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BRAAMHOEK - VENUS 400Kv TRANSMISSION LINE VISUAL IMPACT ASSESSMENT

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VISUAL IMPACT ASSESSMENT

1 INTRODUCTION

Margen Industrial Services / PBA International (SA) as the lead consultants for the Environmental Impact Assessment have commissioned Cave Klapwijk and Associates to undertake the visual assessment investigation for the construction of a 400 kV transmission line from the existing Venus Substation near Frere and the proposed Braamhoek Substation near the De Beers Pass, Kwazulu-Natal.

2 BACKGROUND AND BRIEF

The project components will consist of the transmission lines, pylons and access roads.

This visual assessment is a specialist study to determine the visual effects of the proposed Braamhoek-Venus 400 kV Transmission Line Project on the surrounding environment.

The purpose of this Specialist Study is to determine the impact of the proposed project on the visual and aesthetic character of the proposed alternative routes. The rationale for this Study is that the placement of transmission lines may fundamentally alter the landscape character and sense of place of the local environment. The primary objective of this Specialist Study is therefore to describe the potential impact of these structures on the visual character and sense of place of the area. This Specialist Study will have the following objectives:

- Determine the visual character of the areas along the proposed transmission line routes by evaluating environmental components such as topography, current land use activities, surrounding land use activities, etc.;
- Identify elements of particular visual quality that could be affected by the proposed developments;
- Describe and evaluate the specific visual impacts of the preferred 400 kV Transmission Line and associated infrastructure.
- Recommend mitigation measures to reduce the potential visual impacts generated by the proposed power line.

3 STUDY APPROACH

3.1 Method

In order to address the objectives of the study the following method has been used:

- A site visit to determine the setting, visual character and land uses of the areas was undertaken;
- Determine the setting, visual character and land use of the area surrounding the route, and the *Genius Loci* (sense of place);
- Discussions and meetings with the specialist consultant team and Client to identify specific aspects of the construction and development which would affect the visual quality of a setting;
- Define the extent of the affected visual environmental, the viewing distance and the critical views.

The visual impact assessment statements in this report are based on the expert opinion of the authors and attitudes that are generally accepted worldwide.

The assessment is based on the field trip and the agreed alternative routes as determined during a field inspection held on 12, 13 and 14 January 2005.

As this report is set at a scoping level no definitive surveys such as viewshed analysis and visual absorption capacity studies have been undertaken.

3.2 Limitations, Constraints and Assumptions

The following assumptions and limitations are applicable to this study:

- The basis for this assessment is that scenic wilderness areas form the core of eco-tourism due to the high positive aesthetic appeal;
- The assessment does not consider the ancillary project infrastructure and components such as roads, borrow pits, spoil dumps, etc. These components will be assessed in detail during the design phase should the project be implemented;
- The assessment is based on assumed demographic data. No detailed study was done to determine accurate data on potential viewers of the project components. If necessary these studies could be undertaken during the design phase of the project;

- The location and extent of the construction and labour campsites, as well as material lay-down areas will only be determined during the design and construction phases. These are, however, of a relatively temporary nature and can effectively be controlled through the Environmental Management Plan;

- Determining a visual resource in absolute terms is not achievable. Evaluating a landscape's visual quality is both complex and problematic. Various approaches have been developed but they all have one problem in common: unlike noise or air pollution, which can be measured in a relatively simple way, for the visual landscape mainly qualitative standards apply. Therefore subjectivity cannot be excluded in the assessment procedure (Lange 1994). Individually there is a great variation in the evaluation of the visual landscape based on different experiences, social level and cultural background. Exacerbating the situation is the inherent variability in natural features. Climate, season, atmospheric conditions, region, sub-region all affect the attributes that comprise the landscape. What is considered scenic to one person may not be to another (NLA, 1997).

- The impact assessment is undertaken for the preferred western alternative only.

Localised visual perceptions of the economically depressed communities of the population have not been tested as these may be influenced rather by the economic and job opportunities that will exist rather than the direct visual perception of the project.

If the study, however, determined that the negative visual impact is of such a magnitude and significance that it will seriously influence the decision on whether or not to build, it will then be necessary to test and determine the visual perceptions of neighbouring communities. Such a study is involved, costly and time consuming.

4 DESCRIPTION OF THE BASELINE CONDITIONS

4.1 Description of the Works

The proposed project comprises the following development components:

- Power line and Pylons

  The pylons that will support the 400 kV transmission lines will consist of two steel support structures supported by guy wires (Figure 1 Cross-rope Suspension Pylon). The transmission lines will be suspended between the supports. These 35 m tall pylons use far less steel in their

structure than the commonly seen self-supporting pylons. The self-supporting pylons will only be used where the ground is unstable, where the line changes direction or where the terrain is too steep to accommodate the cross-rope suspension structure. The reduced steel quantity has the added benefit in that they are less visible and obtrusive within the landscape.

Self-supporting suspension pylons will be used where there is a change in direction greater than 3°, where space is limited or on steep slopes. These pylons contain considerably more steel than the cross-rope suspension pylons and are more visible in the landscape.

New designs of pylons are currently underway. These are expected to use less steel and hence be even less visible and obtrusive.

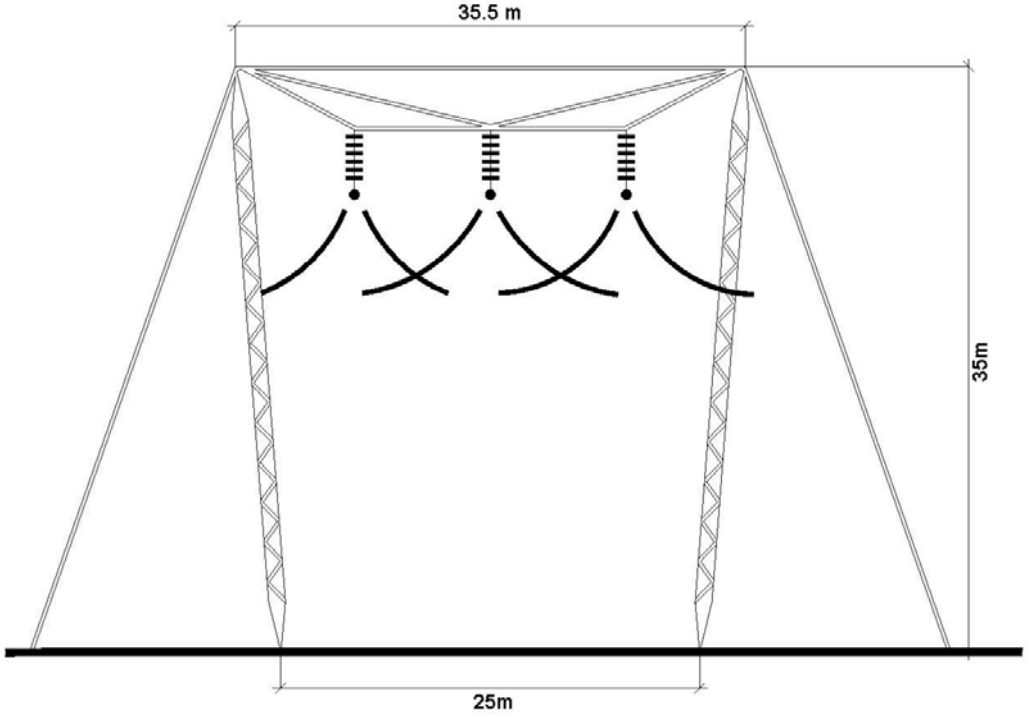

Figure 1: 400 kV Transmission Line Pylon

- Access Roads and Construction Camps

  Access roads will be required to transport personnel to site and for maintenance purposes. In areas that are inaccessible materials are brought in by helicopter. During this period all gates are installed and the tower positions pegged.

Construction camps will need to be developed in strategic positions where they provide the optimum access to as much of the construction route as possible.

- Construction

  Large scraper equipment will be used to establish the access roads. Backactors are generally used to excavate for the foundations.

  Helicopters are used to deliver material and personnel to areas that cannot be accessed by road.

  Construction takes place in phases. The foundations of the towers are laid first, followed by the assembly of the towers on the ground, then the erection of the towers and finally the stringing of the conductors. These operations are not always continuous and each phase would involve a return to the site by the contractors.

  Once the construction is complete, this same representative will ensure that all restoration work has been completed satisfactorily. The landowner will be asked to sign a release from, providing written confirmation that rehabilitation was completed to his satisfaction.

  All areas that will be disturbed such as construction camps, access roads and the construction area around the pylons will be stripped of topsoil which is stockpiled for later use.

- Decommissioning

  Decommissioning of a major transmission line has yet to be undertaken in South Africa. It is assumed that the physical removal of the lines and pylons will be a reversal of the construction phase and that a rehabilitation programme of the land will need to be undertaken.

4.2 Description of the Natural Physical Elements

4.2.1 Eastern Alignment

- Landform

  The southern landform through which the route passes is rolling to undulating with steep valleys that generally run east-west of which the Tugela Valley is the most significant. The northern section from approximately Pepworth to Braamhoek is gently rolling with wider valleys. The northern soils are highly erodable, shallow duplex soils.

- Vegetation

  The southern vegetation, according to Low and Rebelo is classified as Valley Thicket of the Thicket Biome (1998) or Valley Bushveld according to Acocks (1988). The vegetation is well treed with woody species with a canopy of 6 metres.

  The northern vegetation from Pepworth to just south of Braamhoek is classified as Natal Central Bushveld by Low and Rebelo or Southern Tall Grassveld by Acocks. This vegetation is open savannah dominated by *Acacia* sp. The herbaceous layer consists of secondary grasslands.

- Critical Views and Visibility

  The critical views are primarily from the R103 from Frere to Colenso, the area surrounding Colenso, the communities between Colenso and Pepworth, and the communities around Driefontein.

  Tourism facilities that rely on natural landscapes, such as game farms etc., are evident between Frere and Colenso.

  The visibility in the southern section is relatively closed due to the undulating topography and the tall diverse vegetation. These undulations assist in screening the pylons over larger distances.

- Genius Loci

  The spirit, or sense, of place is that quality imparted by the aspects of scale, colour, texture, landform, enclosure, and in particular, the land use. According to K. Lynch (1992) “it is the extent to which a person can recognise or recall a place as being distinct from other places as having a vivid, or unique, or at least a particular, character of its own.”

  The quality of *Genius Loci* is a function of attributes such as the scenic beauty or uniqueness and distinctive character of the built and cultural landscape.

  The spirit of place of the southern section can be described as rural agriculture. This is provided by the relatively undeveloped landscape and the lack of urban and industrial development.

  The spirit of place of the northern section is less definitive in that the route traverses open savannah as well as densely populated rural communities especially around Driefontein.

The southern section is part of the Anglo-Boer War battlefields and these sites impart a cultural / historical sense of place.

- Visual Quality and Character

  The visual quality is the visual significance given to a landscape determined by cultural values and the landscape's intrinsic physical properties (Smardon, *et el*, 1986), while many factors contribute to a landscape's visual quality. They can ultimately be grouped under three headings: vividness, intactness and unity.

  The visual quality of the southern landscape is considered to be moderate due to the intact natural landscape and few human intrusions.

  The visual quality of the northern landscape is considered moderate to low where rural settlements have altered the visual landscape to high in the vicinity of Braamhoek where the landscape is backdropped by the escarpment of the Drakensberg and the unspoilt grasslands.

- Land Use

  Land uses along the route consist mainly of stock grazing, game farms, patches of dry land agriculture, rural settlements and the more formal settlements around Cornfields and Driefontein.

  It is not anticipated that the land uses will change much other than for the expansion of the settlements.

- The Scale of the Landscape

  Visual scale is the apparent size relationship between landscape components or features and their surroundings (Smardon, *et al*, 1986).

  The vertical scale of the southern section is defined by the undulating hills and valleys. The horizontal scale extends to the edge of the hills that disappear in the distance.

  The vertical scale of the northern section is dramatic and overwhelming largely due to the Drakensberg Escarpment which forms the northern backdrop. The scale becomes broad and extensive from Pepworth to approximately Driefontein.

  The capacity of the landscape to absorb the form of changes is regarded as moderate to high in the southern section and low to moderate in the northern section.

4.2.2 Central Alignment

- Landform

  The landform between Venus and Colenso is relatively flat to rolling and generally featureless. From Colenso to Roosboom the landscape changes to a hilly terrain which provides extensive views to the south and the north-northeast.

  The landform from Roosboom to Braamhoek via Besters is undulating.

- Vegetation

  The vegetation from Venus to Chieveley is Valley Bushveld (Acocks, 1988) which has a high canopy and is relatively diverse. The rest of the route (90%) is classified as Southern Tall Grassland (Acocks, 1988) which consists of scattered trees and a grass herbaceous layer that allows for extended views.

- Critical Views and Visibility

  The critical viewpoints are mainly those from the R70, R600 and R103, especially from the rising landform around Roosboom. Extended views of the route are from the scenic De Beers Pass. Although the route bypasses most settlements and towns, the route remains visible from the communities of Roosboom and Besters. The route will be highly visible from the proposed De Beers Pass N3 Highway where it drops down the escarpment.

- Genius Loci

  The sense of place is overwhelmingly defined by the open grassland foothills of the Drakensberg escarpment. Culturally, though not visually, the sense of place in the Ladysmith-Colenso area is defined by the Anglo-Boer Ware battlefields.

- Visual Quality and Character

  The visual qualities of the section from Venus to Roosboom / Ladysmith can be considered low to moderate due to the lack of scenic interplay of landscape elements. The route is visually cluttered with infrastructural elements such as roads, transmission lines, railway lines, towns, settlements, agricultural lands, etc.

  From Ladysmith northwards the landscape becomes less cluttered and more rural with open extended pastoral views where it terminates against the very scenic foothills of the Drakensberg.

- Land Use

  The land uses in the south are predominantly cattle and game farmers. The land uses between Colenso and Ladysmith include also irrigated agriculture and urban settlements. The land use from Ladysmith to Braamhoek reverts back to stock grazing.

  It is not anticipated that these land uses will change or be modified in the foreseeable future.

- The Scale of the Landscape

  The vertical and horizontal scale can be regarded as broad, extensive and horizontal due to the gently sloping topography covered by scattered trees and grasslands. The scale is truncated by the rising landform near Roosboom and again by the massive scale of the Drakensberg escarpment.

  The capacity of the landscape to absorb the form of changes is regarded low to moderate.\

4.2.3 Western Alignment

- Landform

  The landform consists predominantly of a low undulating and featureless landscape interrupted only by minor drainage ways and rounded hills. This landscape is bisected by the hilly region immediately north of the Thukela River Valley where the landform becomes relatively diverse with rolling topography and well defined valleys.

- Vegetation

  The vegetation for most of this route is classified as Southern Tall Grassland (Acocks, 1988). This is interrupted by a large patch of Valley Bushveld along the Thukela Valley and surrounding hills.

  The grassland is very open, short and with only a few trees. The Valley Bushveld area is far more diverse with treed slopes and valleys.

- Critical Views and Visibility

  The route is aligned east and next to the N3 National Road for at least 20 km within 500 m of the viewer. The existing Majuba-Venus 2 line runs through this area. The views are therefore dominant and continuous especially through the grassland areas. The visibility is

somewhat reduced through the hilly areas of the Valley Bushveld vegetation due to the vegetation diversity and the rising backdrop of the hills. Views often extend beyond a distance of five kilometres. Any vertical object within this viewshed will be readily visible. The existing power lines in the area, including the Majuba-Venus 2 line, are a regular part of the views in this area.

Other critical viewpoints are where the route re-crosses the N3 further to the north and the crossing over the R600, R74 and R616 roads and the outskirts of the Frere community.

- Genius Loci

  The *Genius Loci* of the route and surrounding area can be described as rural agriculture. The spirit of place is provided by the undulating open and extensive landscape which provides for a tranquil rural setting. This is reinforced to the north by the dominating Drakensberg. Nevertheless, development in the form of a number of Transmission and Distribution power lines form a common feature of the landscape.

- Visual Quality and Character

  The visual quality is considered to be moderate due to the lack of visual interest or diversity within the relatively featureless landscape. The scene is not vivid although the wide open spaces and grassland can be regarded as unifying the space. Notwithstanding the lack of vividness the area imparts a rural and visually attractive and uncluttered character to the surrounding landscape. This character reinforces an ambience of a rural / agricultural setting. The existing power lines are not seen to significantly alter this character.

- Land Use

  The route passes through a landscape utilised predominantly for stock farming and arable agriculture.

- The Scale of the Landscape

  The broad, extensive and horizontal scale of the landscape with little vertical definition, except on the visual periphery, is due primarily to the low undulating topography covered with grassland.

  The vertical scale is largely due to the lack of definition except for the rising hills north of the Thukela River and the Drakensberg on the northern and western visual periphery.

5 IDENTIFICATION OF RISK SOURCES

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as both negative and positive.

5.1 Construction Phase

It is anticipated that the major risk source during construction would be:

5.1.1 Negative Risk Sources

- Excessive cleaning and stripping of topsoil for site offices, servitudes and temporary access road;
- The relatively random and disorganised lay down of building materials, vehicles and offices;
- Cut and fill slopes of access roads become highly visible if not re-vegetated and shaped to blend in with the existing topography;
- The extent and intensity of the security and construction lighting at night;
- Dust from construction activities;
- Open and unrehabilitated landscape scarring;
- Uncontrolled exploitation of borrow pits and quarries without compliance to environmental controls related to aesthetic rehabilitation;
- High seed bank of alien species such as Black Wattle (Acacia mearnsii) in the topsoil can lead to the uncontrolled spread of this exotic invader plant species along the edges of the transmission line servitude. This could create a treed edge that is visually contrary to the low grasslands; and
- Location and layout of construction workers camp if located in proximity of works area.

5.1.2 Positive Risk Sources

- Image of construction activity could lead to a perceived view of progress and benefit to the community.

5.2 Operational Phase

5.2.1 Negative Risk Sources

- Site engineering such as cuts and fills, could remain aesthetically incompatible with surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated;

- Areas and / or specific sites of high aesthetic value may be disfigured by the introduction of project components such as pylons and power lines within the viewshed resulting in a permanent change to the existing visual quality of visually sensitive areas; and

- Need to keep servitudes clear of vegetation, especially in commercial plantation areas, will result in visual scarring.

5.2.2 Positive Risk Sources

- The Braamhoek-Venus Transmission Line could be the visual affirmation of progress and prosperity for the region.

6 IMPACT DESCRIPTION AND ASSESSMENT

6.1 Introduction

This assessment focuses on the Western Alignment only. The reason for this is that the consensus of the assessment team was that this alignment, for various reasons, was the preferred route.

6.2 The Visual Analysis

This section describes the aspects which have been considered in order to determine the intensity of the visual impact on the area. The criteria includes the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints.

The focus of this study is specifically on the main project components such as the power lines, pylons and access roads and not on the ancillary infrastructure.

6.2.1 The Viewshed

The viewshed is a topographically defined area which includes all possible observation sites from which the project will be visible. The boundary of the viewshed, which connects high points in the landscape, is the boundary of possible visual impact (Alonso, et al, 1986). Local variations in topography and man-made structures would cause local obstruction of views. The viewshed for the route based on the field work extends for the main part beyond a distance of five kilometres.

6.2.2 The Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988).

Thus, the visual impact at 1000 metres would be approximately a quarter of the impact as viewed from 500 metres. Consequently, at 2000 metres, it would be one sixteenth of the impact at 500 metres. The view of the project components would appear so small from a distance of 5000 metres or more that the visual impact at this distance is insignificant. On the other hand the visual impact of the project components from a distance of 500 metres or less would be at its maximum.

6.2.3 Critical Views

Due to the linear nature of the proposed project it is not possible to provide an adequate descriptive analysis of visibility by plotting sections to determine the line of sight from the observer towards the project components to indicate the extent to which the elements are not screened by the intervening landforms or structures.

6.2.4 The Visual Absorption Capacity

The Visual Absorption Capacity (VAC) is a measure of the landscape's ability to visually accept /accommodate or embrace a development. Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them. In this case the VAC has been defined as a function of three factors.

Due to budgetary constraints a full VAC determination was not possible. It was, therefore, prudent to determine the VAC based on the author's field experience.

- Slope
- Visual pattern (landscape texture) with regard to vegetation and structures (including existing powerlines)

- Vegetation height

It is therefore concluded that the VAC of the three alternative routes are regarded as follows:

- Eastern Alternative – Southern Section is high
- Central Alternative – Northern Section is moderate to low
- Western Alternative – Moderate to Low

6.3 The Visual Impact

The visual impact of the project and associated structures in the landscape is a function of many factors (Table 2). Some of the factors are measurable such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective viewpoints, which are extremely difficult to consistently categorise the opinion of the community. Studies in the U.S.A. have shown that professionals and environmental groups view modification of the natural landscape more negatively than other groups (McCool, et al 1986).

The critical appraisal of the visual impact of the project and associated works on the landscape is presented from the viewpoint of the informed citizen and professional. To the community surrounding the proposed project, it may well be that they do not, or will not, object to the visual intrusion in their immediate environment. It may be that they welcome it since they could perceive it as a symbol of prosperity and personal advancement opportunity.

6.3.1 The View Distance

The visual impact of the project and associated structures will reduce exponentially as the viewer moves further away from the proposed structures (Hull and Bishop, 1988).

The pylons will exert a high visual impact within the 500 m and 1 000 m zone. The transmission line will be visible for at least twenty kilometres adjacent to the N3 National Road.

The viewshed analysis, based on the field experience, has indicated that the proposed transmission line will be visible in certain areas beyond the 5 000 m zone especially when viewed from the higher lying areas such as the De Beers Pass and the north-west areas west of the N3.

The servitude, if cleared of vegetation, and the construction access road will be visible, especially where the vegetation is diverse, for an extended distance beyond the 5 000 m zone, if viewed from an elevated position. This

scar will be visible until rehabilitation is complete. Fortunately much of the vegetation is grassland.

6.3.2 Critical Viewpoints

Due to the linear nature of the proposed route specific viewpoints for the transmission line were not selected. However, areas with high volumes of traffic, areas with tourism potential and undeveloped rural areas with high scenic value were regarded as critical view zones against which the visual impact would be evaluated.

Critical views were determined during the field trip and from the 1:50 000 topographical maps. Critical views considered were those views from where the majority of people could see the lines such as the N3, De Beers Pass, provincial road crossings and towns such as Frere.

The impact of the transmission lines is tempered somewhat by the fact that the route is visually modified by existing transmissions lines within the servitude and major roads.

6.3.3 Extent and Spatial Scale

The visual impact for both the construction and operation phases will occur on a local to regional scale due to the considerable length of servitude adjacent to a national road and the view that extends to the edge of the viewshed or beyond a distance of five kilometres.

The visual impact extends beyond the 5 000 m zone for a considerable proportion of the route. This is especially so for the section between the Drakensberg foothills and the R600.

The general lack of effective screening, specifically the northern half through the grassland, in the form of existing landform and trees from critical viewpoints, does not fully assist in limiting the extent of the impact. Readjusting the alignment to the valleys, avoiding alignment along ridges and crests, rather follow necks and gaps through higher lying areas will help mitigate the impacts.

6.3.4 Duration

The duration of the impact during construction will be short term due to the relatively short construction period and the rehabilitation of the disturbed areas.

The duration of the impact during the operational phase will be long term, in other words greater than 15 years, with the impact terminating only after a possible decommissioning of the transmission line.

6.3.5 Intensity or Severity

The intensity of the visual impact during construction will be high within the 500 m zone wherever roads are encountered either alongside or crossing the route due to the fact that the majority of viewers will be exposed to the impacts within this zone.

During the operational phase the visual impact of the transmission line within the 500 m zone will be medium to low as the construction vehicles, camps and stockpiles will be removed and surfaces to disturbed areas will be rehabilitated and the line will be tempered by the existing line adjacent to it.

It is not possible to screen the transmission line from the majority of the viewers, namely the road users.

Due to the fact that the line runs parallel on the east or west of the N3, it will be often viewed in silhouette. It will run parallel with the existing 400kV line that is of similar height, though the design of the cross-rope suspension towers will be less visually intrusive than the existing towers.

Beyond the 1 500 m zone the intensity of the impact becomes low due to the flat to rolling topography. The severity diminishes significantly from the 2 500 m zone to the 5 000 m zone where the impact can be regarded as insignificant due to the flat topography and extended viewing distance.

The visual impact intensity remains medium for both the construction and operational phases.

6.3.6 The Probability of Occurrence

The construction and operational impact described is probable but can be ameliorated to a certain extent by positioning the route alignment lower down in the valleys rather than along the ridge lines.

6.3.7 Magnitude and Significance

It is considered that the significance of the impact of the construction phase is medium to high due to the fact that it is of a short, but intense, duration. The extent will be the full length of the route.

The significance of the operational phase will remain medium even though the route will be rehabilitated and that it will become relatively unobtrusive in

the landscape where suitably aligned except where the route breaks the skyline, crosses or runs closely adjacent to roads due to the relatively long section of the route where it runs parallel with the N3 within the 500 m zone. That the landscape is already affected by the existing Majuba-Venus 2 400kV line is seen to reduce the significance of the impact from a potentially high status.

6.3.8 Status of the Impact

The impact status of the transmission line is considered medium negative for the construction and operational phases.

6.3.9 Degree of Confidence in Predictions

The degree of confidence that the visual impacts will occur is high.

6.3.10 Legislation

There are no specific legal requirements in the NEMA Act specific to the infringement of the visual attributes of the region. The National Heritage Resources Act No 25, 1999 requires that cultural sites and landscapes are protected against physical and aesthetic change.

7 RECOMMENDED GENERAL MITIGATION / MANAGEMENT MEASURES

7.1 Route alignment

The alignment of the new line is constrained by the fact that the vacant servitude runs parallel to an existing line. However, should any realignment be required during the design phase the following should be considered:

Align the route through the lower lying landforms and off the ridge lines. This is to maximise the backdrop screening effect of the topography that will reduce presenting the transmission line in silhouette.

Plan the route so that the route crosses existing main routes is as close to 90° as possible as this will reduce the time that the line is in the viewshed of the passing motorist / viewer.

Align the route as south as possible to avoid most of the visitor access roads, this avoiding the opportunity to view the transmission lines in silhouette. However, if the alignment remains within the existing servitude this mitigation proposal is without merit.

Avoid aligning the route along the top of ridges. Should it be necessary to cross a ridge it is preferable to cross directly over rather than at an angle.

This will limit the extent that the transmission line will be visible. Attempt to cross over at a depression such as a neck or saddle in the ridge. This will limit the visual effect of any pylon standing proud above the ridgeline.

Align the route, where possible, away from any main road where the two are parallel in relative pristine areas to where distance will mitigate the impact or to where the topography will form a screening backdrop.

Table 1: Impacts on the Visual Environment

Table 1.1 Braamhoek-Venus 400kV Transmission Line Western Route		
Theme	Aesthetics	
Nature of impact	***Visual Impacts***	
Stage	**Construction and Decommission**	**Operation**
Extent of impact	Regional	Regional
Duration of impact	Short term	Long term
Intensity or severity	High	Medium
Probability of occurrence	Highly probable	Highly probable
Status of the impact	Negative	Negative
Legal Requirements	National Heritage Resources Act No 25, 1999	National Heritage Resources Act No 25, 1999
Accumulative Impact	Low	Medium
Level of significance	**Medium to high**	**Medium**
Mitigation measures	Options for re-alignment are limited. However, if possible consider the following: re-align away from the N3. Avoid ridges and peaks. Place route on footslopes so that topography can form a backdrop to avoid silhouette or breaking the skyline. Limit extent of landscape disturbance. Align route through areas of great visual and topographical diversity.	None
Level of significance after mitigation	**Potentially medium to high**	**Medium**
EMP requirements	Yes – environmental rehabilitation	None
Discussion: The visual impact of the transmission line is medium to high as it is within a landscape that does not lend itself to natural screening or blending. Furthermore, it is contained within an existing servitude that does not allow for alignment adjustment to mitigate the impact. The VAC of the area is considered low and therefore that landscape has difficulty in visually absorbing the visual change.		

7.2 Earthworks and Landscaping

The visual impact during construction will be moderately significant and little can be done about reducing the effect since the works cannot be screened.

The mitigation measures for the transmission line during operation will need to focus on effective rehabilitation of the construction corridor and work sites. These specifications must be explicit and detailed and included in the contract documentation (Environmental Management Plan) so that the tasks can be costed and monitored for compliance and result.

The galvanising of the pylon should be allowed to weather to a matt grey finish rather than be painted silver, as is often the case. This allows the structures to blend in with the existing environmental colours more readily than the silver which is highly reflective especially early morning and late afternoon. Should it be necessary to paint, it is recommended that a neutral matt finish be used.

Sculpturing or shaping the cut and fill slopes of access roads to angles and forms that are reflected in the adjacent landscape can reduce the visual impact. By blending the edges with the existing landforms the visual impression made, is that the project component has followed a natural route provided by the landscape, rather than been 'engineered' through the landscape.

For access / service roads and servitudes avoid straight edges and corridors. These lines should complement the landscape through which they pass (Litton, 1980).

Special attention should be focussed on the width of servitude actually required for the construction and operational phases. There is a tendency to make these servitudes wider than necessary and access roads built to a higher engineering specification than required for a single lane 4x4 maintenance vehicle track.

Vegetation stripping should be done in a manner where the edges are organic (non-geometric) or curvilinear rather than straight or sharp edged as viewers tend to form positive visual impressions such as "gentleness" and "delicacy" and tend to object to negative visual impressions such as "rough", "rugged" or "violent" (Ribe, 1989). When disturbances in the landscape are viewed from a distance, those with irregular lines, rather than straight lines appear to blend in with the natural configuration and lines in the landscape (Schaefer, 1967).

It is essential that all cut and fill slopes, as well as all areas disturbed by construction activity, are suitably topsoiled and vegetated as soon as is

possible after final shaping. The progressive rehabilitation measures will allow the maximum growth period before the completion of the project.

All areas affected by the construction works will need to be rehabilitated and re-vegetated. This includes the areas beyond the works area such as temporary access roads, construction campsites, workers campsites, borrow pits, laydown areas, etc.

The special conditions of contract must include for the stripping and stockpiling of topsoil from the construction areas for later re-use. Topsoil is considered to be at leas the top 300 mm of the natural soil surface and includes grass, roots and organic matter. The areas to be cleared of topsoil should be all areas that will be covered by structures, roads and construction camps. The presence of degraded and disused roads and areas left over after development that are not rehabilitated, could present a high perceptual visual impact. These areas should be topsoiled and re-vegetated.

All existing large trees that fall outside the earthworks area must be retained. These will assist in softening the forms of the structures and obscure views to them.

Dust generated by construction activity and the haulage of materials and equipment will need to be suppressed by regular wetting.

The importance of suppressing the visual aspects of dust cannot be over-stressed since the visibility will generate the impression of a polluting industry.

8 DISCUSSION

This study described the natural physical environment for the three alternative routes. However, the impact assessment was undertaken for only the western alignment as per the Terms of Reference. This study evaluated the visual impact of the Braamhoek-Venus Transmission Line with a view to assessing its severity based on the author's experience, expert opinion and accepted techniques.

8.1 Evaluation of the Western Alignment

Table 2, Visual Assessment Criteria Ratings, rates each criteria from high, medium to low according to the specific characteristics of that criteria. Table 3 Site Evaluation, lists for each criteria the visual criteria rating and the visual impact of the component on these criteria,

The Eskom Braamhoek-Venus Transmission Line will exert a negative influence on the visual environment. This is largely due to:

- high visibility of transmission lines from 20 kilometres of N3 National Road;
- high visibility of construction and operation activity within large areas of uniform visual pattern, scenic areas such as De Beers Pass and road crossings;
- the low visual absorption capacity of the setting which is attributable to:
  - relatively undulating topography;
  - the low vegetation height (less than one metre);
  - the lack of visual diversity; and
  - a general lack of rising landforms as a backdrop for most of the route; and
- the height of the pylons could be dominant in the landscape if mitigation is not built into the planning process.

The significance of the visual impact during construction is regarded as medium to high due to the construction activities. This is, however, of a short duration until the rehabilitation is complete.

The overall significance of the visual impact of the transmission line during operation is regarded as medium negative rather than high given the existence of the Majuba-Venus 2 and other power lines in the area. Although it is not possible to screen the transmission lines, the placement of the route where it is not readily seen in silhouette, will assist in minimising the visual impact. Furthermore the power line is often viewed from extended distances which diminish considerably the visual intrusion to where it becomes insignificant at distances beyond five kilometres.

In conclusion, it is the author's opinion that, although the western alignment is regarded, tentatively, by the assessment team to be the preferred route, from a visual point of view the eastern alignment is the least sensitive. This is due to the already visually disturbed areas, the diversity in landform and vegetation and the higher VAC which helps to blend the transmission line with the landscape.

Table 2: Visual Assessment Criteria Ratings

CRITERIA	HIGH	MEDIUM	LOW
1. Visibility	Very visible from many places beyond 1000 metre zone	Visible from within the 1000 metre zone but partially obscured by intervening objects.	Only partly visible within the 1000 metre zone and beyond due to screening by intervening objects.
2. Genius Loci	A particularly definite place with an almost tangible dominant ambience or theme.	A place which projects a loosely defined theme or ambience.	A place having little or no ambience with which it can be associated.
3. Visual Quality	A very attractive setting with great variation and interest but no clutter.	A setting which has some aesthetic and visual merit.	A setting which has little aesthetic value.
4. Visible Social Structures	Housing and/or other structures as a dominant visual element.	Housing and/or other structures as a partial visual element.	Housing and/or other structures as a minor visual element.
5. Surrounding Landscape Compatibility	Cannot accommodate proposed development without it appearing totally out of place visually.	Can accommodate the proposed development without appearing totally out of place.	Ideally suits or matches the proposed development.
6. Character	The site or surrounding area exhibits a definite character.	The site or surrounding area exhibits some character.	The site or surrounding area exhibits little or no character.
7. Scale	A landscape which has horizontal and vertical elements in high contrast to the human scale.	A landscape with some horizontal and vertical elements in some contrast to the human scale.	Where vertical variation is limited and most elements are related to the human and horizontal scale.

CRITERIA	HIGH	MEDIUM	LOW
8. Visual Absorption Capacity (VAC)	The ability of the landscape to easily accept visually a particular development because of its diverse landform, vegetation and texture.	The ability of the landscape to less easily accepts visually a particular development because of a less diverse landform, texture and vegetation.	The ability of the landscape not to visually accept a proposed development because of a uniform texture, flat slope and limited vegetation cover.
9. View Distance	If uninterrupted view distances to the site are > than 5 km.	If uninterrupted view distances are < 5 km but > 1 km.	If uninterrupted view distances are >500 m and < 1000 m.
10. Critical Views	Views of the project are to be seen by many people passing on main roads and from prominent areas i.e. towns / urban areas / settlements, game farms, guest farms / lodges, hiking routes.	Some views of the project from surrounding towns / urban areas / settlements, main roads and game farms / lodges.	Limited views to the project from towns / urban areas / settlements, main roads and game farms / lodges.

Table 3: Site Evaluation: Western Route

CHARACTERISTICS	VISUAL CRITERIA RATING	VISUAL IMPACT
1. Visibility	High	High
2. Genius Loci	Medium	Low
3. Visual quality	Medium	Medium
4. Social structures	Low	Low
5. Surrounding landscape compatibility	Medium	Medium
6. Character	Medium	Medium
7. Scale	High	Medium
8. VAC	Low	Medium
9. View Distance	High	High
10. Critical Views	High	High

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