Proposed Tshwane Strengthening Project
between the
Apollo and Verwordburg Substations
and Kwagga and Phoebus Substations

Visual Impact Assessment – Scoping Report

Produced by:
MetroGIS (Pty) Ltd.
PO Box 384, La Montagne, 0184
Tel: (012) 349 2884/5 Fax: (012) 349 2880
E-mail: mgis@metrogis.co.za
www.metrogis.co.za

Produced on behalf of:
Savannah Environmental (Pty) Ltd.
PO Box 148, Sunninghill, 2157
Tel: (011) 234 6621 Fax: 086 684 0547
E-mail: zama@savannahSA.co.za Web: www.savannahSA.com

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Stephen Townshend from MetroGIS (Pty) Ltd undertook the visual assessment in his capacity as a visual assessment and Geographic Information Systems specialist. Stephen has several years of practical knowledge in spatial analysis, digital mapping and graphic rendering, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are utilised in specialist contributions to Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

Savannah Environmental (Pty) Ltd appointed MetroGIS (Pty) Ltd as an independent specialist consultant for the visual assessment. Neither the author, nor MetroGIS will benefit from the outcome of the project decision-making.

1. Introduction and Background

Eskom Holdings Limited intends to connect the Apollo Substation in the Midrand area to the Verwordburg Substation of the same area, as well as connecting the Kwagga substation in the Atteridgeville area with the Phoebus substation in the Shoshanguve area.

The study area for the Apollo-Verwoerdburg line lies immediately south of Centurion (Tshwane Municipality) and is adjacent to the Rietvlei Dam Nature Reserve. Major roads in the area include the R21, M18, and M57 running north-south roughly through the middle, The Olifantspruit River and some of its tributaries account for the most prominent hydrological features of the area flowing roughly south to north through the middle of the study area. Land uses include mostly agricultural holdings. The topography of the area is described as undulating hills.

The study area for the Kwagga-Phoebus line stretches from Kwaggasrand in the south to some parts of Shoshanguve in the north and Ga-Rankuwa in the west. There are many arterial routes running the length and breadth of this study area as indicated on the locality map. Due to the size of the study area and proximity to the City of Pretoria, the land uses include many varied types ranging from protected natural environments to heavy industrial zones, and everything in between. Prominent hydrological features include the Skinnerspruit in the south and the Sand River with many tributaries in the west and northwest. Prominent geological features include the Daspoortrand ridge and the Magaliesberg to the south. The topography of the area is described as gentle plains in the north with distinct ridges in the south.

The natural landcover has been extensively altered by urbanisation and agriculture over most of both study areas. However, significant Nature Reserves and other protected areas are found either within or in very close proximity to the proposed strengthening projects.

2. Scope of Work

This report intends to establish the degree of visual impact of the various alignment alternatives through the use of viewshed analyses for each alternative. These analyses give a good indication of the general visibility of the proposed structures and thus show where potential visual impacts will occur. Other data such as roads, residential zones, or natural features may be overlayed onto the viewshed analysis in order to identify which potentially sensitive visual receptors are likely to be experience the impact. Furthermore, the proximity of visual receptors to the proposed development can also be accurately plotted, thus providing a reasonable means of gauging the degree of visual impact and can be used in conjunction with a sensitivity index to quantify the this impact for the purposes of comparison.

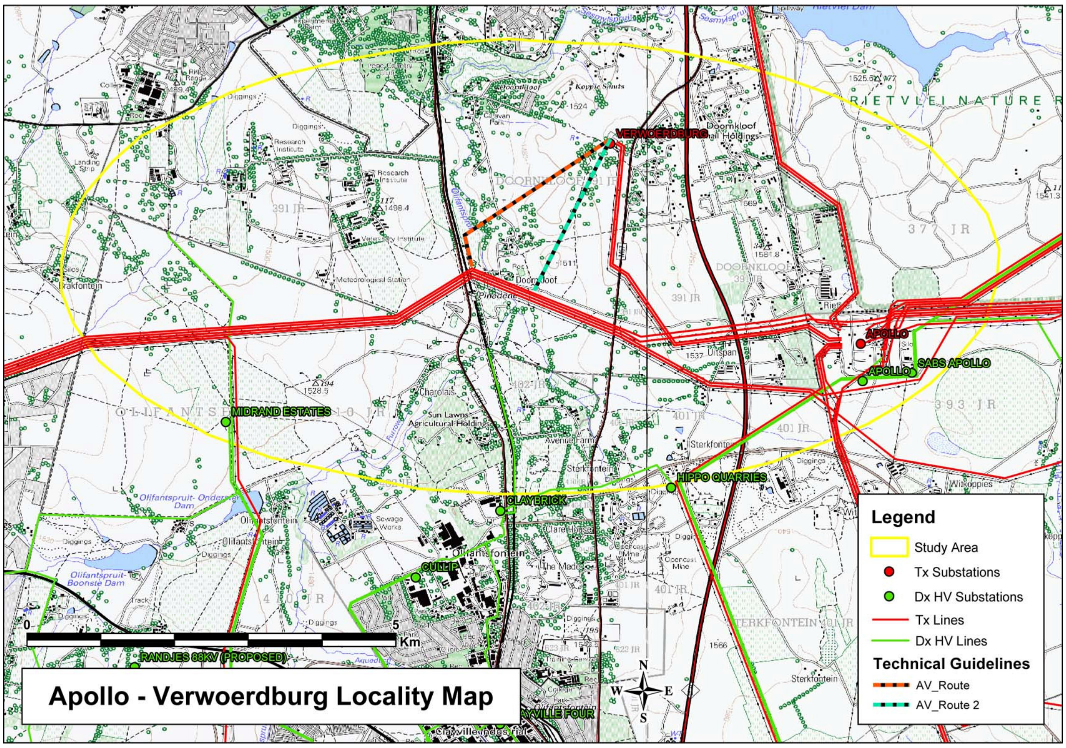
3. Methodology

A visual impact assessment entails a process of data sourcing (collection of data during field work or from other institutions), data capturing (if needed), and data analysis (spatial operations requiring the above input data), and mapping (representation of data for visualisation and interpretation). GIS technology is uniquely suited to this task as it provides a single platform from which to generate, collate, update, and represent all relevant spatial data.

Of crucial importance to a visual impact study is the viewshed analysis which involves a spatial calculation of line-of-sight from a point or series of points to all other points on a digital terrain model (DTM). Parameters such as feature height and viewer height can be set as well as number of points. If more than one feature point is placed, an exposure viewshed can be created which indicates how many points can be seen from where. The viewshed analysis is overlaid onto either topographical maps or aerial photos to show where the proposed development is potentially visible and where it is not. It is worth noting, however, that vegetation does not form part of the DTM and any potential screening effect it might have is thus not included in the viewshed analysis. The contour data used to generate the DTM for the area is taken from the standard SG 1:50 000 topographical maps (20m interval) and merged to form a single dataset. A viewshed analysis is generated from the DTM for each alternative from a point where the highest structure occurs or from several points along a linear route.

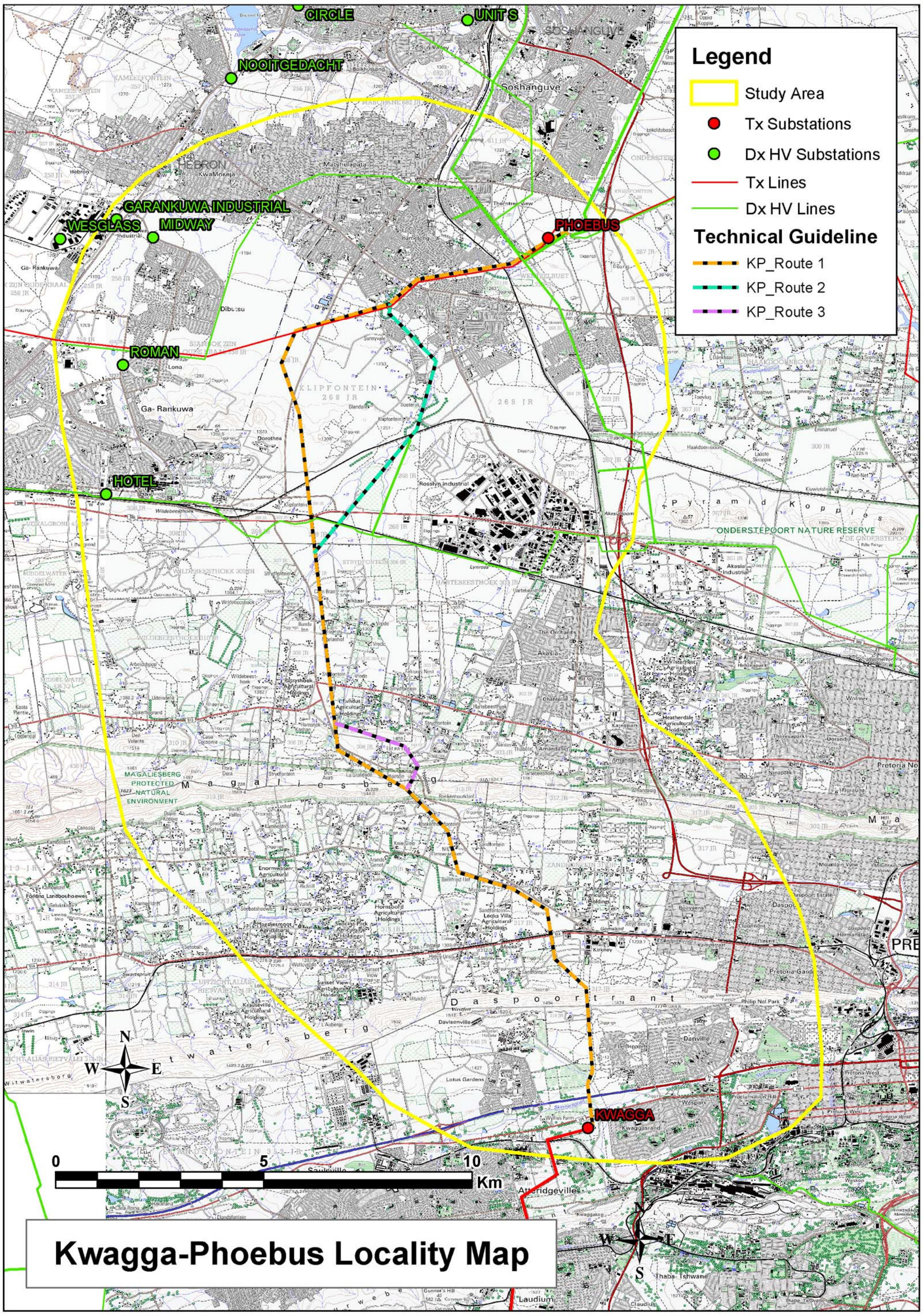
4. Alignment Alternatives: Apollo-Verwoerdburg

Two alternative alignments have been identified that link up with existing transmission line infrastructure rather than directly connect the two substations. The routes are comparatively short in length but are very close to a ridge in the area that in turn has serious implications for visibility and degradation of the visual quality of the immediate area. The locality map below indicates the proposed alignments.



5. Alignment Alternatives: Kwagga-Phoebus

Three alternatives have been identified with much of the length being common to all three. Alternatives 2 and 3 may be viewed as sub-alternatives for the places where Alternative 1 is in close proximity to sensitive features, such as a ridges or protected natural environments. The locality map below indicates the proposed alignments.



6. Assumptions

It is understood that the type of power line in the various alignments will be of the same type and thus no difference in visual impact is anticipated in this regard. All alignments routes used to generate viewshed analyses are thus at the same height above ground level.

Vegetation is difficult and time-consuming to include in a viewshed analysis and is thus not included in the scoping phase. If after investigation it is deemed to constitute a significant change in the results of the viewshed analysis, and by extension the sensitivity analysis, vegetation may be either digitized manually or extracted from satellite imagery to form part of the analysis of the EIA phase.

7. Findings and Implications

8. Conclusions and Recommendations

It is recommended that a finer resolution DTM be generated using the 5m contour dataset for the Tshwane area in order to refine the viewshed analysis to a more accurate level of detail. Individual visual receptors will be more easily and conclusively identified than with a coarse DTM generated from 20m contours.

It is recommended for the EIA phase that the more accurate viewshed analysis mentioned above be merged with two other datasets, namely a proximity analysis and a land use classification, to form a sensitivity analysis that incorporates the value of information of all three into a one dataset. A sensitivity analysis will need to be done on all alternatives emerging from the scoping phase as viable. It is envisaged that area calculations of each sensitivity analysis will provide a quantified estimate of the overall visual impact of each proposed alternative, thus providing a quantifiable means of establishing a preference ranking.