Visual Impact Assessment:

Proposed construction of the ±7 km 132 kV power line from the existing Makonde/Sanari Powerline at Tswera to the proposed new Mutshikili Substation at Thengwe within the Thulamela Local Municipality of the Vhembe District, Limpopo Province (referred to as the Tshilamba Project).

Compiled by:

Dr Wynand Vlok (BioAssets CC)

1 Assegai Close
Acorn Creek
Somerset West
7130

Tel: 082 200 5312
E-mail: wynand.vlok@gmail.com

Prepared for:

Me. Brenda M (Naledzi Environmental Consultants Pty Ltd)

Suite 2
Constantia Park,
No. 546, 16th Road
Midrand, 1685

011 312 2878
brendam@diges.co.za

EXECUTIVE SUMMARY

Eskom SOC Limited (Pty Ltd) is applying for environmental authorisation to construct the proposed 132 kV power line (approximately 7 km long) from the existing Makonde/Sanari Power line at Tswera to the proposed new Mutshikili Substation at Thengwe within the Thulamela Local Municipality of the Vhembe District, Limpopo Province (referred to as the Tshilamba Project).

The aim is to strengthen the electrical supply to the local communities in the Thengwe area.

The brief for the project supplied by the DIGES Group was to compile a Visual Impact Assessment Report for the project that consists of:

- The connecting 132 kV power line from the existing Makonde/Sanari Powerline at Tswera to the proposed new Mutshikili Substation.
- The construction of the substation near Thengwe that will include a communications tower.

The primary visual concern of the proposed new power line, the substation and associated infrastructure was investigated.

Power line and associated infrastructure

- From the survey it was clear that the visual disturbance for the most part of the power line corridors (**Alternative 1 and 2**) (more than 5 km) will be in an area close to the areas inhabited by the local communities or the open cultivated fields and grazing pastures.
    - No high natural vegetation is present that will act as an effective screen of the proposed development (limited screening in small areas).
    - Limited screening was noted from the tar road south of the T-off point in Tswera.
    - The distance to the mountain north of the Mutale River will have a partial positive impact on screening, but the corridor and structures will be visible (moderate to high visual impact) for both alternatives.
- Only a short section (approximately 900 m) of the proposed power line (**Alternative 1**) and approximately 1 200m (Alternative 2 – if that corridor is selected) will cross the mountains.
    - Although the natural vegetation is denser, the trees are not higher than 5 m and will give very little screening to the local community near the Mutale River.
- The height of the single steel structures (pylons) will be in the order of 17 – 24 meters and therefore will be higher than the natural vegetation in most of the corridor.
- When evaluating the power line options (Alternative 1 and 2) it is clear that Alternative 1 will have a higher visual impact to residents and travellers south and north of the mountain.
- If the corridor for Alternative 2 is restricted to the valley between the mountains, the visual impact will be lower compared to a corridor on the mountains east and west of the low-lying area.
- It is recommended that Alternative 2, using the corridor in the valley, is used to lower the visual impacts associated with the higher mountain areas.
- Both the nature reserves, the Mphaphuli Nature Reserve (south of the proposed development) and the Thengwe Nature Reserve (north of the substation site), are within a 10km radius from the project. None will have any visual disturbances related to the development, as the mountains will be a visual barrier for both the reserves.
- It is clear that the existing visual impacts (power lines, telephone infrastructure, farming activities and town developments) is high. The additional impact from the power line will be very small in the Tswera and Makwilidza areas, but moderate to high north from Makwilidza to Thengwe (more open and flat landscape).

Substation and associated infrastructure

- Structures at the substation will be higher (10 – 15 m) than the surrounding vegetation and therefore will not be screened by the trees and shrubs.
    - The height of the communications tower is 15m.
- The impact from lights at the substation during the nights must be noted.
    - It is recommended that all pylons for lights in the substation footprint must be as low as possible, preferably not higher than any other structures.
    - It is recommended that the lights must face towards the activities in order to lower the potential light pollution towards the surrounding landscape.
    - Lights must be managed – only use the lights in areas where physical activities are ongoing, the rest must be switched off.
- When evaluating the visual impacts related to the four sites, all have a similar negative and high visual impact.
- There is no dense and high natural vegetation to screen the infrastructure from residents and tourists using the road or from household in the vicinity of the proposed development.

Contents

The Environmental Impact Assessment Regulations (Regulation 17 of Government Notice No R326 of 2017), 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.
- Involved with visual assessments since 2009.
- Is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (Reg. No. 400109/95).

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.

_____ 20 July 2023

Dr Wynand Vlok (Pr. Sci. Nat 400109/95) Date

1 INTRODUCTION

Eskom SOC Limited (Pty Ltd) is applying for environmental authorisation to construct the proposed 132 kV power line (approximately 7 km long) from the existing Makonde/Sanari Powerline at Tswera to the proposed new Mutshikili Substation at Thengwe within the Thulamela Local Municipality of the Vhembe District, Limpopo Province (referred to as the Tshilamba Project) (Figure 1.1).

The aim is to strengthen the electrical supply to the local communities in the Thengwe area.

The brief for the project supplied by the DIGES Group was to compile a Visual Impact Assessment Report for the project that consists of:

- The connecting 132 kV power line from the existing Makonde/Sanari power line at Tswera to the proposed new Mutshikili Substation.
- The construction of the substation near Thengwe that will include a communications tower.

Figure 1.1: The aerial view of the proposed project – the purple line represent Alternative 1 and the red line Alternative 2 of the power line corridors, with the coloured blocks the proposed substation sites (four alternative substation sites).

1.1 Objectives of the study

During the field survey, the possible visual impact from the proposed new power line and substation and the associated infrastructure were investigated. The important aspect used during the study, was to determine areas where the proposed development will have visual impacts and each of the problem areas were photographed and assessed for this the report. The process followed included:

- The site visit aimed to record the receiving environment.
- During the desktop study and site visit, the physical characteristics of the project were recorded.
- General landscape characterisation was recorded and this was done by focussing on the landscape and the nature of the environment.
- The potential views or visual receptors were mapped related to potential visual impacts. Concerns can be related to the visual changes of the environment with regard to the livestock and the nature reserves, the local residents and to visitors travelling in the area.
- From these aspects the significance of the visual impact for each component of the project was determined and then some mitigation and management options are listed.

1.2 The landscape, structural components, the visual character and absorption capacity (VAC)

When one assess the study area, it is clear that various impacts are currently present and it will have an influence on the visual impact assessment. The study area is in some cases highly developed and many activities contribute to have a negative impact on the area. These include farming activities (e.g. cultivation, livestock grazing, town and industrial developments, power lines, small businesses and the associated infrastructure (e.g. communications towers).

The landscape is characterised by valleys between the larger mountain ranges (east/west orientated) that dominate the area, e.g. the Soutpansberg Mountain to the south. In the valleys, smaller and larger rivers are present that drain water from the higher features in the landscape. The natural vegetation unit is known as the Soutpansberg Mountain Bushveld (associated with the mountain ranges to the south) and the Makuleke Sandy Bushveld in the valleys, lower slopes of the mountain and smaller outcrops. The latter dominate the valleys (larger extent of the power line corridor) with the former associated with the section where the power line crosses the low mountain north of the Mutale River.

The undulating corridor will have an impact on the visual persecution of people in the area. Where tall trees are present, some screening will be achieved from the pylons, but where the corridor crosses the high outcrops, it will be a visual impact that will be observed. The height of the structures (mono steel structures between 17 and 24m) will in most cases be above the tree line along the corridor. As the area is in a low rainfall area, the trees are between 5 – 10m high. Nearer to the Mutale River and its protected mountain gorges, larger trees are present, but the high development level has impact on the vegetation, therefore lowering the potential screening effect.

The clearing of the corridor can be limited to 6m within the 25 – 32m servitude. It is recommend that clearing is limited to the 6m (3m each side of the centreline) with trimming of infringing vegetation at a 45˚ angle to clear a wider area to accommodate the conductors. This clearing will have an impact on the visual receptors of the community in the area. Access to the corridor north of the mountain can be done from existing roads and this will lower impacts to the environment. The area where the power line crosses the ridge (Alternative 1 and 2 – depending on the final route selection), will not be accessible to vehicles.

One of the main factors to take into consideration is the visual absorption capacity (VAC) of the proposed project. This component relates to the visual character of the area and the potential visual impact resulting from a new development. It therefore indicate the ability of that area and landscape to absorb the development (power line and substation) without noticeable intrusion or change to the visual

character of the area. The VAC is measured on a scale from high (an area which has a high capacity to absorb new development) to low (an area in which a new development would be highly visible and would alter the visual character of the area). This will take the current developments and the natural habit (landscape and vegetation) into account. Where the area is highly developed as is the case for this project, the VAC will be mostly high.

1.3 Aspects for consideration

For this study it is possible to look at the **visual resource** associated with the environment and study area and it can be rated as follows:

- High – the majority of the study area is devoid of infrastructure elements
- Moderate – area shows some development, erosion, alterations or degradation
- Low – the area is severely modified or altered with developments lowering the scope for positive enhancement of the area.

One can further rate the impact using the following **exposure ratings** (Table 1.1).

Table 1.1: Visual exposure ratings

	High exposure	Moderate exposure	Low exposure	Insignificant exposure
Local communities	0-1.5km	1.5-3km	3-10km	More than 10km
Tourists	0-1.5km	1.5-3km	3-10km	More than 10km
Local motorists	0-1.5km	1.5-3km	3-10km	More than 10km

The following are **indicators** that could suggest the need for visual input based on the nature of the receiving environment and the nature of the project and includes:

- Areas with protection status, such as national parks or nature reserves;
- Areas with proclaimed heritage sites or scenic routes;
- Areas with intact wilderness qualities, or pristine ecosystems;
- Areas with intact or outstanding rural or townscape qualities;
- Areas with a recognised special character or sense of place;
- Areas lying outside a defined urban edge line;
- Areas with sites of cultural or religious significance;
- Areas of important tourism or recreation value;
- Areas with important vistas or scenic corridors;
- Areas with visually prominent ridgelines or skylines.

Table 1.2: Categorisation of issues to be addressed by the visual assessment

Type of environment	Type of development - Low to high intensity				
	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

The key to the **categories of development** are the following:

- **Category 1 development:** e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.
- **Category 2 development:** e.g. low-key recreation, resorts or residential type development, small-scale agriculture or nurseries, narrow roads and small-scale infrastructure.
- **Category 3 development:** e.g. low density resort and residential type development, golf or polo estates, low to medium-scale infrastructure.
- **Category 4 development:** e.g. medium density residential development, sports facilities, small-scale commercial facilities and office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
- **Category 5 development:** e.g. high density township and residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations, quarrying and mining activities with related processing plants.

Explanation of terms used above is:

- **Low-key development** – generally small-scale, single-storey domestic structures, usually with more than 75% of the area retained as natural (undisturbed) open space.
- **Low density development** - generally single or double-storey domestic structures, usually with more than 50% of the area retained as natural (undisturbed) open space.
- **Medium density development** - generally 1 to 3 storey structures, including cluster development, usually with more than 25% of the area retained as green open space.
- **High density development** - generally multi-storey structures, or low-rise high density residential development.

The following **key to the categories of issues** is used:

- **Very high visual impact expected**:
  - Potentially significant effect on wilderness quality or scenic resources;
  - Fundamental change in the visual character of the area;
  - Establishes a major precedent for development in the area.
- **High visual impact expected**:
  - Potential intrusion on protected landscapes or scenic resources;
  - Noticeable change in visual character of the area;
  - Establishes a new precedent for development in the area.
- **Moderate visual impact expected**:
  - Potentially some effect on protected landscapes or scenic resources;
  - Some change in the visual character of the area;
  - Introduces new development or adds to existing development in the area.
- **Minimal visual impact expected**:
  - Potentially low level of intrusion on landscapes or scenic resources;
  - Limited change in the visual character of the area;
  - Low-key development, similar in nature to existing development.
- **Little or no visual impact expected**:
  - Potentially little influence on scenic resources or visual character of the area;
  - Generally compatible with existing development in the area;
  - Possible scope for enhancement of the area.

In this section the following **terms** refer as follows:

- **Fundamental change** – dominates the view frame and experience of the receptor;
- **Noticeable change** – clearly visible within the view frame and experience of the receptor;
- **Some change** – recognisable feature within the view frame and experience of the receptor;
- **Limited change** – not particularly noticeable within the view frame and experience of the receptor;
- **Generally compatible** – Practically not visible, or blends in with the surroundings.

2 METHODOLOGY

The sites for the new developments were mapped and aerial photographs and maps were studied during the desktop assessment to identify landscape features. The position of the new substation (four alternatives) and the linking power line (two alternatives) were assessed and all possible areas of impacts were photographed during the assessment. Current visual impacts and other positive natural features were assessed as part of the survey.

When carrying out an assessment of likely effects on a landscape resource and on visual amenity it is important to remember this is a complex issue simply because it is determined through a combination of quantitative and qualitative evaluations. When assessing the visual impact in an area, it is important to take the worst-case scenario into account, as this is how all participants (local inhabitants) experience the possible development. Landscape and visual assessments are separate, although linked, procedures.

The landscape, its analysis and the assessment of impacts on the landscape all contribute to the baseline for visual impact assessment studies. The assessment of the potential impact on the landscape is carried out as an impact on an environmental resource, i.e. the physical landscape. Visual impacts, on the other hand, are assessed as one of the interrelated effects on people (i.e. the viewers and the impact of an introduced object into a particular view or scene).

2.1 The Visual Resource

Landscape character, landscape quality (Warnock and Brown, 1998) and “sense of place” (Lynch, 1992) are used to evaluate the visual resource i.e. the receiving environment. A qualitative evaluation of the landscape is essentially a subjective matter. In this study the aesthetic evaluation of the study area is determined by the professional opinion of the author based on site observations and the results of contemporary research in perceptual psychology.

2.2 Landscape Impact

The landscape impact of a new development is measured as the change to the fabric, character and quality of the landscape caused by the physical presence of the new development. Identifying and describing the nature and intensity of change in the landscape brought about by the proposed new power line is based on the professional opinion of the author supported by photographic simulations. It is imperative to depict the change to the landscape in as realistic a manner as possible. To do this, photographs were taken from key viewpoints to illustrate the physical nature of the proposed power line in its final form within the context of the landscape setting. The resultant change to the landscape can then be observed and an assessment of visual intrusion made.

2.3 Visual Impact

Visual impacts are a subset of landscape impacts. Visual impacts relate to the changes that

arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effect with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (i.e. views) caused by the intervention and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the scene as perceived by people visiting, working or living in the area. This approach reflects the layman's concerns, which normally are:

- Will I be able to see the new development?
- What will it look like?
- Will the development affect views in the area and if so how?

Landscape and visual impacts do not necessarily coincide. Landscape impacts can occur in the absence of visual impacts, for instance where a development is wholly screened from available public views, but nonetheless results in a loss of landscape elements and landscape character within a localised area (the site and its immediate surrounds).

2.4 Intensity of Visual Impact

The intensity of visual impact is determined using visual intrusion, visibility and visual exposure criteria (Hull and Bishop, 1988), qualified by the sensitivity of viewers (visual receptors) towards the proposed development. The intensity of visual impact is therefore concerned with:

- The overall impact on the visual amenity, which can range from degradation through to enhancement;
- The direct impacts of the landfill upon views of the landscape through intrusion or obstruction;
- The reactions of viewers who may be affected by the activity.

2.5 Significance of Visual Impact

The significance of impact was determined using a ranking scale, based on terminology from the Department of Environmental Affairs and Tourism's (DEAT, 1998) guideline document on EIA Regulations.

2.6 Criteria used

- Occurrence, based on:
  - Probability of occurrence (how likely is it that the impact may occur?)
  - Duration of occurrence (how long may it last).
- Severity, based on:
  - Intensity of impact (will the impact be of High, Moderate or Low intensity?) and
  - Scale/extent of impact (will the impact affect the national, regional or local environment, or only that of the site?)

3 DISCUSSION

The discussion will focus on the proposed new power line (2 alternatives) from the Makonde/Sanari Powerline at Tswera to the new Mutshikili Substation (4 alternatives) at Thengwe.

3.1 Existing land use

Land use currently includes the following: settlements and towns, cultivation of cash crops, cattle farming, small and medium industries and other associated infrastructure. The residential impacts are associated with the agricultural activities, limited tourism, roads, power lines, telephone lines and cell phone towers, erosion and dumping of refuse.

3.2 Landscape character

The context of the landscape character can be related to the scenic aesthetic value of the area and this must inherently be linked to the land use practices, as this will correlate to how people perceive the development i.e. it can be as viewed as an unwelcome intrusion into their place (i.e. landscape). One must further understand that there is an important factor measuring if people will see the power line and substation (in this project) as an impact, referred to as the visual sensitivity. This concept is defined as "the degree to which anthropogenic change within a landscape would be perceived negatively by the local community and visitors to area".

What is the impact of this then? It is something that will influence how the people value this change to the perceived the aesthetic quality of the area in relation to the general landscape they occupy. People value rural and natural landscapes. A rural landscape can be defined "as an area where an interaction between humans (local communities and visitors) and nature where there if specific landscape characteristics that has value. The value can differ, as the local community see the value in the intrinsic importance of the area for living and survival (e.g. subsistence farming) and those visiting from urban areas will relate to the natural environment. The power line can be viewed as an asset, as it will improve and stabilise the electricity supply to the area.

3.3 Construction of the new powerline and substation

For this study the main focus was on the area associated with the proposed new power line (two alternatives) with the T-off point from the existing Makonde/Sanari power line at Tswera to the new Mutshikili Substation (four alternatives) at Thengwe (approximately 7 km) (Figure 1.1). For the discussion, the report will start from the south and follow the corridors north to the sites for the substation (currently four sites identified).

3.3.1 Alternative 1 (power line)

Figure 3.1 is an aerial image of the route with the most prominent key observation points (KOPs) with the visual exposing rating distances and Figure 3.2 is a closer view of the KOPs. It must be added that additional photographs were taken from other points in the area and will be included in the report.

Table 3.1 is a summary of the key observation points (KOPs).

When evaluating the receiving environments (Table 1.1 and Section 1.3) the following are associated with the study area:

- Areas with protection status, such as national parks or nature reserves
- Areas with visually prominent ridgelines or skylines

No other aspects were noted or raised during the Public Participation Process that was communicated to inform this report.

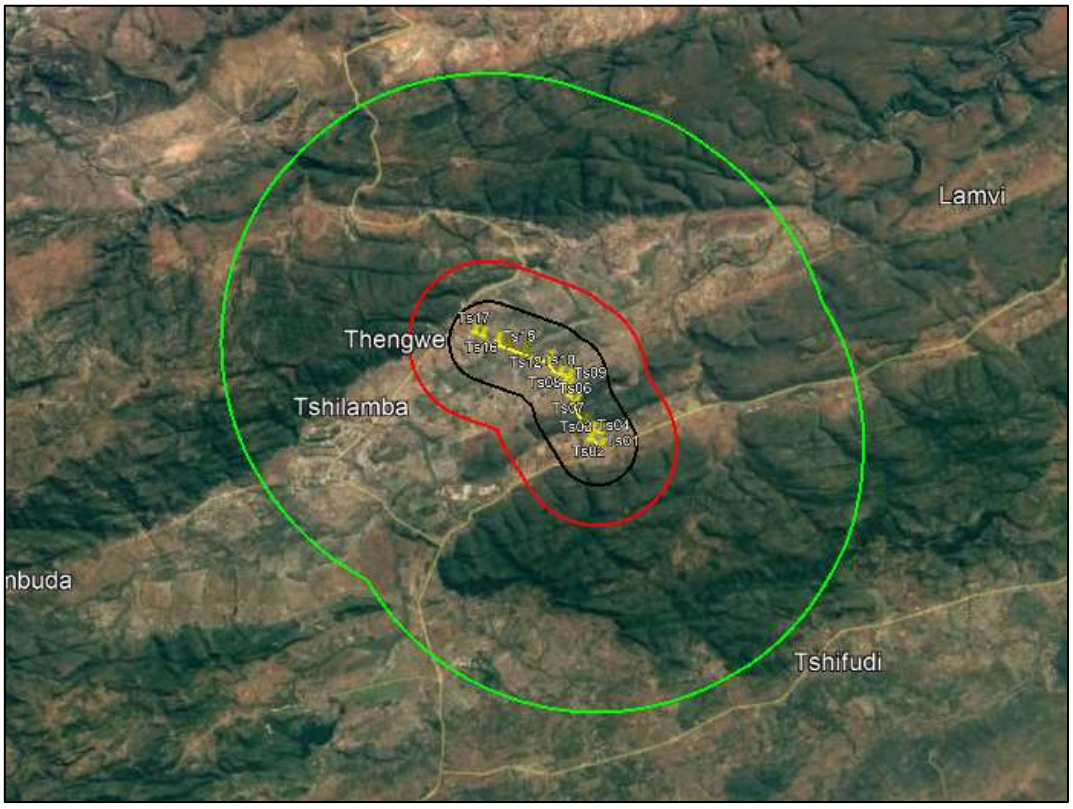

Figure 3.1: The broad corridor surrounding the proposed new power line (yellow line) and substation infrastructure with the key observation points (KOPs) marked and the visual exposure rating distances (as described in Table 1 – black circle = 1.5km, red circle = 3km and green circle = 10km) indicated.

Table 3.1: Summary of the Key Observation Points listed during the study.

KOP Number	KOP Coordinates	
TS01	S22.753055	E030.616019
TS02	S22.750825	E030.611762
TS03	S22.748289	E030.615315
TS04	S22.747724	E030.612644
TS05	S22.744970	E030.609720
TS06	S22.738271	E030.606690
TS07	S22.736106	E030.604241
TS08	S22.733278	E030.603940
TS09	S22.730007	E030.604030
TS10	S22.728722	E030.600840
TS11	S22.725541	E030.602645
TS12	S22.723631	E030.596878
TS13	S22.720831	E030.588106
TS14	S22.718731	E030.581747
TS15	S22.717626	E030.578026
TS16	S22.715696	E030.572434
TS17	S22.714630	E030.569614

Figure 3.2: Aerial image giving a broad overview of the KOP's in relation to the larger study area.

When evaluating the visual resource impacts, it is clear that the visual resource rating will be low due to the fact that the area is "highly modified with extensive infrastructure development (towns and villages), power lines, roads, settlements, telephone and communications towers and agricultural activities i.e. cultivation and grazing.

From a visual exposure perspective it is clear that the new development will have a substantial impact on the receiving communities. The larger trees (few trees left, as clearing was observed into the river channels) in the riparian zone of the Mutale River will have a limited barrier effect from a visual perspective. The high pylons with the conductors will be visible along the largest part of the corridor. Although the structures at the substation is low (mostly a single story), the exposed nature of the site will result in being visible from all directions.

The Visual Exposure Rating (Table 1.1) states an exposure rating of moderate to high (0 – 3km sighting) for people living near the corridor. Due to limited tree cover (near the river and near Makwilidza (just north of the outcrop), the screening effect of the trees and vegetation will not have a significant impact (Figure 3.3). The area where the power line crosses over the low mountain (between KOP Ts05 and Ts06) will have some screening by the vegetation from the people travelling on the road south of the T-off point. This will also be the case between the T-off point and the crossing over the Mutale River (Ts02 and Ts05), where the houses, trees and other infrastructures (small and medium business enterprises) will screen the power line. From the T-off point to the tree line, the power line will be visible (Ts01), but the current developments will lower this visual exposure for travellers on the road.

For the local residents, this will however not be the case. As you move north of the tree line near the road, the current agricultural activities on the southern bank of the river (cultivation and grazing), resulted in a loss of many large trees present that can act as a visual barrier. As noted earlier, there are some trees left in narrow strips between cleared fields and pastures and those will give limited screening of the power line. Therefore the visual absorption capacity is mostly high in the developed areas and be moderate to high in the agriculture-dominated areas north of the mountain and Makwilidza.

When evaluating the categories (able 1.2) it is noted that with regards to the two reserves, it will relate to a "category 1" development (moderate impact expected) due to the distance and screening by the

mountains and natural vegetation. The larger area around the power line and substation can be classified as a “category 2” development, as the community see the benefits from the infrastructure in the area. The section where the power line crosses the mountain can be classified as a “category 3” development where a moderate visual impact from the road south of the Mutale River can be expected.

Figure 3.3: View of the southern section where the study area starts (Tswera, south of the Mutale River) – the area associated with the power line will have a moderate to high impact (yellow and red) from the new development, but low (green) visual impact when 50m to 75m away into the vegetated areas when crossing the mountain on foot.

Figure 3.4: View of the T-off point from the existing power line. Cleared areas for cultivation and grazing lower the screening potential.

Figure 3.5: The view for the local residents towards the mountain north of the Mutale River.

Figure 3.6: The visual impact can be limited in areas where some larger trees are still present, depending on the angle and distance from the power line.

Figure 3.7: View towards the mountain from the southern side of the river – limited screening for the local residents.

Figure 3.8: View of the lower southern slope of the mountain – some screening will be possible, but at a limited scale due to the height of the pylons.

Figure 3.9: Some larger trees (10 – 20m tall) are present and will give some (but limited) screening of the power line.

.

Figure 10: When crossing the mountain from the south (view of southern slope) the dense vegetation will screen structures, but from the road to the south, it will be visible, as the trees and shrubs vary between 2 and 5m.

Figure 3.11: On the mountain – limited screening for distant observers, as the trees are generally small (<10m).

Figure 12: View south from the mountain – it is clear that the trees will have a limited screening effect for people in the valley area. Some screening will be achieved for residents walking on the mountain, but limited.

The second sector is the northern aspect of the mountain, down into Makwilidza, through the town to the agricultural fields and pastures to the north (Figure 3.13).

Once over the crest of the ridge south of Makwilidza, the vegetation thins out as a result of wood harvesting and grazing. As was the case on the southern aspect of the mountain, most of the trees are small (<10m) and will give limited screening to the pylons for the proposed power line. Near the base of the mountain, a few large trees are present and will result in limited screening when people are near these larger trees.

In the town, the current development include some power lines, but these are part of the local distribution network. The structure for the new power line are much taller and will be more visible than the existing structures.

To the north of the town, the vegetation opens up (limited tree cover) into the cultivated fields and pastures and a few large *Sclerocarya birrea* and *Adansonia digitata* are present, but not to the extent that it will give sufficient screening cover for people travelling on the local roads to prevent a visual impact.

It is therefore clear that the visual impact will be moderate to high for local travellers and the residents of the towns and farming areas along the proposed corridor.

Figure 3.13: The section on the northern aspect of the mountain have some low trees (2.5 – 4m) with more open areas in town and to the north along the proposed corridor.

Figure 3.14: The view on the mountain (Ts06) with the lower trees lowering the screening potential of the vegetation.

Figure 3.15: On the northern slope, low shrubs and small trees are present – thus a low screening potential for the pylons and conductors.

Figure 3.16: Example of some of the larger trees (including fruit trees e.g. *Mangifera indica*) and some large protected trees that include *Sclerocarya birrea* and *Adansonia digitata* (in picture) (Ts08).

Figure 3.17: In town the houses, trees and power lines will lower the added impact of the new power line.

Figure 3.18: At Ts09 the existing impacts can add screening to the new power line, but the height of the structures will be more visible than the existing structures.

Figure 3.19: A view of the current visual effects associated with the town area.

Figure 3.20: North of Makwilidza (Ts10) the clearing of natural vegetation for the town and associated cultivated and grazing areas open the landscape and here the visual impact will be high from the new power line. However, the existing changes to the environment already contribute to the higher negative visual exposures.

Figure 3.21: The views towards the corridor (similar from Ts10 and Ts11).

Figure 3.22: If facing to the northeast from Ts11 (as an example), low shrubs and small trees are present on the edge of the cleared fields and pastures, but will not significantly contribute to the screening of the pylons.

Figure 23: View from Ts11, some large trees are present, but the isolated specimens will not act as an effective screen in the area.

The last sector has similar visual impacts (both current and expected) as the rest of the project (Figure 3.24).

Here the natural vegetation is more modified and the visual exposure at Ts13, Ts14 and Ts15 will be high. Near the proposed substation sites, the power line crosses the Mulondodi River with only small trees, shrubs and reeds present and therefore there will be no screening by the natural vegetation. North of the river (Ts16 and Ts17) shrubs, small and medium trees are present with no screening effect on the new pylons. In all directions, the habitat have been modified and therefore the visual impact for surrounding communities will be high.

Figure 3.24: An aerial view of the last section to the substation sites and Thengwe – note the modified natural vegetation resulting in very low or low screening potential of the proposed infrastructure.

Figure 3.25: View of the cultivated areas east of the road (Ts15). The low vegetation will not screen the pylons.

Figure 3.26: The view of the corridor to the left (Ts15/Ts14) showing the open landscape that will result in a high visual impact for resident and visitors using the road.

Figure 3.27: The view towards the cultivated fields along the road.

Figure 3.28: The vegetation associated with the river crossing (Mulondodi River).

Figure 3.29: The current natural vegetation south of the proposed substation sites.

Figure 3.30: Area near Alternative 1 substation. Open, therefore high visual impact.

Figure 3.31: View north towards Alternative 3.

Figure 3.32: The view of Alternative 2, west of the road.

Figure 3.33: View of Alternative 4.

Figure 3.34: The view from the substation site (Alternative 3) towards Thengwe.

Figure 3.35: The screening effect of the vegetation from Alternative 3 towards the low – visual impact will be high.

3.3.2 Alternative 2 (power line)

As was the case with Alternative 1 the focus was on the area associated with the proposed new power line with the T-off point from the existing Makonde/Sanari power line at Tswera to the new Mutshikili Substation at Thengwe (approximately 7 km) (Figure 3.36). For the discussion, the report will start from the south and follow the corridor north to the sites for the substation (currently four sites identified).

Figure 3.1 is an aerial image of the route with the most prominent key observation points (KOPs) with the visual exposing rating distances and Figure 3.37 is a closer view of the KOPs. It must be added that additional photographs were taken from other points in the area and will be included in the report.

Table 3.2 is a summary of the key observation points (KOPs – Alternative 2).

When evaluating the receiving environments (Table 1.1 and Section 1.3) the following are associated with the study area:

- Areas with protection status, such as national parks or nature reserves
- Areas with visually prominent ridgelines or skylines

No other aspects were noted or raised during the Public Participation Process that was communicated to inform this report.

Figure 3.36: A general view of the proposed corridor for power line (Alternative 2) with the KOPs and the visual exposure rating distances (as described in Table 1 – black circle = 1.5 km, red circle = 3 km and green circle = 10 km) indicated.

Table 3.2: Summary of the Key Observation Points listed during the study (Alternative 2 power line).

KOP Number	KOP Coordinates	
TS 18	S22.757	E30.59596
TS 19	S22.7545	E30.59499
TS 20	S22.7528	E30.59337
TS 21	S22.7511	E30.59244
TS 22	S22.7498	E30.59169
TS 23	S22.7469	E30.58999
TS 24	S22.7423	E30.58687
TS 25	S22.7394	E30.58485
TS 26	S22.7344	E30.58901

TS 27	S22.7237	E30.59685
TS 28	S22.7204	E30.58872
TS 29	S22.7177	E30.58158
TS 30	S22.7157	E30.57212

Figure 3.37: Aerial image giving a broad overview of the KOP's in relation to the larger study area (Alternative 2).

When evaluating the visual resource impacts for the option of the power line, it is clear that the visual resource rating will be low due to the fact that the area is currently "highly modified with extensive infrastructure development from the towns and villages, roads, existing power line infrastructure, telephone and communications towers and agricultural activities i.e. cultivation and grazing.

Therefore the new development will have a substantial impact on the receiving communities when evaluating the visual. The larger trees in the riparian zone of the Mutale River will have only a limited barrier effect from a visual perspective, as continuous removal of trees are taking place. The high pylons with the conductors will be visible along the largest part of the proposed corridor for the new power line. Although the structures at the substation is low (mostly a single story), the exposed nature of the site will result in being visible from all directions.

The Visual Exposure Rating (Table 1.1) states an exposure rating of moderate to high (0 – 3 km sighting) for people living near the corridor. Due to limited tree cover (near the river and near Makwilidza (just north of the outcrop), the screening effect of the trees and vegetation will not have a significant impact (Figure 3.3). The area where the power line crosses between the low mountains within the valley (between KOP Ts22 and Ts24), some screening will occur from vegetation from the people travelling on the road south of the T-off point. If the line crosses the low mountain, the screening effect will be lost.

This will be the case between the T-off point and the crossing over the Mutale River (Ts18 and Ts21), where the houses, trees and other infrastructures (small and medium business enterprises) will screen the power line. From the T-off point to the tree line, the power line will be visible (Ts18), but the current developments will lower this visual exposure for travellers on the road.

This scenario is slightly different for the local residents, this will however not be the case. As you move north of the tree line near the road, the current agricultural activities on the southern bank of the river (cultivation and grazing), resulted in a loss of many large trees present that can act as a visual barrier.

As noted earlier, there are some trees left in narrow strips between cleared fields and pastures and those will give limited screening of the power line. Therefore the visual absorption capacity is mostly high in the developed areas and be moderate to high in the agriculture-dominated areas north of the mountain and Makwilidza.

The sector north of the Mutale River follows the valley floor with low mountains on either side. The area has some natural vegetation present, but wood harvesting, grazing and trampling for livestock have modified the integrity of the environment (Figure 3.38).

When evaluating the categories (Table 1.2) it is noted that with regards to the two reserves, it will relate to a ”category 1” development (moderate impact expected) due to the distance and screening by the mountains and natural vegetation. The larger area around the power line and substation can be classified as a “category 2” development, as the community see the benefits from the infrastructure in the area. The section where the power line crosses the mountain can be classified as a “category 3” development where a moderate visual impact from the road south of the Mutale River can be expected.

Figure 3.38: View of the southern section where the study area starts (Tswera, south of the Mutale River) – the area associated with the power line will have a moderate to high impact (yellow and red) from the new development, but low (green) visual impact when 50 m to 75 m away into the vegetated areas when crossing the mountain on foot.

Figure 3.39: View of the T-off point (KOP Ts18) for Alternative 2. Limited screening for residents from the existing vegetation.

Figure 3.40: A view along the exiting power line.

Figure 3.41: To the west of the corridor, near the drainage line, larger trees can act as a limited screen for local residents.

Figure 3.42: Example of some larger trees near the town just north of the T-off point.

Figure 4.43: In the area where the cultivation and grazing is prominent, no effective screening of the power line from vegetation will be achieved.

Figure 3.44: An example of the open grazing areas (TS 20) where no effective screening will occur.

Figure 3.45: The crossing of the Mutale River where the riparian vegetation is modified. In the background, the denser vegetation on the low mountain to the west of the corridor is visible.

Figure 3.46: A view across the river towards the north with the valley area between the mountains (TS22 and 23).

Figure 3.47: The northern bank (right-hand bank) of the Mutale River – activities right into the river channel.

Figure 3.48: View of the valley floor north of the river.

Figure 3.49: Some local screening along the valley floor is possible by some of the larger trees still present.

Figure 3.50: Near the town (Makwilidza), the valley opens and the larger trees and thinned out, therefore the screeing potential of the vegetation is low.

The vegetation in Makwilidza varies (Figure 3.51). To the west of the proposed corridor, some denser natural vegetation is present and the height of the trees varies between 4 and 12 m. The larger trees are scarce and therefore only limited screening will be achieved. Further north, the vegetation thins out as a result of wood harvesting and grazing and larger trees and not present in a high abundance.

It is therefore clear that the visual impact will be moderate to high for local travellers and the residents of the towns and farming areas along the proposed corridor.

Figure 3.51: The section north of Makwilidza with some larger trees near and in the town, but less further northeast.

Figure 3.52: The exit of the valley section in Makwilidza, limited screening due to loss of larger trees.

Figure 3.53: In areas the small trees and shrubs would offer limited screening for the new proposed power line.

Figure 3.54: As new properties are developed, more natural vegetation is removed and this contribute to a loss of screening of the trees.

Figure 3.55: Limited screening will be present due to small numbers of larger trees still present that include indigenous and larger fruit trees.

Figure 3.56: Northwest of the town, the dense vegetation (encroachment) is dominated by small trees with a low potential to screen the new proposed power line.

Figure 3.57: Limited large trees offer little screening north of Makwilidza.

Figure 3.58: Some denser areas with larger trees present – limited screening for short distances.

Figure 3.59: Outside the town (north towards the substation sites) the open fields (cultivation and grazing) dominate and here the screening potential is very low.

The last sector of the corridor overlap with the corridor for Alternative 1 (Figure 3.60). The area to the substation sites is mostly cleared of large trees and the activities are dominated by agriculture i.e. grazing and cultivation. Therefore the screening potential of the vegetation between Makwilidza and Thengwe is very low.

Figure 3.60: An aerial view of the last section to the substation sites and Thengwe – note the modified natural vegetation resulting in very low or low screening potential of the proposed infrastructure.

4 CONCLUSIONS

The primary visual concern of the proposed new power line, the substation and associated infrastructure was investigated.

4.1 Power line and associated infrastructure

- From the survey it was clear that the visual disturbance for the most part of the power line corridors (**Alternative 1 and 2**) (more than 5 km) will be in an area close to the areas inhabited by the local communities or the open cultivated fields and grazing pastures.
    - No high natural vegetation is present that will act as an effective screen of the proposed development (limited screening in small areas).
    - Limited screening was noted from the tar road south of the T-off point in Tswera.
    - The distance to the mountain north of the Mutale River will have a partial positive impact on screening, but the corridor and structures will be visible (moderate to high visual impact) for both alternatives.
- Only a short section (approximately 900 m) of the proposed power line (**Alternative 1**) and approximately 1 200m (Alternative 2 – if that corridor is selected) will cross the mountains.
    - Although the natural vegetation is denser, the trees are not higher than 5 m and will give very little screening to the local community near the Mutale River.
- The height of the single steel structures (pylons) will be in the order of 17 – 24 meters and therefore will be higher than the natural vegetation in most of the corridor.
- When evaluating the power line options (Alternative 1 and 2) it is clear that Alternative 1 will have a higher visual impact to residents and travellers south and north of the mountain.
- If the corridor for Alternative 2 is restricted to the valley between the mountains, the visual impact will be lower compared to a corridor on the mountains east and west of the low-lying area.
- It is recommended that Alternative 2, using the corridor in the valley, is used to lower the visual impacts associated with the higher mountain areas.
- Both the nature reserves, the Mphaphuli Nature Reserve (south of the proposed development) and the Thengwe Nature Reserve (north of the substation site), are within a 10km radius from the project. None will have any visual disturbances related to the development, as the mountains will be a visual barrier for both the reserves.
- It is clear that the existing visual impacts (power lines, telephone infrastructure, farming activities and town developments) is high. The additional impact from the power line will be very small in the Tswera and Makwilidza areas, but moderate to high north from Makwilidza to Thengwe (more open and flat landscape).

4.2 Substation and associated infrastructure

- Structures at the substation will be higher (10 – 15 m) than the surrounding vegetation and therefore will not be screened by the trees and shrubs.
    - The height of the communications tower is 15m.
- The impact from lights at the substation during the nights must be noted.
    - It is recommended that all pylons for lights in the substation footprint must be as low as possible, preferably not higher than any other structures.
    - It is recommended that the lights must face towards the activities in order to lower the potential light pollution towards the surrounding landscape.
    - Lights must be managed – only use the lights in areas where physical activities are ongoing, the rest must be switched off.
- When evaluating the visual impacts related to the four sites, all have a similar negative and high visual impact.
- There is no dense and high natural vegetation to screen the infrastructure from residents and tourists using the road or from household in the vicinity of the proposed development.

5 REFERENCES

Hull, R.B. and Bishop, I.E. (1988), Scenic Impacts of Electricity Transmission Mine: The Influence of Landscape Type and Observer Distance. *Journal of Environmental Management.* 1988 (27) 99-108.

Lynch, K. (1992). *Good City Form*, The MIT Press, London. p131.

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

Warnock, S. & Brown, N., Putting Landscape First. *Landscape Design.* No. 268 March 1998. p 44-46.