Specialist basic assessment report: Tshatane/Lesego 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 Lepele-Nkumpi local municipalities of Sekhukhune and Capricon district, Limpopo Province.
- Construction of the proposed new Tshatane switching substation.
- Construction of the proposed new Lesego substation.

Project Locality:

The study site is north of Jane Furse within Fetakgomo and Lepele-Nkumpi Local municipalities of Sekhukhune district in the Limpopo Province (Figure 1).

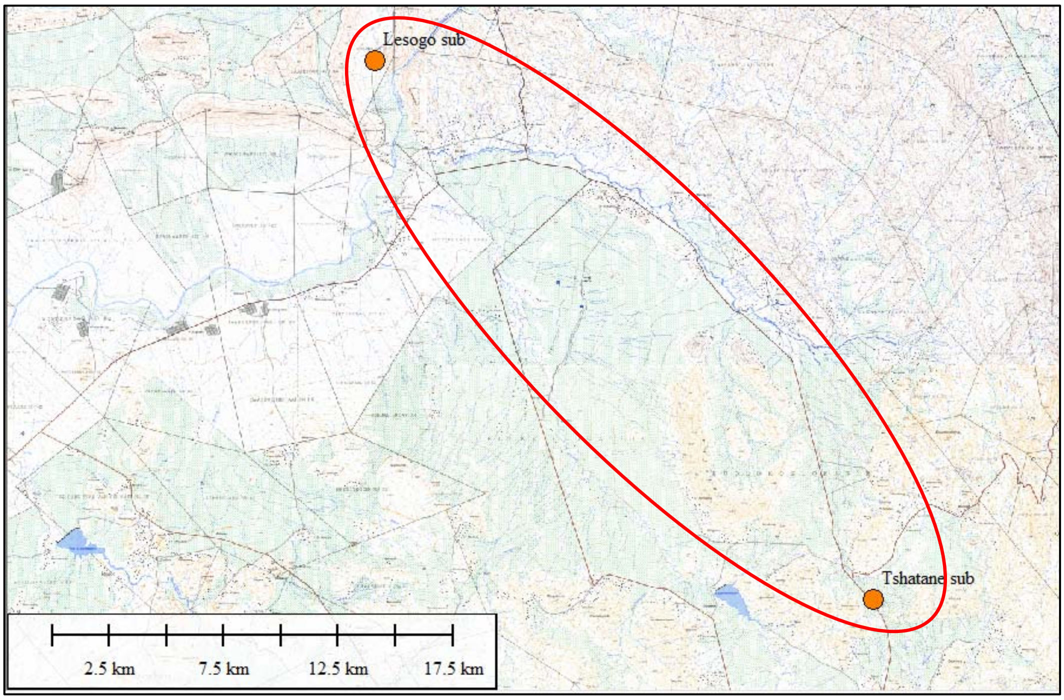

Figure 1: Approximate map of the study area.

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 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).

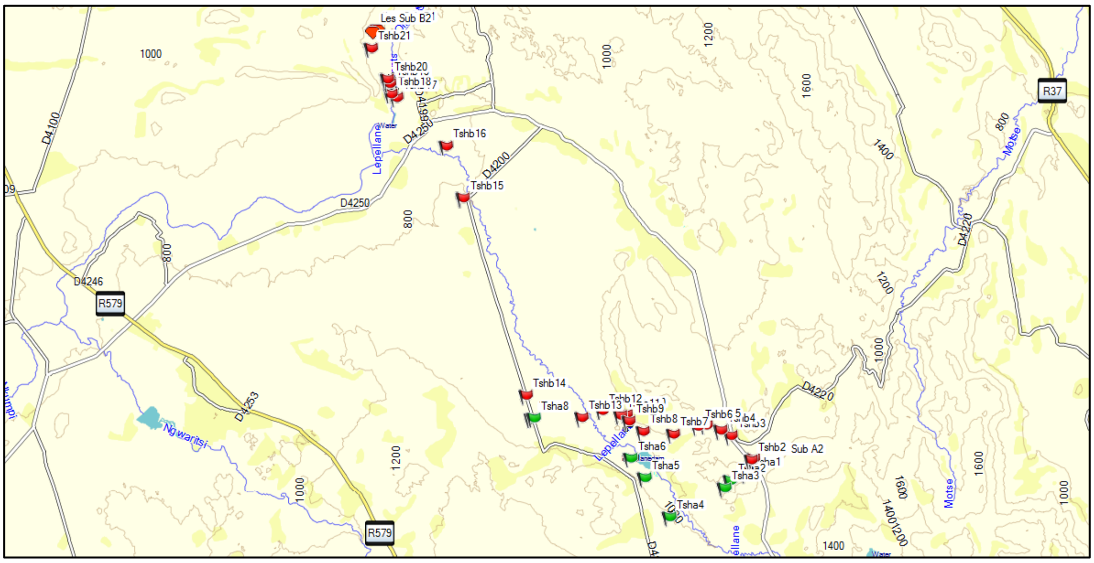

Figure 2: The two alternatives were investigated for the proposed new substations and power line routes, Alternative 1 in green and Alternative 2 in red.

Vegetation:

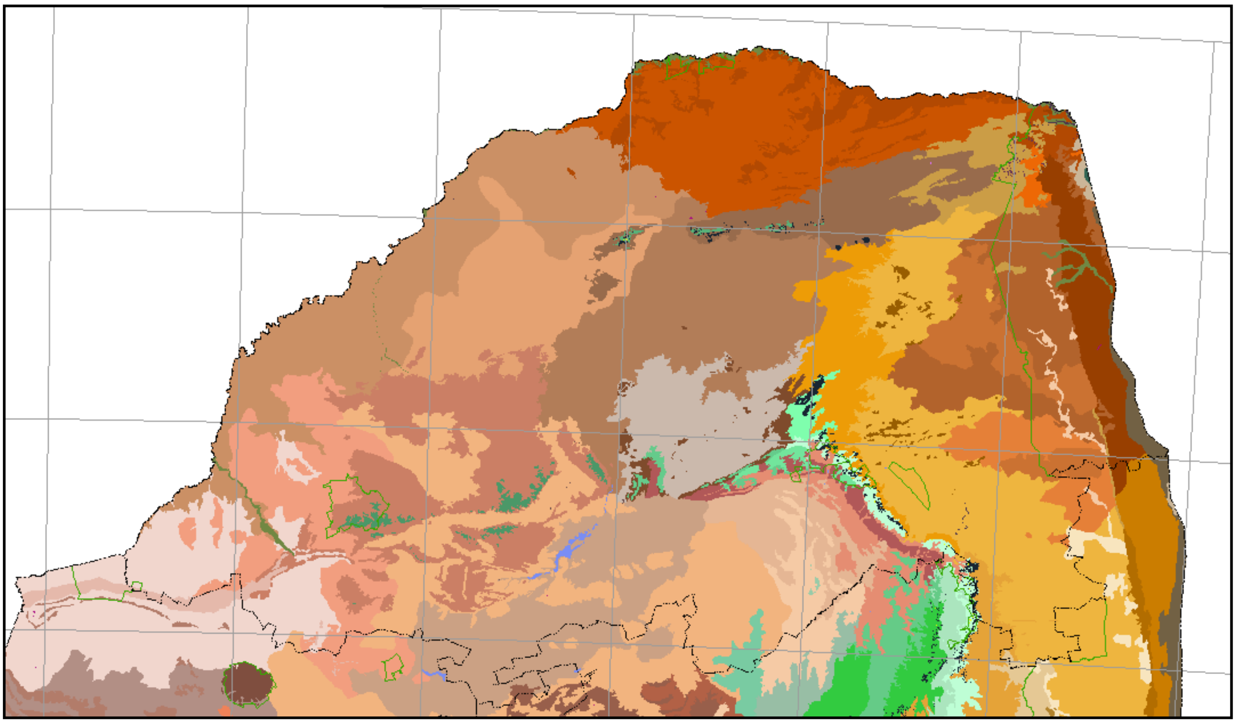

Figure 3: Limpopo Province vegetation units (Mucina and Rutherford, 2006).

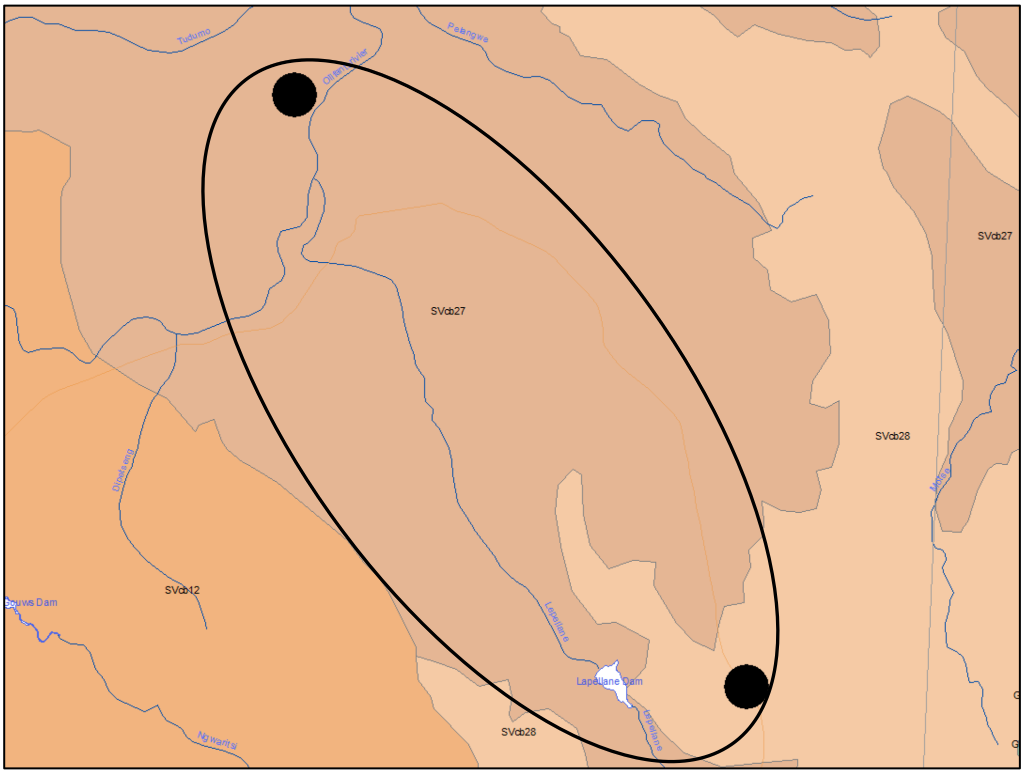

Figure 4: Vegetation unit associated with the study area (Mucina and Rutherford, 2006).

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. The route starts at the new Tshatane substation and follows a corridor southeast to Mamoshweu and Ga-Maila. Here the route turns towards the northwest to Mphanama. Finally it follows the road between Mphanama and Ga-Mankopane (north) to the site for the new Lesego substation.

Alternative 2 follows a corridor to the north of Alternative 1. It exits the new Tshatane substation to the east and the corridor passes Ga-Radingwana. It continues east to the Mphanama and Ga-Mankopane road. From here it follows the same corridor as Alternative 1.

Tshatane substation sites – Alternative 1 and 2

The route is 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 6).

Figure 5: Aerial view of the overall route for Alternative 1.

Figure 6: Aerial view of the proposed sites for the new Tshatane substations, Alternative 1 near the tar road and Alternative 2 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 if this is the final selected site (Figure7 -10). 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 7: View of proposed area - sub Alternative 1.

Figure 8: Sub site 1 – impacts include overgrazing, cultivation and vegetation removal.

Figure 9: View towards sub Alternative 2 – many impacts visible, some *Boscia albitrunca* present.

Figure 10: 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 route for the new power line from the proposed substation crosses to the south of the road, over the Magaragareng Hill to Mamoshweu and Ga-Maila (Figure 11 and 12). The vegetation is in a fair to good condition and access is limited. Clearing of the servitude must not include removal of the basal cover, as this will assist in the lowering of possible erosion. In addition, traffic must be limited to the absolute minimum during construction.

The corridor crosses the sensitive hills and a few streams and drainage lines. All of these are considered as sensitive due to the relative good condition and the fact that it acts as important migration corridors and habitat for feeding for birds and mammals (13 – 19). The pylons of the power line must be placed at least 75m from all stream banks. There final positions must be confirmed during the walk-down study once the final route is known. In addition, these areas have the higher plant and animal diversity in the area. As part of the project, a plant rescue and rehabilitation plan (separate report) will be submitted.

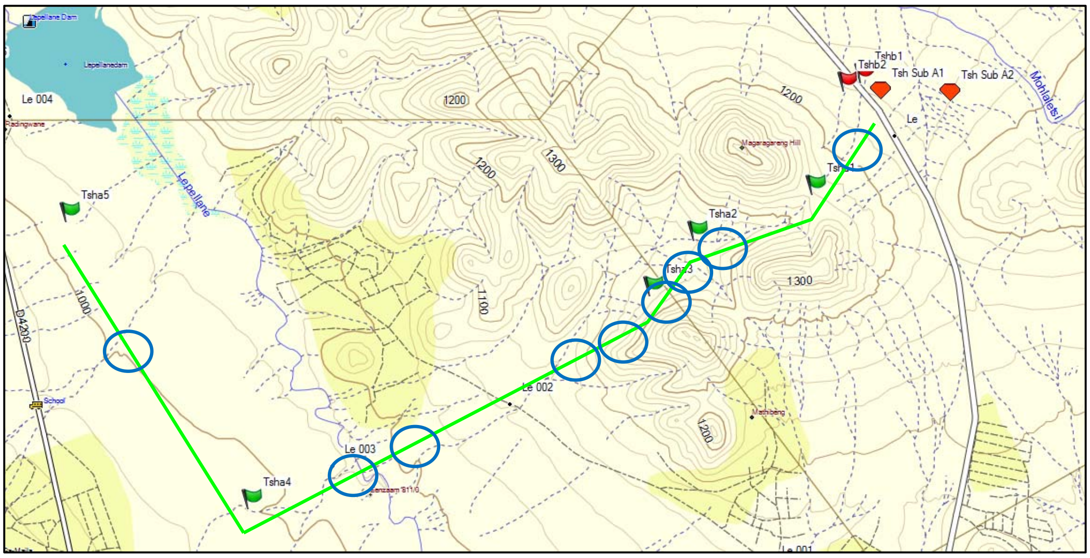

Figure 11: The first sector of the power line (Alternative 1) in green from the proposed new Tshatane substation to the new Lesego substation. The stream crossings are circled in blue.

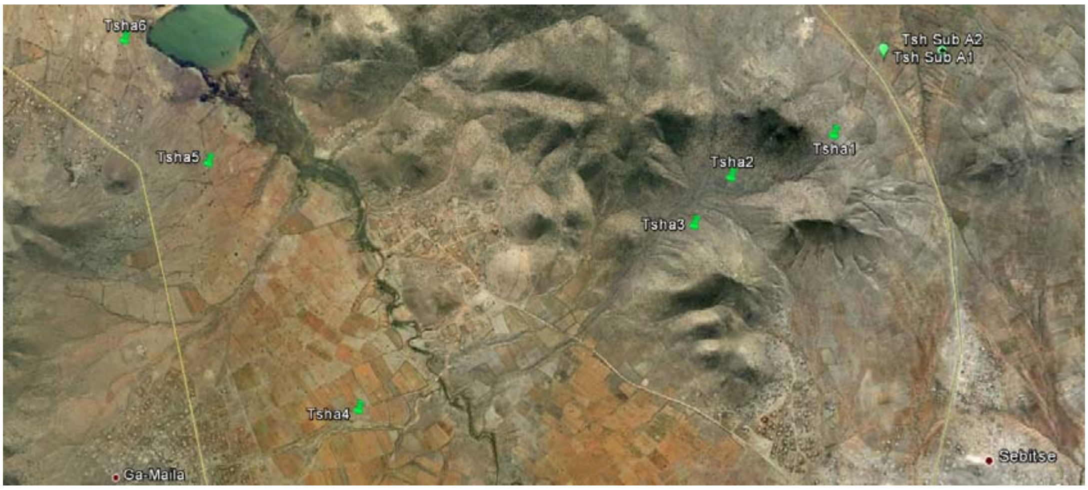

Figure 12: Aerial view of the sector in Figure 11 – note the hills and difficult terrain Tsha1 – south of Tsha3.

The vegetation 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 13: View to the east of hills, facing towards the new Tshatane sub.

Figure 14: Steep slopes with trampling and overgrazing resulting in erosion in the hills.

Figure 15: View of slopes between the hills. Natural vegetation is in a fair condition, but signs of increased harvesting were observed.

Figure 16: Some trampling and sand mining impact on streams – erosion visible.

Figure 17: Vegetation on the lower slopes with some encroachment – result from over grazing and wood collection.

Figure 18: Wood harvesting near the village south of the hills visible over large areas.

Figure 19: Dumping of refuse near the village a common occurrence.

To the southeast of the hills, the corridor passes through an area where agriculture activities are dominating. These include grazing and cultivation and some evidence of wood harvesting is present. Due to poor maintenance of infrastructure and the grazing and trampling by cattle, erosion on the slopes and near the river is prominent. The corridor crosses the Lepellane River near Mamoshweu (Figure 11 and 12, 20 – 25). This crossing is considered as a sensitive area. It is suggested that it must be near the existing road bridge, as no crossing through the river is allowed during construction. Steep riverbanks will further cause problems for the construction vehicles and will increase the erosion of the riverbanks. The pylons must be placed outside the 1:100 year flood line of the riverbanks. As a result from clearing for agriculture and wood collection, there is very little riparian vegetation left and should not pose a problem to get a clear area to cross the river (Figure 26 - 27).

Figure 20: View across the cultivated lands towards the hills.

Figure 21: View from the road, southeast towards the Lepellane River.

Figure 22: Erosion on exposed soils on slopes towards the river.

Figure 23: Grazing and cultivation on slopes aggravates erosion problems.

Figure 24: Natural vegetation severely modified due to land use practices.

Figure 25: Cultivated lands near the river.

Figure 26: View of proposed crossing point of the new power line over the Lepellane River.

Figure 27: Riparian vegetation totally modified and erosion visible on the river banks.

South of the Lepellane River the proposed corridor swings to the northwest. The area is dominated by cultivated lands (Figure 11, 12 and 28). The corridor then passes to the west of the Lepellane Dam (Figure 29 and 30). The impacts are related to urban development, roads, cultivation and grazing and the erosion on the soils are high, especially on the slopes in the area.

Figure 28: Proposed turning point of the new power line towards the Lepellane Dam.

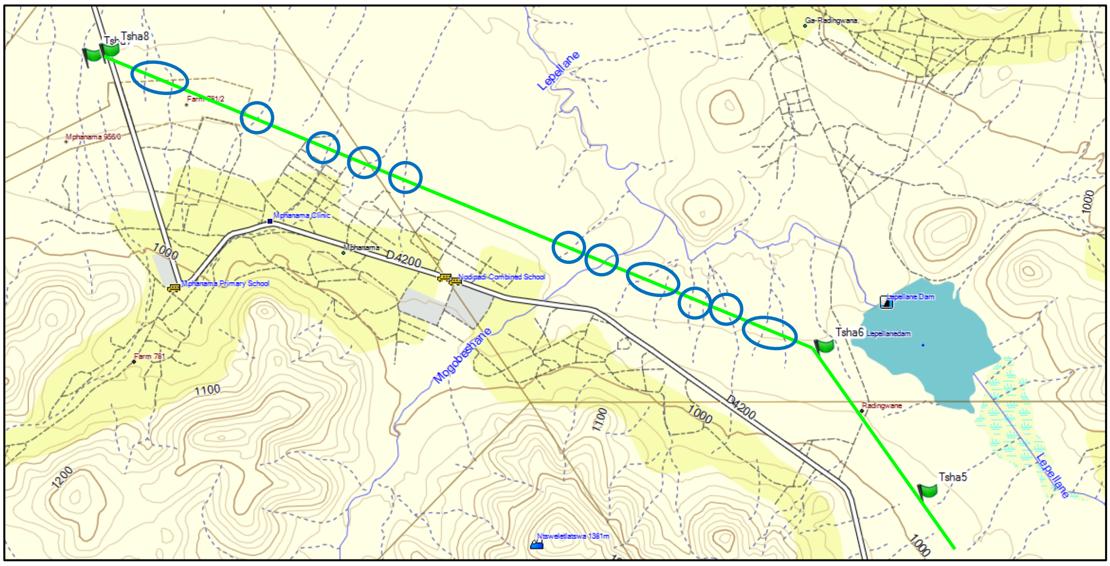

Figure 29: Sector of corridor near the Lepellane Dam.

Figure 30: Aerial view of sector – note land use practices and disturbed and modified natural vegetation and erosion.

A number of stream crossings are encountered along the sector of the corridor and pylons must be placed at least 75m from it. Existing roads must be used for access and construction vehicles must be limited on the servitude as this will ensure that erosion is limited. Access to the proposed new power line servitude will be from the villages and this will ensure that impacts along the corridor will be lower (Figure 31 – 40).

To the west Mphanama, the corridor will swing to the north, following the road (D4200) to Ga-Mokopane. The corridor will be on the west of the road.

Figure 31: Over grazing evident in the area.

Figure 32: View from the corridor towards the Lepellane Dam.

Figure 33: Natural vegetation modified in the area.

Figure 34: Some large trees (*Sclerocarya birrea*) present – most other removed.

Figure 35: Grazing and cultivation modified the natural vegetation.

Figure 36: Trampling and overgrazing causes of erosion.

Figure 37: Areas around stream heavily impacted. Alien invasive plants such as *Agave ssp*. present.

Figure 38: In some areas, the route will follow narrow corridor in villages.

Figure 39: View towards the D4200.

Figure 40: Crossing point on the D4200, view towards Lesego sub. The power line corridor is to the left of the road.

The proposed corridor follows the D4200 in a northerly direction. Impacts along the road are severe and the natural vegetation is modified (Figure 41 and 42). Grazing, trampling, wood harvesting and cultivation are the main factors related to the degradation of the landscape and have resulted in erosion. The corridor crosses many drainage lines and the potential for erosion is high. The existing road must be used for access during construction and pylons must be placed 75m from streams. It is suggested that during the walk down study once the line route is finalised, all protected trees must be mapped (GPS), as this is needed for the permit application before clearing and construction can commence. During the walk down, it must be confirmed that no pylons are in or near any drainage lines.

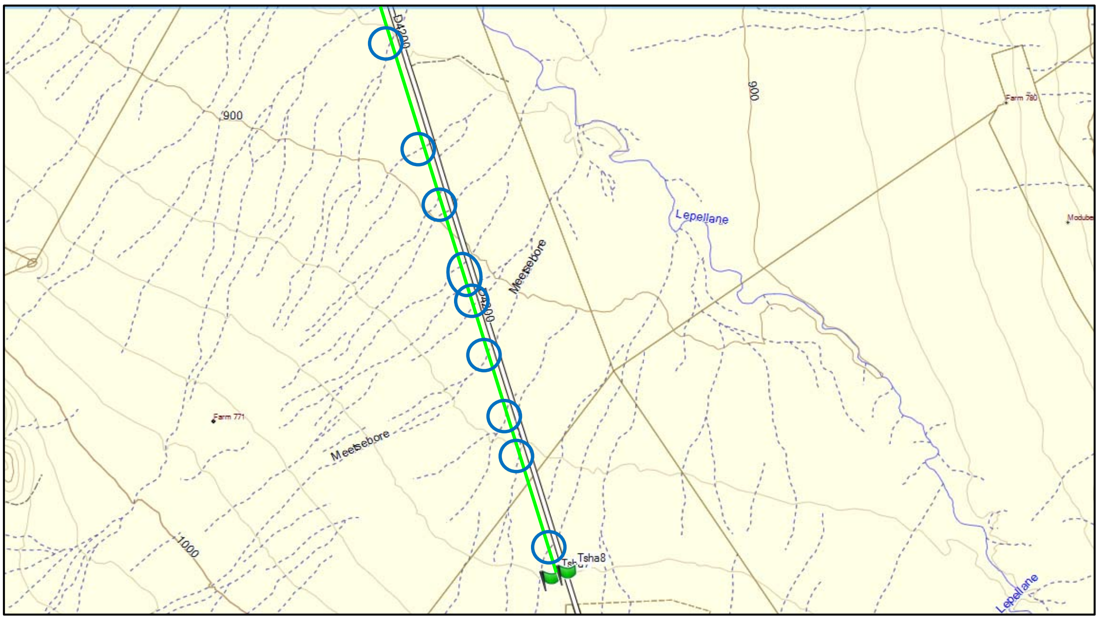

Figure 41: Corridor for new power line following the D4200 towards the new Lesego substation.

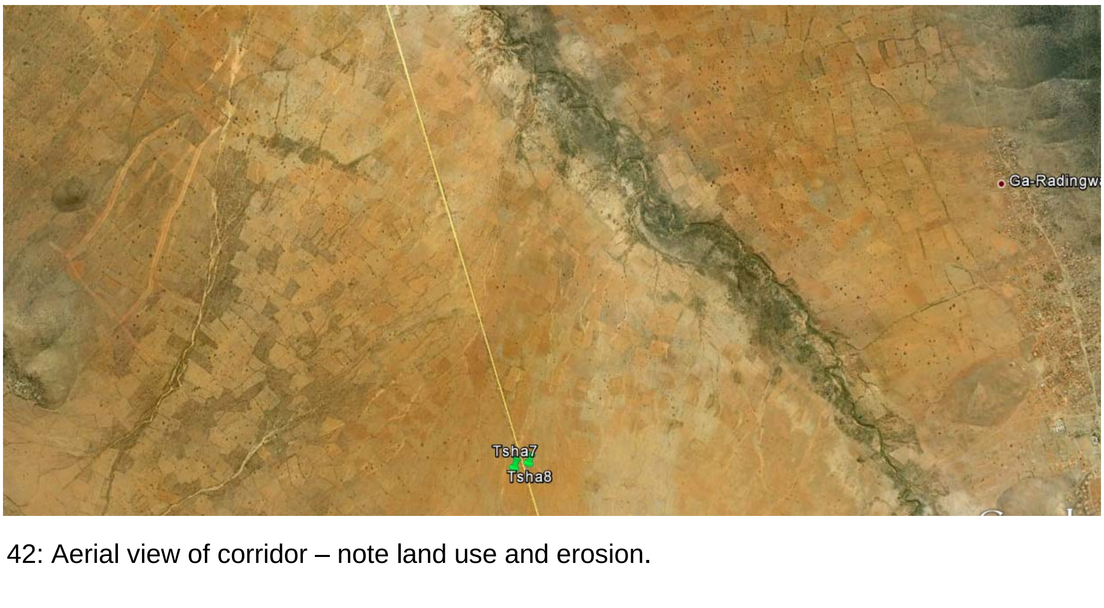

Figure 42: Aerial view of corridor – note land use and erosion.

The corridor follows the road to the bend where it swings northeast to Ga-Mankopane. The corridor continues northwest to Mabokotswana where it crosses the Olifants River (Figure 43 – 46). Impacts are similar and include agriculture and poor road maintenance resulting in erosion (Figure 47 -50).

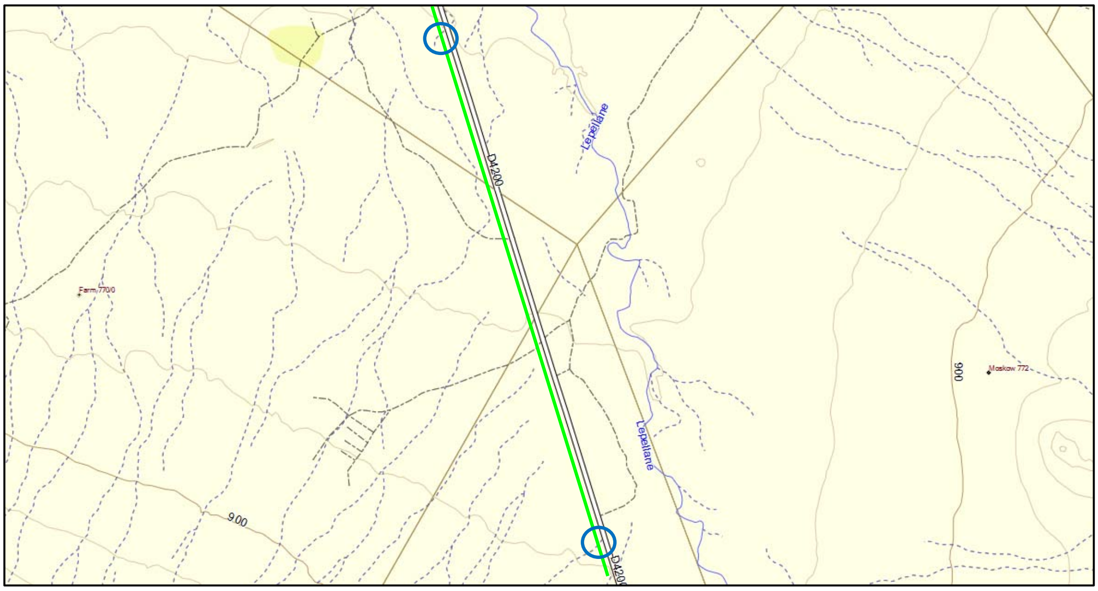

Figure 43: Corridor north of Mphanama.

Figure 44: Aerial view of route – note high impacts from grazing and cultivation.

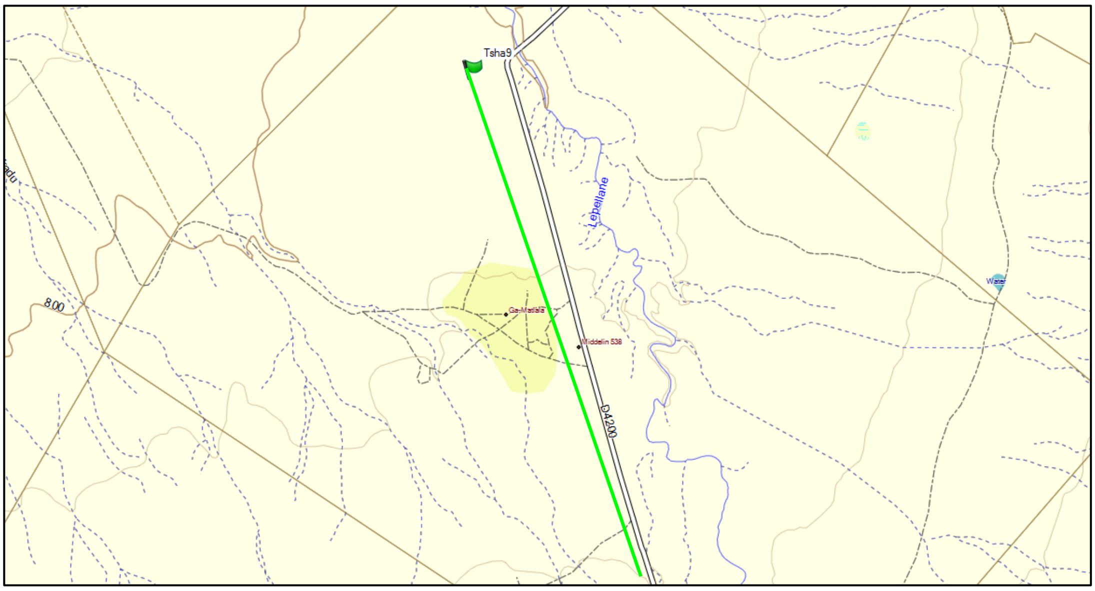

Figure 45: Sector of the corridor to the point where the D4200 swings to the northeast.

Figure 46: Aerial view of sector – apart from agriculture, erosion is clearly visible.

Figure 47: Modified natural vegetation along the D4200.

Figure 48: Erosion a problem along the corridor – due to overgrazing and trampling.

Figure 49: Deep eroded gullies present.

Figure 50: Few large trees present – natural vegetation dominated by low shrubs, mostly *Acacia spp*.

Where the corridor moves away from the D4200, it cuts through grazing and cultivated areas. Another problem is the high incidence of wood harvesting and all of this leads to erosion in the area (Figure 53 – 58). During construction, care must be taken to limit vehicle movement along the servitude, as this will contribute to the serious erosion problems in the area. The corridor crosses the Lepellane River and this is considered a sensitive area (Figure 51 and 52). Pylons must be placed at least 75m from the river banks and during the walk down study all protected trees must be mapped (GPS). This information is needed for the permit application to cut or trim protected trees. The clearing of the servitude can only commence once the permits are obtained.

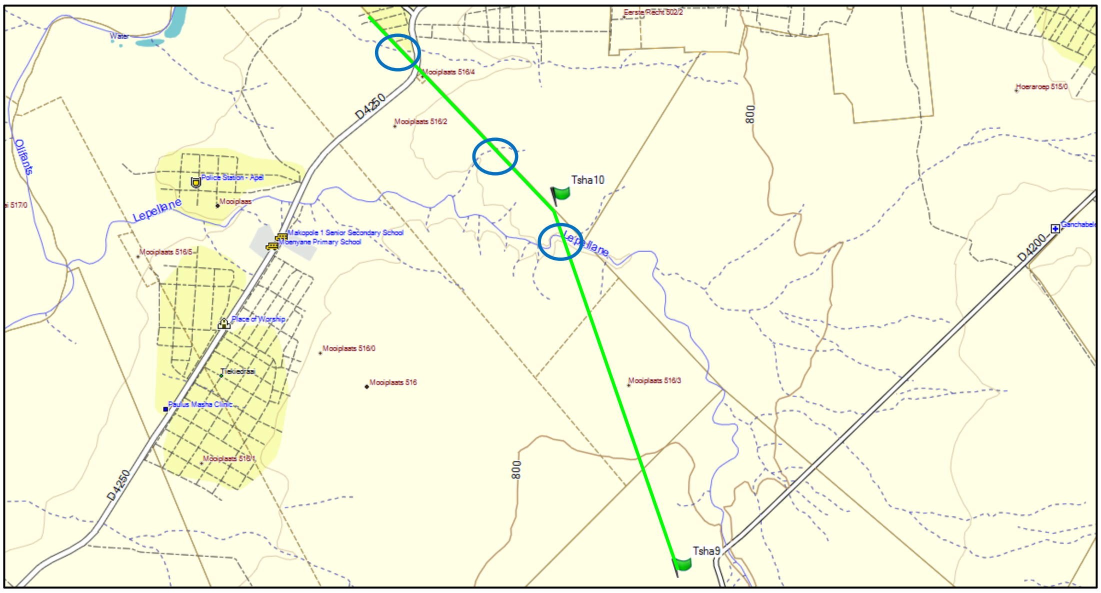

Figure 51: View of the section where the corridor swings to the west, crossing the Lepellane River to the D4250 and Apel.

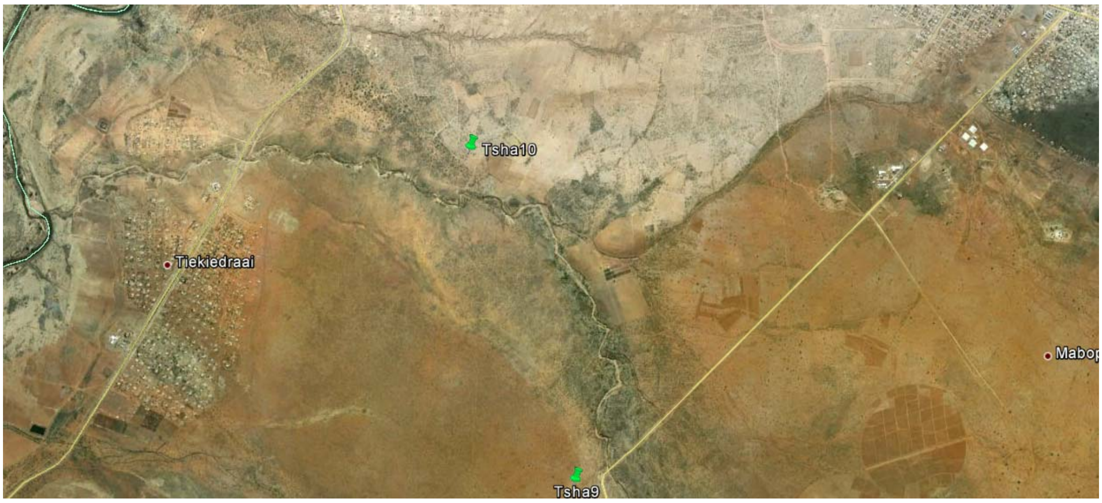

Figure 52: Aerial view of the sector to Apel.

Figure 53: The corridor swings northwest towards Apel – many roads to areas where wood harvesting takes place.

Figure 54: Most large trees removed, natural vegetation severely modified – some *Boscia albitrunca* remain.

Figure 55: Point where the power line crosses the Lepellane River – riparian vegetation totally modified.

Figure 56: Cultivation present over a large area.

Figure 57: Over grazing and wood harvesting a cause of erosion.

Figure 58: View of corridor to the west of the village near D4250.

The route follows a corridor to the west of the Apel Clinic and crosses the Olifants River to Mabokotswane Figure 59 and 60). The area has very little natural vegetation due to grazing, cultivation and wood collection. A few large *Faidherbia albida* (20+ m high) is present on the banks of the river. It is possible to place the structures to ensure none of the few remaining trees will be removed.

To the west of the Olifants River, the proposed corridor passes the village in a northerly direction to the proposed sites for the new Lesego substation. The vegetation is modified due to grazing and cultivation and erosion is present along the roads and cultivated areas (Figure 61 – 67).

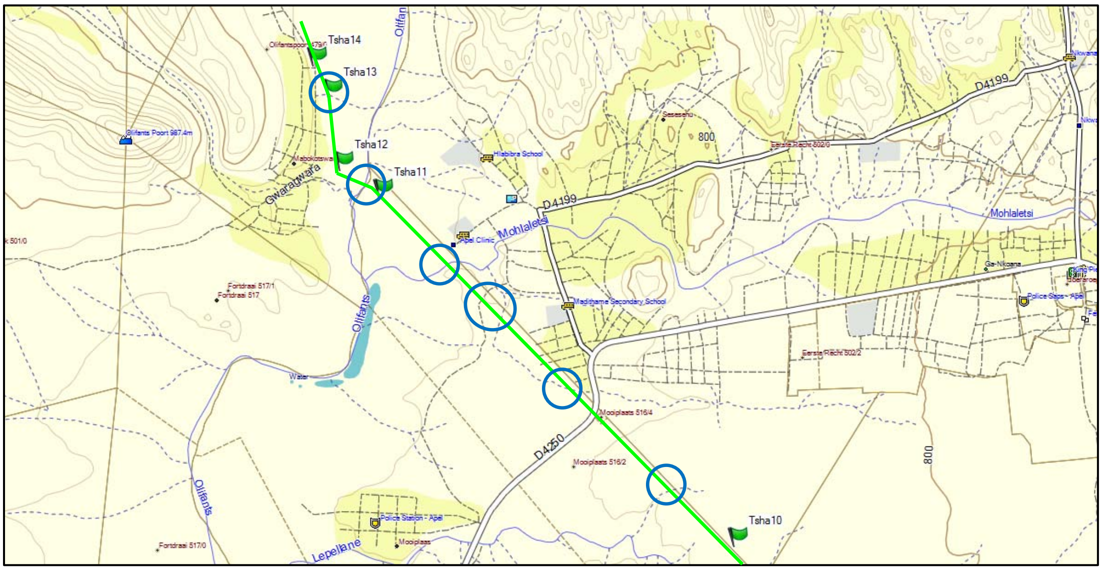

Figure 59: Corridor to the west Apel, crossing the Olifants River.

Figure 60: Aerial view of corridor where it crosses the Olifants River.

Figure 61: Stream crossing present along the corridor.

Figure 62: Wood harvesting having negative impact on natural vegetation community.

Figure 63: Low *Acacia* shrubs (acting as pioneer species) dominate the landscape in areas.

Figure 64: Possible crossing point over the Olifants River.

Figure 65: Corridor to the east of Mabokotswane.

Figure 66: Most of the natural vegetation removed – a few *Boscia albitrunca* and *Faidherbia albida* present.

Figure 67: Over grazing leads to severe erosion in the area.

Tshatane substation sites – Alternative 1 and 2

The vegetation at the proposed sites for the Lesego substation is modified and encroachment from *Acacia mellifera* is indicative of historical poor land use practices related to overgrazing and wood harvesting (Figure 68 and 69). Some *Boscia albitrunca* is present and permits for cutting on the site for the substation must be obtained before clearing can commence (Figure 70 – 75). All protected trees must be mapped (GPS), once the final route for the power line and substation site is determined.

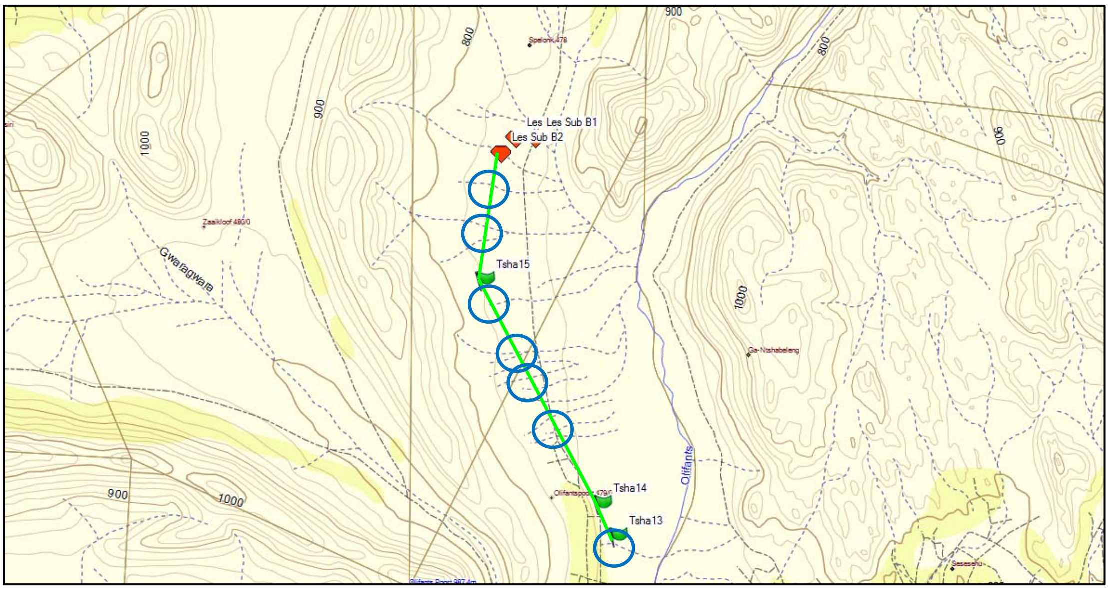

Figure 68: View of the last sector to the new proposed Lesego substation sites.

Figure 69: Aerial view of the sector to the new proposed Lesego substation sites.

Figure 70: Modified natural vegetation – some coppiced *Sclerocarya birrea* present.

Figure 71: Over grazing present – exposed soils prone to erosion, some *Boscia albitrunca* left.

Figure 72: Encroachment of *Acacia mellifera* present.

Figure 73: View of the proposed Lesego substation sites.

Figure 74: Encroachment of *Acacia mellifera* present – some *Boscia albitrunca* on the site.

Figure 75: Modified natural vegetation on Lesego substation sites present.

Power line – Alternative 2

The corridor for the Alternative 2 line exits the new proposed Tshatane substation to the north and follows the tar road to the junction with the D4220 where it turns to the west. It passes to the north of Phageng and south of Ga-Radingwana, before crossing the Lepellane River. After the river it continues to the west and at the D4200, it swings north and follows the same corridor as Alternative 1 to the new proposed Lesego substation sites Figure 76 and 77).

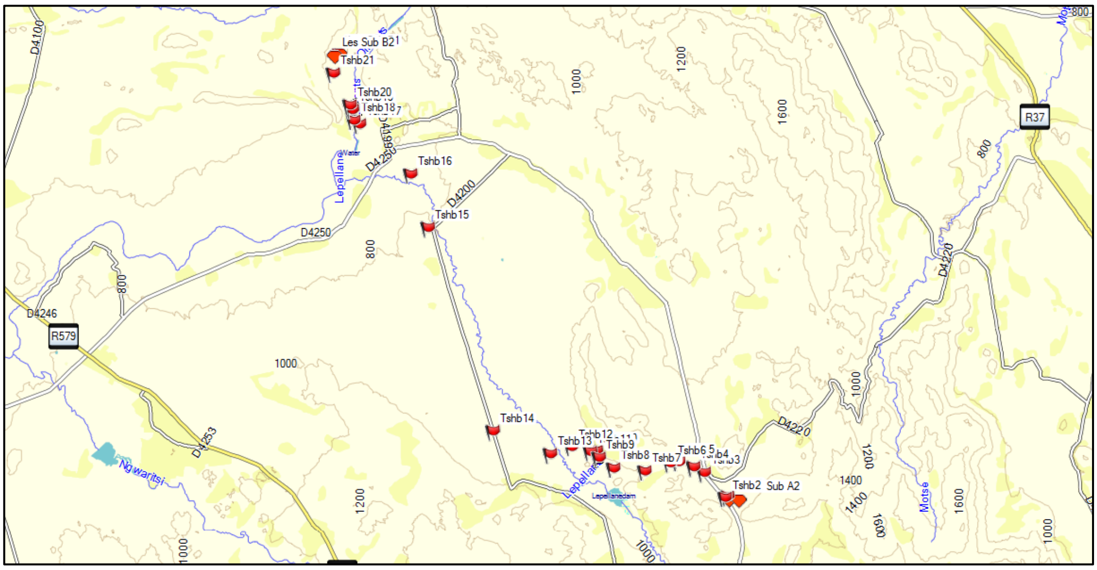

Figure 76: Approximate view of the route for Alternative 2.

Figure 77: Aerial image of the proposed corridor for Alternative 2.

The natural vegetation along the tar road to the D4220 (Figure 78 and 79) is modified by over grazing, wood harvesting and cultivation. Some large *Boscia albitrunca* and *Sclerocarya birrea* is present (Figure 80 and 81). Permits must be obtained for cutting or trimming before the project can commence.

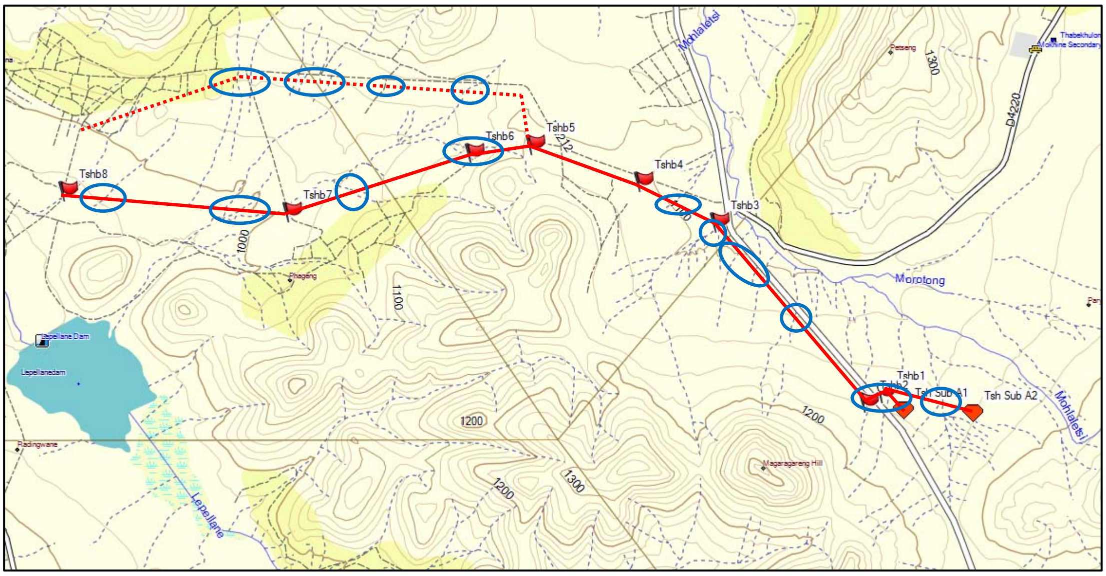

Figure 78: First sector of Alternative 2 (red line) with a proposed modification (dotted line) which allow for easier access during construction.

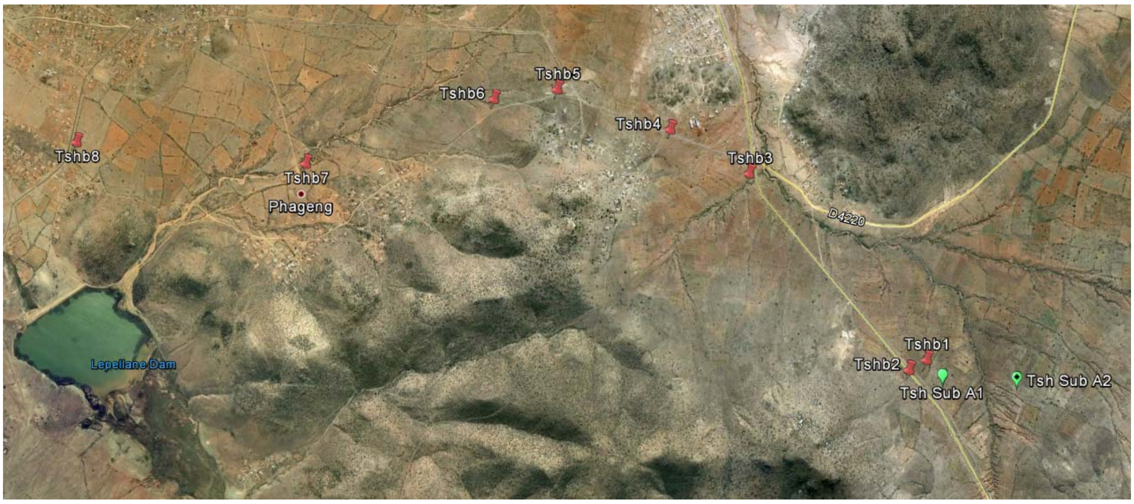

Figure 79: Aerial image of sector – note land use and modified natural vegetation.

Figure 80: View of substation and exit of power line.

Figure 81: View of corridor along the road towards the junction with the D4220.

At the junction with the D4220, the route swings west, following the road to Phageng. Impacts include vegetation removal, grazing, trampling and construction. The natural vegetation is modified and very few large trees are present. A walk down is needed to map (GPS) all protected trees, as this is needed for permits before clearing can commence (Figure 82 – 85).

Figure 82: View from crossing along corridor to Phageng.

Figure 83: View from hill to crossing.

Figure 84: Corridor passing the village near the road.

Figure 85: Natural vegetation modified – some *Boscia albitrunca* present.

At point Tshb5 (Figure 78) the corridor follows a route south of the exiting road and cut through cultivated lands and grazing areas. There are a number of drainage lines and small streams and tracks are resulting in severe erosion in some areas. For ease of access, it is suggested to follow the road (dotted line – Figure 78) as it will lower the need to construct an access road and crossing over the numerous streams. The existing road can be used as access and it will lower the risk of increased erosion (86 – 91).

Figure 86: Point where the corridor is to the south of the road.

Figure 87: Natural vegetation modified – exposed soils susceptible to erosion.

Figure 88: Erosion potential high in the area.

Figure 89: Exposed slopes around streams with high erosion potential.

Figure 90: Example of erosion along the corridor.

Figure 91: Possible corridor along the existing road.

The corridor passes to the south of Ga-Radingwana, before crossing the Lepellane River (Figure 92 and 93). The natural vegetation is modified and rural development, cultivation, roads, grazing, trampling and wood collection contribute to the poor cover. The landscape is prone to erosion and this is evident along the corridor (94 – 101).

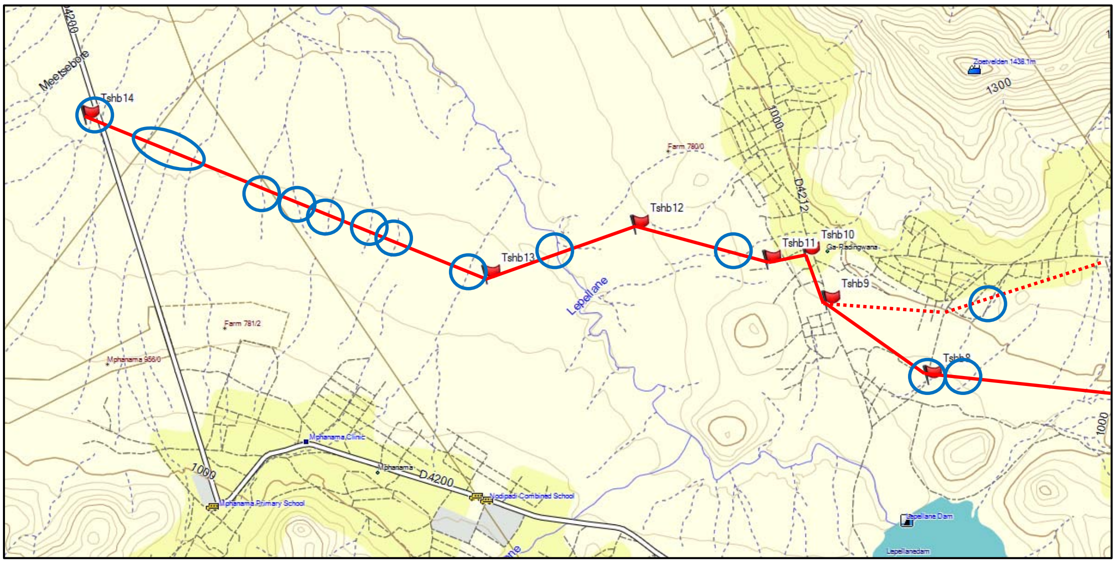

Figure 92: Sector past villages to point where it joins corridor for Alternative 1.

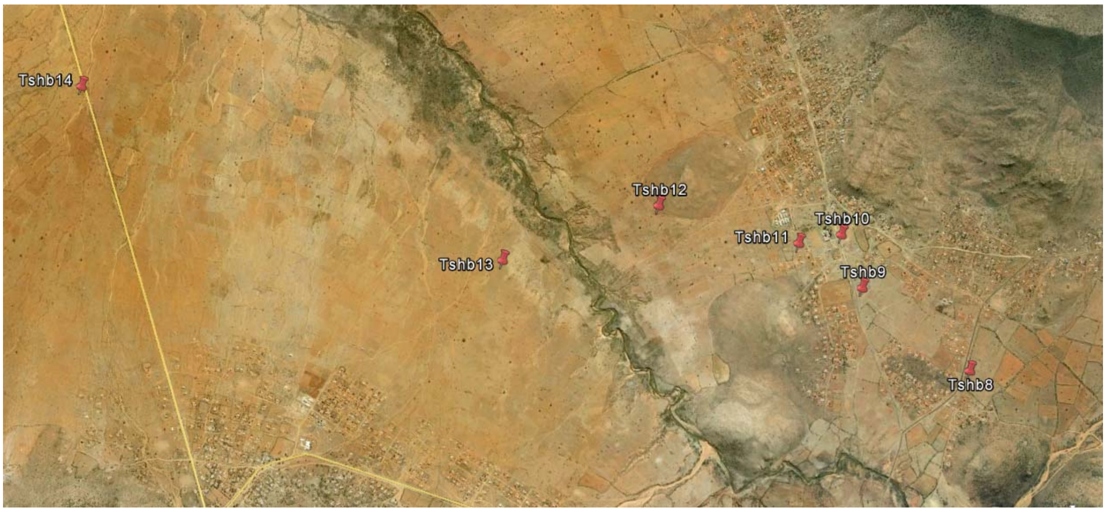

Figure 93: Last sector of the Alternative 2 route before it follows the same corridor north to the new proposed Lesego substation sites.

Figure 94: Route winds through villages.

Figure 95: Natural vegetation severely modified in rural areas.

Figure 96: Access along existing roads available.

Figure 97: Few large trees present along the corridor.


Figure 98: Small streams susceptible to erosion.

Figure 99: Crossing of the Lepellane River a sensitive area – no vehicles to drive through it.



Figure 100: Protected trees in the area include *Boscia albitrunca* and *Sclerocarya birrea*.

Figure 101: Erosion a problem in the area due to poor land use practices.


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) are 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 the small deviation suggested (Figure 78 and 92) will lower the need to clear natural vegetation.
- With regard to the substation sites the Alternative 1 site for the new Tshatane substation is preferred because of its proximity to the road. For the new proposed Lesego substation, Alternative 1 is preferred, simply because it is the furthest from the river and will lower impacts that can occur.
- 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 and Olifants 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 substations, the Alternative 1 site for both 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*.
- Thirteen 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 they are 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.

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

Tshatane/Lesego 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. • 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 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
ACANTHACEAE	*Dicliptera fruticosa*	NT	Strydpoort Mountains to Ohrigstad. Savanna and open woodland, shady areas on rocky magnetite and dolomite slopes.	Low
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	*Elaeodendron transvaalense*	NT	Widespread in Southern Africa, including Angola, Namibia, Botswana, Zambia, Zimbabwe, Swaziland and Mozambique. In South Africa it is restricted to eastern, summer rainfall areas from the KwaZulu-Natal coast northwards through eastern Mpumalanga into Limpopo and North West provinces. Savanna or bushveld, from open woodland to thickets, often on termite mounds. Elaeodendron transvaalense is threatened by harvesting of bark for medicinal use.	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 a 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
FABACEAE	*Acacia ormocarpoides*	NT	Northern Leolo Mountains, Sekhukhuneland. Sandy or loamy soils between norite boulders. A. ormocarpoides qualifies for the category Endangered due to its restricted geographical distribution, the threat of extreme overgrazing and extensive mining activities.	Very low

HYACINTHACEAE	*Drimia sanguinea*	NT	Northern Cape and diagonally across to Limpopo and Mpumalanga Provinces, Namibia, Botswana and Zimbabwe. Open veld and scrubby woodland in a variety of soil types. Drimia sanguinea is a distinctive, well known and highly poisonous bulb that has a deep-red colour. It has caused mass livestock mortality in the pass and was subject to frequent land clearance by farmers.	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
PASSIFLORACEAE	*Adenia fruticosa subsp. fruticosa*	NT	Strydpoort Mountains southwards to Ohrigstad and the Steelpoort River Valley. Arid woodland, rocky outcrops, slopes and sandy flats, on dolomite, granite and quartzite, 800-1400 m. Habitat in low-lying areas are transformed by agriculture, human settlements and mines.	Very low
SCROPHULARIACEAE	*Jamesbrittenia macrantha*	NT	Sekhukhuneland. Grassy slopes with other scattered shrubs, restricted to norite.	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