Specialist Ecological Report:

Construction of a 132 kV power line from the proposed Tshatane switching substation to the existing Lesideng substation within Fetakgomo, Greater Tubatse and Makhudutamaga Local Municipalities of Sekhukhune District.

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INTRODUCTION:

Project Description:

- The proposed construction of 3 x 132 kV power lines from the proposed Tshatane switching substation to the existing Lesideng substation within Fetakgomo, Greater Tubatse and Makhuduthamaga local municipalities of Sekhukhune District.

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).

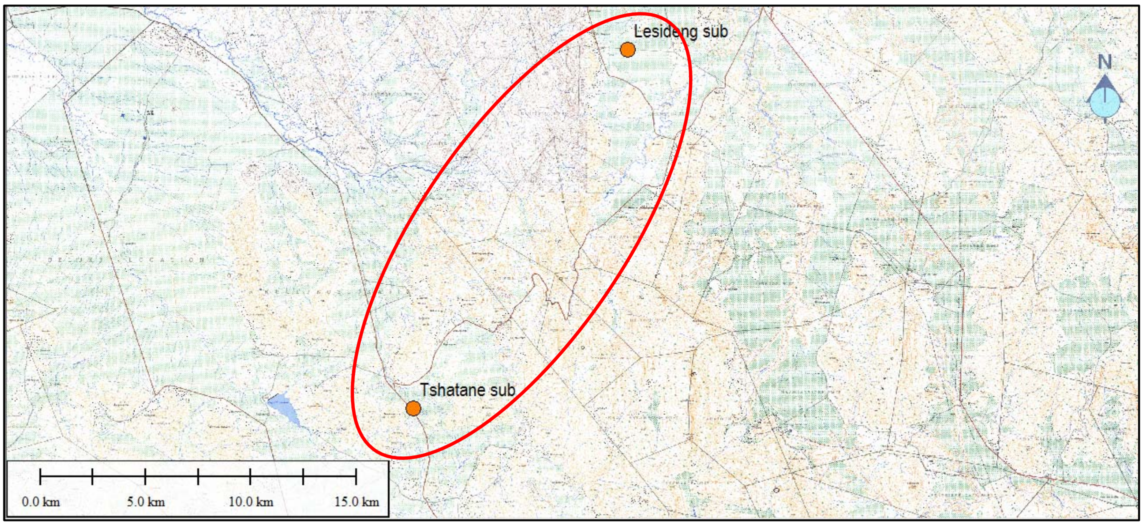


Figure 1: Approximate map of the study area.

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 March 2013 and October 2013 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 hot (35 ºC). It seems that the region has received rainfall prior to the site visit and the vegetation was sparse to dense 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.

The Environmental Impact Assessment Regulations (Regulation 17 of Government Notice No R354 of 2010), requires that certain information is included in specialist reports. The terms of reference, purpose of the report, methodologies, assumptions and limitations, impact assessment and mitigation (where relevant to the scope of work) and summaries of consultations (where applicable) are included within the main report. Other relevant information is set out below:

Expertise of author:

- Working in the field of ecology since 1996 and in specific vegetation related assessments since 2000.

- Worked in the field of freshwater ecology and wetlands since 2000.

- Is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Reg. No. 400109/95).

- Has been working with plants indigenous to South Africa since 2004.

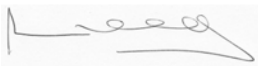
Declaration of independence:

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

Disclosure:

BioAssets undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to BioAssets by the client, and in addition to information obtained during the course of this study, BioAssets present the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practise.



______________________________ 30 November 2013

Dr Wynand Vlok Date

Pr. Sci. Nat 400109/95

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.

According to in the National Environmental Management Act (NEMBA) none of the vegetation types are listed as vulnerable (NEMBA, 2004). Management and mitigations actions are discussed in detail in the summary and Addendum 1 at the end of the report.

Management and mitigations actions are discussed in detail in the summary and Addendum 1 at the end of the report. As part of the project, the **“plant rescue and rehabilitation plan”** is incorporated. Once the final route is known and the route is pegged, a walk down survey for rare and protected plants (Addendum 2) will be conducted. The plants will be marked and then the local community will have the opportunity to collect medicinal plants. In addition, rare plants can be collected by other organisations interested in the propagation and rehabilitation of the plants. This process will be done under the auspices of the local conservation agencies, as they must be present to issue the relevant collection and transport permits.

With regard to the **erosion issues, the management and mitigation recommendatio**ns is captured in the discussion of the report and in the “Management and Mitigation” summary (Addendum 1).

Three options were investigated and a 100m wide corridor was covered for each (Figure 2).

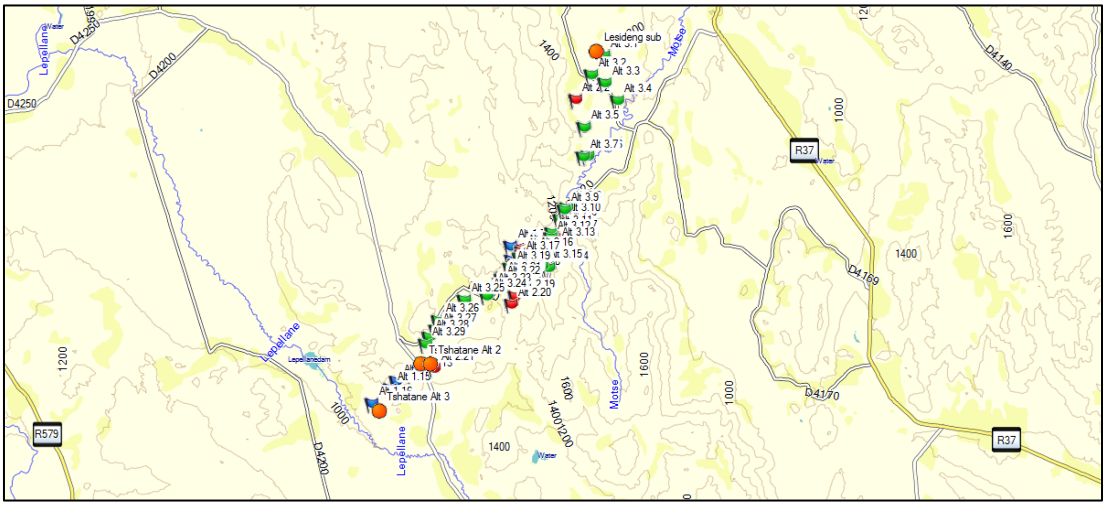


Figure 2: The three alternatives were investigated for the proposed new substations and power line routes, Alternative 1 in blue, Alternative 2 in red and Alternative 3 in green.

Vegetation:

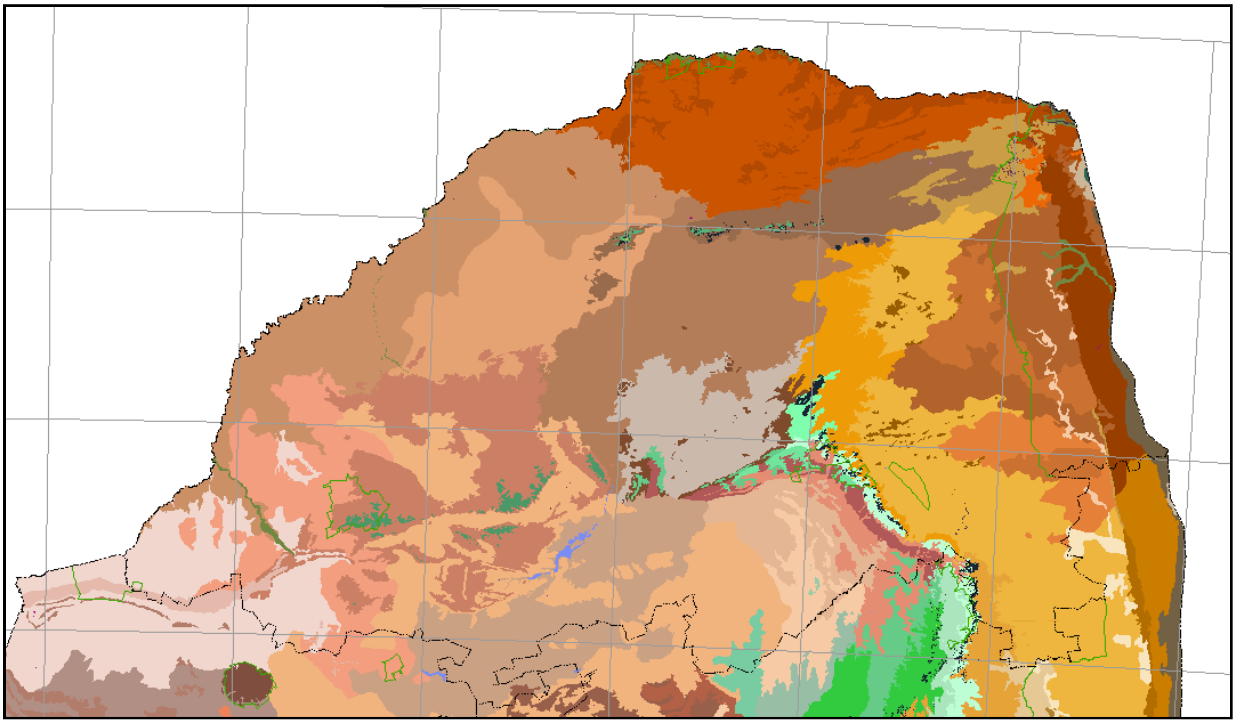


Figure 3: Limpopo Province vegetation units (Mucina and Rutherford, 2006).

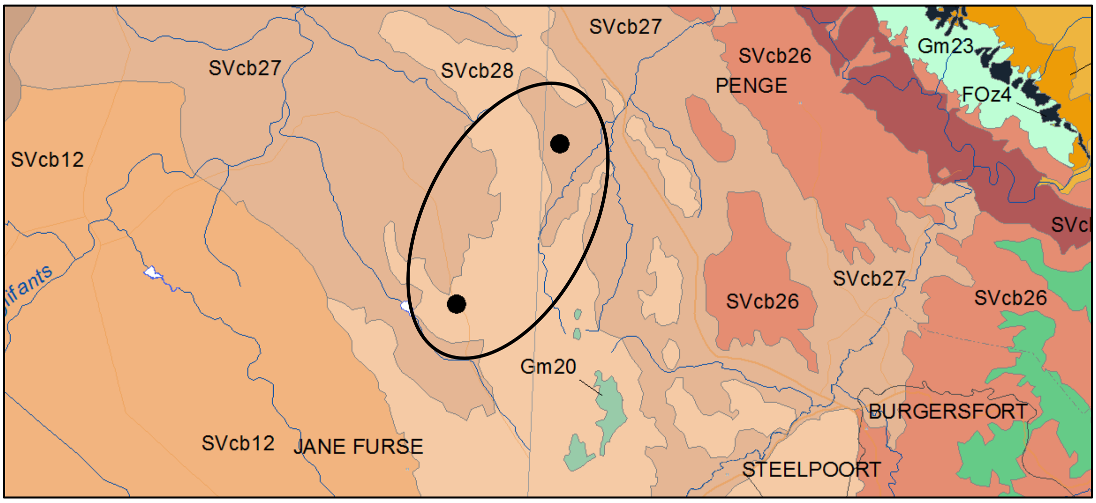


Figure 4: Vegetation unit associated with the study area (Mucina and Rutherford, 2006).

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).

According to in the National Environmental Management Act (NEMBA) none of the vegetation types are listed as vulnerable (NEMBA, 2004). Management and mitigations actions are discussed in detail in the summary and Addendum 1 at the end of the report. According to Mucina and Rutherford (2006) the following protected trees occur in the vegetation types (not necessarily the study area): *Acacia erioloba, Philenoptera violacea, Balanites maughamii, Combretum imberbe* and *Boscia albitrunca*. All protected trees in the different corridors were noted and the estimated numbers is used in the recommendation regarding the most suitable route. Once the final route is selected, a detailed survey (count) of the protected trees must be carried out as this information is used in the application for permits to cut/trim the trees during construction of the power line.

RESULTS and DISCUSSION

For this project, three alternative routes were selected. There is some overlap between the different alternatives. Alternative 1 will be discussed in detail and for Alternative 2 and 3 the deviations from the first option will be discussed.

Power line – Alternative 1 (Figure 5 and 6)

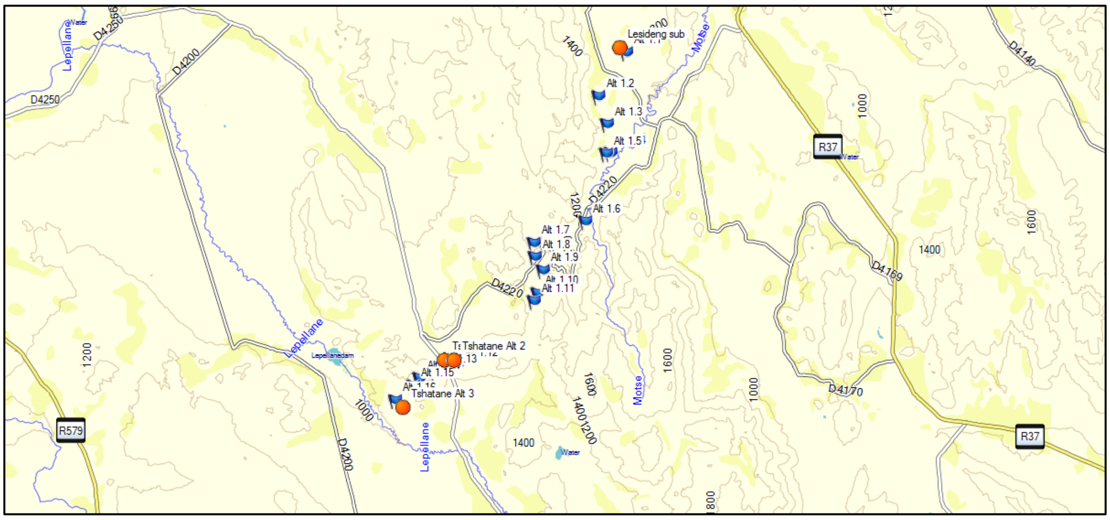


Figure 5: The proposed corridor for Alternative 1 between the Lesideng and Tshatane substations.

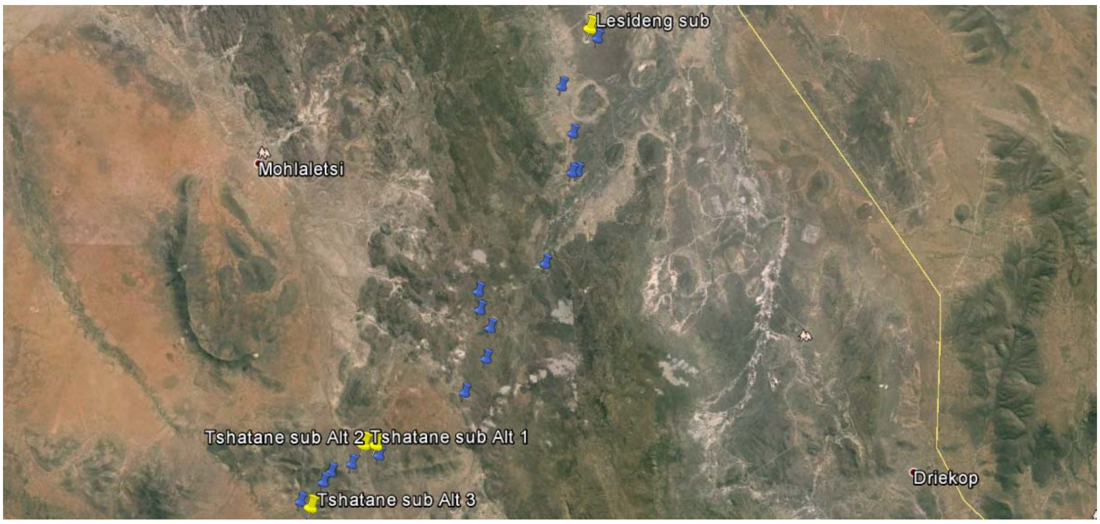


Figure 6: Aerial view of Alternative 1.

The natural vegetation around the Lesideng substation is modified as a result from construction, grazing, wood harvesting and cultivation. The proposed new power lines will exit the substation to the southeast and follow a corridor just to the east of the Leolo Mountains (Figure 7 – 12). Trees are dominated by low *Acacia* shrubs (*Acacia tortilis, A. mellifera*) and *Boscia foetida* with some *Sclerocarya birrea* present between the cultivated lands. Erosion as a result from poor land use practices was observed.

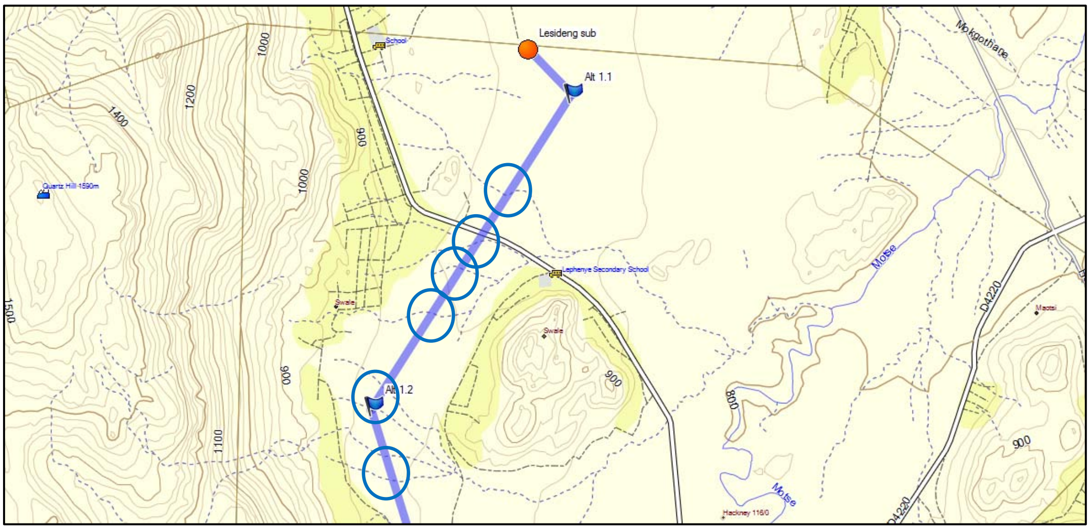


Figure 7: View of the Lesideng sub site and power line exiting to the south east – stream crossings are circled in blue.

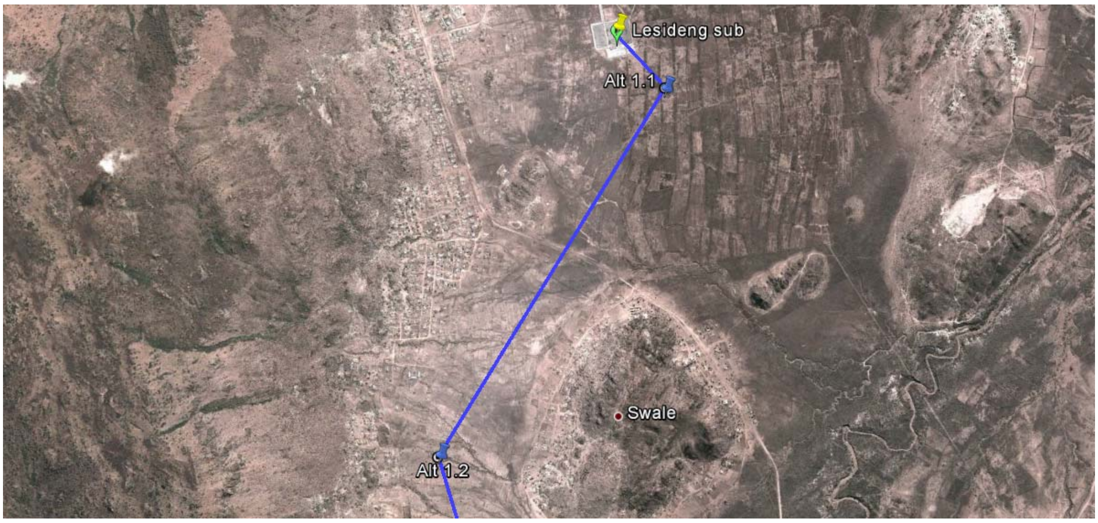


Figure 8: Aerial view of sector – note land use and erosion present.

Further south, *Acacia exuvialis, A. robusta, Balanites maughamii, Ziziphus mucronata, Schotia brachypetala* and some *Dichrostachys cinerea* are present.

Figure 9: View of cultivated lands southeast of the substation.

Figure 10: Corridor follow a route east of the Leolo Mountains and numerous villages along the foothills.

Figure 11: View southeast of the sub – modified natural vegetation and deep erosion gullies (arrow).

Figure 12: Modified natural vegetation with low *Acacia* shrubs and the erosion gullies present.

A concern is the number of erosion gullies present and these must be considered as sensitive. Along with the streams and drainage lines, no vehicles must drive through it, unless there is a road. Part of the EMP must include regular inspection and maintenance during construction.

The corridor continues south and the valley floor is dominated by agricultural activities with erosion a serious impact to the landscape. The area near the Motse River (Figure 13 – Alt 1.5) is severely degraded and apart from wood harvesting in the riparian zone, trampling, cultivation and sand mining was observed as impacts. The vegetation is modified, but a good diversity was observed (Figure 13 – 18).

The trees included *Acacia nigrescens, A. tortilis, A. nilotica, Schotia brachypetala, Mundulea sericea, Euclea crispa, Ziziphus mucronata, Ximenia americana, X. caffra, Dichrostachys cinerea, Flueggea virosa, Peltophorum africanum, Gymnosporia buxifolia, Ficus sur, Grewia vernicosa, Euphorbia ingens, Cussonia transvaalensis* and *Spirostachys africana* (a protected tree not listed in Mucina and Rutherford (2006).

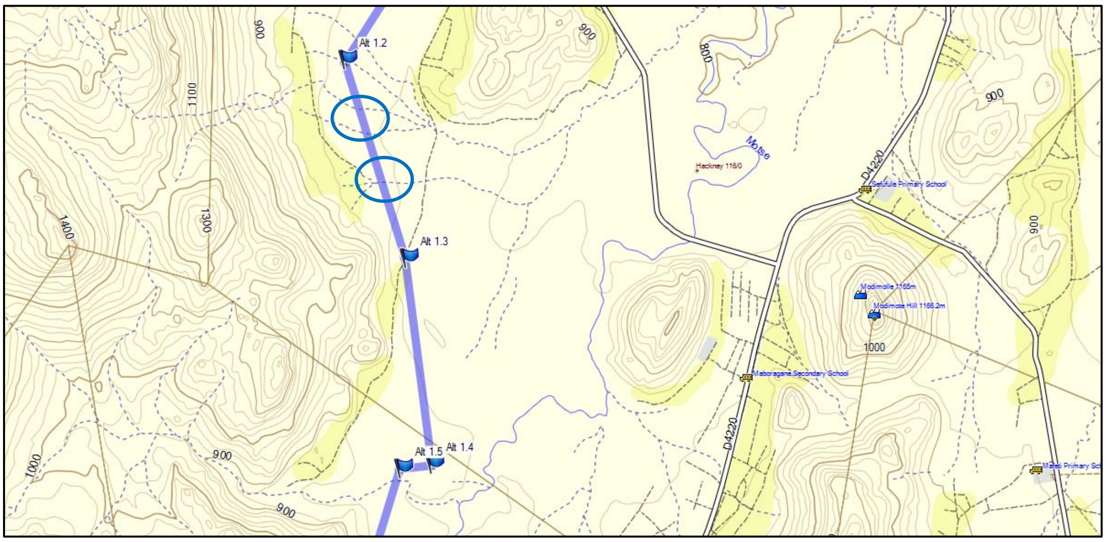


Figure 13: Second sector of the corridor following a route east of the Leolo Mountains.

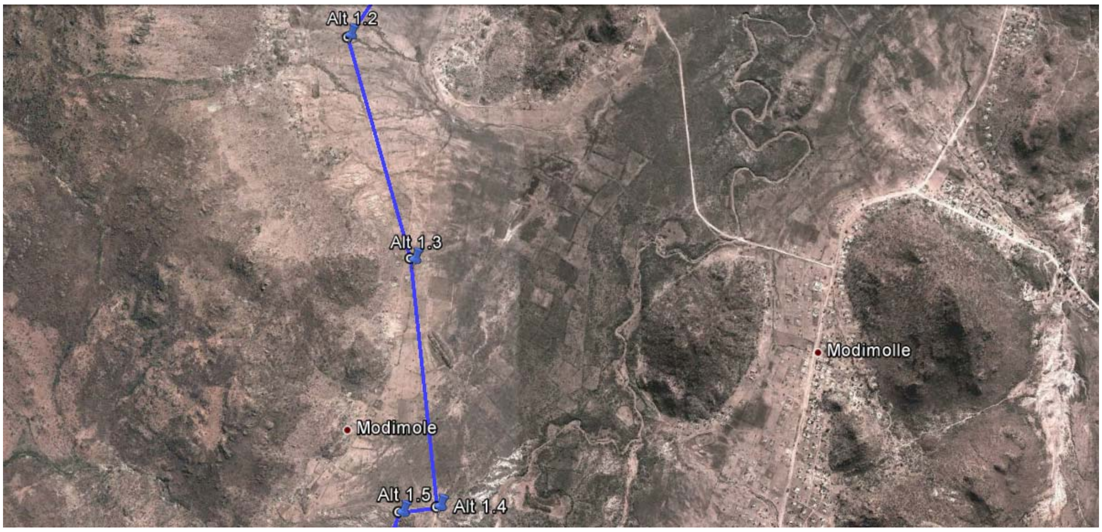


Figure 14: An aerial view of the sector – the white areas represents eroded and exposed soils.

Figure 15: Example of poor land use resulting in erosion.

Figure 16: Over grazing along the corridor evident.

Figure 17: An example of the sensitive areas associated with the headwaters of the Motse River.

Figure 18: A view of the streams feeding into the Motse River.

The corridor continues to the east of the Leolo Mountains and then crosses the Motse River and the D4220 (Figure 19 – 22). The corridor is in close proximity to the river and the natural vegetation is in a poor to fair state. Although the vegetation is dense, it is modified as most of the larger trees associated with the riparian zone is removed. Sand mining during the dry seasons has caused collapses of river banks and this accelerated the erosion in the area. During construction, stream and river crossing with construction vehicles must be limited as a high volume of traffic will increase the erosion. Existing roads must be utilised and regular maintenance to lower the risk of erosion must form part of the EMP.

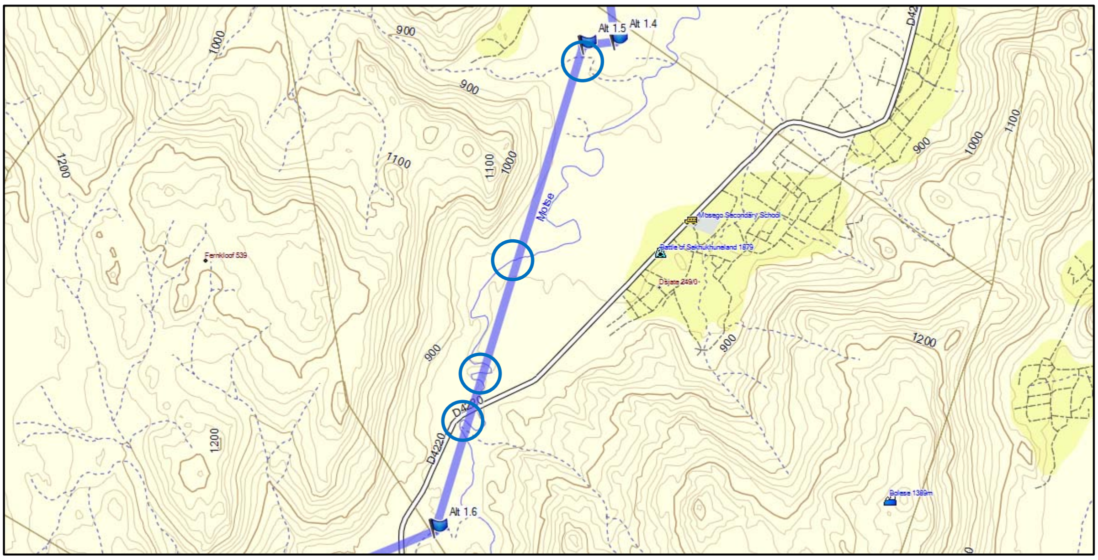


Figure 19: Sector associated with the crossing of the Motse River – stream and river crossings circled in blue.

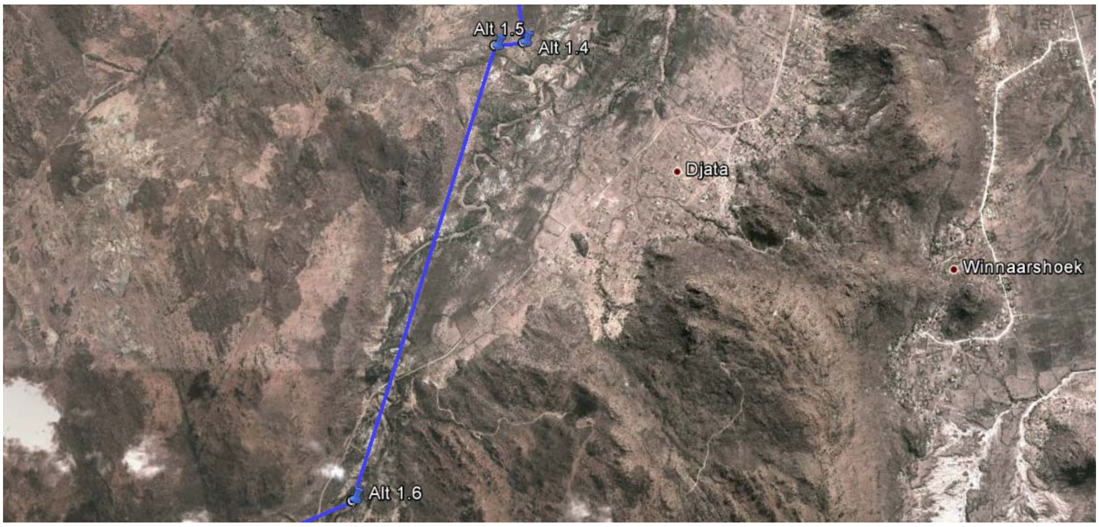


Figure 20: Aerial view of the sector where the corridor crosses the Motse River.

Figure 21: Impacts around the streams visible – vegetation modification, trampling and sand mining.

Figure 22: Some riparian trees present, but mostly modified and replaced by low shrubs and forbs – many invasives present.

After crossing the Motse River, the proposed corridor swings to the west, crossing the Leolo Mountains to Ga-Mahlanya near the proposed Tshatane substation sites (Figure 23 – 34). Impacts include sand mining, trampling, grazing, wood harvesting and granite mining. The corridor follows an existing power line that cross over the mountain and the existing servitude can be used as access during construction. No vehicles can use this section of the corridor and equipment and material must be carried along the corridor. Due to the terrain form and height of the lines above the ground, limited clearing of vegetation will be needed during preparation for construction. Trees include *Kirkia wilmsii, Terminalia prunioides, Sclerocarya birrea, Cussonia transvaalensis, Commiphora mollis, C. pyracanthoides, Sterculia rogersii, Searsia keetii, Ozoroa insignis, Aloe marlothii, A. castanea, A. greatheadii, Combretum molle, Acacia mellifera, Dombeya rotundifolia, Grewia flava, G, vernicosa, Ficus abutilifolia* and *Phyllanthus glaucophyllus*.

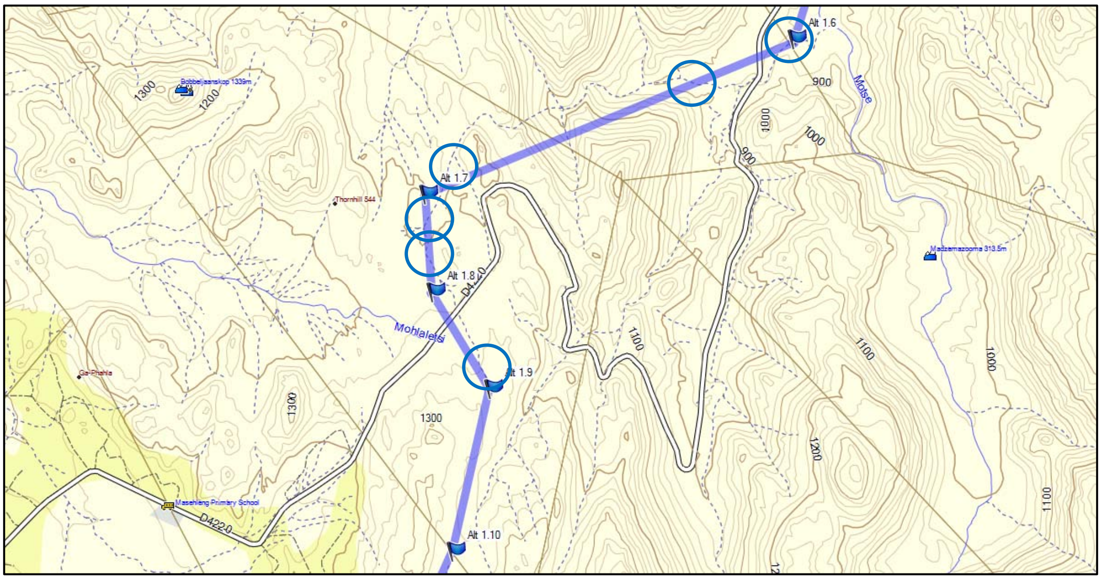


Figure 23: View of the corridor crossing the Leolo Mountain.

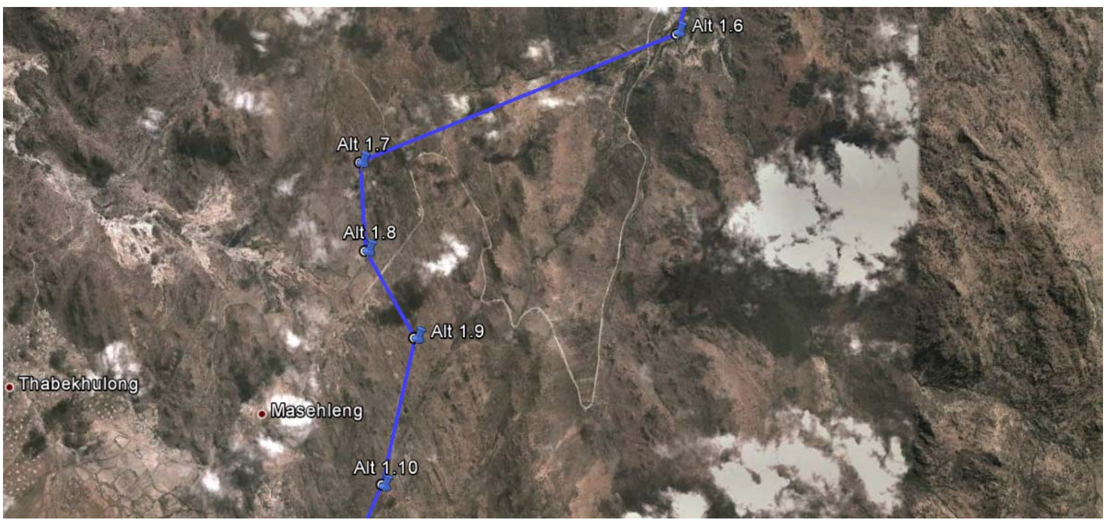


Figure 24: Aerial view of the corridor view impacts on mountain visible.

Figure 25: View of the valley before crossing the mountain.

Figure 26: Some sand mining on slopes of the mountain in the proposed corridor.

Figure 27: Route crossing the mountain – following the existing power line.

Figure 28: View of corridor and vegetation on slopes near the crest.

Figure 29: Point near crest where the power line will cross over the mountain.

Figure 30: Corridor east of granite mine on top of the mountain.

Figure 31: Corridor swings southeast to pass village on top of the Leolo Mountain.

Figure 32: Crossing point over the D4220 to pass east of Ga-Mahlanya.

Figure 33: Corridor continues into the valley east of village.

Figure 34: General view of the corridor east of Ga-Mahlanya.

The last sector of the power line to the substations for Alternative 1 and 2 crosses into the valley near Ga-Mahlanya, before moving south to the sites. The report and study for the sites for the Tshatane substations (Alternative 1, 2 and 3) is captured in the document for the Tshatane/Jane Furse power line and substations.

Impacts south of the Leolo Mountains are mainly infrastructure development (houses and roads), wood harvesting, sand mining, grazing, cultivation, trampling and erosion (Figure 35 – 44). Trees are dominated by low *Acacia senegalensis* and *A. robusta* shrubs, with *Boscia albitrunca, Ziziphus mucronata, Aloe castanea, Gymnosporia polyacanthus, Combretum apiculatum, C. molle, Diospyros lycioides* subsp. *nitens, Euclea crispa, Croton gratissimus* var. *subgratissimus, Mundulea sericea, Schotia brachypetala, Grewia flava, G. vernicosa* and *Ximenia caffra* present.

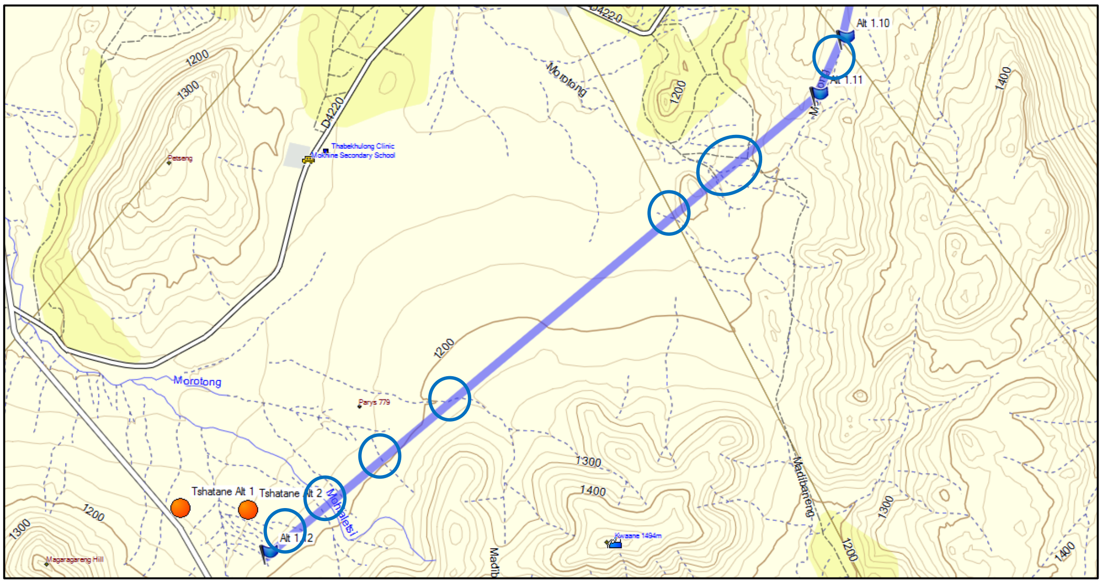


Figure 35: View of the sector for Alternative 1 to the Tshatane substation (Alt 1 and 2).

Figure 36: Aerial view of the sector – note land use and erosion along the corridor.

Figure 37: Erosion a problem on the slopes of the foothills south of the Leolo Mountains.

Figure 38: General view along the corridor.

Figure 39: Sand mining a problem in streambeds in the area.

Figure 40: Trampling contribute to exposed soils – lead to invasives establishing.

Figure 41: Deep gullies in the valley present.

Figure 42: Over grazing, wood harvesting, trampling and alien invasives modified the natural vegetation near the Tshatane substation.

Figure 43: General view of the landscape near the substation.

Figure 44: View of modified natural vegetation at the Tshatane substation.

From the proposed substation sites north of the road, the corridor crosses the road to the proposed site for Alternative 3. The route for the new power line crosses to the south of the road, over the Magaragareng Hill to Mamoshweu and Ga-Maila (Figure 45). 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 (circled in brown, Figure 45) and a few streams and drainage lines (circled in blue, Figure 45). 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 (46 – 52). 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, as plant rescue and rehabilitation plan (separate report) will be submitted. 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 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*.

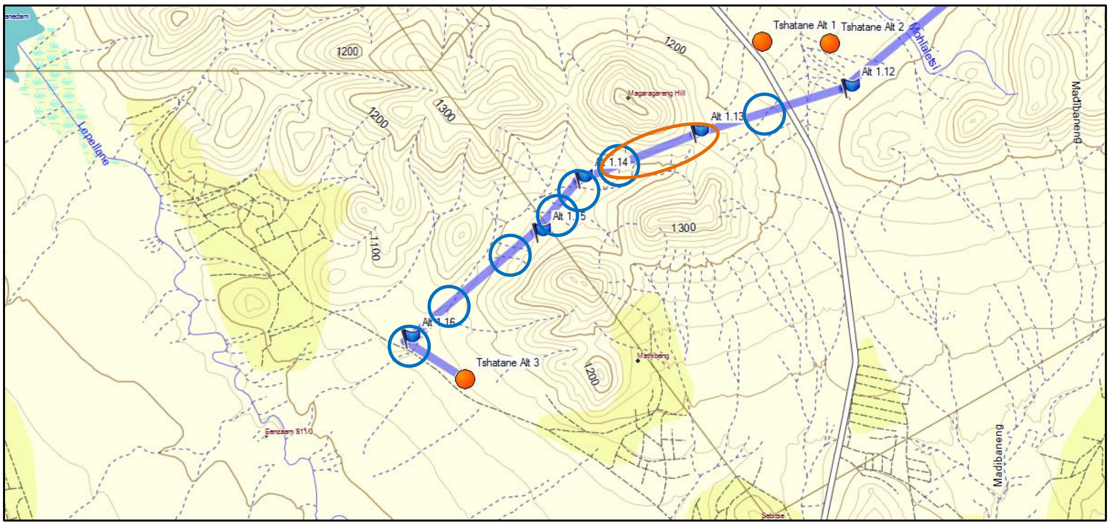


Figure 45: Last sector to the site for substation Alternative 3.

Figure 46: View to the east of hills, facing towards the new Tshatane sub.

Figure 47: Steep slopes with trampling and overgrazing resulting in erosion in the hills.

Figure 48: View of slopes between the hills. Natural vegetation is in a fair condition, but signs of increased harvesting were observed.

Figure 49: Some trampling and sand mining impact on streams – erosion visible.

Figure 50: Vegetation on the lower slopes with some encroachment – result from over grazing and wood collection.

Figure 51: Wood harvesting near the village south of the hills visible over large areas.

Figure 52: Dumping of refuse near the village a common occurrence.

Power line – Alternative 2 (Figure 53 and 54)

For the first part, Alternative 1 and Alternative 2 follow the same corridor. At point Alt 2.6 (Figure 53) the routes then split in different directions. For this section of the discussion, the first part will not be repeated (refer to Alternative 1) and only the last part will be discussed and illustrated. The last sector from substation sites 1 and 2 is the same and one will therefore refer to the discussion for Alternative 1.

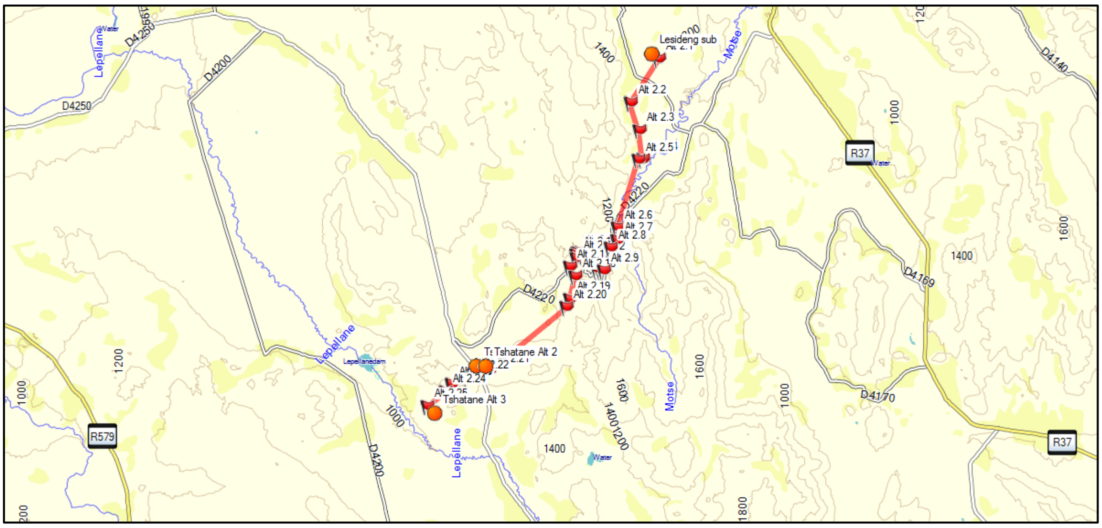


Figure 53: Overall view of Alternative 2.

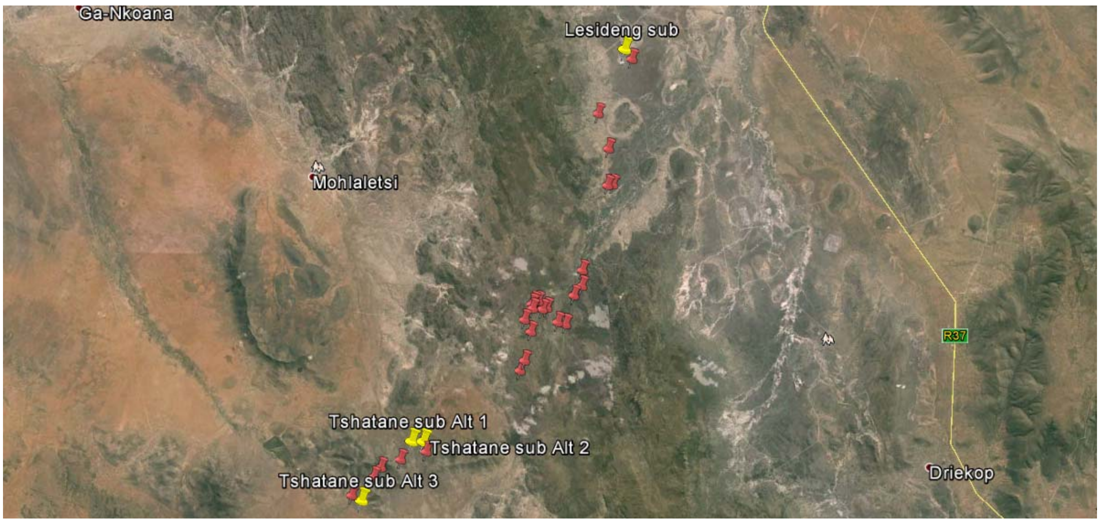


Figure 54: Aerial view of the corridor for Alternative 2.

As noted, the difference between Alternative 1 and Alternative 2 starts at point Alt 2.6 (Figure 55 and 56). At this point, Alternative 1 crosses the D4220 to the west (Figure 23) and Alternative 2 follows a corridor to the south.

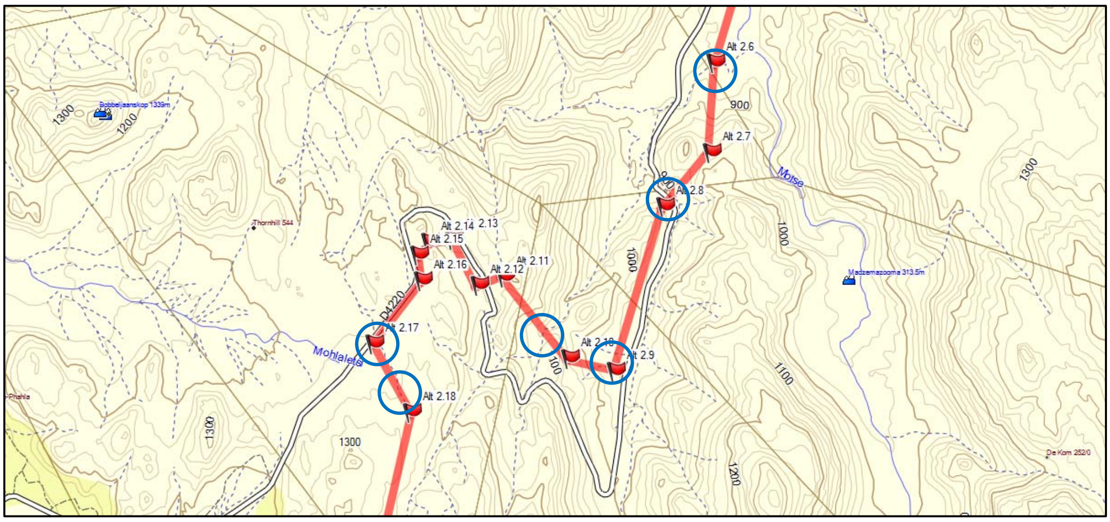


Figure 55: View of the approximate route for Alternative 2. Stream crossing circled in blue.

Figure 56: Aerial view of Alternative 2.

From the point where the two split, the route continuous between the two low outcrops east of the D4220. The natural vegetation is in a fair to good condition and no direct access along the corridor is available. Some clearing of the vegetation is therefore needed. The corridor then cross the road and follows the road before swinging west to cross the mountain. The access along the corridor is difficult and it will mean clearing a corridor for the construction of the power line. The route then crosses the mountain to the south of the D4220 (Figure 57 – 65) and then follows the route to point Alt 2.18 (Figure 55). From this point it follows the same route corridor as Alternative 1.

Figure 57: View along the valley where Alternative 2 follows the D4220.

Figure 58: View where the power line crosses between the two koppies (arrow).

Figure 59: Narrow corridor following the D4220.

Figure 60: Point where the corridor swings west to cross the mountain.

Figure 61: Valley that the corridor follows on northern slope of the Leolo Mountains.

Figure 62: View along the corridor nearing the crest of the mountain.

Figure 63: The view at the crest where the power line crosses from the northern slopes.

Figure 64: Example of a stream crossing along the corridor.

Figure 65: The view from the crest towards the south towards the Tshatane substation.

Power line – Alternative 3 (Figure 66 and 67)

The alternative follows the same corridor as Alternative 1 and 2 for the first part exiting the Lesideng substation. At the dirt road south of the substation, Alternative 3 swings to the east, following the dirt road for a short distance and then swings south again. This corridor is parallel to those for Alternative 1 and 2, but to the east of Swale. It then follows the same corridor along the valley to the Motse River. After crossing the river, it is to the west of the road (Alt 1 and 2 east of the road). It then follows the same corridor as Alternative 2 over the Leolo Mountains before splitting to the west to follow the dirt road to the Tshatane substation. From here it follows the same corridor as Alternative 1 to the substation (Alternative 3).

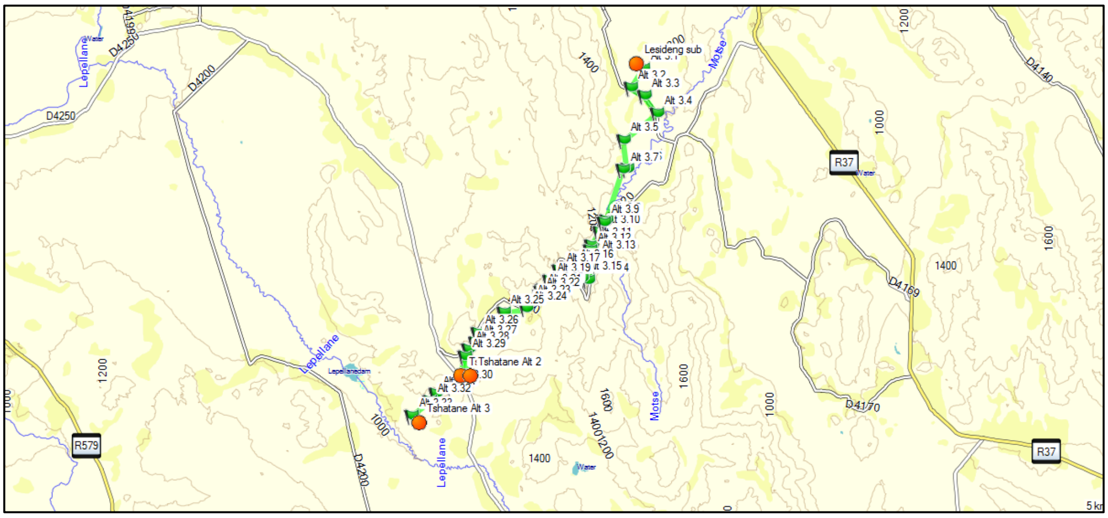


Figure 66: General view of the proposed corridor for Alternative 3.

Figure 67: Aerial view of Alternative 3.

The section following the road east will have a low impact, as it is parallel to the road and limited clearing of vegetation is needed (Figure 68 – 60).

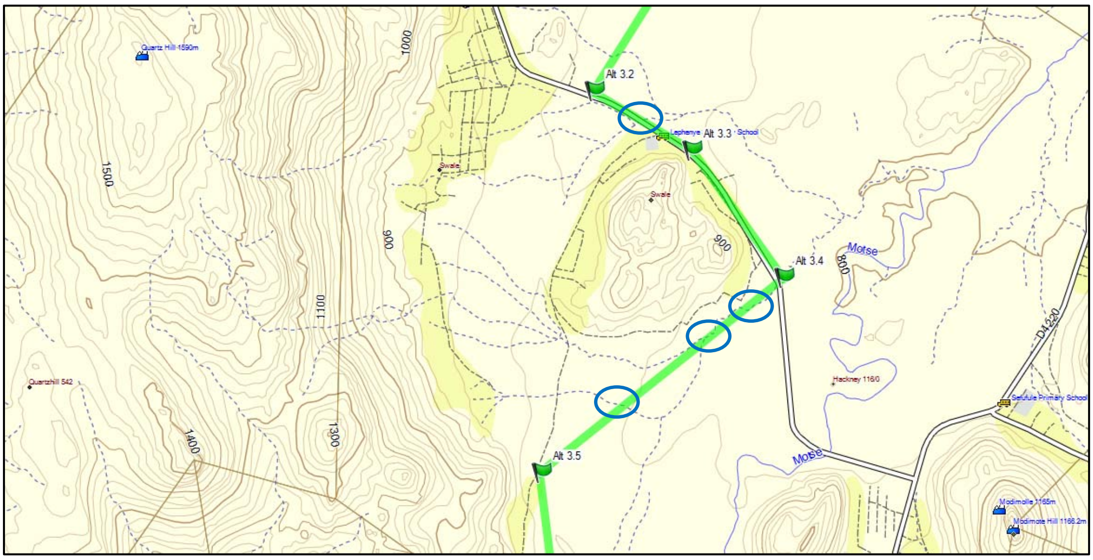


Figure 68: Sector of the power line (Alternative 3) to the east of Alternative 1 and 2. Stream crossings circled in blue.

Figure 69: Aerial view of the sector – note land use and erosion.

The impacts are related to overgrazing, cultivation and wood harvesting and the poor roads planning and maintenance is responsible for severe erosion in the area (Figure 70 – 73).

Figure 70: View of the corridor swinging east.

Figure 71: Erosion associated with the roads and culverts.

Figure 72: Overgrazing and encroachment modified the natural vegetation.

Figure 73: Example of stream crossings along the sector.

The stream crossings are considered as sensitive and must be managed for erosion.

The corridor for Alternative then follows the Motse River (as Alternative 1 and 2) and when it reaches the D4220, it stays to the west of the road, compared to Alternative 1 and 2 (east of the road). Where Alternative 1 and 2 swings west to the top of the mountain the corridor for Alternative 3 keep following the road (D4220). The result is that there is a need for the clearing of vegetation, but the road can be used as an access route, lowering the risk of erosion compared to the other options. The vegetation is in a fair to good condition and some stream crossings are encountered. The fact that the existing road is used will lower the possible impacts to the streams (Figure 74 – 83).

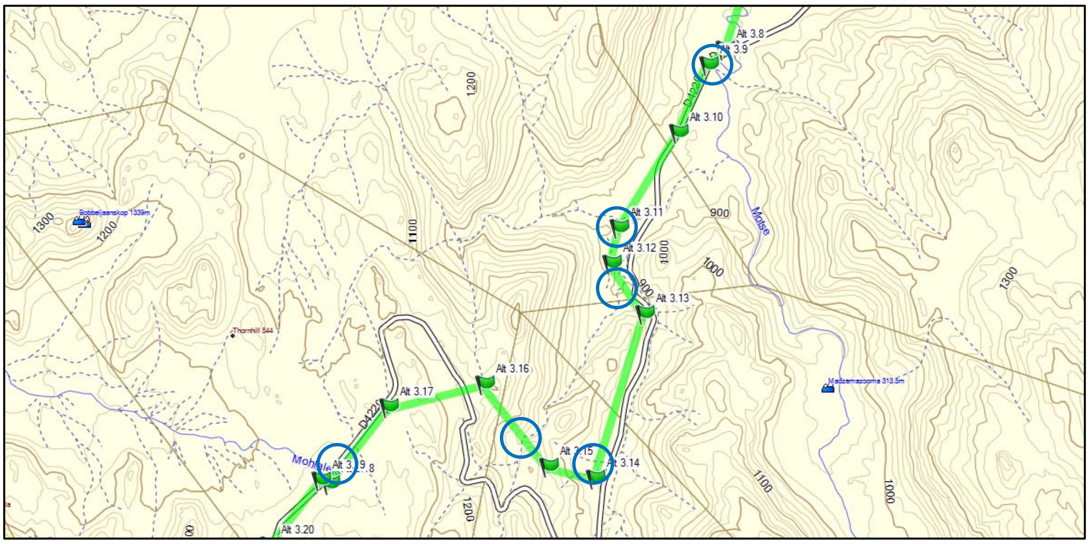


Figure 74: Sector south of the Motse River where the corridor for Alternative 3 follows the D4220.

Figure 75: Aerial view of the sector following the D4220.

Figure 76: Crossing point of Alternative 3 over the Motse River.

Figure 77: Impacts next to the road related to erosion, grazing and wood harvesting resulting in encroachment.

Figure 78: General view showing severe erosion around the river.

Figure 79: Some grazing and encroachment evident.

Figure 80: View of the corridor following the D4220.

Figure 81: Vegetation near crest in a fair to good condition.

Figure 82: View of point where the line crosses the crest.

Figure 83: View of crest area – Alternative 3. Compare with Alternative 1 and 2 for impacts.

Once over the crest, the corridor stays close to the D4220 and then passes between Maseleng, Ga_Mahlanya and Kgwaripane to the substation in the valley (Figure 84 and 85). Here the slopes are prone to erosion and the over grazing, cultivation and poor infrastructure management and development are the main contributing factors to the problem (Figure 86 – 91). The stream crossings are still sensitive areas but the use of the road will lower the risk of further impacts.

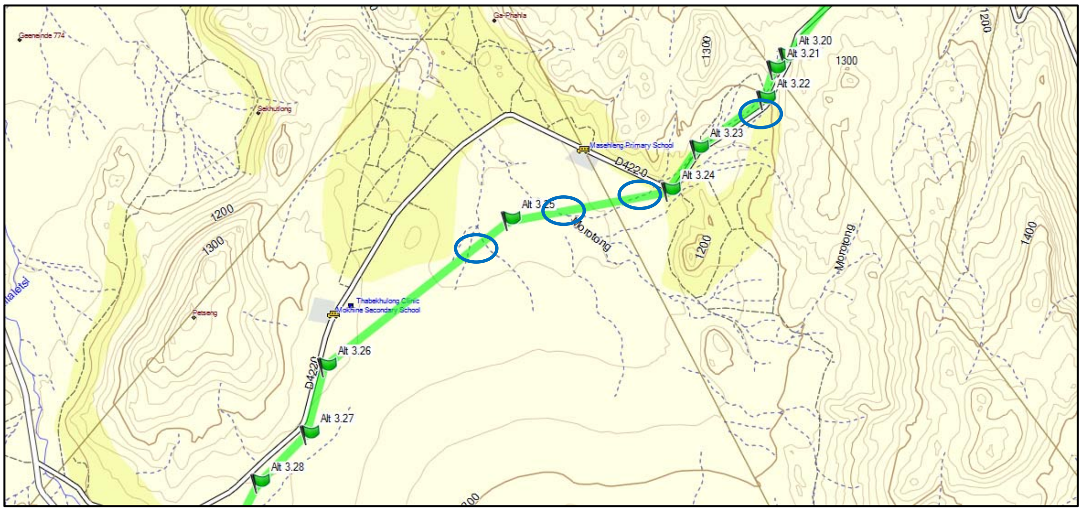


Figure 84: Corridor route south of the mountain towards the substation.

Figure 85: Aerial view of the sector – note land use and erosion.

Figure 86: Crossing point over the mountain.

Figure 87: Vegetation south of the crest in a good condition.

Figure 88: Impacts near the villages increase.

Figure 89: General view of impacts along the corridor.

Figure 90: Severity of impacts clear on the steep slopes.

Figure 91: Severe erosion a problem in the area.

The last sector of the corridor crosses the valley floor to substation sites (Alternative 1 and 2) (Figure 92 and 93). Here the erosion, over grazing, cultivation and wood harvesting is clearly visible and this has compromised the natural vegetation. Some exotic invasive plants are present and the stream crossings are a concern during construction (Figure 94 – 97). It will be important to use existing roads/tracks and that regular maintenance is done (see Addendum 1 for management and mitigation).

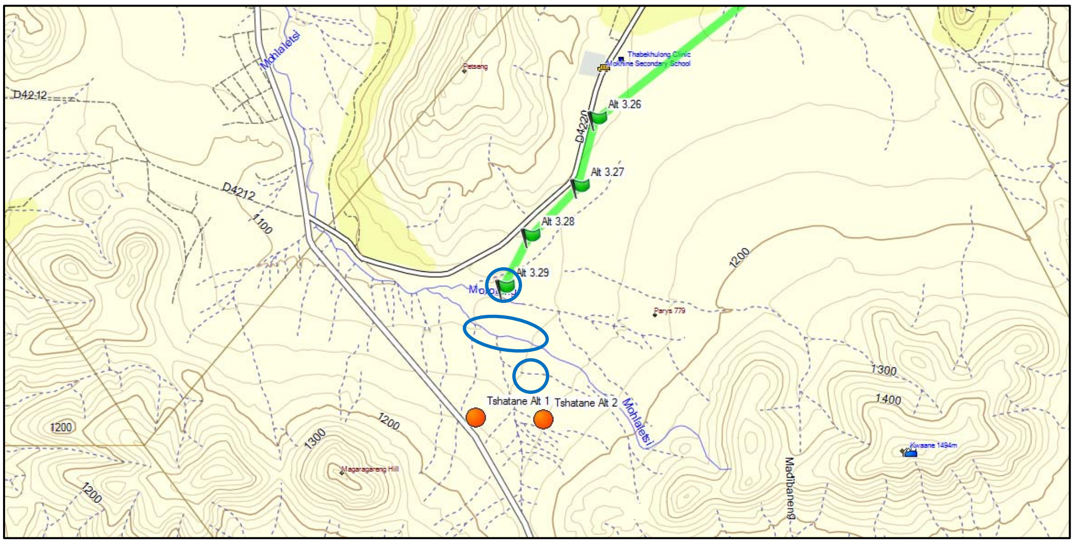


Figure 92: Last sector of the proposed corridor for Alternative 3 from Lesideng to Tshatane.

Figure 93: Aerial view of the last sector – note land use and erosion.

Figure 94: Example of land use impacts on the valley floor.

Figure 95: Increasing development prominent in the area.

Figure 96: Impacts from grazing, cultivation and wood harvesting evident on the natural vegetation.

Figure 97: General view of the area near the substation sites.

From here, the route to the third substation site (Alternative 3) is the same and the discussion for Alternative 1 (power line) is used.

RECOMMENDATIONS:

- From an ecological perspective all alternatives (power line) is viable. Where the power lines ends at the sites for the substations sites (Alternative 1 and 2), the following apply:
  - o Alternative 1 follows a corridor near the existing power line and this servitude can be used as an access road during construction. Some vegetation clearing is needed for this option.
  - o Alternative 2 follows a similar corridor, but the mountain crossing is in an area with no existing access and here clearing and access roads can have negative impacts on the natural vegetation and erosion.
  - o Alternative 3 follows the existing D4220 and this will result in limited clearing of vegetation. The road can further be used as an access road during construction.
  - o Option 3 following the D4220 from the Lesideng substation is preferred from an ecological perspective to the point where it crosses the Motse River. From that point the crossing over the mountain following the existing power line (Alternative 1) is preferred – lowest impact in general. Once over the mountain the option following the D4220 is preferred from an ecological perspective (Alternative 2). The corridor through the villages can be a problem and therefore the option to continue following the existing power line (Alternative 1 and 2) is preferred. From this point, the route can't follow a direct route to the third substation site, but must follow the tar route to the east of the koppies.
- The section of the power line from substation sites 1 and 2 towards the sites for the substation 3 (Alt 3) is not viable from an ecological perspective. The crossing over the koppies south of the route cuts through areas with very good natural vegetation and no access (currently). The clearing of a servitude and access road will open the area for illegal wood harvesting by vehicle and this will have a negative impact on the environment. If the route is following the tar road from the substations (Alternative 1 and 2) towards the proposed site (Alternative 3), it will lower the impacts. A route similar to that proposed for the Tshatane/Jane Furse power line (Alternative 1 or 2) is suggested.

- 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. See Addendum 1 for mitigation and management options.
- Soils are highly erodible and care must be taken during construction to lower the risk. See Addendum 1 for mitigation and management options.
- With careful planning of construction activities impacts to the sensitive areas (rivers and streams) can be severely reduced. See Addendum 1 for mitigation and management options.
- 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. See Addendum 1 for mitigation and management options.
- 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 rivers. See Addendum 1 for mitigation and management options.

Summary

- The study area investigated had a vegetation cover in a “poor state to fair” with impacts related to grazing, cultivation, wood collection, infrastructure development and maintenance and erosion.
- From an ecological perspective, all alternatives for the power line are viable, except the section between substations sites 1 and 2 and substation site 3. A combination of Alternative 1 and 3 is suggested (see “Recommendations”). As part of the study, a plant “rescue and rehabilitation plan” is in place (See Addendum 1 for mitigation and management options).

- 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 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. See Addendum 1 for mitigation and management options.
- 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. See Addendum 1 for mitigation and management options.
  - 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.

Erosion: see discussion in the report and See Addendum 1 for mitigation and management options.

Plant rescue and management plan: no plants of concern in the area. It will be confirmed during the walk down study once the final route in pegged (before clearing and construction.)

Management and mitigations actions are discussed in detail in the summary and Addendum 1 at the end of the report. As part of the project, the **"plant rescue and rehabilitation plan"** is incorporated. Once the final route is known and the route is pegged, a walk down survey for rare and protected plants (Addendum 2) will be conducted. The plants will be marked and then the local community will have the opportunity to collect medicinal plants. In addition, rare plants can be collected by other organisations interested in the propagation and rehabilitation of the plants. This process will be done under the auspices of the local conservation agencies, as they must be present to issue the relevant collection and transport permits.

With regard to the erosion issues, the management and mitigation recommendations is captured in the discussion of the report and in the "Management and Mitigation" summary (Addendum 1).

References

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

Burrows, J.E., Burns, S. & von Staden, L. 2006. *Jamesbrittenia macrantha* (Codd) Hilliard. National Assessment: Red List of South African Plants version 2012.1.

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.

von Staden, L., Winter, P.J.D., Raimondo, D. & Manyama, P.A. 2008. *Acacia ormocarpoides* P.J.H.Hurter. National Assessment: Red List of South African Plants version 2012.1.

von Staden, L., Victor, J.E. & van Wyk, A.E. 2008. *Adenia fruticosa* Burtt Davy subsp. *fruticosa*. National Assessment: Red List of South African Plants version 2012.1.

Williams, V.L., Raimondo, D., Crouch, N.R., Cunningham, A.B., Scott-Shaw, C.R., Lötter, M. & Ngwenya, A.M. 2008. *Elaeodendron transvaalense* (Burtt Davy) R.H.Archer. National Assessment: Red List of South African Plants version 2012.1.

Williams, V.L., Raimondo, D., Crouch, N.R., Brueton, V.J., Cunningham, A.B., Scott-Shaw, C.R., Lötter, M. & Ngwenya, A.M. 2008. *Drimia sanguinea* (Schinz) Jessop. National Assessment: Red List of South African Plants version 2012.1.

Winter, P.J.D. & von Staden, L. 2010. *Dicliptera fruticosa* K.Balkwill. 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/Lesideng 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 (2013).

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