion	
Stage	Construction and maintenance	Possibility for erosion during construction possible due to soil types.
Extent of impact	Site, local and region	The impact will be moderate on-site, but limited to low on a regional scale. Silt will have a negative impact in streams and rivers, but will be very high for this project if not managed.
Duration of impact	Immediate	If not addressed on constant basis, permanent damage is a reality.
Intensity	Moderate	If not properly managed as part of operational plan, it will be high.
Probability of occurrence	High	Must be managed on daily basis.
Status of the impact	Project: negative Environment: negative	If well managed, can be neutral for both.
Cumulative impact	Moderate.	If no maintenance is done, the impact will have a compounding impact on the environment.
Level of significance	Very low if controlled.	Will be very moderate-high if not managed.
Mitigation measures	• Limited traffic during construction. • Constant rehabilitation during construction. • Must have maintenance strategy as part of EMP. • Use existing road (servitude) as access road	
Level of significance after mitigation	Low.	
EMP requirements	• No surface storm water generated as a result of the development may be directed directly into any natural drainage system or wetland. • A surface runoff and storm water management plan, indicating the management of all surface runoff generated as a result of the development (during	

	both the construction and operational phases) prior to entering any natural drainage system or wetland, must be submitted (e.g. storm water and flood retention ponds). • No activity such as temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment or any other use of the buffer/flood zone whatsoever, may be permitted during the construction phase. • An on-site ecological management plan must be implemented for drainage lines including management recommendations as well as potential rehabilitation of disturbed areas.	
Nature of issue	Construction – material, by products and construction sites.	This includes accommodation, storing of material and ablution facilities for all workers during construction. It is recommended that no workers stay on the construction sites at any time. No storing of hazardous material on site (oil, fuel)
Stage	Construction and maintenance	Must have strict environmental guidelines and management plan in place before clearing and construction can commence.
Extent of impact	Site, local and region	Can have a medium impact on site, related to pollution, but the impact in the region will be low.
Duration of impact	Immediate	If not addressed on constant basis, permanent damage is a reality.
Intensity	Low	If not properly managed as part of operational plan, it will be high.
Probability of occurrence	High	Must be managed on daily basis.
Status of the impact	Project: negative Environment: negative	If well managed, can be neutral for both.
Cumulative impact	Marginal.	If no maintenance is done, the impact will have a compounding impact on the environment.
Level of significance	Low if controlled.	Will be very high if not managed.
Mitigation measures	• Proper ablution facilities on site.	This refers to storage of material, oil and fuel spills, ablution

	• Constant management during construction. • Must have rehabilitation strategy as part of EMP.	facilities and rehabilitation of construction sites at the completion of the project.
Level of significance after mitigation	Low.	Will have to form part of the EMP to ensure low impact/significance at completion.
EMP requirements	• During the construction phase, workers must be limited to areas under construction and access to neighbouring undeveloped areas must be strictly regulated. • Construction should be limited to the daylight hours preventing disturbances to the nocturnal activities of certain species. • Alien vegetation removal will continue through all phases of the development especially in the open spaces. • All temporary stockpile areas - litter and rubble must be removed on completion of construction. All dumped material must be taken to an approved dump site in the area. • Soil stockpiling areas and storage facilities must follow environmentally sensitive practices and be situated a sufficient distance away from drainage areas or drainage line – preferably off-site. • The careful position of soil piles, and runoff control, during all phases of development, and planting of some vegetative cover after completion (indigenous groundcover, grasses etc.) will limit the extent of erosion occurring on the site.	
Nature of issue	Pollution	Includes oil and fuel spills, erosion, storage of by-products and ablution facilities.
Stage	Construction and maintenance	Must have a strict environmental guidelines and management plan in place before clearing and construction can commence.
Extent of impact	Site, local and region	Can be severe if not well managed. Must be done on a daily

		basis (part of the EMP).
Duration of impact	Immediate	If not addressed on constant basis, permanent damage is a reality. Water pollution can be a severe problem.
Intensity	Low	If not properly managed as part of operational plan, it will be high.
Probability of occurrence	High	Must be managed on daily basis.
Status of the impact	Project: negative Environment: negative	If well managed, can be neutral for both.
Cumulative impact	Marginal - compounding	If no maintenance is done, the impact will have a compounding impact on the environment.
Level of significance	Low if controlled.	Will be very high if not managed.
Mitigation measures	• Proper ablution facilities on site. • Constant rehabilitation of erosion problems. • Berms to contain spills. • Proper storage facilities of construction materials. • Waste management is very important. Proper storage and removal strategy must be in place. • Must have rehabilitation strategy as part of EMP.	This refers to storage of material, oil and fuel spills, ablution facilities and rehabilitation of construction sites at the completion of the project. Due to the nature of the slopes and soils, water pollution can be a problem if not properly managed.
Level of significance after mitigation	Low.	Will have to form part of the EMP to ensure low impact/significance at completion.
EMP requirements	• Proper strategy to prevent erosion – see above. • Berms and containment measures for fuels and oils, also around transformers to prevent spills during accidents and maintenance. • Cleanup plan/strategy if spills occur. • Proper facilities (ablution) to ensure no sewerage spills into streams and rivers. • Proper storage of material during construction and cleanup after the construction is completed. • Proper strategy to remove and dispose of oil from transformers.	

Nature of issue	Alien vegetation	Includes all exposed areas – substation sites and servitudes for the power lines.
Stage	Construction and maintenance	Must have a strict environmental guidelines and management plan in place before clearing and construction can commence.
Extent of impact	Site, local and region	Can be severe if not well managed. Must be done on a daily basis (part of the EMP).
Duration of impact	Immediate	If not addressed on constant basis, permanent damage is a reality. Many exotics are present and can invade exposed areas during and after construction.
Intensity	Low	If not properly managed as part of operational plan, it will be high.
Probability of occurrence	Low	Must be managed on regular basis.
Status of the impact	Project: negative Environment: negative	If well managed, can be neutral for both.
Cumulative impact	Marginal - compounding	If no maintenance is done, the impact will have a compounding impact on the environment.
Level of significance	Low if controlled.	Will be high if not managed.
Mitigation measures	• Need to ensure all alien plants on construction sites are removed. • Must clear alien vegetation on a regular basis. • Must plant/re-seed with indigenous grasses as part of EMP. • Disturbed areas around the construction sites should be re-vegetated. • Exposed areas should be rehabilitated. • Must have rehabilitation strategy as part of EMP.	
Level of significance after mitigation	Low.	Will have to form part of the EMP to ensure low impact/significance at completion.
EMP requirements	• Proper strategy to prevent invasive alien plants from establishing and this will further prevent pollution and erosion – see above. • Regular maintenance and inspections and removal of alien plants.	

	• Possible to link with Working for Water in this regard.	
Nature of issue	Wood collection and illegal hunting	Includes all areas around the construction site and adjacent properties. Trees present as well as small game.
Stage	Construction and maintenance	Must have a strict environmental guidelines and management plan in place.
Extent of impact	Site, local and region	Can be severe if not well managed. Must be done on a daily basis (part of the EMP).
Duration of impact	Immediate	If not addressed on constant basis, permanent damage is a reality. Many exotics are present and can invade exposed areas during and after construction.
Intensity	Moderate	If not properly managed as part of operational plan, it will be very high.
Probability of occurrence	High	Must be managed on regular basis.
Status of the impact	Project: negative Environment: negative	If well managed, can be neutral for both.
Cumulative impact	Marginal - compounding	If no maintenance is done, the impact will have a compounding impact on the environment.
Level of significance	Low-medium if controlled.	Will be very high if not managed.
Mitigation measures	• Must ensure no wood collection takes place (by construction workers for cooking). • Although little game animals are present, care must be taken that no illegal hunting takes place – mostly by snares. • The construction teams must be informed – strategy must form part of EMP.	
Level of significance after mitigation	Low.	Will have to form part of the EMP to ensure low impact/significance at completion.
EMP requirements	• Proper strategy to prevent hunting and wood collection. • Regular inspections.	
Nature of issue	Removal on natural vegetation	Includes the servitude for the power line .

Stage	Construction and maintenance	Must have a strict environmental guidelines and management plan in place before clearing and construction can commence.
Extent of impact	Site, local and region	Limited removal of vegetation for the servitude of the power line is needed. The impact on site will be low to moderate, with very low impact on local and regional level. Can be severe if not well managed. Must be monitored on a daily basis (part of the EMP) to ensure no illegal removing or cutting occur. Use existing roads for access where possible. Acquire permits for cutting and trimming of protected trees.
Duration of impact	Permanent	The removal of plants from the corridor for the power line will have permanent impact.
Intensity	Low/moderate	Although the duration of the impact is of a permanent nature, the intensity is low on a local and regional scale. The immediate habitat surrounding the power line corridor is in a fair to good condition. The protection of the environment is the function of local and provincial authorities and this will be important. The construction of the power line will have negligible impacts if well managed.
Probability of occurrence	High	Again, the impact will be confined to the site of the substation. In the larger environment, the probability will be low.
Status of the impact	Project: negative Environment: neutral	If well managed, can be neutral for both.
Cumulative impact	Marginal	If maintenance is poor, the impact will have a compounding result on the environment. One refers to illegal or unnecessary cutting of trees on the power line servitude during routine clearing of vegetation. This must be well managed by all role players (Eskom and conservation authorities).
Level of significance	Low-medium if controlled.	Will be very high if not managed.
Mitigation measures	• Limited plants need to be removed when clearing the servitude for the new power line. Clear guidelines and proper plans must be given to the contractor. Daily inspections are needed to prevent problems. • Must clear alien vegetation on a regular basis.	A clear plan must be in place before the project commence. The contractor must clearly understand where to clear. The area should be marked. All trees to be cut must be marked. Trees to be trimmed should be marked and the contractor should understand what branches must be cut/trimmed. A

	• Exposed areas should be rehabilitated with a grass mix that blends in with the surrounding vegetation. The grass mix should consist of indigenous grasses adapted to the local environmental conditions. The grass seeds should a variety of grass species including several pioneer species. • Must have rehabilitation strategy as part of EMP.	policy should be in place to penalise the contractor. Eskom and conservation services should have an official on site to ensure no problems occur.
Level of significance after mitigation	Low.	Will have to form part of the EMP to ensure low impact/significance at completion.
EMP requirements	• Proper strategy to prevent invasive alien plants from establishing and this will further prevent pollution and erosion – see above. • Regular maintenance and inspections and removal of alien plants. • Possible to link with Working for Water in this regard.	

Addendum 2: List of red data species and CITES species in Limpopo Province (LEDET State of the Environment Report, 2004). The probability of occurrence is obtained from Skinner and Chimimba (2005).

Category	**Common Name**	**Scientific Name**	**Does suitable habitat occur on site? (Yes/No)**	**Probability of the species occurring on site? (high/medium/low)**
Critically Endangered	Black rhinoceros	*Diceros bicornis*	No	No
	Juliana's golden mole	*Neamblysomus julianae*	No	No
Endangered	African wild dog	*Lycaon pictus*	No	No
Vulnerable	African elephant	*Loxodonta africana*	Yes	Low
	Gunning's golden mole	*Neamblysomus gunningi*	No	No
	Cheetah	*Acinonyx jubatus*	Yes	No
	Lion	*Panthera leo*	Yes	Low
	Black-footed cat	*Felis nigripes*	Yes	Low
Near Threatened	White rhinoceros	*Ceratotherium simum*	Yes	No
CITES Appendix	**Common Name**	**Scientific Name**	**Does suitable habitat occur on site? (Yes/No)**	**Probability of the species occurring on site? (high/medium/low)**
Appendix 1	Black-footed cat	*Felis nigripes*	No	Very low
	Leopard	*Panthera pardus*	Yes	Medium
	Cheetah	*Acinonyx jubatus*	Yes	No
	Black rhinoceros	*Diceros bicornis*	No	No
Appendix 2	African elephant	*Loxodonta africana*	Yes	Low
	Chacma baboon	*Papio ursinus*	Yes	High
	Vervet monkey	*Cercopithecus aethiops*	Yes	High
	Samango monkey	*Cercopithecus mitis*	Yes	Medium
	Greater galago	*Otolemur crassicaudatus*	Yes	Medium
	South African galago	*Galago moholi*	Yes	Very low
	Spotted-necked otter	*Lutra maculicollis*	Yes	Medium
	African clawless otter	*Aonyx capensis*	Yes	Medium
	Caracal	*Caracal caracal*	Yes	Low
	Serval	*Leptailurus serval*	Yes	Medium
	African wild cat	*Felis sylvestris*	No	Low
	Lion	*Panthera leo*	Yes	Low
	Hippopothamus	*Hippopothamus amphibious*	Yes	Low
	White rhinoceros	*Ceratotherium simum*	Yes	No
	Pangolin	*Manis temminckii*	Yes	Very low

Addendum 3: List of Red data species from the ¼ degree square (SANBI, 2012).

Alternative 1:

Family	*Genus and species*	Status	Distribution, habitat and threats	Probability of occurrence
ZINGIBERACEAE	*Siphonochilus aethiopicus*	CR	Limpopo, Mpumalanga, Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. Extinct in KwaZulu-Natal. Widespread elsewhere in Africa. Tall open or closed woodland, wooded grassland or bushveld.	Low
AMARYLLIDACEAE	*Clivia caulescens*	NT	Limpopo, Mpumalanga Forest patches and forest margins.	No
APOCYNACEAE	*Ceropegia decidua subsp. pretoriensis*	VU	Gauteng, North West, Magaliesberg Associated with ridges and quartzitic rocky outcrops in pockets of soil among rocks in direct sunshine or shaded areas.	Low
ASTERACEAE	*Helichrysum junodii*	Rare	Limpopo, Mountains between the Wolkberg and the Downs. Rock outcrops in grasslands, 1100-1925 m.	Low
CANELLACEAE	*Warburgia salutaris*	EN	North-eastern KwaZulu-Natal, Mpumalanga and Limpopo Province. Forest, Variable, including coastal, riverine, dune and montane forest as well as open woodland and thickets.	Low
DRACAENACEAE	*Dracaena transvaalensis*	Rare	Limpopo, Mpumalanga, Dublin Mine to Penge. Quartzite or dolomite lithosols, sometimes in deep rock cracks, hot and dry exposed slopes covered in deciduous woodland, occasionally in light shade in evergreen tall woodland on mountain slopes, 750-1000 m.	No
LAMIACEAE	*Thorncroftia media*	Critically Rare	Limpopo, Drakensberg Mountains west of Trichardtsdal. Afromontane forest in sandstone outcrops.	No
PROTEACEAE	*Leucospermum saxosum*	EN	Mpumalanga and Limpopo Drakensberg Escarpment, Habitat is not well known, plants tend to occur on quartzitic soils.	No
SANTALACEAE	*Thesium gracilentum*	VU	Limpopo, Woodbush and Lekgalameetse. Serpentine soils in northern escarpment bushveld.	No
ZAMIACEAE	*Encephalartos dolomiticus*	CR	Sekhukhuneland. Grassland, in shallow soils on dolomite ridges.	Low

Alternative 2:

Family	*Genus and species*	Status	Distribution, habitat and threats	Probability of occurrence
ACANTHACEAE	*Barleria dolomiticola*	VU	From Bewaarkloof in the Strydpoort Mountains to Lekgalameetse, southern Wolkberg Mountains. Grassland or low, open woodland, restricted to rocky dolomite slopes, 1360-1950 m. Habitat degradation	Low
AMARYLLIDACEAE	*Clivia caulescens*	NT	Limpopo, Mpumalanga Forest patches and forest margins.	Medium
ANACARDIACEAE	*Searsia gracillima var. gracillima*	NT	Restricted to a small area to the northeast of Pretoria. Rocky quartzitic outcrops in bushveld.	Low
APOCYNACEAE	*Ceropegia decidua subsp. pretoriensis*	VU	Gauteng, North West, Magaliesberg Associated with ridges and quartzitic rocky outcrops in pockets of soil among rocks in direct sunshine or shaded areas.	Low
APOCYNACEAE	*Brachystelma minor*	NT	Wolkberg to Graskop. Grassland, Shallow pockets of dolomite, tolerating both open and shady conditions.	Medium
APOCYNACEAE	*Mondia whitei*	EN	KwaZulu-Natal, Limpopo Mainly swamp forest in South Africa and occasionally in riverine and coastal forest, further north it is found in Afromontane forest. It is currently restricted to lower elevations, although historically it was recorded in higher altitude midlands forest.	No
ASPHODELACEAE	*Aloe monotropa*	VU	Limpopo, Dublin Mine Kloof, southern Limpopo Province. Occurs on steep, rocky slopes at the margins of closed woodland, 1000-1400 m.	Low
ASPHODELACEAE	*Aloe thompsoniae*	Rare	Limpopo, Wolkberg Mountains Montane mistbelt grasslands, rock crevices on steep cliffs, among large boulders, or in seepages or shallow soils at the edges of large exposed rock sheets.	Low
ASTERACEAE	*Helichrysum junodii*	Rare	Limpopo, Mountains between the Wolkberg and the Downs. Rock outcrops in grasslands, 1100-1925 m.	Low
CANELLACEAE	*Warburgia salutaris*	EN	North-eastern KwaZulu-Natal, Mpumalanga and Limpopo Province. Forest, Variable, including coastal, riverine, dune and montane forest as well as open woodland and thickets.	Low
CELASTRACEAE	*Lydenburgia cassinoides*	NT	Limpopo, Mpumalanga Exposed norite bedrock and dolomite.	Low
CORNACEAE	*Curtisia dentata*	NT	Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga Evergreen forest from coast to 1800 m.	Medium
DRACAENACEAE	*Dracaena transvaalensis*	Rare	Limpopo, Mpumalanga, Dublin Mine to Penge. Quartzite or dolomite lithosols, sometimes in deep rock cracks, hot and dry exposed slopes covered in deciduous woodland, occasionally in light shade in evergreen tall woodland on mountain slopes, 750-1000 m.	Medium
EUPHORBIACEAE	*Euphorbia restricta*	Rare	Limpopo. East of Mokopane and along the Strydpoort Mountains to the Drakensberg Escarpment and southwards to the Olifants River Valley near Penge. Montane mistbelt grassland, in shallow, humus-rich soils wedged among boulders of dolomite outcrops at around 1500 m.	Medium
FABACEAE	*Argyrolobium muddii*	EN	Limpopo, Mpumalanga, Haenertsburg to Pilgrim's Rest. Mistbelt Grassland.	Low

FABACEAE	*Lotononis pariflora*	Critically Rare	Limpopo. Wolkberg Mountains, The Downs. Mistbelt grassland, gentle slopes, 1900 m.	Medium to high
HYACINTHACEAE	*Merwilla plumbea*	NT	KwaZulu-Natal, Mpumalanga Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.	Low
IRIDACEAE	*Hesperantha brevicaulis*	Rare	Eastern Mpumalanga Escarpment and the Wolkberg Mountains. In damp moss between rock crevices on steep rocks and cliffs, around 1600 m.	Medium
LAMIACEAE	*Thorncroftia media*	Critically Rare	Limpopo, Drakensberg Mountains west of Trichardtsdal. Afromontane forest in sandstone outcrops.	Medium to high
LAMIACEAE	*Syncolostemon rugosifolius*	Rare	Limpopo - South of Lekgalameetse Nature Reserve. Quartzite rocks.	Medium to high
LAURACEAE	*Ocotea bullata*	EN	Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga High, cool, evergreen Afromontane forests.	Low
LAURACEAE	*Ocotea kenyensis*	VU	Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga Scarp and mistbelt forest.	Low
ORCHIDACEAE	*Disa aristata*	VU	Limpopo. Wolkberg Mountain and The Downs. Rock crevices on cliffs in mistbelt grassland, 1500 m. The habitat of this species is entirely surrounded by pine plantations, although plantations are not planted on the cliffs, seedlings do escape and establish on the cliffs, where they are very difficult to manage.	Low to medium
ORCHIDACEAE	*Disa extinctoria*	NT	Limpopo, Mpumalanga Crest of the escarpment in damp grassland and swamps, 1000-1300 m.	Low
PROTEACEAE	*Leucospermum saxosum*	EN	Mpumalanga and Limpopo Drakensberg Escarpment, Habitat is not well known, plants tend to occur on quartzitic soils.	Unsure about presence
ROSACEAE	*Prunus africana*	VU	Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North West Evergreen forests near the coast, inland mistbelt forests and afromontane forests up to 2100 m.	Low
SANTALACEAE	*Thesium davidsonae*	VU	Limpopo. Abel Erasmus Pass. Bushveld, on dolomites.	Low
SANTALACEAE	*Thesium gracilentum*	VU	Limpopo, Woodbush and Lekgalameetse. Serpentine soils in northern escarpment bushveld.	Medium
SCROPHULARIACEAE	*Nemesia zimbabwensis*	EN	Limpopo, Sekhukhuneland, Haenertsburg and Zimbabwe. Associated with rocky outcrops, often on moist, rocky ledges in forest where they grow in pockets of sandy humus, 1800 m.	Low to medium
WOODSIACEAE	*Hypodematium crenatum*	VU	Mpumalanga. Bourke's Luck Potholes and Sodwala in South Africa. Crevices on dolomite cliffs or in soil at the base of dolomite outcrops, from 1260-1600 m.	Medium
ZAMIACEAE	*Encephalartos dolomiticus*	CR	Sekhukhuneland. Grassland, in shallow soils on dolomite ridges.	Low
ZAMIACEAE	*Encephalartos laevifolius*	CR	Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga Restricted to high mountain peaks in eastern Mpumalanga and parts of Swaziland. Locally extinct in Limpopo, KwaZulu-Natal and Pondoland.	No
ZAMIACEAE	*Encephalartos nubimontanus*	EW	Limpopo. Formerly occurred in the Mountains north of Penge. Steep cliffs in low open woodland.	Low
ZINGIBERACEAE	*Siphonochilus aethiopicus*	CR	Limpopo, Mpumalanga, Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. Extinct in KwaZulu-Natal. Widespread elsewhere in Africa. Tall open or closed woodland, wooded grassland or bushveld.	Low

Alternative 3:

Family	***Genus and species***	**Status**	**Distribution, habitat and threats**	**Probability of occurrence**
ZINGIBERACEAE	*Siphonochilus aethiopicus*	CR	Limpopo, Mpumalanga, Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. Extinct in KwaZulu-Natal. Widespread elsewhere in Africa. Tall open or closed woodland, wooded grassland or bushveld.	Low
AMARYLLIDACEAE	*Clivia caulescens*	NT	Limpopo, Mpumalanga Forest patches and forest margins.	No
APOCYNACEAE	*Ceropegia decidua subsp. pretoriensis*	VU	Gauteng, North West, Magaliesberg Associated with ridges and quartzitic rocky outcrops in pockets of soil among rocks in direct sunshine or shaded areas.	Low
ASTERACEAE	*Helichrysum junodii*	Rare	Limpopo, Mountains between the Wolkberg and the Downs. Rock outcrops in grasslands, 1100-1925 m.	Low
CANELLACEAE	*Warburgia salutaris*	EN	North-eastern KwaZulu-Natal, Mpumalanga and Limpopo Province. Forest, Variable, including coastal, riverine, dune and montane forest as well as open woodland and thickets.	No
DRACAENACEAE	*Dracaena transvaalensis*	Rare	Limpopo, Mpumalanga, Dublin Mine to Penge. Quartzite or dolomite lithosols, sometimes in deep rock cracks, hot and dry exposed slopes covered in deciduous woodland, occasionally in light shade in evergreen tall woodland on mountain slopes, 750-1000 m.	No
LAMIACEAE	*Thorncroftia media*	Critically Rare	Limpopo, Drakensberg Mountains west of Trichardtsdal. Afromontane forest in sandstone outcrops.	No
PROTEACEAE	*Leucospermum saxosum*	EN	Mpumalanga and Limpopo Drakensberg Escarpment, Habitat is not well known, plants tend to occur on quartzitic soils.	No
SANTALACEAE	*Thesium gracilentum*	VU	Limpopo, Woodbush and Lekgalameetse. Serpentine soils in northern escarpment bushveld.	No
ZAMIACEAE	*Encephalartos dolomiticus*	CR	Sekhukhuneland. Grassland, in shallow soils on dolomite ridges.	Low