Specialist basic assessment report:

Tshatane/Jane Furse project

Dr Wynand Vlok (BioAssets)
40 Juno Ave
Sterpark
Polokwane
0787

Tel: 082 200 5312
Fax: 0866 1877 44
E-mail: wynand.vlok@gmail.com

INTRODUCTION:

Project Description:

- The proposed construction of ±36 km 132 kV power line from the proposed Tshatane switching substation to the proposed Lesego substation within Fetakgomo and Makhuduthamaga local municipalities of Sekhukhune district, Limpopo Province.
- Construction of the proposed new Tshatane switching substation.
-

Project Locality:

The study site is north of Jane Furse within Fetakgomo and Makhuduthamaga local municipalities of Sekhukhune district in the Limpopo Province (Figure 1).

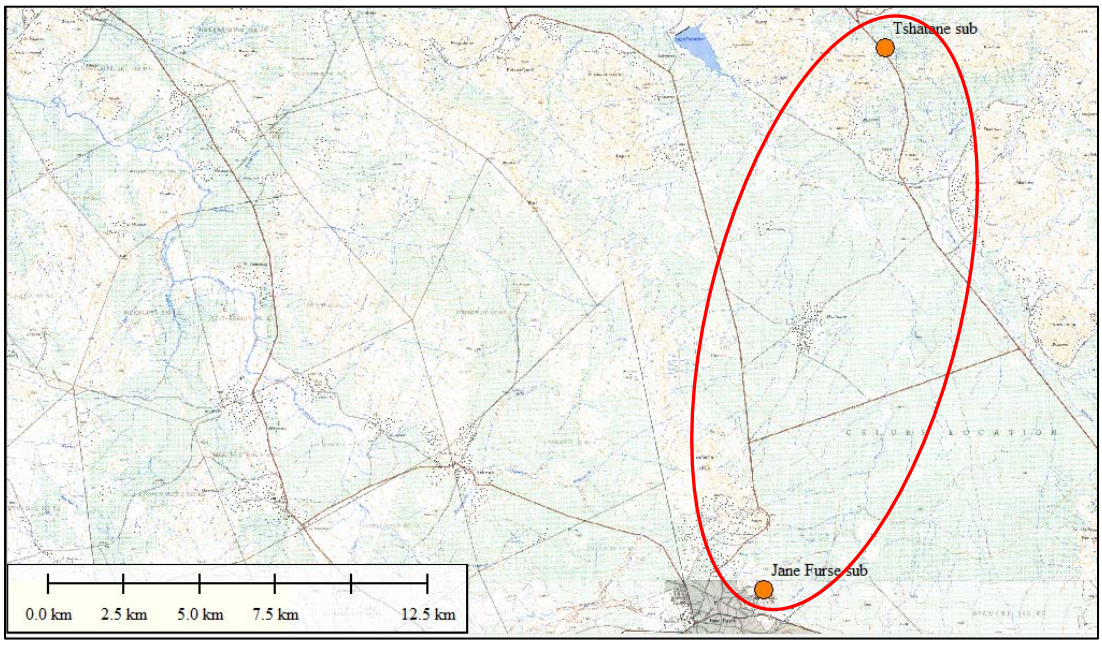

Figure 1: Approximate map of the study area.

ASSUMPTIONS AND LIMITATIONS:

Availability of baseline information:

Baseline information about the plant community of the site was obtained from Mucina and Rutherford (2006). The desktop survey provided adequate baseline information for the area and therefore this was not a constraint. The baseline information for the mammal survey was obtained from Skinner and Chimimba (2005) and LEDET State of the Environment Report (2004).

Constraints:

The survey was conducted in September and October 2012 during daytime only. The study area is stretched out over a large area and access to all areas was not always possible. 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 at the site, or that are likely to occur there.

Bio-physical constraints:

Weather conditions during the surveys were moderate to moderate to hot (35 ºC). It seems that the region has received no rainfall prior to the site visit and the vegetation was sparse during the site visit. There were signs of overgrazing and no standing water was present away from the rivers. 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, ESKOM provided the specialists with basic information of the study site locality and briefed us on the scale and extent of the project. The appropriate 1:50 000 was used to identify the major habitat features such as roads, railways, drainage channels, old cultivated fields, wooded areas, wetlands, ridges etc. 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. After the visit, a further desktop survey was carried out to gather any further relevant information on the area.

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 determine the possible environmental impacts by the proposed power line. All activity of animals was noted and a general plant list was compiled. Due to the time constraint, a full survey of plants was not possible. Photographs of important features were taken and will be included in the report. No red data species occur in the area when compared to the plant lists supplied by SANBI (2012) (Addendum 2). Addendum 3 is a list of historic records on red data mammals and the probability of occurrence currently. Protected trees listed in Mucina and Rutherford (2006) includes *Boscia albitrunca, Acacia erioloba, Philenoptera violacea, Balanites maughamii* and *Combretum imberbe*. The SANBI Précis lists only lists *Balanites maughamii* and *Boscia albitrunca*. The difference is that the list from Mucina and Rutherford (2006) cover an area larger than the ¼ degree squares of the study area. However, during the fieldwork, all protected trees were noted.

Two options were investigated (100m wide corridor) with Alternative 1 to the south and Alternative 2 to the north, before they follow a similar corridor, one east and one west of the road (Figure 2).

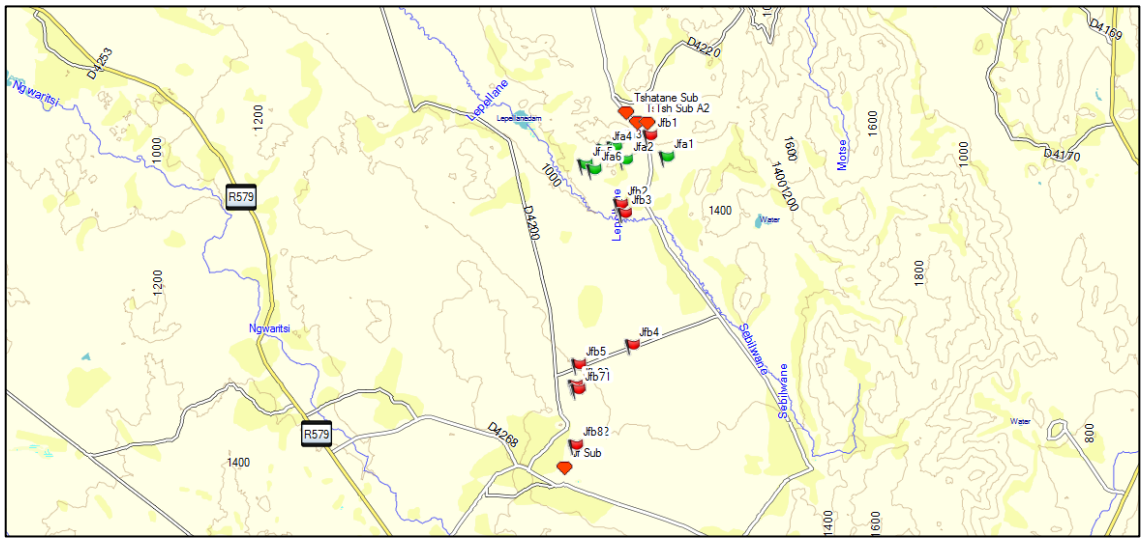

Figure 2: The two alternatives were investigated for the proposed new substations and power line routes, Alternative 1 in green and Alternative 2 in red.

Vegetation:

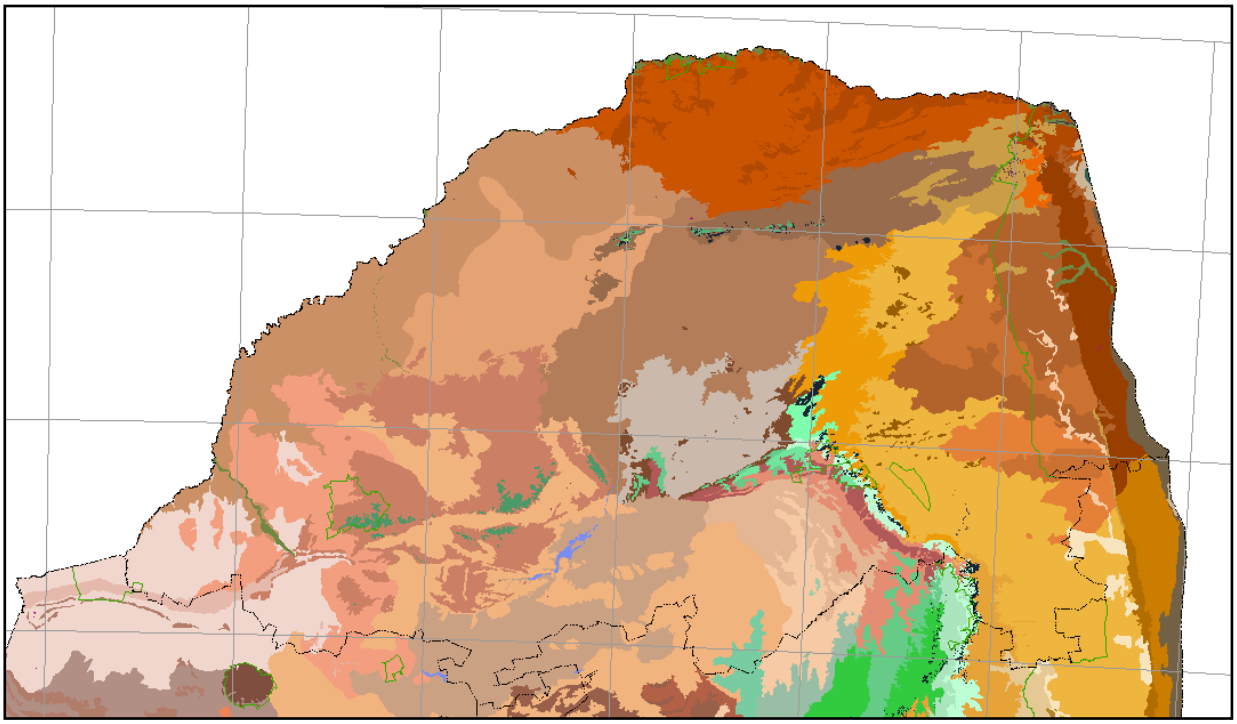

Figure 3: Limpopo Province vegetation units (Mucina and Rutherford, 2006).

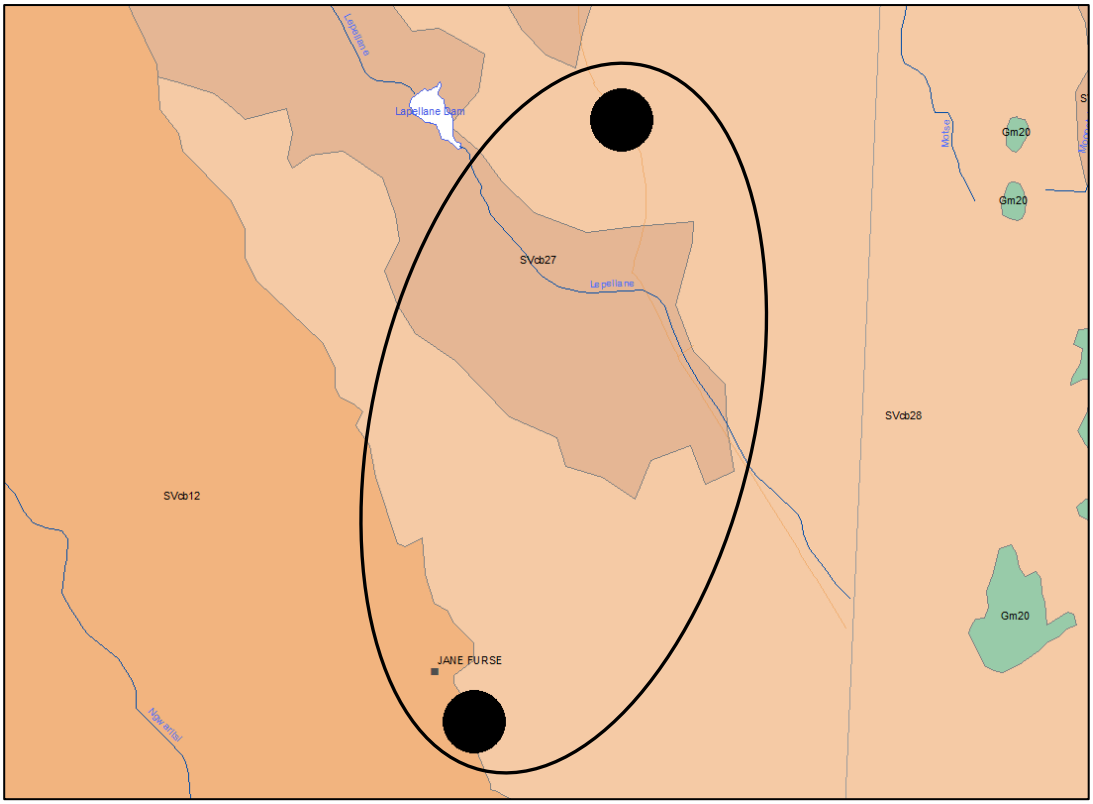

Figure 4: Vegetation unit associated with the study area (Mucina and Rutherford, 2006).

Vegetation:

Two vegetation types are present in the study area, the Sekhukhune Plains Bushveld (SVcb 27) and the Sekhukhune Mountain Bushveld (SVcb 28).

The dominant vegetation type in the study area is the Sekhukhune Plains Bushveld (SVcb 27) according to Mucina and Rutherford (2006) (Figure 3 and 4). The veld type classification previously was known as Mixed Bushveld (Acocks, 1953, Low and Rebelo, 1996). The vegetation unit is well represented in the Limpopo Province, mostly occurring in lower river basins and plains at an altitude mostly between 700 - 1 100 m. The area is mainly semi-arid plains with open valleys associated with the small hills and mountains running parallel to the larger escarpment mountains. Predominantly found is closed thornveld with a variety of *Aloes* and other succulents. Erosion dongas is prominent in the clay rich soils of the area (Mucina and Rutherford, 2006).

The Sekhukhune Mountain Bushveld (SVcb 28) was previously known as the Sourish Mixed Bushveld (Acocks, 1953) or the Mixed Bushveld (Low and Rebelo, 1996). Siebert et al. 2002) called it the *Kirkia wilmsii-Terminalia prunioides* Closed Mountain Bushveld, *Combretum hereroense-Grewia vernicosa* Open Mountain Bushveld, *Hippobromus pauciflorus-Rhoicissus tridentate* Rock Outcrop Vegetation. The vegetation is found in the Limpopo and Mpumalanga provinces comprising of mountains and undulating landscape. It is known for its dry with open to closed micro-phyllus and broad-leaved savanna. On the mountain slopes, the bushveld vegetation is taller in the valleys with a well-developed herb layer. In the dryer habitats, a number of xerophytic adapted species are present (Mucina and Rutherford, 2006).

Geology and soils:

The Sekhukhune Plains Bushveld is known for its complex geology consisting of the Rustenburg Layered Suite on the eastern lobe of the Bushveld Igneous Complex. The zones are dominated by belts of norite, gabbro, anorthosite and pyroxenite with localised protrusions of magnetite, chromatite, serpentinised, harzburgite, olvine diorite, shale, dolomite and quartzite. The deep, loamy Valsriver soils are found on the plains, while the shallow Glenrosa soils are characteristic of the low-lying, rocky hills (Mucina and Rutherford, 2006).

The Sekhukhune Mountain Bushveld is dominated by rocks associated with the eastern Rustenburg Layered Suite of the Bushveld Igneous Complex with three sub suites or zones, the Croydon, Dwars River and Dsjate present. These are made up of norite, pyroxenite, anorthosite, and gabbro. A wide variety of soils are present associated with the complex geological composition (Mucina and Rutherford, 2006).

Climate:

The Sekhukhune Plains Bushveld is known for its dry winter and summer rainfall with the average between 400-600 mm per annum. Very little frost occur and the mean daily temperatures range between 37.3°C and -0.9°C. The Sekhukhune Mountain Bushveld has a MAP of 500-700mm with infrequent frost (Mucina and Rutherford, 2006).

Conservation:

The Sekhukhune Plains Bushveld is vulnerable with very little protected in reserves (Potlake, Bewaarkloof and Wolkberg). More than 25% is transformed by dry-land subsistence cultivation and the increased mining activities are a threat. Erosion is a serious problem with large areas scarred by deep dongas. Alien species include *Agave spp., Caesalpinia decapetala, Lantana camara, Melia azedarach, Nicotiana glauca, Opuntia spp., Verbesina encelioides* and *Xanthium strumarium*. The Sekhukhune Mountain Bushveld is considered as least threatened with some protected in the Potlake Reserve. Cultivation and urban areas resulted in more than 20% transformation of the vegetation unit and again dongas are present. The main invasive alien present is *Melia azedarach* (Mucina and Rutherford, 2006).

RESULTS and DISCUSSION:

The two alternatives will be discussed separately. The full route will be discussed under the first option.

Tshatane substation sites – Alternative 1 and 2

The sites are indicated in Figure 2 and 5. The natural vegetation at the proposed new Tshatane substation sites are in a poor to fair condition. Impacts include heavy grazing, wood harvesting, cultivation and poor infrastructure maintenance. This has resulted in some erosion in the area (Figure 5).

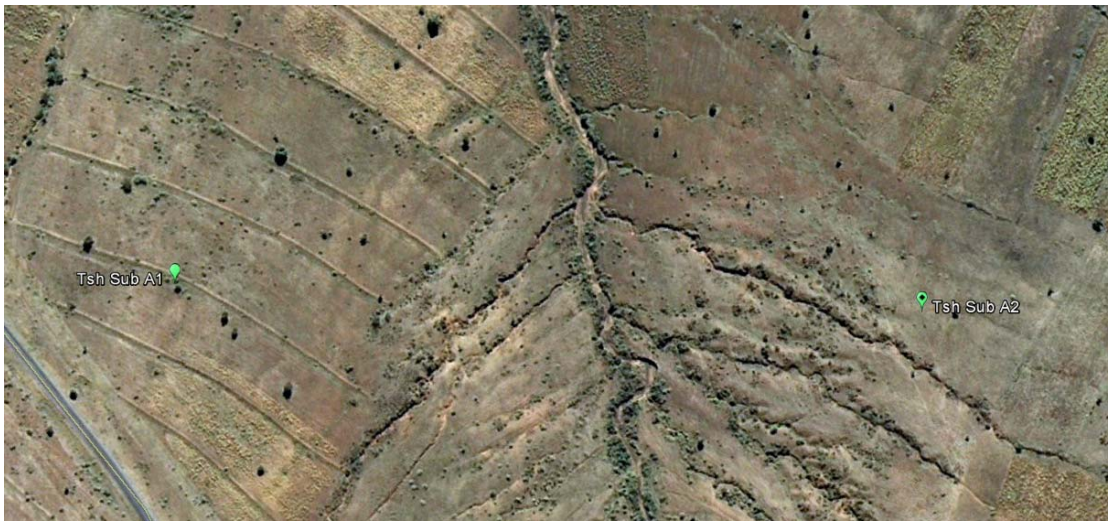

Figure 5: Aerial view of the proposed sites for the new Tshatane substations, Alternative 1 near the tar road (Tsh Sub A1) and Alternative 2 (Tsh Sub A2) east of the stream that drains into the Mohlaletsi River.

The slopes in the area will be susceptible to erosion and care must be taken construction to limit any possible erosion at the substation site. The access to Alternative 2 (substation site) is difficult and an access road must be constructed is this is the final selected site (Figure 6 - 9). Some protected trees (*Boscia albitrunca*) are present. Once the final site is selected, all protected trees must be mapped (GPS) and permit applications submitted. Once the permits are issued, clearing of the site can commence.

Figure 6: View of proposed area - sub Alternative 1.

Figure 7: Sub site 1 – impacts include overgrazing, cultivation and vegetation removal.

Figure 8: View towards sub Alternative 2 – many impacts visible, some *Boscia albitrunca* present.

Figure 9: Site 2 – impacts are grazing, wood collection and cultivation resulting in high erosion potential on slopes.

From an ecological perspective, Alternative 1 is the preferred site for the new proposed Tshatane substation. The reason is its close proximity to the existing road. The route to Alternative 2 crosses steep slopes and the stream in the valley bottom, resulting in more opportunities for erosion in future. In both cases some *Boscia albitrunca* is present and once the final position for the substation is determined, all protected trees must be mapped (GPS) and permits for cutting or trimming obtained before clearing and construction can commence.

Power line – Alternative 1

The proposed power line exits the substation following the road to Sebitse. It then crosses the road (west) towards Mathibeng. The proposed route cut through the hills to the dirt road between Sebitse en Mamoshweu (Figure 10). The vegetation to the east of the proposed new substation is modified due to the grazing pressure, cultivation and the removal of natural vegetation. The incidence of erosion is high, especially of the steeper slopes. Once the corridor turns west towards the hills, the natural vegetation is in a good condition. There are no access roads and more clearing of natural vegetation is needed. If the corridor could follow the tar road to Sebitse, the clearing of vegetation will be low and a good access road is present (Figure 12 – 20).

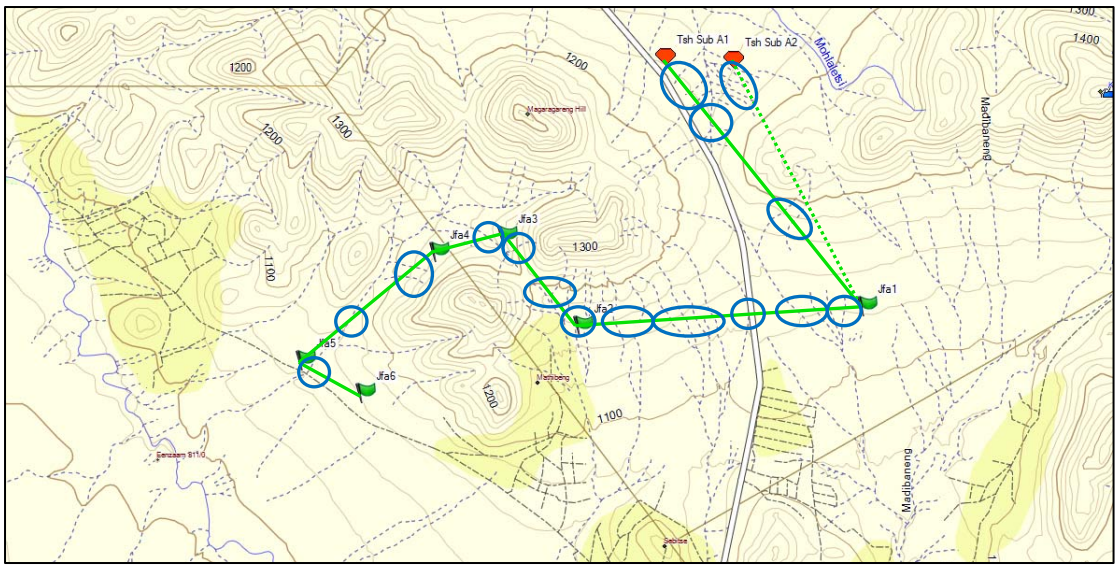

Figure 10: The first sector of the power line (Alternative 1) in green from the proposed new Tshatane substation to the existing Jane Furse substation. The stream crossings are circled in blue.

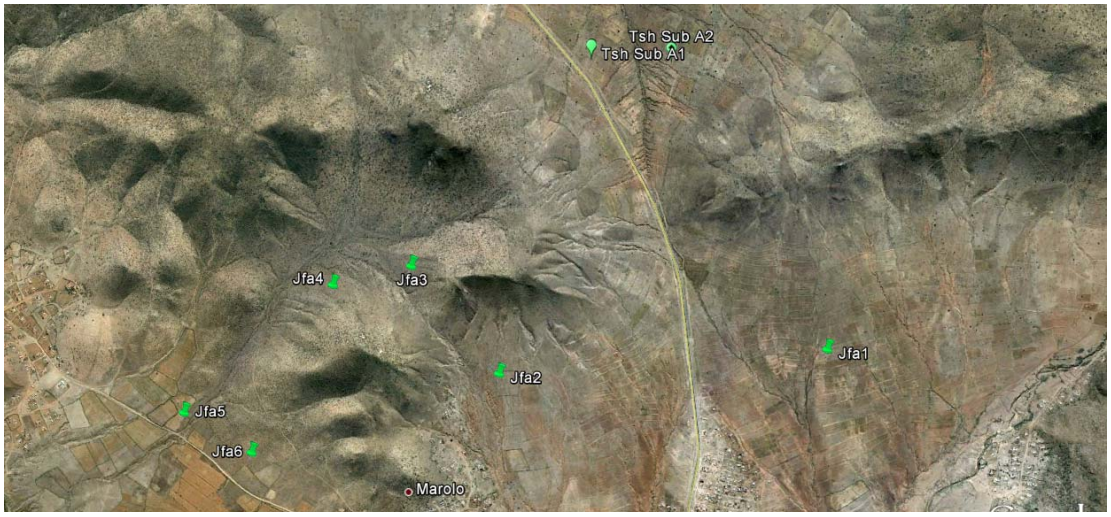

Figure 11: Aerial view of the sector in Figure 10 – note the hills and difficult terrain Tsha1 – south of Tsha3.

Figure 12: View from the substation site towards Sebitse.

Figure 13: Modified vegetation on the steeper slopes.

Figure 14: View from the turning point (Jfa 1 – Figure 9 and 10) towards the substation sites.

Figure 15: View from Jfa 1, crossing the road towards Sebitse.

Figure 16: View of impacts to the north of Sebitse.

Figure 17: Erosion gully in foreground, with hills in background.

Figure 18: Low ridge where power line crosses into the hills.

Figure 19: View of impacts near low ridge on southern slopes.

Figure 20: Low ridge – northern slope.

Once the power line crosses the low ridge, it enters into the more natural area between the hills (Jfa 3 and 4 – Figure 9 and 10). Here the natural vegetation is in a good condition and includes *Sclerocarya birrea, Mundulea sericea, Euphorbia ingens, E. tirucalli, Peltophorum africanum, Grewia flava, G. monticola, Aloe marlothii, Commiphora harveyi, C. marlothii, C. neglecta, C. pyracanthoides, C. schimperi, Schotia brachypetala, Dichrostachys cinerea, Acacia tortilis, A. mellifera, A. grandicornuta, Euclea crispa, E. undulata, Gymnosporia buxifolia, Kirkia wilmsii, Ochna inermis, Ziziphus mucronata* and *Searsia engleri* (Figure 21 – 24).

Figure 21: Good natural vegetation in the hills – some drainage lines present.

Figure 22: Natural vegetation in a good condition.

Figure 23: Grazing and wood collection present in the hills.

Figure 24: Slopes susceptible to erosion.

To the south of the hills, the corridor follows a route to the southeast, past Sebitse to cross the Lepellane River (Figure 25 and 26). The landscape is dominated by modified natural vegetation and the impacts are related to heavy grazing, cultivation and wood collection. This result in the erosion that is evident along the route. Some *Boscia albitrunca* and *Sclerocarya birrea* is present, but very few other large trees are observed (Figure 27 – 33). Permits must be obtained after the final walk down to map (GPS) trees. The stream and river crossing must be considered as a sensitive area and no vehicles can cross it, unless there is a proposer river crossing (bridge).

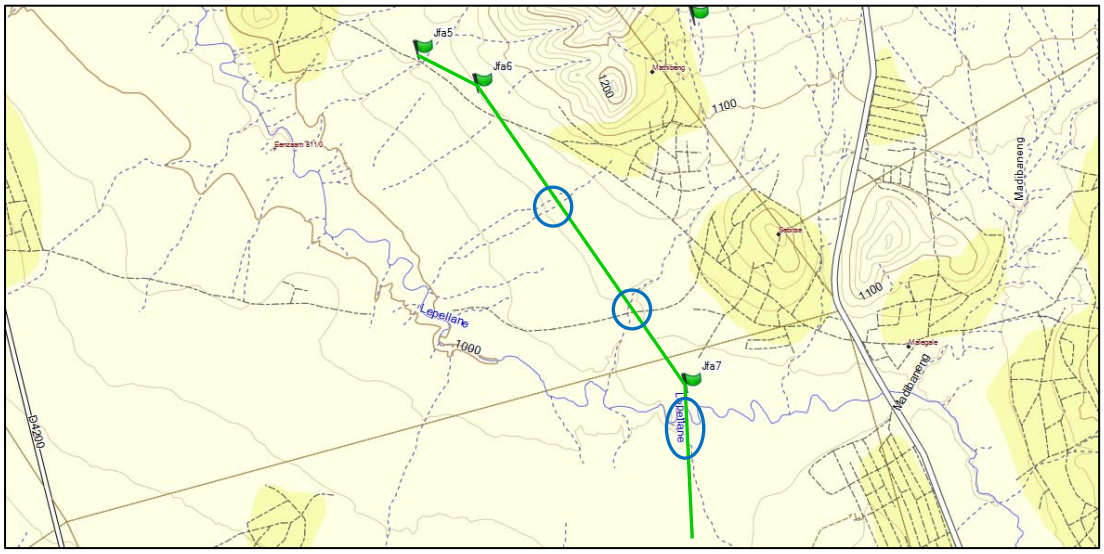

Figure 25: Corridor to the south of the hills.

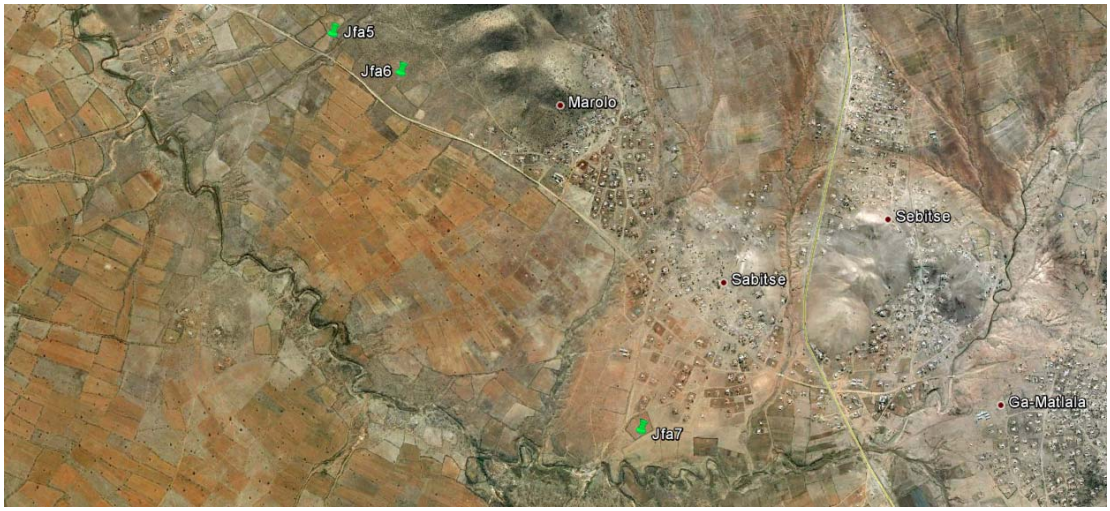

Figure 26: Aerial view of sector – note land use and erosion present in the area.

Figure 27: Cultivation an important activity south of the hills.

Figure 28: Grazing and wood harvesting have impacts on the vegetation.

Figure 29: Erosion a problem on exposed soils and slopes in the area.

Figure 30: Example of *Sclerocarya birrea* and grazing in area.

Figure 31: Example of large cultivated areas - coppicing of protected trees evident in the area.

Figure 32: View past school towards the Lepellane River.

Figure 33: View of the crossing of the Lepellane River.

To the south of the Lepellane River the natural vegetation is modified due to the extensive cultivation, wood harvesting and heavy grazing and areas of encroachment was observed (Figure 34 and 35). The presence of dense stands of *Opuntia ficus*-indica and *Dichrostachys cinerea* can be mentioned. In general, the vegetation cover is sparse with little to no basal cover and this result in areas of erosion. The new proposed power line will follow the corridor of the existing power lines and this servitude can be used as an access road during construction. There are some stream crossings and no traffic is allowed to drive through it during construction or maintenance. Other species include *Acacia mellifera, A. tortilis, Peltophorum africanum, Sclerocarya birrea* and *Aloe marlothii* (Figure 36 – 38). All protected trees must be mapped (GPS) once the final corridor is known. A permit for cutting and trimming must be obtained before the project commence.

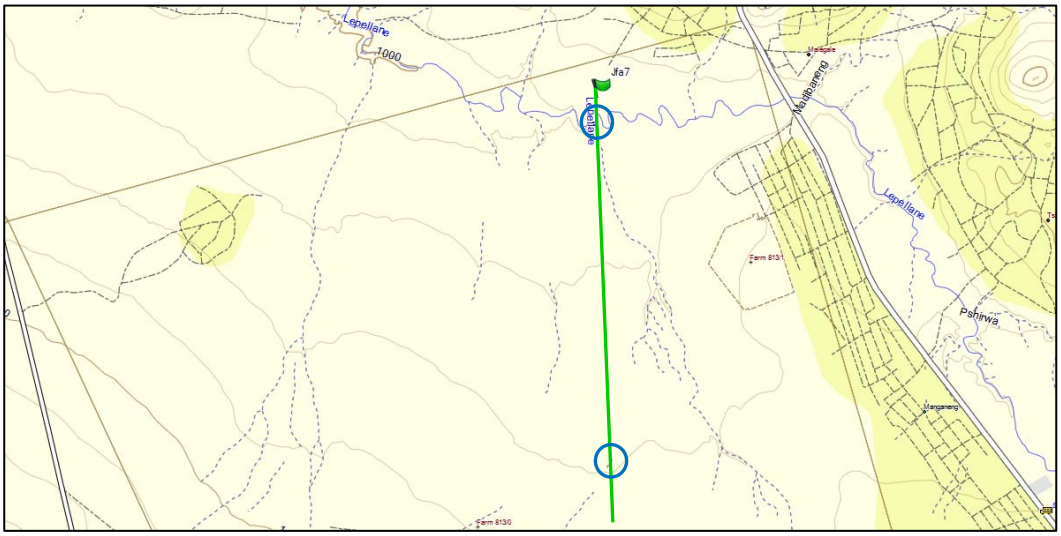

Figure 34: Corridor to the south of the Lepellane River.

Figure 35: Aerial view of sector – note high presence of cultivation and erosion.

Figure 36: Impact of vegetation changes – high presence of *Opuntia ficus-indica* and *Agave americana*.

Figure 37: Large areas where the vegetation in modified – old cultivated fields and grazing areas are present.

Figure 38: Very few large trees are present – route follows existing power line.

At the dirt road between Maganeng and Marulaneng, the corridor swings to the west to the Marulaneng/Jane Furse road (D4200) (Figure 39 and 40). The natural vegetation is

severely modified due to over grazing, cultivation, wood harvesting and the many small roads resulting in severe erosion in some areas (Figure 41 – 44).

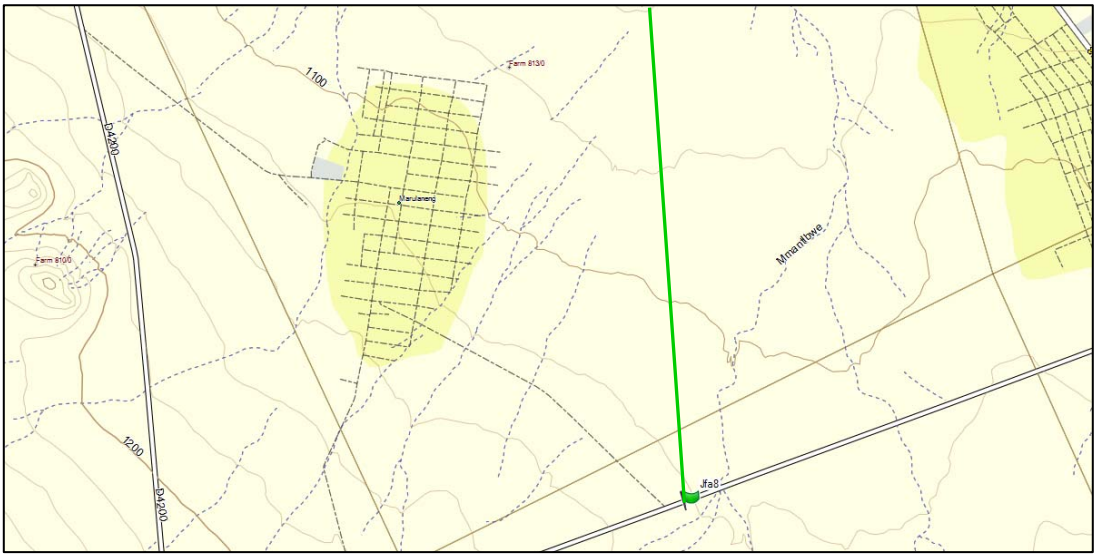

Figure 39: Sector to the Maganeng/Marulaneng road.

Figure 40: Aerial view, note impacts related to cultivation and grazing.

Figure 41: Cultivation and tilling of furrows have modified the landscape severely.

Figure 42: No large trees are present and the natural vegetation is dominated by low shrubs.

Figure 43: Erosion a result of the exposed soils with very little basal cover.

Figure 44: The Maganeng/Marulaneng road can be used as access to the servitude.

The corridor swings west to follow the road to the D4200. At the road it swings south towards the Jane Furse substation (Figure 45 and 46). The natural vegetation is severely modified and cultivation and grazing are the main activities. In addition, the development of villages and wood collection further contributed to the problem.

Very few large trees are present and a few large *Sclerocarya birrea* is present. The shrubs are dominated by *Acacia spp.* and *Dichrostachys cinerea* with many exotics present. These include *Agave americana, Opuntia ficus-indica* and some *Melia azedarach* (Figure 47 – 51).

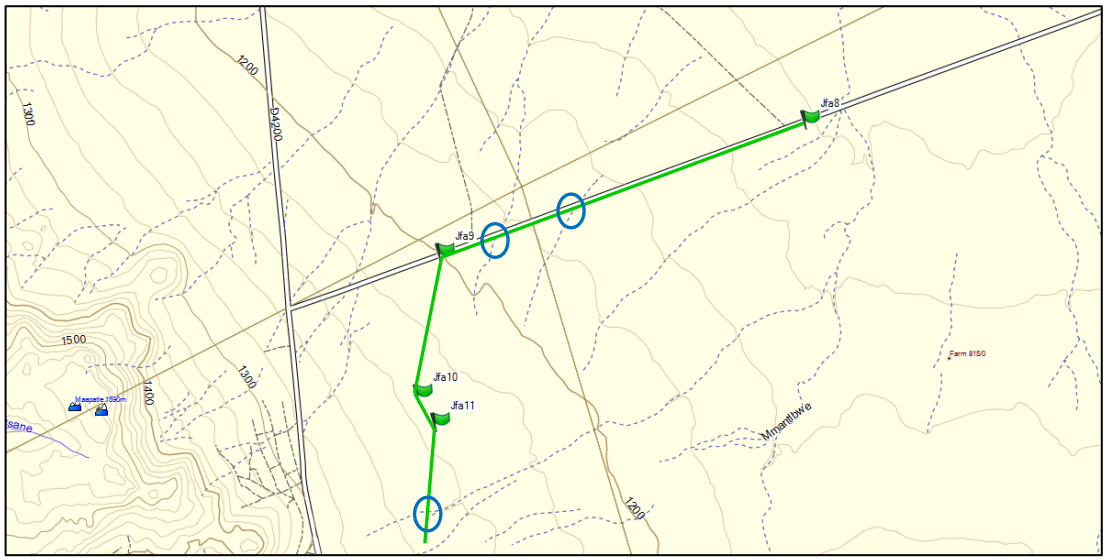

Figure 45: Sector of the corridor following the D4200 south towards the Jane Furse substation.

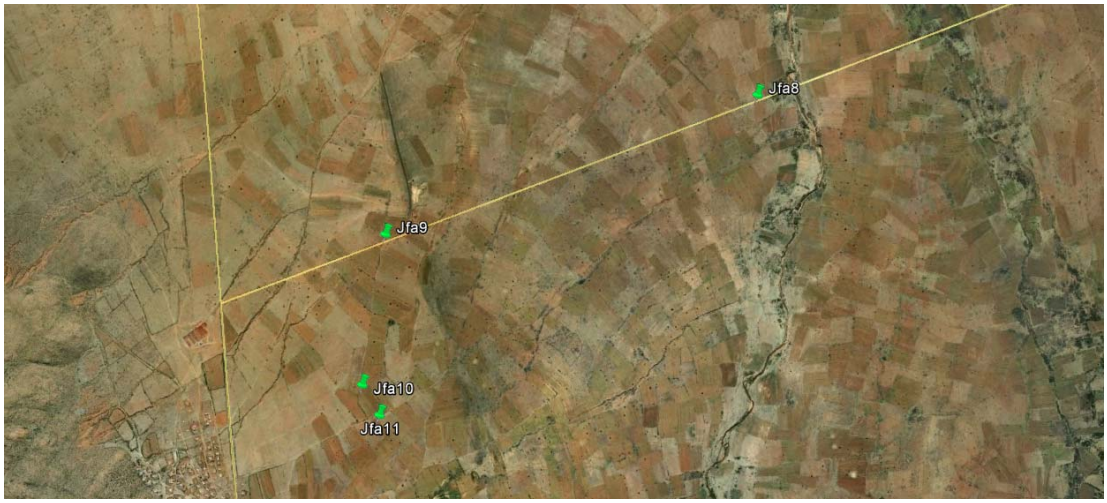

Figure 46: Aerial view of sector with agricultural activities visible.

Figure 47: View of corridor following the Maganeng/Muralaleng.

Figure 48: Large areas cleared of natural vegetation.

Figure 49: Erosion and problem along the areas of exposed soils.

Figure 50: Some large trees present (sparse) with small shrubs dominating the woody vegetation.

Figure 51: Example of erosion donga between cultivated lands.

The last sector to the Jane Furse substation passes to the east of a densely populated area - including Thabatshweu, Sekhutlong and Jane Furse (Figure 52 and 53). The impacts are severe and new houses are constantly built along the proposed route. The grazing pressure is very high and large areas are under cultivation. Very little large trees are present and only a few large *Sclerocarya birrea* are seen in the area. The shrubs are dominated by *Acacia tortilis* and *Dichrostachys cinerea* with some coppiced *Peltophorum africanum* and *Euclea spp.* present. The presence of *Algarve americana* and *Opuntia ficus-indica* are noted. Deep erosion gullies are present and is a result of the poor land use practices and increased run-off from the hard surfaces in the villages (Figure 54 – 61). Place pylons at least 75m from all streams.

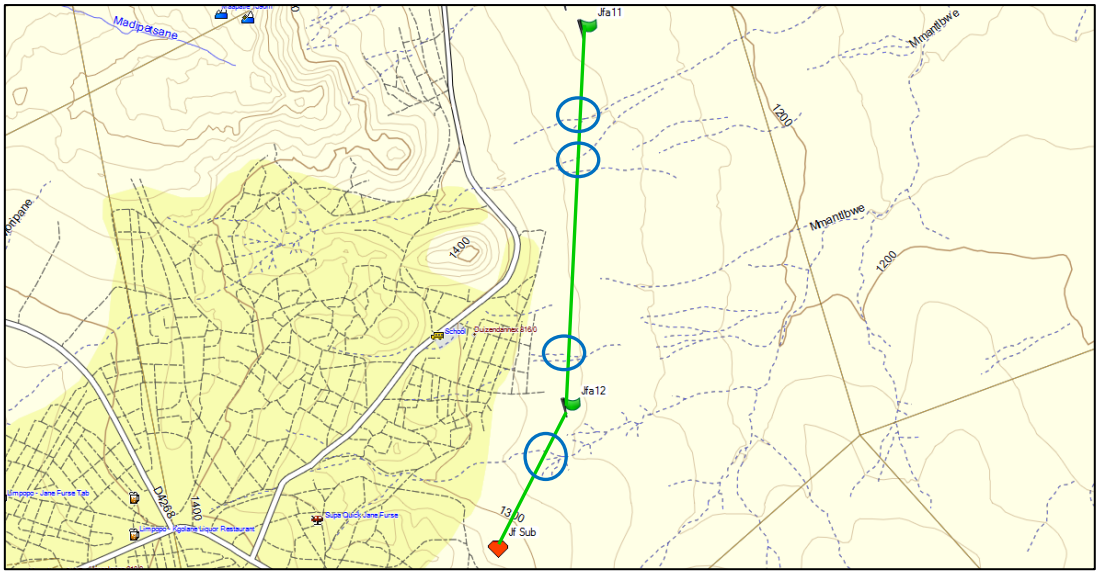

Figure 52: Last sector of the power line to the Jane Furse substation.

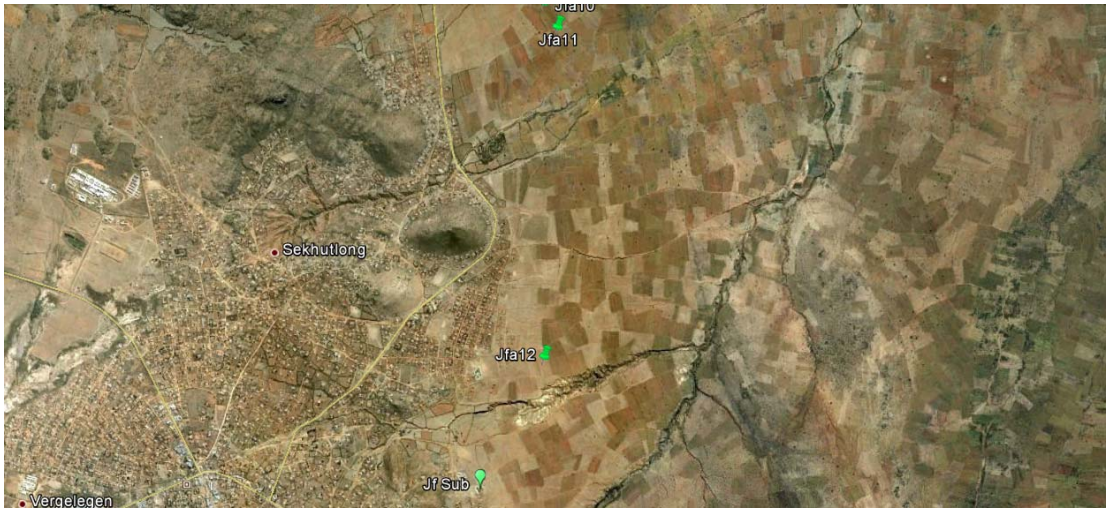

Figure 53: Aerial view of the last sector.

Figure 54: Close-up view of extensive erosion near the substation.

Figure 55: Example of erosion in the cultivated areas.

Figure 56: Exotic vegetation are present along the corridor.

Figure 57: Cultivation an important activity in the area.

Figure 58: Large areas heavily grazed along the corridor.

Figure 59: New stands are being developed near the substation.

Figure 60: Corridor throught the newly built houses to the north of the Jane Furse substation.

Figure 61: View of erosion north of the sub (compare with Figure 54) with the substation in the background.

Power line – Alternative 2

The second alternative follow a corridor more to the east compared (Figure 62 and 63) to Alternative 1. Once the proposed route for Alternative 2 reaches the Lepellane River (Jfb 3 – Figure 62 and 63), it follows the same route as Alternative 1. Therefore only the first section will be discussed.

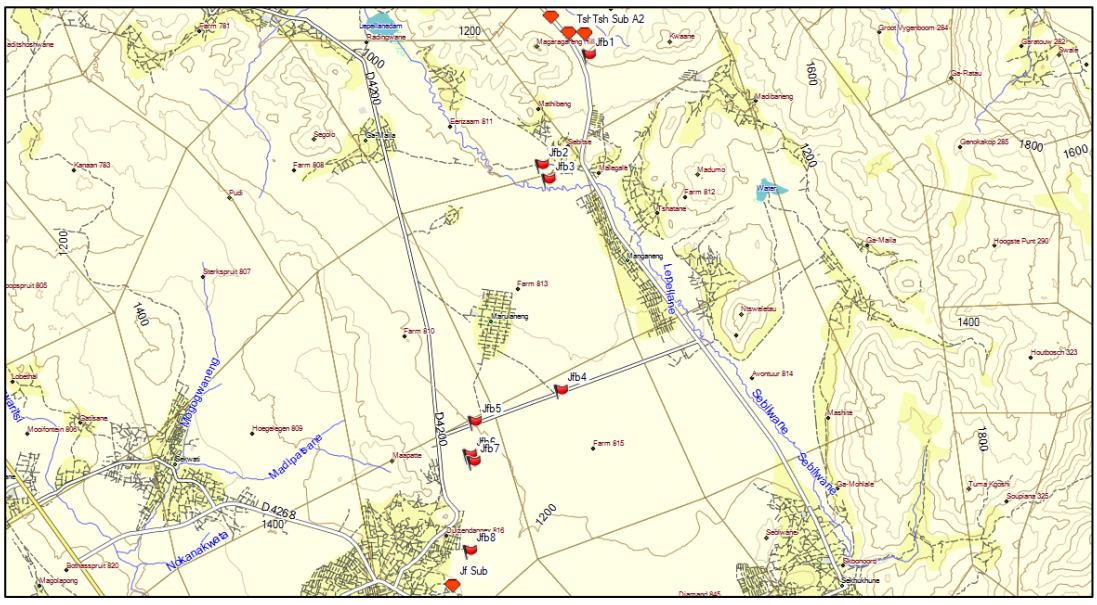

Figure 62: Approximate corridor proposed for the route between the new Tshatane and existing Jane Furse substations (Alternative 2).

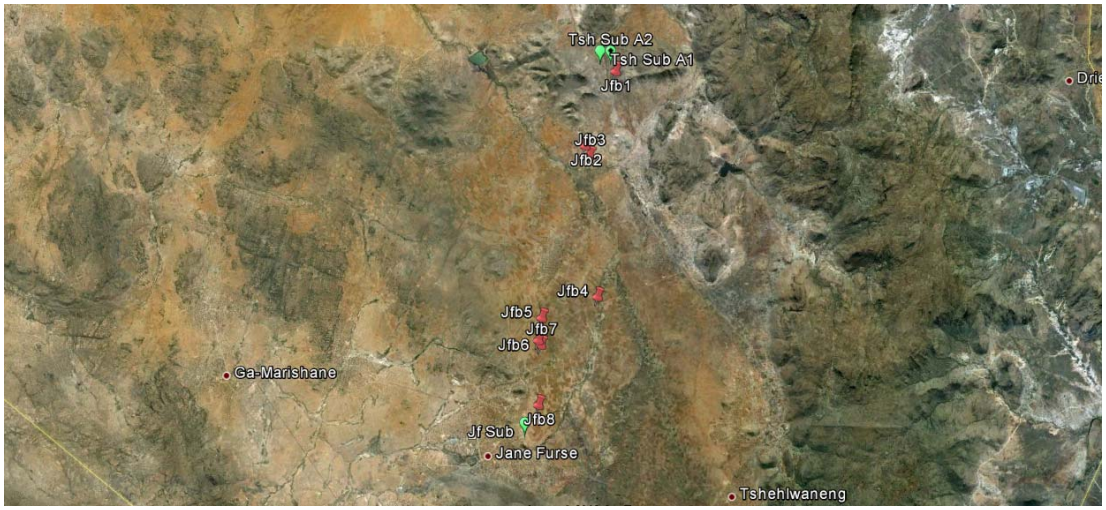

Figure 63: Aerial view of the route proposed for Alternative 2.

From the proposed new Tshatane substation the corridor follows the road south before crossing to pass between Mathibeng and Sebitse (Figure 64 and 65). The natural vegetation is in a severely modified state due to heavy grazing, wood harvesting and cultivation. The many tracks contribute to the high incidents of erosion present in the study area. The protected trees, *Sclerocarya birrea* and *Boscia albitrunca* is present and permits is needed for cutting or trimming (Figure 66 – 75). Once the final route is establised, a walk down study must be undertkaen to map (GPS) all the trees. This is needed for the permit applications. Once the permits are issued, clearing of the servitude can commence.

There are a number of streams and drainage lines along the route. These are sensitive areas and no crossing through it is permitted, unless it is at a proper road crossing. All pylons must be placed at least 75m from the streams and outside the 1:100 year flood line of the Lepellane River (at least 120m from the river banks).

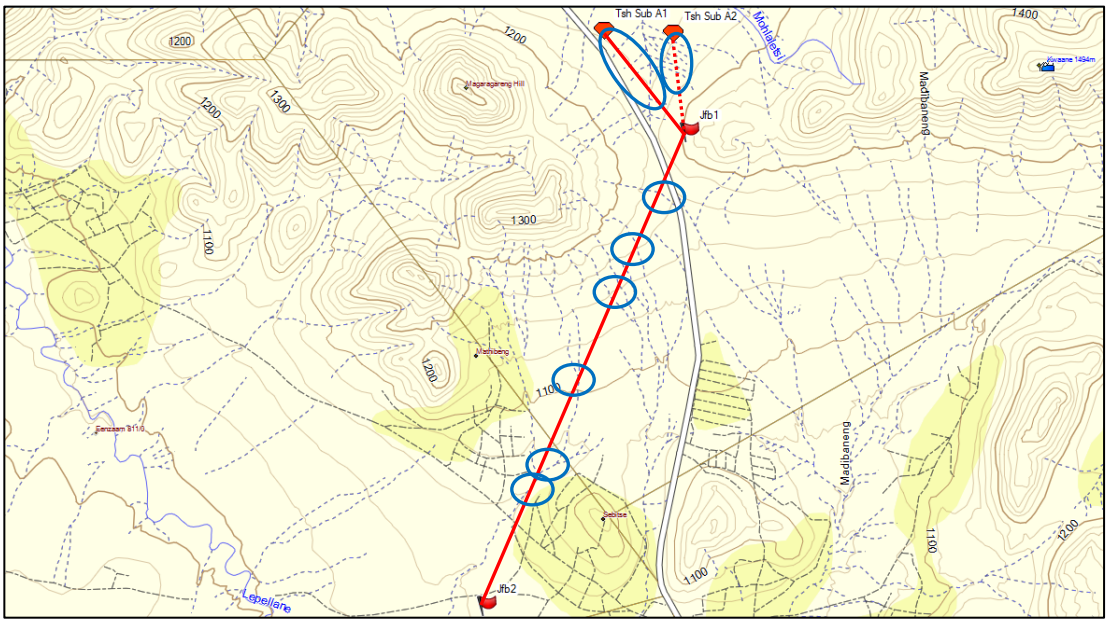

Figure 64: Corridor from the substation to the south of Mathibeng and Sebitse.

Figure 65: Aerial view of the first sector of Alternative 2.

Figure 66: View along the corridor from the Tshatane substation sites – following the road south.

Figure 67: Impacts along the corridor includes grazing, wood collection and cultivation.

Figure 68: Other impacts include the many tracks and houses on slopes resulting in erosion.

Figure 69: Example of erosion on the slopes in the area.

Figure 70: Some *Boscia albitrunca* and *Sclerocarya birrea* present among the low *Acacia* shrubs.

Figure 71: An important activity in the area is the cultivation of cash crops.

Figure 72: Exposed soils dominate the area – many alien ivasive such as *Argave americana* and *Opuntia ficus-indica* present.

Figure 73: View of a stream – no crossing allowed during construction.

Figure 74: Some curreent developments asociated with the propsoed new corridor – Alternative 2.

Figure 75: Near the school, the corridor for Alternative 1 and 2 meet. Natural vegetation modified and erosion present.

Just north of the Lepellane River, the corridor for Alternative 1 and 2 follows the same route (Figure 76 and 77). The natural vegetation is modified and mnay exotic alien plants are present. The river crossing is considered as a sensitive area and no drinving is allowed through it (Figure 78 – 81). It is suggested that the pylons is placed at least 175m from the river banks in a effort to lower the risk of future erosion associated with the power line. The final position of the pylons can be confirmed during the walk down study.

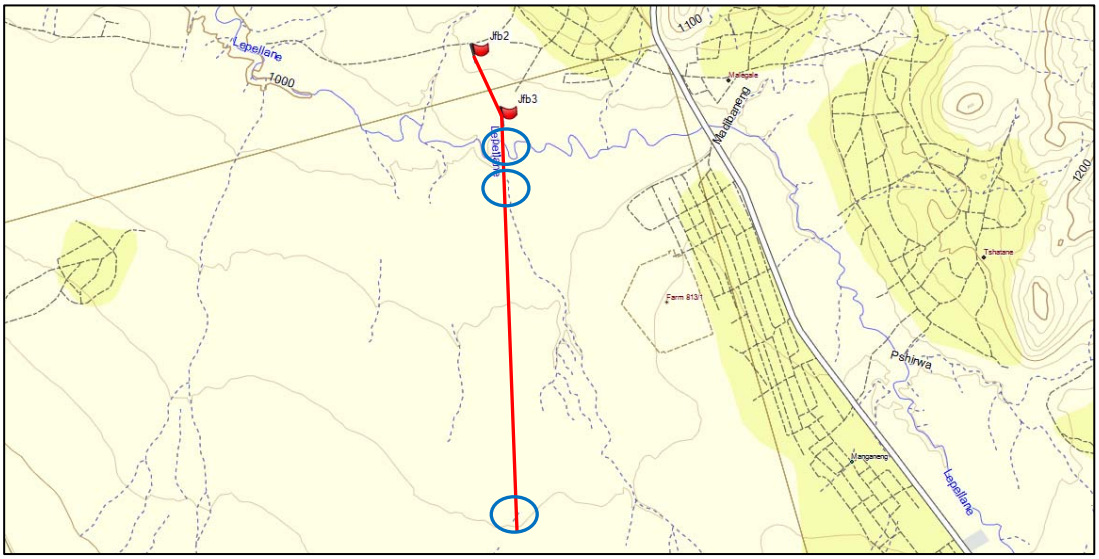

Figure 76: Sector of Alternative 2 to the Lepellane River.

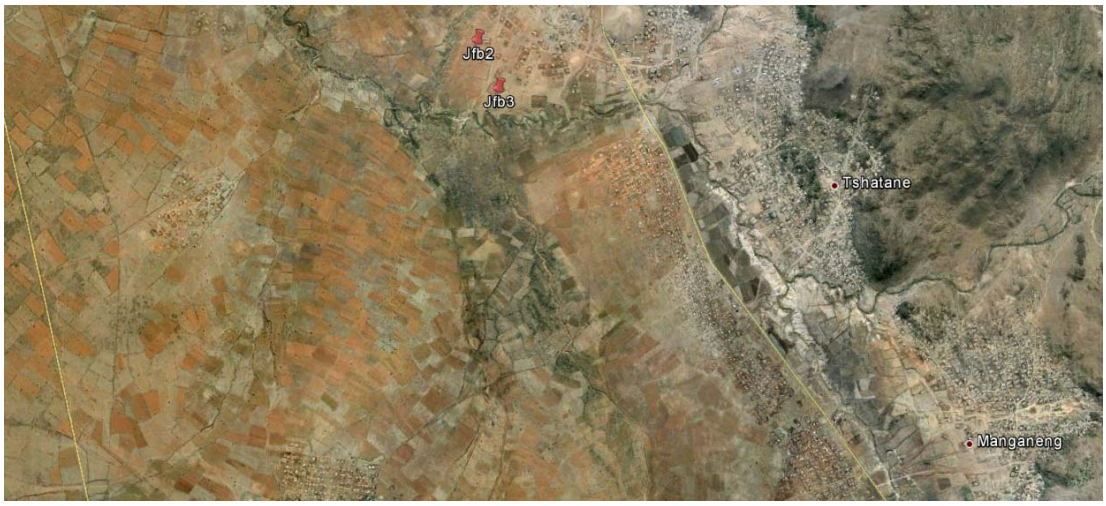

Figure 77: Aerial view of the sector of Alternative 2 to the Lepellane River.

Figure 78: View of modified natural vegetation north of the Lepelane River.

Figure 79: Exposed soils susceptable to erosion.

Figure 80: Area with high infestation of *Argave americana* and *Opuntia ficus-indica*.

Figure 81: View of the river crossing – similar area as for Alternative 1.

Game observed was *Sylvicapra grimmia* and further dung and footprints of hare and rodents were noted.

RECOMMENDATIONS:

- From an ecological perspective both alternatives (power line) is viable. Alternative 1 crosses the hills to the south of the proposed new Tshatane substation. This area is in a good condition and clearing of natural vegetation, including large trees are needed. There are a few protected trees and permits are needed before clearing can commence. There are no access roads and this will mean some clearing is needed. Alternative 2 follows existing roads and would be a better option compared to Alternative 1.
- With regard to the substation sites the Alternative 1 site for the new Tshatane substation is preferred because of its proximity to the road.
- Once the route is negotiated, the planners (Eskom) and consultants must do a walk down to determine areas of concern related to the placement of pylons near streams and rivers. All protected trees must be mapped (GPS) and permit applications completed. Clearing can only commence once the permits are issued.
- Soils are highly erodible and care must be taken during construction to lower the risk.
- With careful planning of construction activities impacts to the sensitive areas (rivers and streams) can be severely reduced.
- Ensure no oil or fuel spills occur during construction or installation of transformers.
- Build berms or containment dams around transformers to contain accidental spills.
- Prevent and rehabilitate erosion.
- Make sure no wood collection takes place by contractors.
- During the finalisation on the power line, placement of structures near all streams must be confirmed to ensure the integrity of the habitat is not compromised. Place structures at least a 75m from stream banks and outside the 1:100-year flood line of the Lepellane River.

Summary

- The study area investigated had a vegetation cover in a “poor state” with impacts related to grazing, cultivation, wood collection and erosion.
- From an ecological perspective, both alternatives for the power line are viable. Minimum clearing for the servitude is needed. Alternative 2 is suggested, as it is nearest to the road infrastructure. For Alternative 1, more clearing in the hills to the south of the Tshatane substation is needed. As part of the study, a plant “rescue and rehabilitation plan” is in place. A preliminary survey by the expert team was conducted (see separate report).
- With regard to the substation at Tshatane, the Alternative 1 is preferred.
- Before any clearing or trimming commences, this specialist must accompany Eskom and the contractors to verify trees to be trimmed or cut.
- The following protected tree species were seen on the site: *Boscia albitrunca, Sclerocarya birrea* and *Balanites maughamii*.
- Seven red book data plant species is recorded for the area. Most species listed (Addendum 3) occur in habitats not present along the corridor.
- The drainage lines, streams and rivers must be considered as corridors for the limited migration of species. The corridor won’t impact on these corridors and therefore will have no large scale effect on the species or area.
- With regard to biodiversity patterns, little if any impacts will occur.
    - 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.
    - No red data plant species were noted. This must be confirmed during the walk down study, once the final route is known – will form part of the plant rescue operation.
    - As stated, some drainage lines occur, but very limited impacts may occur. Although, if activities is limited to the servitude as access road, impacts will be very low if well managed (high confidence).
    - Some alien plant infestations were observed on the site or in the near vicinity. Clearing of soil can always lead to some infestations.
    - The activity 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

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.

Addendum 1 is a summary of potential problems that can be encountered during the construction of the substation and associated power line. Some mitigating and management actions/strategies are listed.
Addendum 2 is red data species listed on SANBI précis list.
Addendum 3 is a summary of possible red data mammals (historic records) that may occur. With the habitat modification and large scale urbanisation, the probability of any occurring in the area is very low.

References

Acocks, J.P.H. 1953. Veld types of South Africa. *Mem. Bot. Surv. S. Afr.* No. 40:1-128.

Department of Water Affairs and Forestry. 2006. Notice of list of protected tree species under the national forests act, 1998 (Act no. 84 of 1998); as amended. Government Gazette no. 29062, notice 897, 8 September 2006.

LEDET State of the Environment Report. 2004. Department of Agriculture, Conservation and Environment, Limpopo Province.

Low, A.B. and Rebelo, A.G. (eds). 1996. *Vegetation of South Africa, Lesotho and Swaziland. A companion to the vegetation map of South Africa, Lesotho and Swaziland*. Dept. of Environmental Affairs and Tourism, Pretoria.

Manyama, P.A., von Staden, L. & Winter, P.J.D. 2008. *Plectranthus porcatus* Van Jaarsv. & P.J.D.Winter. National Assessment: Red List of South African Plants version 2012.1.

Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African Biodiversity Institute, Pretoria.

Siebert, S.J., Van Wyk, A.E. and Bredenkamp, G.J. 2002. The physical environment and major vegetation types of Sekhukhuneland, South Africa. *S. Afr. J. Bot.* 68: 127-142.

Siebert, S.J., van der Merwe, I.J., Stehle, T. & Victor, J.E. 2005. *Lydenburgia cassinoides* N.Robson. National Assessment: Red List of South African Plants version 2012.1.

Skinner, J.D and Chimimba, C.T. 2005. *The mammals of the southern African subregion*. 3rd Edition. Cambridge University Press.

South African National Biodiversity Institute. 2012. *Précis information on red data species*. Pretoria.

Victor, J.E. & van Wyk, A.E. 2005. *Searsia sekhukhuniensis* (Moffett) Moffett. National Assessment: Red List of South African Plants version 2012.1.

Victor, J.E., Winter, P.J.D. & Siebert, S.J. 2005. *Plectranthus venteri* Van Jaarsv. & Hankey. National Assessment: Red List of South African Plants version 2012.1.

von Staden, L., Winter, P.J.D. & Raimondo, D. 2008. *Aneilema longirrhizum* Faden. National Assessment: Red List of South African Plants version 2012.1.

Winter, P.J.D., Siebert, S.J., Archer, R.H., Victor, J.E. & von Staden, L. 2008. *Euphorbia barnardii* A.C.White, R.A.Dyer & B.Sloane. National Assessment: Red List of South African Plants version 2012.1.

Winter, P.J.D., Victor, J.E. & von Staden, L. 2008. *Euphorbia sekukuniensis* R.A.Dyer. National Assessment: Red List of South African Plants version 2012.1.

Addendum 1: List of impacts and suggested mitigating and management strategies.

Tshatane/Jane Furse project		
Theme	Natural environment	
Nature of issue	Erosion	
Stage	Construction and maintenance	Possibility high for erosion during construction due to soil types and slopes in near rivers and streams.
Extent of impact	Site, local and region	The impact will be moderate to high on-site (power line servitude and substations), but limited to low on a regional scale. Silt will have a negative impact in streams and rivers, but will be low to moderate for this project, if well managed.
Duration of impact	Immediate	If not addressed on constant basis, permanent damage is a reality. Currently erosion is a huge problem in the area.
Intensity	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	High.	If no maintenance is done, the impact will have a compounding impact on the environment.
Level of significance	Low-medium if controlled.	Will be high if not managed.
Mitigation measures	• Limited traffic during construction. • Constant rehabilitation during construction. • Must have maintenance strategy as part of EMP.	No driving through any streams and rivers, except on existing roads. Limit traffic along the power line servitude.
Level of significance after mitigation	Low.	
EMP requirements	• 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). • Special care needs to be taken during the construction phase to prevent surface storm water rich in sediments and other pollutants from entering the natural drainage systems/wetlands. In order to prevent erosion, mechanisms are required for	

	dissipating water energy. • An on-site ecological management plan must be implemented for rivers including management recommendations as well as potential rehabilitation of severely 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 along the servitude for the power line at any time.
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/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	Marginal.	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	• Proper ablution facilities on site. • Constant management during construction. • Contain oils and fuel in berm area. • 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. Build containment berms around oil and fuel storage areas, as well as around the transformers. All by products and materials must be disposed at approved sites.
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 nearby human populations. • 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 lines. • The careful position of soil piles and runoff control during all phases of development 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/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	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	• 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. • Clean-up plan/strategy if spills occur. • Proper facilities (ablution) to ensure no sewerage spills into streams and rivers. • Proper storage of material during construction and clean-up 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 site and servitude for the power line.
Stage	Construction and maintenance	Must have a strict environmental guideline 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/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	• Need to ensure all alien plants on construction sites are removed. • Must clear alien vegetation on a regular basis. • 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	Removal on natural vegetation	Includes the servitude for the power line and substation sites.
Stage	Construction and maintenance	Must have strict environmental guidelines and management plan in place before clearing and construction can commence. A "rescue and rehabilitation plan" is in place for the hills to the south of the Tshatane substation and the Lesego substation site.
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.
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-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. 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. • 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.	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 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.	
Nature of issue	Wood collection	Includes servitude for power line and where workers stay.
Stage	Construction and maintenance	Must have a strict environmental guidelines and management plan in place before clearing and construction can commence. Preferable no workers to stay on site. Wood collection (mostly illegal) is having serious environmental consequences.
Extent of impact	Site, local and region	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 fire wood will have a permanent effect on the environment.
Intensity	Moderate to high	Although the duration of the impact is of a permanent nature, the intensity is moderate to high on a local and regional scale. The immediate habitat surrounding the corridor is in a poor to fair condition. The protection of the environment is the function of local and provincial authorities and this will be

		important.
Probability of occurrence	High	The impact to the surrounding environment will be high.
Status of the impact	Project: negative Environment: negative	If well managed, can be neutral for both.
Cumulative impact	Compounding	If not controlled the cumulative impact will have a compounding effect on animal and bird populations in the area. This must be well managed by conservation authorities.
Level of significance	Low if controlled.	Will be very high if not managed.
Mitigation measures	• It is suggested that no workers stay on site and must be limited to the construction site as far as possible.	The contractor must understand the importance of the issue and the impacts poor management will have on the environment.
Level of significance after mitigation	Low.	
EMP requirements	• Proper strategy to prevent illegal wood collection. • Regular inspections to monitor if illegal activities occur.	

Addendum 2: Plants listed in the SANBI Précis lists (2012).

Family	*Genus and species*	Status	Distribution and threats	Probability of occurrence
ANACARDIACEAE	*Searsia sekhukhuniensis*	Rare	A habitat specialist restricted to the Sekhukhuneland centre of endemism. No known threats. Sekhukhuneland, Roossenekal to Steelpoort. Rocky hillsides in bushveld, on pyroxenitic substrates of the eastern rim of Bushveld Igneous Complex.	Very low
CELASTRACEAE	*Lydenburgia cassinoides*	NT	Roossenekal to Strydpoort Mountains. Exposed norite bedrock and dolomite.	Very low
COMMELINACEAE	*Aneilema longirrhizum*	NT	Sekhukhuneland, northern Leolo Mountains and Olifants River Valley. Sekhukhune Plains Bushveld, on well-drained, gravel slopes and along dry riverbeds. This species is endemic to Sekhukhune Plains Bushveld (Mucina and Rutherford 2006), an extensively transformed vegetation type that has been classified as Vulnerable	Very low
EUPHORBIACEAE	*Euphorbia barnardii*	EN	Sekhukhuneland, from the Strydpoort Mountains southwards along the Leolo Mountains to Steelpoort. Savanna and closed woodland, rocky slopes and summits, mainly norite outcrops, with one subpopulation on banded ironstone. At most sites the habitat has been degraded to shrubby, succulent-dominated vegetation with low grass and tree cover. E. barnardii is threatened mainly by overgrazing and trampling by livestock which damages plants, especially the terminal flower bearing stems which also then results in poor reproduction, disease, habitat loss through erosion and expanding human settlements and to a lesser extent mining and harvesting for horticultural purposes.	Very low
EUPHORBIACEAE	*Euphorbia sekukuniensis*	Rare	Sekhukhuneland, Steelpoort River Valley and along the summit of the Leolo Mountains as far as the Olifants River Valley. Closed woodland and thicket, in shallow norite soils on rocky outcrops among large boulders, 900-1300 m. This species occurs in a habitat relatively safe from expanding human settlements and the impacts of subsistence agriculture and overgrazing and is not declining	Very low
LAMIACEAE	*Plectranthus venteri*	Rare	Sekhukhuneland, Leolo Mountains. Among norite boulders, usually in shallow soil and rock pockets.	Very low
LAMIACEAE	*Plectranthus porcatus*	VU	Sekhukhuneland, northern Leolo Mountains. Dry savanna, among boulders on southwest-facing, rocky norite slopes. The area where this species occurs is very remote, and is at present lightly utilized for firewood harvesting and grazing (D. Raimondo pers. obs.) Increasing grazing pressure in future could potentially lead to the degradation of the habitat, but is unlikely to impact the species directly as it grows protected among boulders.	Very low

Addendum 3: 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 jubatis*	No	No
	Lion	*Panthera leo*	No	No
	Black-footed cat	*Felis nigripes*	No	No
Near Threatened	White rhinoceros	*Ceratotherium simum*	No	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	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*	Limited	Low
	Samango monkey	*Cercopithecus mitis*	No	No
	Greater galago	*Otolemur crassicaudatus*	No	No
	South African galago	*Galago moholi*	Yes	Very low
	Spotted-necked otter	*Lutra maculicollis*	No	No
	African clawless otter	*Aonyx capensis*	No	No
	Caracal	*Caracal caracal*	Yes	Very low
	Serval	*Leptailurus serval*	No	No
	African wild cat	*Felis sylvestris*	No	No
	Lion	*Panthera leo*	No	No
	Hippopothamus	*Hippopothamus amphibious*	No	No
	White rhinoceros	*Ceratotherium simum*	No	No
	Pangolin	*Manis temminckii*	No	No