Basic Assessment report:

Survey of study for the Borutho MTS NDP project.

Specialist consultant:
Dr Wynand Vlok (Pr. Sci. Nat. – 400109/95)
40 Juno Avenue
Sterpark, Polokwane, 0699

082 200 5312
Fax: 0866 18 77 44
wynand.vlok@gmail.com

Introduction

This report is to discuss the biological survey (excluding the avifaunal component) conducted for the project.

During the survey, two possible options were investigated for the substation and the proposed power lines between the substations (Figure 1).

The project consists of the following components:

- Investigate a corridor for the construction of a 10km Kingbird line from Borutho to the PPrus North Kingbird line.
- Investigate a corridor for the construction of a 10.3km Kingbird line from Borutho to the Sandsloot line.
- Investigate a corridor for the construction of a 32.6km Kingbird line from Borutho MTS to Potgietersrus substation

Project locality

The proposed power line will be constructed in the area to the north of Mokopane (Limpopo Province) (Figure 1 and 2).

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 a list of the red data plant species found in the broader study area.

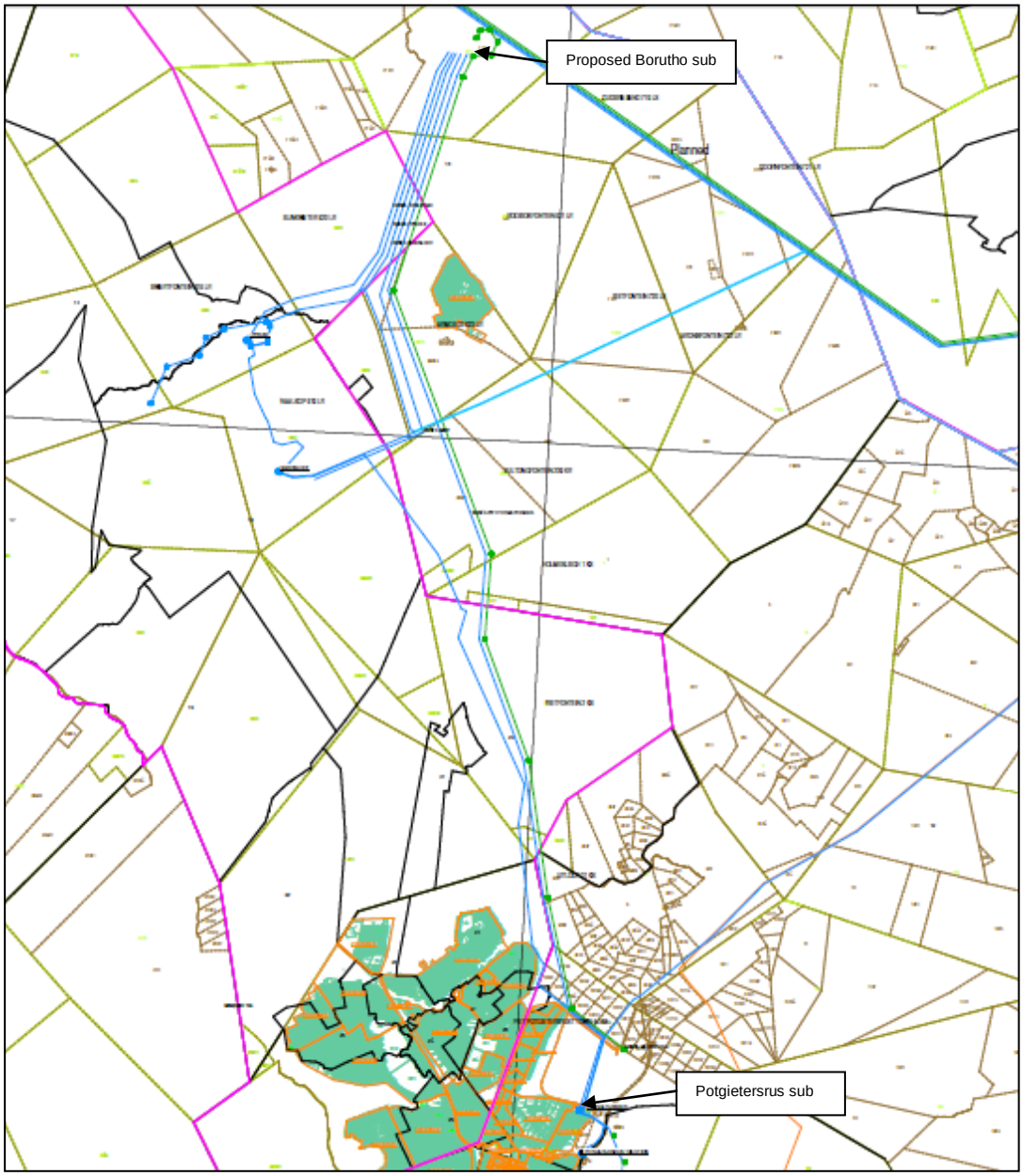

Figure 1: Approximate routes of the power lines and position for the substations for the proposed project.

Figure 2: General aerial view of the study area.

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 habitat assessment the relevant 1:50 000 maps were used. The State of the Environment Report (2004) from the Department of Agriculture, Conservation and Environment, Limpopo Province were used to determine if any red data animals occur in the area. 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 habitat types in the study area 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 hot with a light wind blowing. The region has received rainfall prior to and during the site visits as the vegetation was lush. There was some 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, limited 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. The State of the Environment Report (LEDET, 2004) and Skinner and Chimimba (2005) were used for the mammal assessment.

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 lines. 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. No red data species supplied by SANBI (2011) occur in the ¼ degree for the study site. The following protected trees occur in the veld type: *Boscia albitrunca, Combretum imberbe, Acacia erioloba* and *Sclerocarya birrea*.

Vegetation

According to Mucina and Rutherford (2006) the study area consists of two vegetation types (Figure 3 and 4). The vegetation units fall within the Savanna Biome (SV) and the units form part of the Central Bushveld (cb) vegetation units.

The first vegetation units are known as the Makhado Sweet Bushveld (SVcb 20) (Mucina and Rutherford, 2006). Earlier it was known as the Mixed Bushveld (Acocks, 1953) or Mixed Bushveld and Sweet Bushveld (Low and Rebelo, 1996). The second is referred to as the Polokwane Plateau Bushveld (SVcb 23) (Mucina and Rutherford, 2006) (Figure 3 and 4). Earlier the Polokwane Plateau Bushveld was known as the Pietersburg Plateau Grassveld (Acocks, 1953) or Mixed Bushveld (Low and Rebelo, 1996).

The Makhado Sweet Bushveld is distributed from the Soutpansberg to the Waterberg areas at an altitude between 850 and 1 200m. The area is dominated by slight to moderate undulating plains generally sloping towards the north. Some hills occur in the southwest and the area is covered by short shrubby bushveld with a poorly developed grass layer (Mucina and Rutherford, 2006).

The Polokwane Plateau Bushveld is distributed on the higher-lying plains around Polokwane and is known for the undulating plains with a short open tree layer and well developed grass layers and plains (Mucina and Rutherford, 2006).

Geology:

For the Makhado Sweet Bushveld, the migmatites and gneisses of the Hout River Gneiss and Goudplaats Gneis are dominant formations. Some sandstones and mudstones of the Matlabas Subgroup are found and soils include deep, grayish sands, eutrophic plinthic catenas, red-yellow apedal freely drained soils and clays in the lower areas (Mucina and Rutherford, 2006).

The geology of the Polokwane Plateau Bushveld is dominated by migmatites and gneisses of the Hout River Gneiss and Turfloop Granite are dominant formations. The soils are variable, freely drained and mostly of the Glenrosa and Mispah soil forms (Mucina and Rutherford, 2006).

Climate:

The area is a summer rainfall area with dry to very dry winters. The annual MAP varies between 350 and 550 mm for the Makhado Sweet Bushveld and frost is infrequent but may occur occasionally at the higher altitudes of the escarp. The mean maximum and minimum temperatures vary between 36.5° C and -0.8° C across the study area (Mucina and Rutherford, 2006).

The Polokwane Plateau Bushveld is a summer rainfall area with very dry winters. The annual MAP is about 400mm and frost can be severe in winter. The mean maximum and minimum for the study site is in the order of 33.2° C for October and 0.6° C for June (Mucina and Rutherford, 2006).

Conservation:

Although the Makhado Sweet Bushveld is an extensive veld type, it is considered to be vulnerable and only 1% of the targeted 19% has formal protection. About 27% is transformed, mainly by cultivation and urban areas (Mucina and Rutherford, 2006). Various exotic invaders are present and include *Melia azedarach* and *Opuntia ficus-indica*. Erosion potential is high to moderate and of serious concern in the area.

The Polokwane Plateau Bushveld is an extensive veld type, little of it has formal protection and about 17% is transformed. About 7% is transformed due to urban development and 10% by agricultural activities. Various exotic invaders are present and include *Jacaranda mimosifolia, Melia azedarach* and *Opuntia ficus-indica*. Erosion potential is high to moderate and of serious concern in the area. Erosion in normally low, but can be high on steeper slopes (Mucina and Rutherford, 2006).

Four protected tree is listed for the area namely *Boscia albitrunca, Acacia erioloba, Combretum imberbe* and *Sclerocarya birrea*. The red data plants present are listed in Addendum 3 (SANBI, 2011).

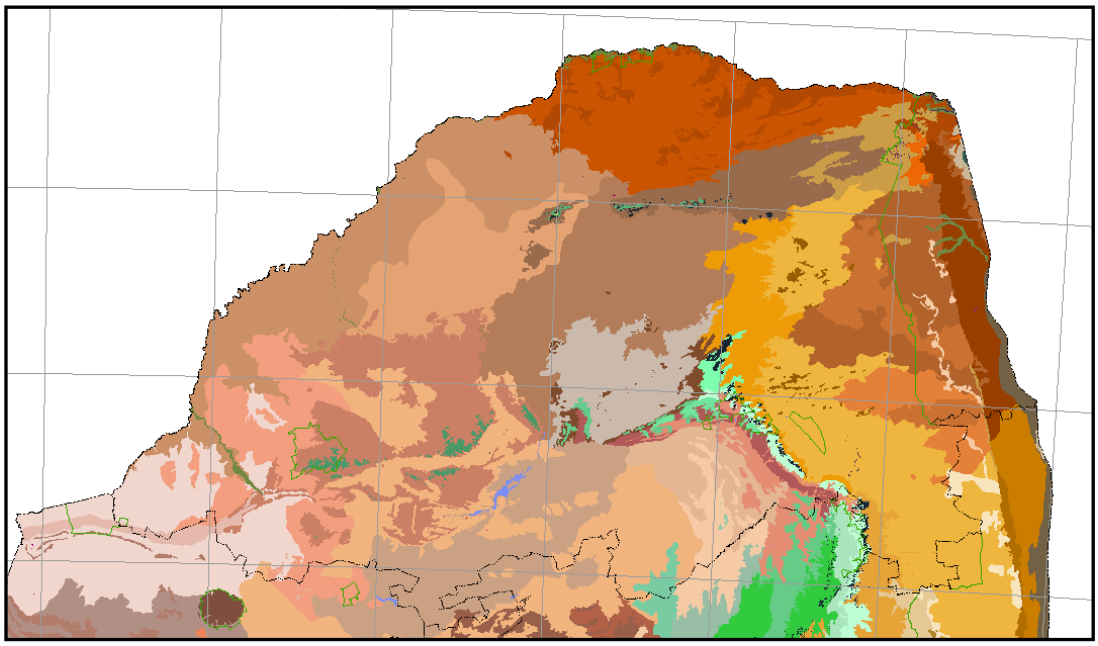

Figure 3: Regional vegetation map: vegetation map in the Limpopo Province according to Mucina and Rutherford (2006).

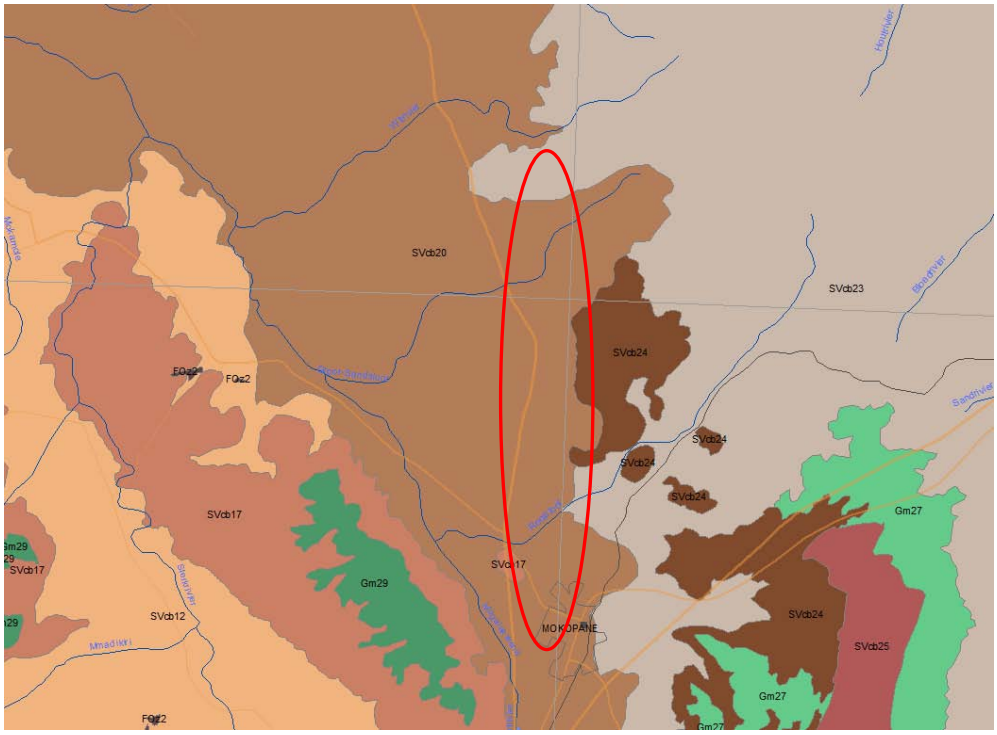

Figure 4: Vegetation types found in areas of the proposed project.

Results and discussion

The three routes will be discussed as follows: 1) the discussion of the corridor for the construction of a 32.6km Kingbird line from Borutho MTS to Potgietersrus substation and 2) the corridor for the construction of a 10km Kingbird line from Borutho to the PPrus North Kingbird line and the corridor for the construction of a 10.3km Kingbird line from Borutho to the Sandsloot line.

The two shorter lines run parallel to each other and only the last 4 km they split to the two separate mines. The first line will follow a similar corridor for the last 10 km to the Borutho substation.

The corridor for the construction of a 32.6km Kingbird line from Borutho MTS to Potgietersrus substation

The area around the Potgietersrus substation is very well vegetated, although there are some developments around the area (Figure 5). The trees include *Sclerocarya birrea, Combretum apiculatum, C. molle, C. hereroense, Gymnosporia senegalensis, Ziziphus mucronata, Z. zeyheriana, Acacia rehmanniana, A. robusta, A. caffra, A. nilotica, Searsia leptodictya, S. pyroides, Dichrostachys cinerea, Euclea crispa, E. undulata, Grewia flavescens, G. flava, Berchemia zeyheri, Olea capensis, Dombeya rotundifolia, Euphorbia ingens* and *Ehretia rigida*. Some aloes are present and include *Aloe marlothii, A. greatheadii* and *A.* zebrina. To list some of the more prominent species observed (Figure 6 and 7).

The impacts at the substation site include clearing for power lines, some road and dumping of household, building and garden refuse (Figure 8). From the substation, the new power line follows a corridor to the north and then swings to the northwest in an effort to skirt the outside of the residential and industrial areas of Mokopane. The new power line will follow the existing power line. The natural vegetation is modified and is dominated by low shrubs and small to medium trees (Figure 9). A few larger *Sclerocarya birrea* and a few large *Acacia caffra* are present (Figure 10). The smaller trees and shrubs consists of *Combretum apiculatum, Dichrostachys cinerea, Acacia rehmanniana, A. erubescens, A. mellifera, Grewia flavescens, G. flava, Euclea crispa, E. undulata, Commiphora pyracanthoides* and *Burkea africana*.

Figure 5: Aerial view of substation.

Figure 6: General view of vegetation to the south of the substation.

Figure 7: View of some impacts – clearing of vegetation to the east and north of the substation.

Figure 8: Example of dumping of refuse material.

Figure 9: Natural vegetation with small trees dominating.

Figure 10: Some large *Sclerocarya birrea* survived in the area.

To the northwest, some cultivated lands from subsistence farmers are present. The vegetation is severely modified and many informal roads and dumping sites are present. A few large *Sclerocarya birrea* are present and the low shrubs are dominated by *Combretum apiculatum* and some *Acacias* (Figure 11). The power line swings to the north and follows a route between Mahwelereng to the west and the small holdings to the east. The natural vegetation is severely modified and informal roads, dumping of refuse, sand mining and small industrial developments contributing to the habitat modification (Figure 12 and 13). The power line crosses the Rooisloot and although it is severely modified, it is suggested that the structures are placed at least 50m from the river banks. There is an informal crossing over the river, but large vehicles may cause severe damage and it is recommended that construction vehicles don't use it as an option during construction of the power line (Figure 16). The vegetation in this section is severely modified and totally encroached by *Dichrostachys cinerea* (Figure 14). Some *Searsia lancea* and *S. pyroides* are spread in-between the dense Sicklebush. Large *Aloe marlothii* are also present in areas where the bush have been cleared, probably for cultivated lands and grazing (Figure 15).

Figure 11: Vegetation modified by historic land use practices.

Figure 12: Example of roads and cultivated lands in the area.

Figure 13: Dumping of refuse a problem.

Figure 14: Example of encroachment north of the Sandsloot.

Figure 15: Large trees remained – in areas where cultivation and grazing kept encroachment low.

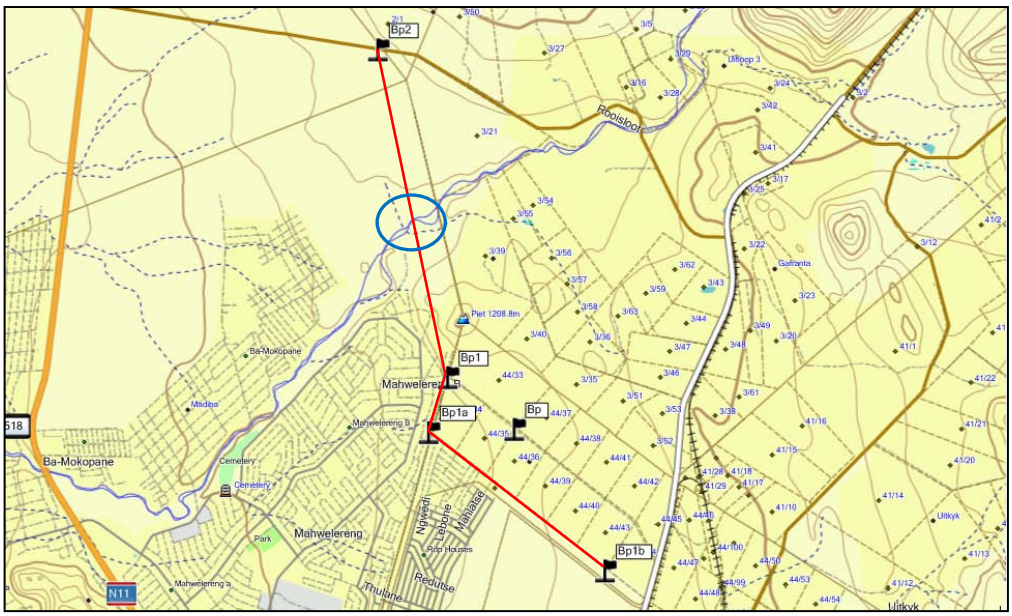

Figure 16: Proposed route and river crossing circled in blue.

The corridor then crosses the dirt road to the south of Ga-Magongwa and passes to the east of the town. It is suggested that the power line passes to the east of the koppie, as there is a low area and access to the corridor will be much easier (Figure 17). The vegetation is more open and most of the larger trees have been replaced by

small trees and shrubs Figure 18). Wood collection (building, cooking and heating) is having an impact on the natural vegetation. Here *Dichrostachys cinerea, Grewia flava, G. monticola, Searsia lancea, S. leptodictya, Ziziphus mucronata, Acacia permixta, A. rehmanniana, Aloe marlothii, A. greatheadii* and *A. zebrina* dominate.

To the east of Ga-Magongwa the vegetation is modified. Grazing, cultivated lands, wood collection, bush tracks and the town development all contribute to the changes in habitat and the vegetation (Figure 19). The new power line follows a corridor next to the existing power line and the route is between the town and the koppies to the east. It is suggested that the new power line must be constructed to the west of the existing power line if possible. The vegetation on the koppies are severely modified, but more clearing of vegetation can lead to erosion of the exposed slopes (Figure 20). Large *Aloe marlothii* are present on the koppies and other trees include *Searsia lancea, Dichrostachys cinerea, Ziziphus mucronata, Euphorbia ingens, Grewia monticola, G. flava* and *Acacia spp*. a few small drainage lines are present and no vehicle can cross through these unless there is a properly constructed road. These areas are sensitive and erosion can be a problem, especially against the steeper slopes (Figure 21).

Figure 17: Suggest route to go around koppie (arrow) (to its right).

Figure 18: Vegetation to the east of the town severely modified.

Figure 19: Vegetation on koppies modified, but line not to encroach on the koppies.

Figure 20: North towards the N11 the vegetation in a fair condition.

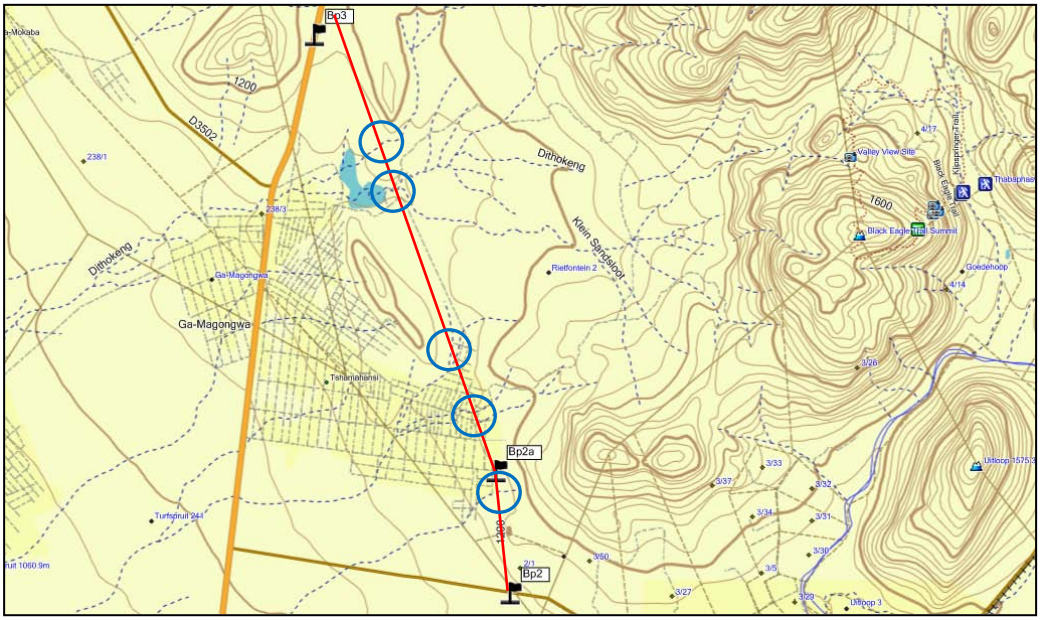

Figure 21: Route towards the N11 with sensitive areas circled in blue.

Near the N11, the gradient increases and the vegetation are denser (Figure 22). The area is dominated by a number of species that include *Kirkia wilmsii, Dombeya rotundifolia, Grewia flava, G. flavescens, Searsia leptodictya, S. pyroides, Combretum zeyheri, Acacia tortilis, Dichrostachys cinerea* and *Aloe greatheadii* (Figure 23). The power line crosses the N11 to the west as this is necessitated by the presence of the Witvlag Nature Reserve to the east of the road. The vegetation to the west of the road is in a fair to good condition (Figure 24). It is suggested that the power line crosses to the west of the N11 as close as possible to the Nature Reserve, as it will lower the impact on the koppie to the west of the road (Figure 25). The koppie is considered as a sensitive area and is an important refuge area for vegetation, birds and animals (Figure 27). To the west of the Nature Reserve, the vegetation is modified due to historic activities such as cultivation, grazing and planting of exotic trees near

homesteads. This resulted in the presence of large *Eucalyptus spp* and encroachment of *Dichrostachys cinerea* having an impact on the natural vegetation (Figure 26). Other species include *Acacia caffra, Ziziphus mucronata, Combretum apiculatum, Grewia monticola, Aloe marlothii, Peltophorum africanum, Sclerocarya birrea, Lannea schweinfurthii* and the exotic *Agave spp*.

Figure 22: Near the N11, the steeper slope is denser vegetated.

Figure 23: The koppie west of the N11 is densely vegetated – avoid placing the power line here.

Figure 24: The vegetation near the reserve denser.

Figure 25: Near the reserve, the vegetation to the east of the N11 is open – little clearing needed.

Figure 26: Example of exotic vegetation near the Witvlag Nature Reserve.

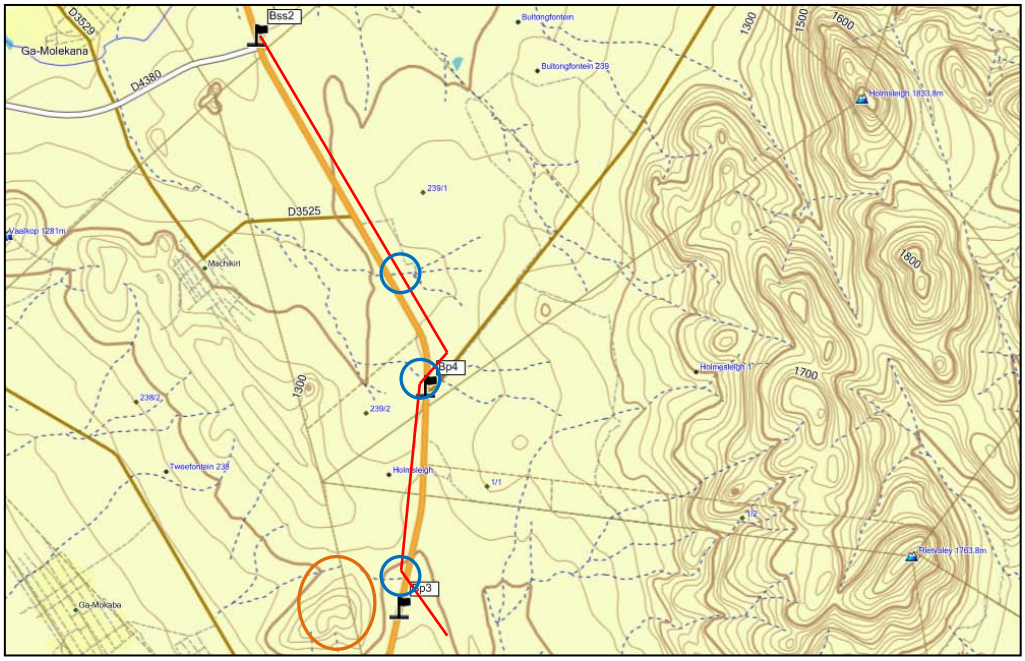

Figure 27: Power line near Witvlag Nature Reserve. Streams circled in blue, koppie in brown.

To the north of the Nature Reserve, the proposed power line will re-cross the N11 to the east and follow a corridor to the existing power line near the road (Figure 28). The vegetation in general is modified and in a fair to poor state (Figure 29). Apart from a few large *Acacia caffra* and *Sclerocarya birrea*, the vegetation includes some exotics (*Eucalyptus spp* and *Agave spp*), *Combretum apiculatum, Peltophorum africanum, Ziziphus zeyheriana, Terminalia sericea* and *Dichrostachys cinerea*. Some drainage lines are encountered and travelling through it is not permitted. Structures for the new power line must be placed at least 50m from the drainage lines (Figure 30).

The vegetation to the north is in a fair condition, despite the recent fire in the area, a good basal cover was present after the above average rainfall late in the season (Figure 31). Trees and shrubs include *Acacia caffra, A. tortilis, Peltophorum africanum, Burkea africana, Terminalia sericea, Dichrostachys cinerea* and *Sclerocarya birrea*.

To the north of the D4380, some streams are present (Figure 32). Again, the existing road must be used as access and travelling through the streams are not permitted. Structures must be placed at least 50m from the stream banks to ensure no impacts on the habitat occur. This will also lower the risk of erosion in future. The vegetation is

modified due to historic and current activities which include road construction, grazing, cultivated lands, wood collection and town and mine developments (Figure 33). The trees in this area include *Dichrostachys cinerea, Aloe marlothii, Terminalia sericea, Combretum zeyheri, C. apiculatum, C. molle, Searsia lancea, S. leptodictya, Acacia nilotica, Sclerocarya birrea, Euphorbia ingens* and *Grewia monticola*.

Figure 28: The point where the power line re-cross the N11 to the east.

Figure 29: Vegetation modified – fair to poor condition.

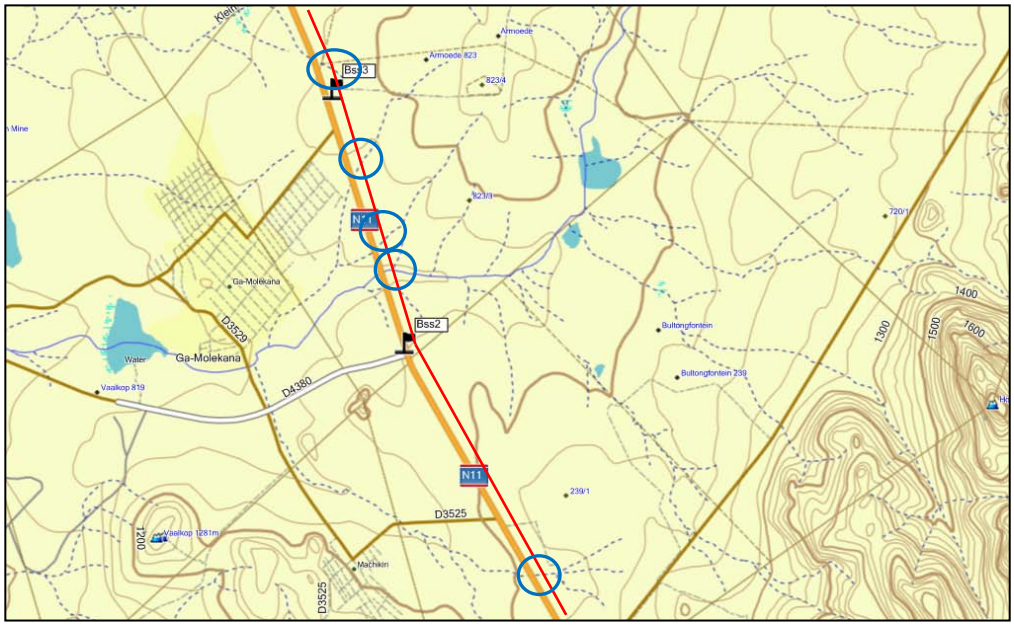

Figure 30: The route near the Sandsloot Mine. Sensitive areas circled in blue.

Figure 31: Vegetation in a fair condition.

Figure 32: Stream not to be crossed during construction.

Figure 33: Severe impact of sand mining in the river.

To the north of the Sandsloot Mine turnoff, some streams and the Sandsloot River are encountered. No crossings through the streambeds are permitted and structures for the new power line must be placed at least 50m from the banks. Sand mining is causing severe damage to the river bed and banks and erosion is a real problem in the area. This will ensure that erosion is limited after construction. The vegetation in general consists of open grassveld (good basal layer) with sparse shrubs and small trees. A few larger *Sclerocarya birrea* are present. To the north of the river, the vegetation is denser and includes *Gymnosporia buxifolia, Boscia foetida, Ziziphus mucronata, Euphorbia ingens, Combretum apiculatum, C. imberbe, Acacia robusta, A. tortilis, A. nigrescens, Euclea crispa, E. undulata, Dichrostachys cinerea, Grewia flavescens, Terminalia sericea, Peltophorum africanum, Ehretia rigida* and *Ormocarpum trichocarpum*.

To the north of the river, the power line will swing towards the proposed new Borutho substation (Figure 34). The vegetation is modified and erosion is a problem in the area. This is as a result of over grazing, poor planning of roads (mostly informal), wood collection and cultivation (lesser extent). The new power line passes to the east of Sekuruwe and here erosion is also a problem (Figure 35). Care must be taken

during construction to limit traffic and any further impacts on the environment. The vegetation is dominated by shrubs and small to medium trees and includes *Dichrostachys cinerea, Acacia tortilis* and a few larger *Sclerocarya birrea*. Various drainage lines are present (erosion present) and this is considered as sensitive areas. Caution during construction is needed and only existing roads must be used. The power line swings to the northeast and the vegetation is in a fair to good condition. The land use is predominantly cattle farming. The basal layer is in a good condition after the good rains of the season. Some encroachment is evident in areas were over grazing is a problem and here *Dichrostachys cinerea* forms dense stands (Figure 36). Other trees include *Terminalia sericea, Combretum zeyheri, C. apiculatum, C. molle, Searsia lancea, Peltophorum africanum, Burkea africanum, Euphorbia ingens* and *Faurea saligna*.

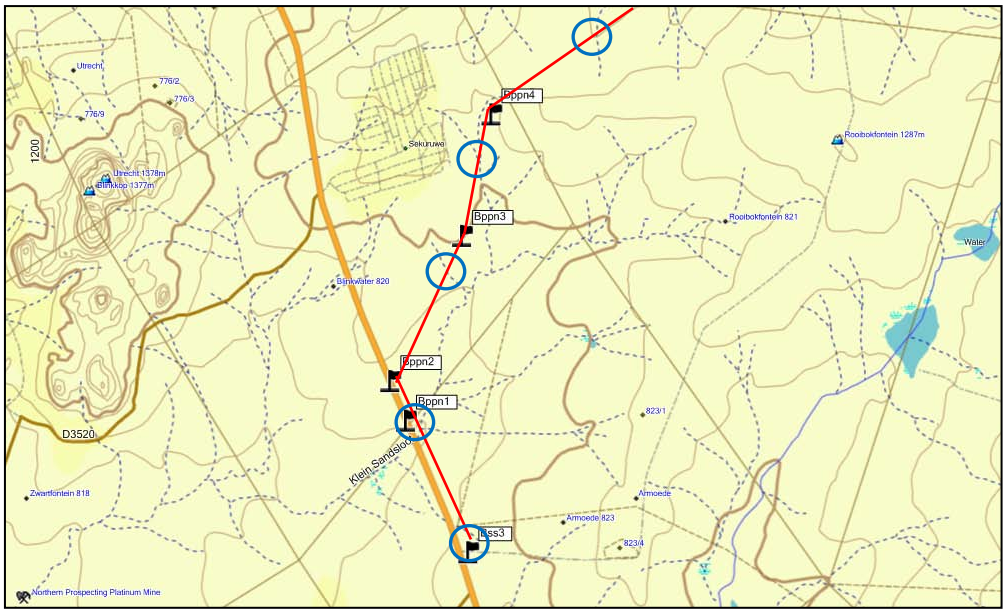

Figure 34: Section to the north, turning towards the new Borutho substation – sensitive areas circled.

Figure 35: Example of severe erosion in the area.

Figure 36: Encroachment a problem in cattle areas.

The last section to the proposed new substation also crosses through cattle farms (Figure 37). The natural vegetation in general is modified but in a fair condition (Figure 38). Some encroachment (*Dichrostachys* cinerea) is present as a result of overgrazing. Other trees include *Acacia tortilis, Euclea undulata, E. natalensis, Searsia leptodictya, S. pyroides, Ziziphus mucronata, Sclerocarya birrea, Grewia flava, G. flavescens, Terminalia sericea* and *Boscia foetida*. Around the substation site the trees are dominated by *Sclerocarya birrea, Dichrostachys cinerea, Acacia rehmanniana, A. tortilis* and *A. nigrescens*.

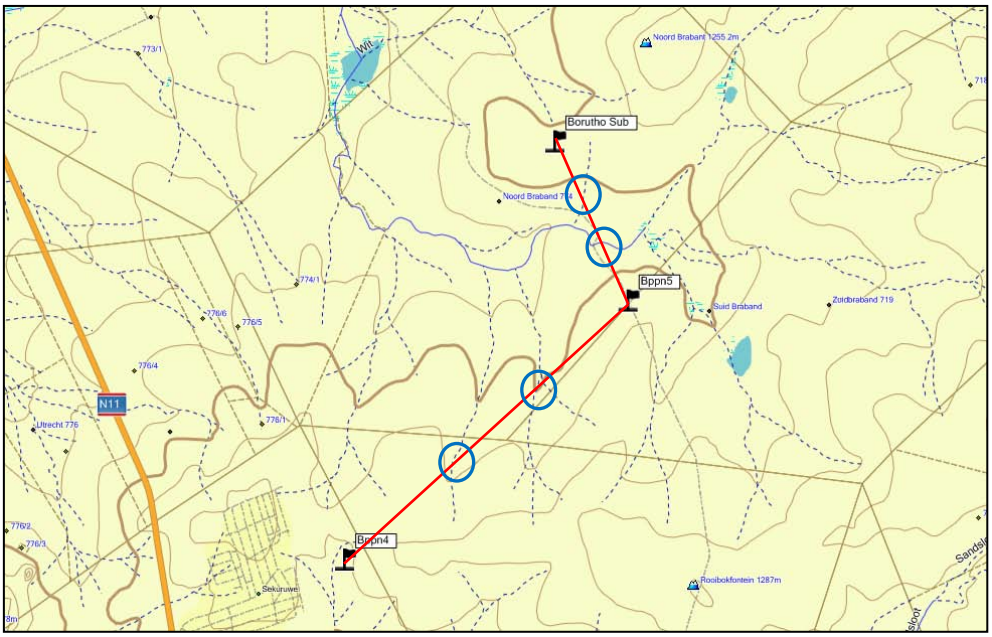

Figure 37: View of last section of the proposed route with possible sensitive areas circled in blue.

Figure 38: General view of natural vegetation at the proposed Borutho substation site.

The corridor for the construction of a 10km Kingbird line from Borutho to the PPrus North Kingbird line and the corridor for the construction of a 10.3km Kingbird line from Borutho to the Sandsloot line

The two proposed new power lines from the new Borutho substation will link to the existing power lines - the Sandsloot and PPrus North power lines.

The power line from Sandsloot will T-off from the existing Sandsloot/Witkop power line at the D4380. From this point it follows the N11 in a general north-easterly. The corridor will be o the east of the existing power line connecting to the PPrus North substation. There are some streams present and it is recommended that the existing road must be used, as access and travelling through the streams are not permitted. The structures for the power line must be placed at least 50m from the stream banks to ensure no impacts on the habitat occur. This will also lower the risk of erosion in future. The vegetation is modified due to historic and current activities which include road construction, grazing, cultivated lands, wood collection and town and mine developments. The trees in this area include *Dichrostachys cinerea, Aloe marlothii, Terminalia sericea, Combretum zeyheri, C. apiculatum, C. molle, Searsia lancea, S. leptodictya, Acacia nilotica, Sclerocarya birrea, Euphorbia ingens* and *Grewia monticola*.

To the north of the Sandsloot Mine turnoff, some streams and the Sandsloot River are encountered. No crossings through the streambeds are permitted and structures for the new power line must be placed at least 50m from the banks. Sand mining is causing severe damage to the river bed and banks and erosion is a real problem in the area. This will ensure that erosion is limited after construction. The vegetation in general consists of open grassveld (good basal layer) with sparse shrubs and small trees. A few larger *Sclerocarya birrea* are present. To the north of the river, the vegetation is denser and includes *Gymnosporia buxifolia, Boscia foetida, Ziziphus mucronata, Euphorbia ingens, Combretum apiculatum, C. imberbe, Acacia robusta, A. tortilis, A. nigrescens, Euclea crispa, E. undulata, Dichrostachys cinerea, Grewia flavescens, Terminalia sericea, Peltophorum africanum, Ehretia rigida* and *Ormocarpum trichocarpum*.

To the north of the river, the power line will swing towards the proposed new Borutho substation. It is at this point that it will also join the proposed new PPrus/Borutho power line. This power line will T-off from the existing PPrus North/Witkop power line and link up to the proposed new Borutho substation. The two proposed new power lines (Sandsloot/Borutho and PPrus North/Borutho) will run parallel to the new substation. It will also run parallel to the new proposed Potgietersrus/Borutho power line discussed in the first section of the report (Figure 39).

Figure 39: General route for the Sandsloot/Borutho power line (from Bss 2 – Borutho sub) and the PPRus North/Borutho power line (from Bppn 2 – Borutho sub).

The vegetation is modified and erosion is a problem in the area. This is as a result of over grazing, poor planning of roads (mostly informal), wood collection and cultivation (lesser extent). The new power line passes to the east of Sekuruwe and here erosion is also a problem. Care must be taken during construction to limit traffic and any further impacts on the environment. The vegetation is dominated by shrubs and small to medium trees and includes *Dichrostachys cinerea, Acacia tortilis* and a few larger *Sclerocarya birrea*. Various drainage lines are present (erosion present) and this is considered as sensitive areas. Caution during construction is needed and only existing roads must be used. The power line swings to the northeast and the vegetation is in a fair to good condition. The land use is predominantly cattle farming. The basal layer is in a good condition after the good rains of the season. Some encroachment is evident

in areas were over grazing is a problem and here *Dichrostachys cinerea* forms dense stands. Other trees include *Terminalia sericea, Combretum zeyheri, C. apiculatum, C. molle, Searsia lancea, Peltophorum africanum, Burkea africanum, Euphorbia ingens* and *Faurea saligna*.

The last section to the proposed new substation also crosses through cattle farms. The natural vegetation in general is modified but in a fair condition. Some encroachment (*Dichrostachys* cinerea) is present as a result of overgrazing. Other trees include *Acacia tortilis, Euclea undulata, E. natalensis, Searsia leptodictya, S. pyroides, Ziziphus mucronata, Sclerocarya birrea, Grewia flava, G. flavescens, Terminalia sericea* and *Boscia foetida*. Around the substation site the trees are dominated by *Sclerocarya birrea, Dichrostachys cinerea, Acacia rehmanniana, A. tortilis* and *A. nigrescens*.

Summary

- The natural vegetation in general is in a fair to condition.
- All stream and river crossings must be avoided with vehicle traffic during construction and only existing bridges must be used for access with large trucks.
- Some *Sclerocarya birrea* and *Combretum* imberbe are present and must be avoided. If cutting or trimming is needed, permits must be obtained **before** any clearing or construction commences.
- Although *Acacia erioloba* is listed as being present in the area, it is found more to the south of Mokopane (deep sand soils) and to the north and north east of the study area. None were observed, but must be confirmed during the final walk down study.
- *Boscia albitrunca* occur in the area – none were observed during the survey – must be confirmed during final walk down survey.
- Very little activity of wild animals was observed. It was mostly dung of small antelope (*Sylvicarpa grimmia* and *Raphicerus campestris*), hare (*Lepus saxatilis*) and rodents that were present.

Conclusions

All role players must agree to the correct clearance of the servitude (*refer to EPC 32-247 (Sept 2007): Procedure for vegetation clearance and maintenance within overhead power line servitudes and on Eskom owned land*) and this must further follow the accepted environmental protocols (*EPC 32-96: Eskom environmental procedure*).

- The vegetation along the route varies in condition.
    - Along waterways some alien plants are present and the riparian vegetation is in a poor to fair state.
    - In the open area, the cultivation of lands (cash crop cultivation) and grazing dominates. Large areas are further cleared for grazing and in many areas, encroachment (*Dichrostachys cinerea*) have become a problem.
    - The areas where the power lines passes near koppies, the vegetation are generally in a better condition, ranging from fair to good.
    - Erosion to the east of Sekuruwe in severe and must be addressed by the relevant authorities (not Eskom).
- When looking at the options for the new power line the following is recommended:
    - All stream and river crossings must be avoided with vehicle traffic during construction and only existing bridges must be used for access with large trucks.
    - Some *Sclerocarya birrea* and *Combretum imberbe* are present and must be avoided. If cutting or trimming is needed, permits must be obtained **before** any clearing or construction commences.
    - All protected trees must be recorded during the walk down phase (once final route is pegged) and the presence or absence of *Acacia erioloba* and *Boscia albitrunca* must be comfirmed.

- Some red book data plant species is recorded for the site. Habitat for most are not present and in other instances, over utilisation of habitat modified possible habitat. This must be confirmed during the final walk down phase.
- Although some mammals can occur in the area (suitable habitat), none were observed – only dung. There is little free roaming game present but poaching can be a problem during construction.
- There are some drainage lines, streams and rivers and it must be considered as corridors for the migration of species. If well planned and the structures are properly placed it won't impact on these corridors and therefore will have no large scale effect on the species or area.
    - No rivers or streams can be crossed unless at existing bridges. This will lower the risk of erosion.
- With regard to biodiversity patterns, little if any impacts will occur.
    - The vegetation type occurs over a very large area and the power line and new substation site will have no negative impact on it. Current impacts far outstrip the impact of the power lines.
    - No red data plant species occur – no impact.
    - As stated, some drainage lines occur, but very limited impacts may occur. Although, if activities is limited to the servitude and existing roads as access road, impacts will be very low.
    - There were some limited alien plant infestations observed along the corridor. Alien invasives are further associated the homesteads and old farms and along the road servitudes. Clearing of soil can always lead to some infestations and with seed source available, this will increase the impact of alien invasives. 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 natural vegetation and habitat of the study area is in a poor to fair condition and historic and current land use practices having a negative impact. Apart from roads and the existing power line, land-use includes grazing, cultivation of cash crops, wood collection, mining and settlements. Overgrazing occurred and lead to encroachment.

- The activity (power line construction) will have no real 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 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 currently no Biodiversity Conservation Plan is available for the Limpopo Province. Yet, this development won't have a negative impact on the region with regard to plants, plant communities, water courses – when looking at it in a regional perspective.

Addendum 1 is a summary of the potential impacts related to the project (construction of the substation and 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.

Addendum 3 is the list of red data species from the SANBI précis lists.

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Addendum 1: Impacts and mitigating recommendations.

Borutho project		
Theme	Natural environment	
Nature of issue	Erosion	
Stage	Construction and maintenance	Possibility for erosion during construction possible due to soil types and slopes.
Extent of impact	Site, local and region	The impact will be moderate to high on-site, but limited to low on a regional scale. Silt will have a negative impact in streams and rivers, but will be low for this project. **A concern is the extensive erosion near Sekuruwe.**
Duration of impact	Immediate	If not addressed on constant basis, permanent damage is a reality.
Intensity	Moderate to high	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 • No travel through streams and rivers – use existing bridges and roads.	
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. • In order to minimise artificially generated surface	

	storm water runoff, total sealing of paved areas such as parking lots, access roads, pavements and walkways should not be permitted. ***Permeable material should rather be utilized for these purposes***. In addition, runoff rain water from all roofs must be managed to prevent erosion. • 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 to high 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 to medium	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. • Vegetation plays a critical role in the hydrological cycle by influencing both the quantity and quality of surface run-off. It influences the quantity of run-off by intercepting rainfall, promoting infiltration and thus decreasing run-off. Vegetation can influence water quality in two ways: by binding soils thus protecting the surface layer, and by intercepting surface run-off thus buffering rivers and wetlands against suspended and dissolved substances. When the speed of the run-off is reduced, suspended particles can settle out	

	and dissolve substances, such as nutrients, can be assimilated by plants. The vegetation has a filtering effect.	
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 a problem 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. • Disturbed areas around the construction sites should be re-vegetated. • 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 game.
Stage	Construction and maintenance	Must have a strict environmental guidelines and management plan in place. Constant contact with landowners important.
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 scare and rare game species are present.
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). • 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. • Good communication with landowners.	
Nature of issue	Removal on natural vegetation	Includes 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	Limited removal of vegetation 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.
Duration of impact	Permanent	The removal of plants for the project will have permanent impact. The limited removal of some plants and the maintenance of the power line corridor will also have a permanent effect.
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 study site is in a fair to poor 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 and power line servitude. 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 poor 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	• Limited quantities of natural vegetation need to be removed when clearing the servitude for the new power line. Clear guidelines and proper plans must	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.

	be given to the contractor. Daily inspections are needed to prevent problems. • Apply in advance for permits where needed. • All trees must be marked and the contractor must visit the site with the consultant and ESKOM officials to ensure that the correct trees are cut or trimmed and that the procedures are followed. • Must clear alien vegetation on a regular basis. • Must have rehabilitation strategy as part of EMP.	Trees to be trimmed should be marked and the contractor should understand what branches must be cut/trimmed. A 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*	No	No
	Gunning's golden mole	*Neamblysomus gunningi*	No	No
	Cheetah	*Acinonyx jubatus*	No	No
	Lion	*Panthera leo*	Yes	No
	Black-footed cat	*Felis nigripes*	No	No
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	No
	Leopard	*Panthera pardus*	Yes	Low
	Cheetah	*Acinonyx jubatus*	No	No
	Black rhinoceros	*Diceros bicornis*	No	No
Appendix 2	African elephant	*Loxodonta africana*	No	No
	Chacma baboon	*Papio ursinus*	Yes	Medium
	Vervet monkey	*Cercopithecus aethiops*	Yes	Medium to high
	Samango monkey	*Cercopithecus mitis*	No	No
	Greater galago	*Otolemur crassicaudatus*	No	No
	South African galago	*Galago moholi*	No	No
	Spotted-necked otter	*Lutra maculicollis*	No	No
	African clawless otter	*Aonyx capensis*	No	No
	Caracal	*Caracal caracal*	Yes	Low
	Serval	*Leptailurus serval*	No	No
	African wild cat	*Felis sylvestris*	No	No
	Lion	*Panthera leo*	Yes	No
	Hippopothamus	*Hippopothamus amphibious*	No	No
	White rhinoceros	*Ceratotherium simum*	Yes	No
	Pangolin	*Manis temminckii*	Yes	Very low

Addendum 3: List of possible red data species in the study area (SANBI, 2011).

Family	***Genus and species names***	**Status**	**Habitat**	**Probability of presence?**
APOCYNACEAE	*Brachystelma inconspicuum*	Rare	Savanna, wetter areas.	Very limited
FABACEAE	*Argyrolobium muddii*	EN	Little habitat, higher altitude in mountainous areas, montane grassland	No
IRIDACEAE	*Gladiolus dolomiticus*	Rare	Mountainous area, dolomitic outcrops	No
APOCYNACEAE	*Brachystelma hirtellum*	NT	Wooded grassland	Limited
CELASTRACEAE	*Elaeodendron transvaalense*	NT	It favours soils rich in lime, grows in various soils and is found in forests, bushveld, scrub, thornveld and woodland, along streams and often on termite mounds.	No
CORNACEAE	*Curtisia dentata*	NT	Grows in most of the forests in southern Africa and Swaziland, from sea level to 1 800 m. It ranges from the Cape Peninsula through the forest patches of the eastern Western Cape to the forests of the Knysna region, the Eastern Cape, KwaZulu-Natal, Mpumalanga, Limpopo and Swaziland. In the forest it is usually found in climax forest and grows into a tall tree with a clean, unbuttressed bole. It also grows on grassy mountain slopes and in coastal scrub forest where it is a small bushy tree.	No
EUPHORBIACEAE	*Euphorbia clivicola*	CR	Threatened succulent confined to only two known populations in the Northern Province of South Africa, one of which is protected in a nature reserve.	No
HYACINTHACEAE	*Bowiea volubilis subsp. volubilis*	VU	This species occurs at low and medium altitudes, and is usually found along mountain ranges, in thickly vegetated river valleys, under bush clumps and in boulder screes	No
PASSIFLORACEAE	*Adenia fruticosa subsp. fruticosa*	NT	On dry slopes and granite.	Limited
ROSACEAE	*Prunus africana*	VU	Confined to evergreen forests from near the coast to the mist belt and montane forests in KwaZulu-Natal, Eastern Cape, Swaziland, Mpumalanga, Zimbabwe and tropical Africa.	No