E02.JNB.001277

Eskom Distribution – Mookodi Integration Project – Visual Impact Assessment Report

August 2012

A Specialist Report for: SiVEST Environmental

SSI
A DHV COMPANY
ENGINEERS AND ENVIRONMENTAL CONSULTANTS
Linking People. Promoting Growth.

Tel: +27 (0) 11 798 6000
Email: pauld@ssi.co.za
Building No 5, Country Club Estate, 21 Woodlands Drive, Woodmead, 2191

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APPENDIX A: LOCALITY MAPS

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Specialist Declaration

I, Paul da Cruz, declare that I –

- act as an independent specialist consultant in the field of visual impact assessment
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have 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 Environmental Impact Assessment Regulations, 2006; and
- will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

PAUL DA CRUZ

1 INTRODUCTION

SiVEST have been appointed by Eskom Distribution to undertake an EIA study for the proposed development of a number of power lines and associated electricity infrastructure as part of an upgrade of the electricity infrastructure in the Vryburg and Stella areas in the North West Province - the Mookodi Integration Project). As part of the EIA studies being conducted for the proposed development, the need to undertake a visual impact assessment study has been identified by the EIA Team and by a number of stakeholders who expressed concern regarding the potential visual and aesthetic impacts associated with the proposed power lines. Accordingly a scoping-level visual impact assessment study was initially conducted to identify all potential visual impacts and issues related to the proposed development. This study has now been followed up with a more detailed visual impact assessment in the EIR phase.

The EIR-phase study aims to identify how the visual environment and in particular the sensitive receptors within the study area may be affected by visual impacts associated with the proposed power lines. A detailed methodology has been developed to assess the visual impacts associated with the proposed power lines at the level of each receptor.

1.1 Project Description

The proposed project consists of a number of components which are listed below:

☐ Substations:

- the proposed Bophirima 132/88kV Distribution Substation; and
- the proposed Kalplats 132kV Distribution Substation.

☐ 132kV power lines:

- the proposed Bophirima Substation to Kalplats Substation 132kV servitude power line (~89km);
- the proposed Kalplats Substation to the existing Edwards Dam Substation 132kV servitude power line to be stepped down to 88kV at the Edwards Dam substation (~35km);
- the proposed Bophirima Substation to existing Vryburg Municipal Substation 132kV servitude power line (~7km);
- the proposed Bophirima Substation to existing Woodhouse 132kV servitude power line (~0.1km – temporary line until the decommissioning of Woodhouse Substation); and
- the proposed Bophirima Substation to Mookodi Transmission Substation 132kV servitude power line (~14km)[+].

[+] It should be noted that the Mookodi Transmission Substation does not form part of the scope of this project, as environmental authorisation for the substation has been obtained as part of a separate EIA process. However, a single alignment for the Mookodi Transmission Substation site to the proposed Bophirima Substation Alternatives is included as part of the component of this proposed project.

1.1.1 Substations

The proposed substations will occupy an approximate area of 100m X 100m (~10,000m2 or 1ha). The substations will consist of a number of different components, including feeder bays, transformers, a central control room, lightning conductor mast (14m-high) and a bunded oil drainage area (into which transformer oil / liquids would drain in the event of a spillage). The substation would be enclosed by two levels of fencing to secure the area. The substations will also be lit at night (by a number of 400 Watt floodlights) for security and emergency operational maintenance reasons. A number of power lines will typically enter / leave the substation.

1.1.2 Tower Types and Servitudes

It is proposed that both monopole structures (Figure 3) and lattice structures (Figure 4) will be used where appropriate. Single-tern conductor power lines are proposed. Monopole and lattice tower types that are bird-friendly will be used for the proposed power lines. The monopole tower type is approximately 25m in height. The footprint will be unique for each tower based on the ground conditions such as slope etc. A diagram of the proposed tower types are indicated below. Strain towers will also be used (A strain tower is a larger tower utilised in bends and where reinforcement is required with regards to tower stability).

In most cases the land beneath the overhead lines can be used, as normal, by the landowners. Eskom, however, require that no dwellings or vegetation/crops higher than 4m be established within the servitude.

The minimum servitude width for each line will be 31m.

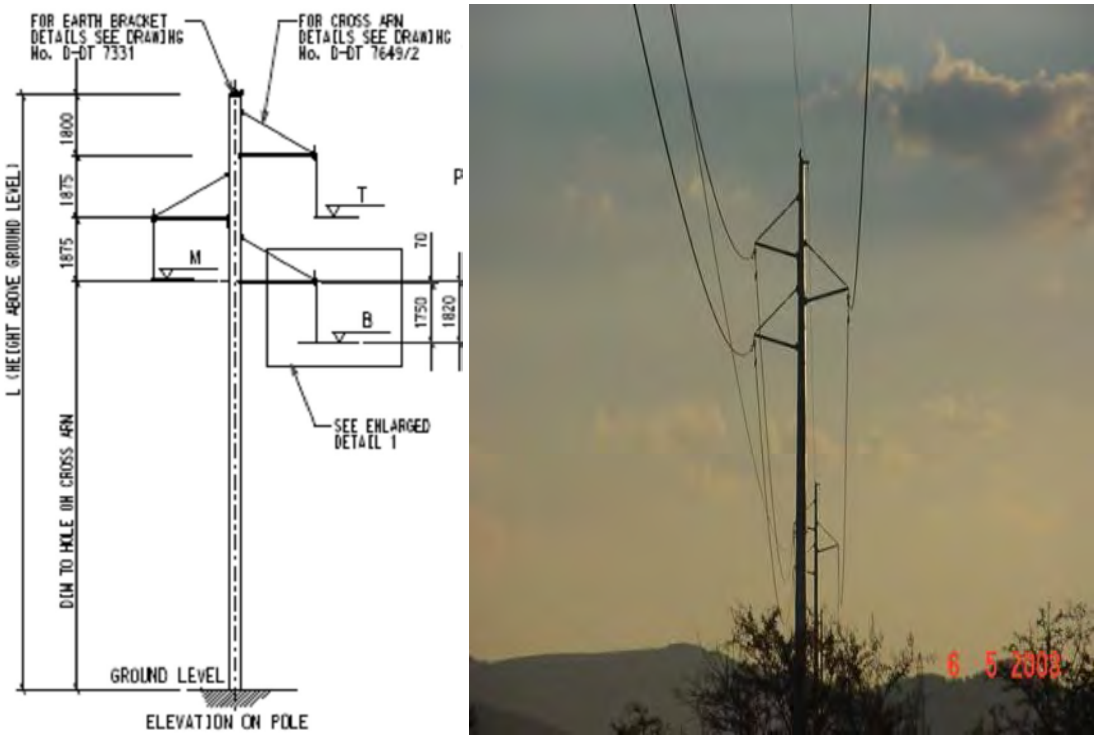
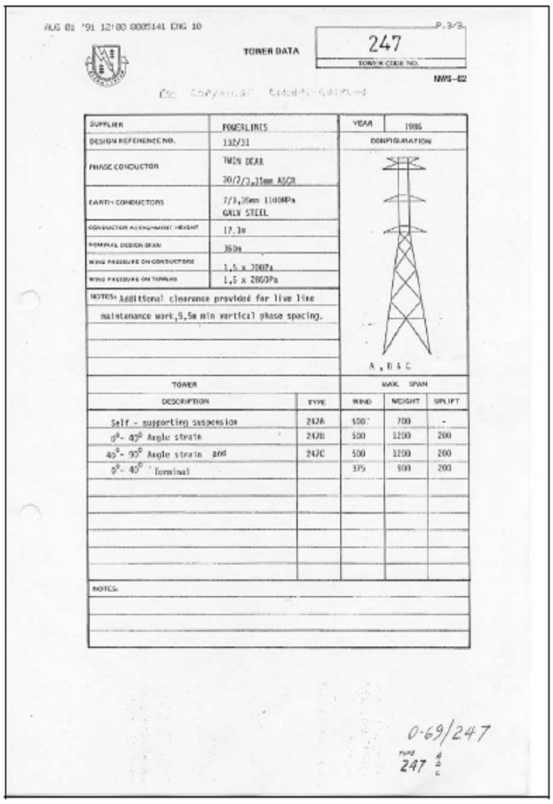


FIGURE 1 – PROPOSED MONOPOLE STRUCTURES



TOWER DATA 247

SUPPLIER	POWERLINES
DESIGN REFERENCE NO.	132/31
PHASE CONDUCTOR	TWIN DEAR 30/7/3,15mm ASCR
EARTH CONDUCTORS	7/3,05mm 1100MPa GALV STEEL
CONDUCTOR ATTACHMENT HEIGHT	17,1m
NOMINAL DESIGN SPAN	360m
WIND PRESSURE ON CONDUCTORS	1,5 x 300Pa
WIND PRESSURE ON TOWERS	1,5 x 200Pa
YEAR	1986
CONFIGURATION	A, B & C

NOTES: Additional clearance provided for live line maintenance work, 5,5m min vertical phase spacing.

TOWER DESCRIPTION	TYPE	MAX. SPAN WIND	WEIGHT	UPLIFT
Self - supporting suspension	247A	600	700	-
0° - 45° Angle strain	247B	500	1200	200
45° - 90° Angle strain and 0° - 45° terminal	247C	500	1200	200
		375	900	200

NOTES:

0·69/247

247 A B C

FIGURE 2 - PROPOSED LATTICE STRUCTURES

1.1.3 Assessment Corridor

A 300m-wide corridor is currently being investigated to allow some flexibility during construction, and to take any site-specific environmental sensitivities into account. The corridor will allow for numerous route alternatives within its width to potentially be selected, and thus forms part of the location alternative assessment. The 31m servitude will be placed within this corridor, unless the EIA studies identify the need to re-route the proposed alignment to avoid sensitive environmental or no-go areas.

The study area is indicated in the map in Figure 3 below.

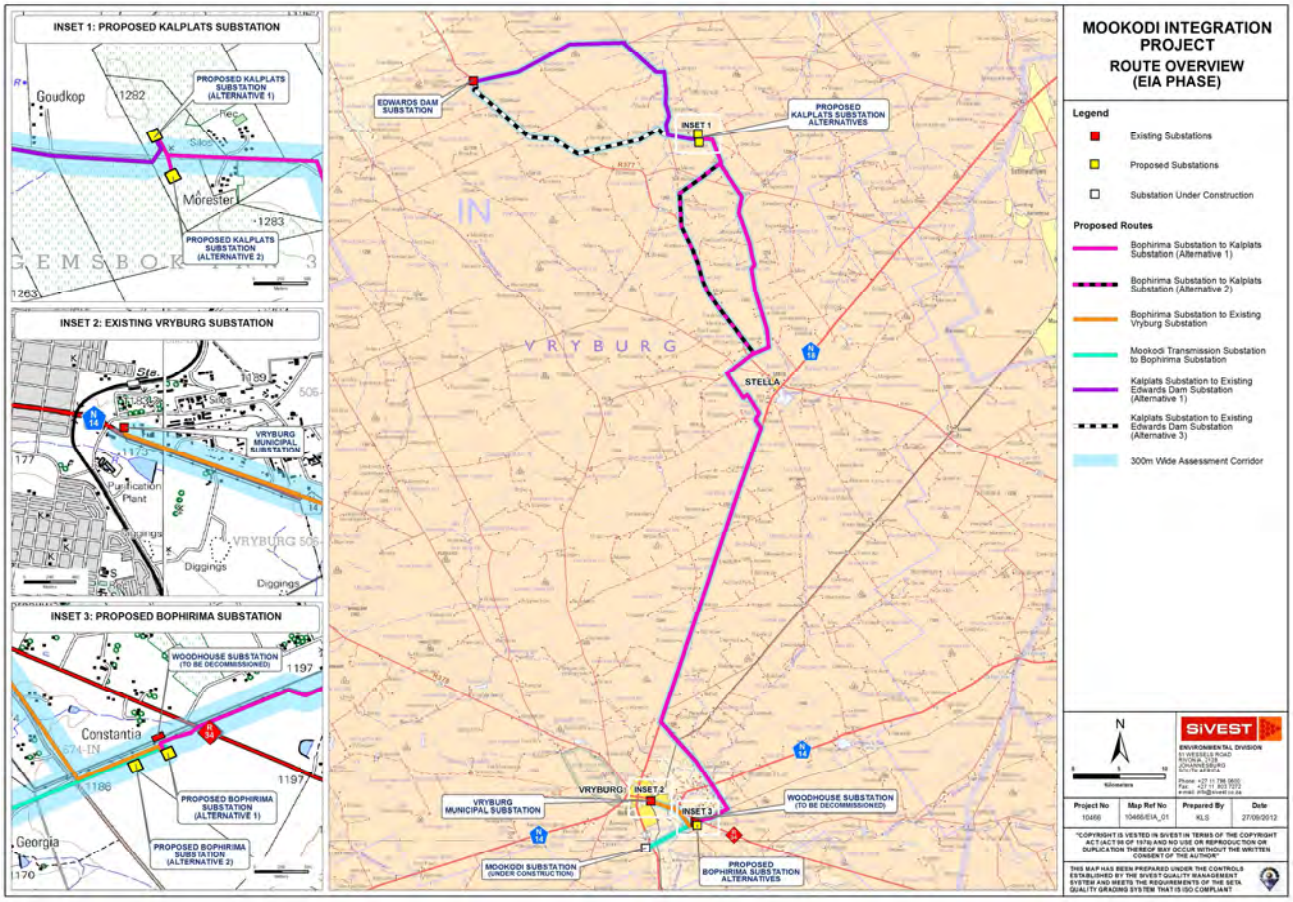


FIGURE 3 – MOOKODI INTEGRATION PROJECT STUDY AREA MAP

1.2 Assumptions and Limitations

The identification of visual receptors has been based on feedback from the public, including potentially-affected landowners and other stakeholders. In addition, analysis of the study area tourism and other recreational facilities has been undertaken to identify sensitive receptor locations. A desktop search for households / farmsteads within the corridor using Google Earth has been undertaken. Lastly notes and observations in the field have been used to add to the list of receptors. It should be noted that not all receptor locations may perceive the proposed power lines in a negative way. Where no receptor or property-specific feedback has been received, a number of broad assumptions have been made in terms of the identification of sensitive receptors; e.g. homesteads / farmsteads in a largely natural setting have been assumed to be likely to be sensitive from a visual perspective.

A matrix has been developed to assist in the assessment of the potential visual impact at each receptor location. The limitations of quantitatively assessing a largely subjective or qualitative type of impact should be noted. The matrix is relatively simplistic in considering four main parameters relating to visual impact, but provides an indicative assessment of the degree of visual impact likely to be exerted on each receptor location by the route of the proposed power line.

Viewsheds have not been generated for the proposed lines due to the complexity associated with generating viewsheds off multiple points on each of the lines. Rather distance banding from the lines has been used to gain an understanding of the level of visual exposure associated with the power line alignments.

The assessment of receptor-based impacts has been based on the proposed alignments for the power lines as provided to SSI by SiVEST. A challenge is posed by the potential ability of the power lines to be placed in a number of locations across the 300m-wide corridor. It is impractical to model or rate these permutations in this report; hence the corridor centre line as provided to SSI has been used for the assessment (in terms of distance banding).

Due to budget limitations visualisation modelling has not been undertaken for the proposed power lines.

1.3 Assessment Methodology

1.3.1 Summary of Study Area Visual Character

A summary of the findings of the Scoping Phase visual study assessment of the Study Area's visual environment has been included in this report to contextualise the assessment of potential visual impacts and associated sensitivity. The summary includes a description of the physical characteristics of the Study Area that affect the visual environment, as well as an assessment of visual sensitivity.

1.3.2 Identification of Sensitive Receptor Locations

The visual study has included a refinement of the identification of sensitive receptors along all line components and alternatives being considered during the EIA phase of the study from those identified in the Scoping Phase. New / additional receptors have been identified based on field-based observation within the new additions to the corridors.

1.3.3 Visual Intrusion Rating Matrix

In order to assess the impact of the proposed power line on the sensitive receptor locations in the study area a matrix that takes into account a number of factors that have a bearing on visual impact is applied to each receptor location within a certain radius of the proposed lines. The matrix has been based on a number of factors relevant to the experiencing of visual impacts, and thus provides a combined assessment of the likely visual impact that would be experienced at each receptor location.

1.3.4 Assessment of Visual Impacts associated with the substations

The visual impacts associated with the construction of the two proposed substations have been assessed. An examination of the components of the substation upgrades has been undertaken to identify potential visual impacts.

2 SUMMARY OF SCOPING PHASE VISUAL STUDY FINDINGS

2.1 Physical Landscape Characteristics and Visual Implications

The macro-geomorphological context of the Study Area determines the nature of the topography, which is largely very flat in nature. Most of the Study Area is located within a very flat area, a characteristic very common to the wider regional area The very flat nature of the topography is a strong factor influencing the types of vistas typically present in the Study Area, as there are few areas of rising ground which would block views and limit viewsheds, and no incised valleys within which views would be restricted. As a result, typically wide-ranging vistas are experienced within the Study Area (where there is no vegetation to block views), especially from locally higher elevations.

The Study Area falls within the savannah biome, and as such is characterised by a mix of grassy and wooded vegetation, with varying densities of tree / shrub and open grass cover reflecting a number of different natural and anthropogenic factors. The flatness of the area combined with the predominance of a very low shrub layer results in a visual environment that is characterised by wide, open vistas. Apart from the urban area of Vryburg and its immediate surrounds, natural low shrubveld was noted to be present across much of the southern part of the Study Area, with limited areas of transformation. In these areas much of the natural vegetation has been cleared to form cattle pastures (open grassy areas) which afford even more wide-ranging vistas

FIGURE 4 – TYPICAL WIDE-RANGING VISTA OVER FLAT TERRAIN IN THE SOUTHERN PART OF THE STUDY AREA

The northernmost reaches of the Study Area fall within the Mafikeng Bushveld vegetation type, which is characterised by relatively 'closed' woodland with medium-sized trees of 2-4m in size being relatively effective in limiting vistas. Much of the natural vegetation has been removed, however, and replaced either with open pastures or areas of dry land maize cultivation, with these areas affording much wider vistas.

The above physical and land use-related characteristics of the Study Area contribute to its visual character. Most of the Study Area can be considered to have a largely natural visual character, with certain parts displaying a rural or pastoral component where maize cultivation and farmsteads occur. Human infrastructure in this setting occurs at a low density, with limited roads, one north-south aligned railway and other structures such as power lines and phone lines typically being aligned along access roads. Closer to the town of Vryburg, in the areas characterised by smallholdings, the density of built infrastructure increases. In these areas the visual character can still be considered largely rural. Only in the light industrial area of Vryburg to the east of the railway line bisecting the town and the town's CBD doe the visual character change completely to an urban-industrial characteristic, with large buildings, warehouses and derelict railway yards characterising this part of Vryburg. Accordingly the area has been assigned to have a low visual absorption capacity and a high visual sensitivity in the context of the potential development of large electricity infrastructure. In assigning these visual sensitivity characteristics however, the potential sensitivity of receptors in the area needs was examined; in the southern parts of the study area the intensive nature of agricultural production along with the proposed routing of power lines along existing linear infrastructure such as roads and existing (albeit smaller) power lines has been assessed to engender these areas with a lower potential level of sensitivity than the northern parts of the study area, where thornveld

vegetation is more predominant, where there is a slightly lesser profusion of human infrastructure, and where certain highly visually sensitive land-uses (such as hunting) occur.

FIGURE 5 – THE SEMI-INDUSTRIAL AREA ON THE OUTSKIRTS OF VRYBURG ALONG THE BOPHIRIMA-VRYBURG ALIGNMENT

2.2 Sensitivity to Visual Impacts and Presence of Sensitive Receptors

Potential sensitivity to visual impacts is closely interrelated to the presence of sensitive visual receptors / receptor locations in the study area. For the purposes of this report, a sensitive receptor is defined as a receptor which would potentially be adversely impacted by a proposed set of power lines or a proposed substation. This takes into account a subjective factor on behalf of the viewer – i.e. whether the viewer would consider the impact as a negative impact. As described below, the adverse impact is often associated with the alteration of the visual character of the area in terms of the intrusion of power lines into a 'view', which may affect the 'sense of place'. Thus receptors of visual impacts in areas / landscapes where the current visual character of the environment is part of the appeal of an area and thus has a socio-economic or cultural importance are more likely to be considered as sensitive receptors. As such a distinction must be made between receptor locations and sensitive receptor locations – receptor locations may be able to view the proposed power lines and substations, but would not necessarily be adversely affected by any visual intrusion associated with the power lines

The low density of human habitation in the rural parts of the study area (mostly isolated farmsteads) entails that there would be a very low density of receptor locations that could be affected by the proposed power lines, In addition as mentioned above most of these are likely to be associated with commercial farming activities and thus unlikely to be highly sensitive to visual impacts. However in the northernmost part of the study area, the Kudu Hills Game Lodge property and the rural farmsteads and Game Farm situated in the area between the proposed Kalplats Substation and the existing Edwards Dam Substation have been identified to be potentially highly sensitive to the proposed power lines, due to the practising of nature-based ecotourism activities, hunting, and due to the value placed in the area related to its natural character and sense of place. Thus most of the sensitive receptors in the study area are located here, as indicated in Figure 6 below.

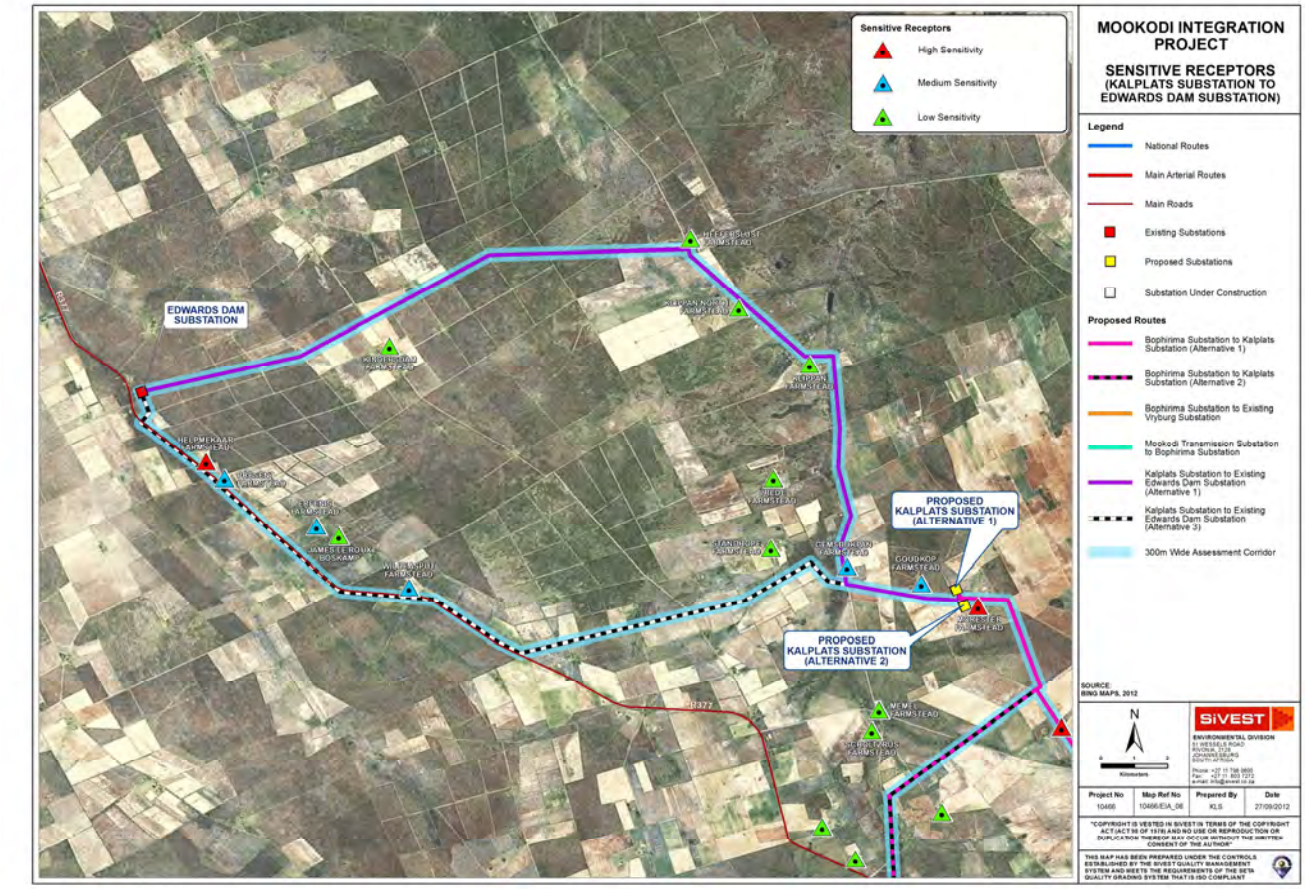


FIGURE 6 – SENSITIVE RECEPTORS IDENTIFIED IN THE KALPLATS SUBSTATION TO EDWARDS DAM SUBSTATION ALTERANTIVE CORRIDORS

2.3 Generic Visual Impacts associated with power lines and substations

Transmission power line towers (Figure 7) are by their nature very large objects and thus highly visible. The standard tower height of a proposed 132kV power line is 25m (equivalent in height to a 7-storey building). The height of a tower / pylon thus means that the pylon is typically visible from a large radius around the tower. A power line consists of a series of towers spaced approximately 200m apart in a linear alignment. The power line consisting of a number of these tall towers spaced linearly is thus typically highly visible.

FIGURE 7 – POWER LINES IN THE NORTHERN-MOST PART OF THE STUDY AREA

The degree of visibility of an object informs the level and intensity of the visual impact, but there are other factors that influence the nature of visual impact. The landscape and aesthetic context of the environment in which the object is placed, as well as the perception of the viewer are also important factors. In the context of power lines, the type of tower used as well as the degree to which the towers would impinge upon or obscure a view is also a factor in the experiencing of visual impacts associated with the power line.

As described above, power lines are not a feature of the natural environment, but are rather representative of human (anthropogenic) intrusion into the natural environment. Thus when placed in a largely natural landscape, power lines can be perceived to be highly incongruous in the context of the setting. The height and linear nature of power lines exacerbate this incongruity with the natural landscape, as the towers can impinge on views within the landscape. In addition, the practice of clearing a strip of vegetation under the power line servitude in certain vegetation types can exacerbate the visibility and incongruity of the power line in a largely natural setting, by causing fragmentation of natural vegetation, thus making the power line more visible, especially from greater distances. The cleared strip of land is often highly visible and draws the viewer's attention to the power line servitude, especially when it occurs within a context of natural thicket / bushveld vegetation where bushes or trees commonly occur.

Power lines are often perceived to be a source of visual impact if they affect or change the visual quality of a landscape. It is in this context of incongruity with a natural setting that power lines are often perceived to be a source of visual impact. The perception of the viewer /receptor of impact is also very important, as certain receptors may not consider the development of a power line to be a visual impact. The perception of visual impacts is thus highly subjective and thus involves 'value judgements' on behalf of the receptor. The context of the landscape character, the scenic / aesthetic value of an area, and the types of landuse practiced tend to affect the perception of whether power lines are an unwelcome intrusion, and thus the sensitivity of receptors to the erection of power lines in an area. Power lines are often perceived as visual impacts where value is placed on the

scenic or aesthetic character of an area, and where activities such as tourism are practised which are based upon the enjoyment of, or exposure to, the scenic or aesthetic features of the area. Sensitivity to visual impacts is typically most pronounced in areas set aside for the conservation of the natural environment (such as protected natural areas or conservancies), or in areas in which the natural character or scenic beauty of the area acts as a draw card for visitors (tourists) to visit the area. Residents and visitors to these areas may perceive power lines to be an unwelcome intrusion that would degrade the natural character and scenic beauty of the area, and which would potentially even compromise the practising of tourism activities in the area.

Conversely, the presence / existence of other anthropogenic objects associated with the built environment may influence the perception of whether a power line is associated with a visual impact. Where buildings and other linear structures such as roads, railways and especially other power lines exist, the visual environment could be considered to be already altered from a natural context and thus the introduction of a new power line into this setting may be considered to be less of a visual impact than if there was no existing built infrastructure visible.

Visual impacts can be experienced by different types of receptors, such as people driving along roads, or people living / working in the area in which the power line is visible. The receptor type in turn affects the nature of the typical 'view' of a potential source of visual impact, with views being permanent in the case of a residence or other place of human habitation, or transient in the case of vehicles moving along a road. The nature of the view experienced affects the intensity of the visual impact experienced. Viewing distance is a critical factor in the experiencing of visual impacts, as beyond a certain distance, even large objects such as power line towers tend to blend in with the landscape. The visibility of an object tends to decrease exponentially with increasing distance away from the object. Other factors, as listed below can impact the nature and intensity of a potential visual impact associated with a power line:

- the location of a power line in the landform setting – i.e. in a valley bottom or on a ridge top. In the latter example the power line would be much more visible and would 'break' the horizon.
- the presence of macro- or micro-topographical features such as buildings or vegetation that would screen views from a receptor position to the power line.
- The number of power lines proposed to run in parallel to each other
- temporary factors such as weather conditions (presence of haze, or heavy mist) which would affect visibility

It is important to note that visual impacts are only experienced when there are receptors present to experience this impact; thus in a context where there are no human receptors or viewers present there are not likely to be any visual impacts experienced.

3 EIR-PHASE SENSITIVE RECEPTOR LOCATIONS

3.1 Sensitive Receptor Locations

The table below lists all of the sensitive receptors that have been identified throughout the EIA to date, that could be potentially visually affected by the proposed power lines. As potential visual impacts would be potentially experienced in the immediate area outside of the corridor, receptors within a 2km buffer outside of the boundary of the corridors have also been included. A 2km buffer outside the boundary of the corridors has been chosen as beyond this distance it has been assumed that the visual impact associated with the power lines would greatly diminish (even if the power lines were located on the boundary of the corridor). The receptor locations are listed in the table below.

TABLE 1 – RECEPTOR LOCATIONS IN THE STUDY AREA

Receptor Location	Type of Receptor	Proximity to Line
Helpmekaar Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 3)
Present Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 3)
Wildeasput Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 3)
Erfenis Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 3)
Standhope Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 1)
Kinderdam Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 1)
Heeferslust Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 1)
Klippan North Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 1)
Klippan South Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 1)
Gemsbokpan Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 1)
Memel Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)
Rustig Farmstead	Farmstead	Bophirima – Kalplats (Alternative 1)
Doorndam Farmstead	Farmstead	Bophirima – Kalplats (Alternative 1)
Waterval North Farmstead	Farmstead	Bophirima – Kalplats (Alternative 1)
Waterval Farmstead	Farmstead	Bophirima – Kalplats (Alternative 1)
Morestêr Farmstead	Farmstead	Bophirima – Kalplats
Taaiboschhoek Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)
Alleskop Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)
Geelhoutkoppie Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)
Dankbaar Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)
Scholtzrus Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)
Plankplaas Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)
Kudu Ridge Lodge and Owners House	Homestead and Tourism Accommodation	Bophirima – Kalplats (Alternative 1)
N14-R34 Homestead	Homestead	Bophirima – Vryburg Municipal
Oppie Koppie Farmstead	Farmstead	Bophirima – Kalplats
Oppie Koppie Farmstead West	Farmstead	Bophirima – Kalplats
Robyn Farmstead East	Farmstead	Bophirima – Kalplats
Robyn Farmstead West	Farmstead	Bophirima – Kalplats
Lushof Farmstead	Farmstead	Bophirima – Kalplats
James le Roux Boskamp	Farmstead	Kalplats – Edwardsdam (Alternative 3)
Vrede Farmstead	Farmstead	Kalplats – Edwardsdam (Alternative 1)
Kromdraai Farmstead	Farmstead	Bophirima – Kalplats (Alternative 1)
Goudkop Farmstead	Farmstead	Bophirima – Kalplats
De Neute Dop Guesthouse and homestead	Homestead and Tourism Accommodation	Bophirima – Kalplats; Bophirima – Vryburg Municipal;

Receptor Location	Type of Receptor	Proximity to Line
		Bophirima – Mookodi
Poppiesdale Farmstead - Bowmans Estate	Homestead	Bophirima – Kalplats
Bowmans Estate - Stand 1	Housing to be built	Bophirima – Kalplats
Bowmans Estate - Stand 13-4	Housing to be built	Bophirima – Kalplats
Bowmans Estate - Stand 23-24	Housing to be built	Bophirima – Kalplats
Smitsrus Farmstead	Farmstead	Bophirima – Kalplats (Alternative 2)

Maps of all of these sensitive Receptor locations have been generated and are presented in Appendix A. The maps show the location of the receptor locations in relation to:

- the proposed alignments within the corridors
- the corridors
- the distance banding associated with the respective corridors

4 IMPACT ASSESSMENT

4.1 Visual Intrusion Matrix

In order to assess the impact of the proposed power lines on the sensitive receptor locations listed above that are potentially affected by the proposed lines, a matrix that takes into account a number of factors to determine the likely level of visual intrusion to which a sensitive receptor location would be subjected has been developed.

The matrix has been based on a number of factors as listed below:

- Distance of receptor away from the lines (distance banding)
- Primary focus / orientation of the receptor
- Presence of screening factors (topography, vegetation etc.)
- Visual context

These factors are considered to be the most important factors when assessing the visual impact of a proposed development on a sensitive receptor. It must be remembered that the experiencing of visual impacts is a complex and qualitative phenomenon, and thus difficult to accurately quantify; thus the matrix should be seen only as a representation of the likely visual intrusion factor of the lines at a receptor location. An explanation of the matrix follows.

FIGURE 8 – A FARMSTEAD IN THE STUDY AREA – NOTE THE SCREENING EFFECT OF THE VEGETATION AROUND THE HOUSEHOLD

Factors	Classes and Scores			
Distance of Receptor away from proposed alignment (distance banding)	0-250m Score: 4	250-500m Score:3	500-1000m Score:2	>1km Score:1
Primary Focus / orientation of receptor	'Arc of view' directly towards proposed lines Score:4	[redacted]	'Arc of view' partially towards proposed lines Score:2	'Arc of view' in opposite direction towards proposed lines Score:1
Presence of Screening Factors	No screening factors – lines highly visible Score:4		Screening factors partially obscure power lines Score:2	Screening factors completely block any views towards power lines Score:1
Visual Context	Visual context highly natural; no visually 'degrading' factors Score:4	Visual environment rural / pastoral with typical rural infrastructure Score:3	Partially transformed visual context (e.g. outlying residential areas) with partial presence of industrial-type infrastructure Score:2	Transformed visual context (e.g. industrial) and / or high degree of industrial-type anthropogenic objects present Score:1

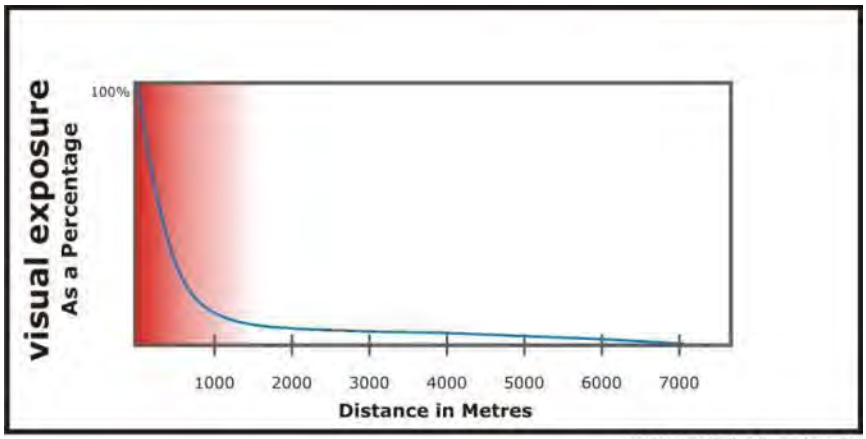
Categories of impact:

High Visual Impact = >3-4

Medium Visual Impact = >2-3

Low Visual Impact = 1-2

The distance of the viewer / receptor location away from the power line is the most important factor in the context of the experiencing of visual impacts. Beyond a certain distance, even large structures such as power lines tend to be much less visible, and are difficult to differentiate from the surrounding landscape. The visibility of an object is likely to decrease exponentially with increasing distance away from the object, with maximum impact being exerted on receptors at a distance of 500m or less. The impact decreases exponentially as one moves away from the source of impact, with the impact at 1000m being a quarter of the impact at 500m away (see the figure below). At 5000m away or more, the impact would be negligible.



SOURCE: Hull, RB; Bishop, ID

FIGURE 9 – DIAGRAM ILUUSTRATING DIMIISHING VISUAL EXPOSURE OVER DISTANCE

The highest rating has thus been assigned to receptor locations that are located within 0-250m of the proposed alignment. Beyond 1km, the visual impact associated with a power line is likely to be minimal, and any receptor location beyond 1km from the proposed corridor has been allocated into the lowest class.

The orientation of a receptor becomes important in many cases, as the receptor location is typically oriented in a certain direction, e.g. with views towards a certain area / part of the landscape from a highly frequented area like a porch or garden. The visual impact of a set of power lines could be potentially much greater if power lines intruded into such a view, and thus the highest rating has been given to a situation where the power lines would cross directly across an 'arc of view / orientation' – i.e. the 180o panorama in a certain direction.

The presence of screening factors is equally as important in this context in many circumstances as the distance away from the power lines. Screening factors can be vegetation, buildings, as well as topography. For example a grove of trees located between a receptor location and a set of power lines could effectively completely shield the lines from the receptor. Topography (relative elevation and aspect) plays a similar role as a receptor location in a deep or incised valley will have a very limited viewshed and may not be able to view an object that is close by, but not in its viewshed. The opposite applies, and tall objects such as power lines that cross a ridge would be highly visible.

Visual context is the last factor considered in the matrix. This factor attempts to bring in the visual environmental context, which is important, as much of the study area is largely natural in character, with the aesthetic quality of the area and sense of place being an important characteristic in which value is placed. Placing a power line in this context has the potential to adversely affect or degrade the natural visual environment of these areas. Receptors in these areas are typically most sensitive to visual changes that would be brought about by power lines being placed in such a landscape. Many parts of the study area are somewhat visually altered from a completely natural state due to agricultural activities such as crop cultivation, planting of pastures etc. Although there is a relative density of anthropogenic (human) infrastructure (e.g. fences, centre pivots, buildings such as barns and

farmhouses) and influence on the landscape (for example the presence of groves of tall exotic trees), this type of 'pastoral' or rural landscape is often perceived as sensitive to visual impacts associated with more industrial or large-scale infrastructure such as power lines. The second most sensitive class is thus assigned to this landscape. The relative degree of intrusion of large-scale or industrial-type infrastructure into a landscape as well as the degree of change of visual environment is reflected in the last two classes of visual context.

Urban settings are typically highly visually transformed, and the presence of power lines in this environment would typically not be seen as intrusive. Residential areas may be associated with more visual sensitivity, especially those areas present in parts of the study area that have views onto surrounding natural areas. This context is captured in the 3rd class of sensitivity. Less built up areas may have a profusion of existing large-scale or industrial infrastructure within them. In these cases, these areas would be assigned to the one of the lower 2 classes due to the existing visual degradation associated with the existing electricity infrastructure.

Through the matrix a 'Visual Intrusion Score average' for each receptor location is calculated. This average score is derived by tallying the scores for each of the four classes and averaging these. The visual impact rating for each receptor location is determined by the range of numbers within which this average score falls as listed above. It should be again noted that this rating matrix is a relatively simplified way to assign a likely representative degree of visual intrusion which allows a number of factors to be considered. Part of its limitation lies in the quantitative assessment of what is largely a qualitative or subjective impact. The simplified matrix also has certain limitations in that in certain cases the complete screening of the source of the impact from the receptor may not be taken into account. An example of this would be where thick bushveld vegetation completely hides the proposed power line from view at a receptor location. In order to take factors such as this into account, an 'override' function has been introduced to the matrix. The override allows the visual intrusion rating assigned to a receptor location to be either increased or lowered based on the one of the following factors:

- The receptor location is completely screened from the proposed power lines by micro-topographical features such as vegetation or buildings
- The power lines are outside of the viewshed of the receptor location, and thus are not visible

The table below presents the results of the visual intrusion matrix. Receptor locations in those areas beyond the 2km buffer outside of the corridor are too far away from the proposed corridors to be likely to be impacted by the proposed power lines. Thus the visual impact on these receptor locations is considered to be negligible or non-existent.

A challenge is posed by the potential ability of the power lines to be placed in a number of potential alignments across the corridor. The permutations for aligning the power line within the corridor make it impractical to model or rate all of these permutations in this report. Thus for the purposes of the impact rating matrix and the visual modelling, the centreline alignment as presented to the EIA Team (as proposed) by the proponent has been used as the basis on which to undertake the assessment.

The matrix is presented in the table below.

TABLE 2 – VISUAL INTRUSION MATRIX

Receptor Location	Distance	Orientation	Screening	Visual Context	Total Score	Visual Impact Score Average	Visual Impact Rating	Overriding Factors?	Corrected Visual Rating
Helpmekaar Farmstead	3	4	4	3	15	**3.75**	**HIGH**		
Present Farmstead	4	2	2	3	11	**2.75**	**MODERATE**		
James le Roux Boskamp	1	2	1	4	8	**2.00**	**LOW**	**Vegetation Screening**	**LOW**
Wildeasput Farmstead	3	1	4	3	11	**2.75**	**MODERATE**		
Erfenis Farmstead	1	4	4	3	12	**3.00**	**MODERATE**		
Standhope Farmstead	2	2	1	3	8	**2.00**	**LOW**	**Vegetation Screening**	
Kinderdam Farmstead	1	1	2	3	7	**1.75**	**LOW**		
Heeferslust Farmstead	3	1	1	3	8	**2.00**	**LOW**		
Klippan North Farmstead	3	1	1	3	8	**2.00**	**LOW**	**Vegetation Screening**	**LOW**
Klippan South Farmstead	4	4	1	3	12	**3.00**	**MODERATE**	**Vegetation Screening**	**LOW**
Vrede Farmstead	1	1	1	3	6	**1.50**	**LOW**		
Gemsbokpan Farmstead	4	2	2	3	11	**2.75**	**MODERATE**		
Memel Farmstead	1	1	2	3	7	**1.75**	**LOW**		
Rustig Farmstead	4	2	2	3	11	**2.75**	**MODERATE**	**Immediate proximity of lines**	**HIGH**
Kudu Hills Lodge and Owners House	1	2	2	4	9	**2.25**	**MODERATE**	**Topography obscures closest lines**	**LOW**
Doorndam Farmstead	2	1	2	3	8	**2.00**	**LOW**		
Waterval Farmstead	3	2	2	3	10	**2.50**	**MODERATE**		

Receptor Location	Distance	Orientation	Screening	Visual Context	Total Score	Visual Impact Score Average	Visual Impact Rating	Overriding Factors?	Corrected Visual Rating
North									
Waterval Farmstead	2	4	4	4	14	**3.50**	**HIGH**		
Taaiboschhoek Farmstead	1	1	2	3	7	**1.75**	**LOW**		
Alleskop Farmstead	2	2	1	3	8	**2.00**	**LOW**		
Geelhoutkoppie Farmstead	1	1	1	3	6	**1.50**	**LOW**		
Dankbaar Farmstead	1	2	2	3	8	**2.00**	**LOW**		
Scholtzrus Farmstead	1	1	1	3	6	**1.50**	**LOW**		
Plankplaas Farmstead	1	2	1	3	7	**1.75**	**LOW**	**Vegetation Screening**	
Smitsrus Farmstead	3	2	4	3	12	**3.00**	**MODERATE**		
Morestêr Farmstead	3	4	4	3	14	**3.50**	**HIGH**		
Kromdraai Farmstead	1	1	1	3	6	**1.50**	**LOW**	**Vegetation Screening**	**LOW**
Oppie Koppie Farmstead	3	1	1	3	8	**2.00**	**LOW**		
Oppie Koppie Farmstead west	2	2	2	3	9	**2.25**	**MODERATE**		
Robyn Farmstead East	3	2	2	3	10	**2.50**	**MODERATE**		
Robyn Farmstead West	2	2	1	3	8	**2.00**	**LOW**		
Lushof Farmstead	4	2	2	3	11	**2.75**	**MODERATE**		
Goudkop Farmstead	4	2	1	3	10	**2.50**	**MODERATE**		
De Neute Dop guesthouse and homestead	3	1	4	3	11	**2.75**	**MODERATE**		
Poppiesdale Farmstead - Bowmans Estate	1	1	2	4	8	**2.00**	**LOW**		

Receptor Location	Distance	Orientation	Screening	Visual Context	Total Score	Visual Impact Score Average	Visual Impact Rating	Overriding Factors?	Corrected Visual Rating
Bowmans Estate - stand 1	1	2	4	4	11	**2.75**	**MODERATE**		
Bowmans Estate - Stand 13-4	1	2	4	4	11	**2.75**	**MODERATE**		
Bowmans Estate - Stand 23-24	1	2	4	4	11	**2.75**	**MODERATE**		
N14-R34 Homestead	4	4	4	2	14	**3.50**	**HIGH**		

4.2 Implications of the visual intrusion factor of the power lines for receptors and associated degree of visual impact

Examining the relative number of receptor locations subject to high, moderate and low degrees of visual intrusion is useful in gauging the degree of visual impact associated with the proposed power lines, however due to the presence of certain route segments along which there are alternative alignments, this is not completely realistic, as the matrix above represents a worst-case scenario for each receptor point, and does not represent a scenario in which one of each of the alternatives is discarded. Five (5) receptor locations have been assessed to be subject to be high level of visual intrusion. Three of these receptor locations are located close to alternative line components. Thus in these three cases the high visual intrusion rating would be negated if the other alternative were selected. The comparative degree of visual intrusion associated with different alternatives has an important bearing on the overall degree of visual impact that would be associated with the lines, as discussed below.

Ideally, as many receptor locations as possible should be subject to a low level of visual intrusion and thus it is useful to examine the reasons why certain locations are subject to a greater degree of visual intrusion, and what measures can be taken to ameliorate or reduce the intensity of these impacts.

The common factor that emerges when one examines the list of receptor locations that are likely to be subject to a high visual intrusion factor is the very close proximity of the proposed alignment to the receptor location that would make the lines highly visible. In many cases at other receptor locations screening factors in the form of vegetation around the farmstead or vegetation between the farmstead and the proposed alignment help to minimise the potential visibility of the line from the receptor location. Conversely the absence of screening factors can elevate the visual intrusion factor associated with the lines.

An important question which needs to be posed is to what degree a moderate or high level of visual intrusion would be associated with visual impact. As discussed above, the experiencing of visual impact is subject to the perception of the person exposed to the view. The aesthetic quality of the landscape and visual sensitivity of the area also plays an important role. In the parts of the study area with the most natural visual character (the parts of the study area north of Stella) a moderate or high degree of visual intrusion is likely to be associated with the experiencing of a visual impact. It is in these areas that a game farm and private nature reserve (Kudu Hills) exist, at which hunting and nature based tourism activities respectively are practised. In the wider area the presence of large areas of woodland vegetation and the presence of the iconic Camel Thorn Tree in the area engender it with a natural bushveld character that is highly valued by its inhabitants. It is thus important that, as a mitigating factor, the line alternatives with the least degree of visual intrusion be selected. In this context it is useful to examine each of the line components where alternatives have been presented.

FIGURE 10 – WOODLAND VEGETATION IN THE NORTHERN-MOST PART OF THE STUDY AREA

The Kalplats-Edwardsdam line component would exert a high degree of visual intrusion on only one receptor (Helpmekaar). This receptor location is located in close proximity to Alternative 3. Importantly the northern alternative (Alternative 1) would subject only one receptor location to a moderate degree of visual intrusion with the remainder of the sensitive receptor locations being exposed to a low level of visual intrusion, and no receptor locations being assessed to be likely to experience a high degree of visual intrusion. Along Alternative 1 many of the receptor locations are slightly set back from the road along which the lines are proposed to run, or if located closer to the lines, are very well screened by vegetation around the farmhouse itself or along the nearby drainage line. This comparative degree of visual intrusion of each of the line alternatives is important in terms of choosing an alternative that is associated with the least degree of visual impact in what is arguably the most visually-sensitive part of the route.

Two of the receptor locations that would be exposed to a high degree of visual impact would be completely unaffected if Alternative 2 of the Bophirima-Kalplats alignment were selected. Like Alternative 1 of the Kalplats-Edwardsdam alignment, Alternative 2 of the Bophirima-Kalplats alignment would only expose one receptor location to a moderate degree of visual intrusion, with the other receptor locations being exposed to a low level of visual intrusion, thus this alternative is unlikely to be associated with visual impacts. Importantly, the Kudu Hills property is most closely located to Alternative 1. Although the visual intrusion of the lines at the lodge has been assessed to be low, the reserve's boundary is located close to the lines, and views of the lines from the edge of the property would be much more greatly affected by the proposed power lines (guided game drives are conducted on the property). The lodge (and owner's house) is situated on a ridge that enjoys wide-ranging views of a mix of natural rangeland and pastures to the north and the west. This is thus considered a critical view, and the presence of power lines within this view would be incongruous, even if they were located some distance away. This lends weight to the need to run the power line along Alternative 2, as the lines would then be located at a distance away from the lodge and the wider property that would make them visually inconsequential.

FIGURE 11 – WIDE-RANGING VIEW TO THE NORTH WEST FROM THE KUDU HILLS LODGE

In the southern part of the study area, there are more receptor locations that would be exposed to a moderate degree of visual intrusion, due mainly to the relative proximity of the receptor locations to the lines in this area. There are a cluster of receptor locations in the area where the Bophirima-Kalplats line component crosses the N14 to the north-east of Vryburg. Although this area is outside of the bounds of Vryburg, its visual character is similar to the other areas on the outskirts of the town where a profusion of smallholdings occurs. The lines are unlikely to thus be responsible for creating significant visual impact in this area, as a certain degree of human influence on the visual character of the local area is already present.

The other cluster of receptor locations in the southern part of the study area represents the Bowmans Hill EcoEstate, located on the Poppiesdale farm. This estate is planned as a low density, high-income luxury development, with stands being laid out along a low ridge that runs in an east-west alignment across the property. The elevated position of the ridge and the northern-facing aspect of the stands would entail that the Bophirima-Kalplats line that runs along part of the northern boundary of the property would be within the typical orientation of the view of households to be built along the ridge. The emphasis of the estate would be the enjoyment of the natural character of the estate, and in this context the power lines may be viewed as an unwelcome visual impact. It should be noted that double-storied houses would be able to be built, hence the position of the viewer in the houses would be even more elevated than ground level. The visual intrusion matrix assessed that these stands would be exposed to be a moderate degree of visual intrusion. Key to whether a visual impact would be likely to be experienced at this location would be whether the power lines would break the horizon and be visible above it. Analysis in Google Earth using the ground level view function indicates that power lines placed along the proposed alignment at a height of 25m above the ground would break the horizon slightly, with the height of the top of the towers being at, or just above the horizon. The towers and line would be unlikely to ‘break’ the horizon significantly and be visible in their entirety above the horizon.

FIGURE 12 – VIEW TO THE NORTH FROM THE BOWMANS HILL ECO-ESTATE STAND

Lastly the other two receptor locations in the study area which would be exposed to a high degree of visual intrusion to the power lines that have not yet been discussed are the Morestêr Farmstead and the private household close to the N14/R34 intersection. The Morestêr Farmstead would also be located close to the Kalplats Substation , but more importantly would be located very close to the proposed mine which the Kalplats Substation would supply. Although the mine is not yet approved, under a 'worst case' scenario in which the mine was developed, the receptor location would be subject to a much greater and intensive visual impact by the mine and associated infrastructure than the proposed power line and substation. While the power lines would be highly visually intrusive from this receptor location, the mine would potentially alter the entire visual character of the immediate area, thus being significantly more of a visual impact than the line and substation. Under the scenario in which the mine would not be developed at all, the power line and substation would provide a high degree of visual intrusion, as discussed. Consideration could be given to moving the alignment to the south of the receptor location, but this would not be likely to be practical as this would then create alternate problems of the lines bisecting actively cultivated fields. The area around this receptor location is extensively cultivated, hence the perception of impact on the part of this receptor may not be that pronounced.

The private household near the N14 / R34 intersection would be located very close to the proposed line component between the Bophirima Substation and the Vryburg Municipal Substation. The front of the double-storied house faces the road, and thus would be oriented towards the lines. It should be noted that the visual context is not natural in this area as the house is located on the outskirts of Vryburg. The presence of the Road and filling station close by, is likely to increase the tolerance level for a new power line in this environment, and it is not expected that the proposed power line would be associated with a high degree of visual impact in this area.

4.3 Visual Impacts Associated with the Proposed Substations

The proposed substations are located in different parts of the study area, thus each one is examined independently below.

4.3.1 Bophirima Substation

The Bophirima Substation is proposed to be located very close to the existing Woodhouse Substation. Although Bophirima will occupy a larger footprint than the Woodhouse Substation, it is important to the note that the presence of the existing substation and associated power lines has an effect on the visual environment, by providing an electricity infrastructure component to the landscape. The new Bophirima Substation will significantly increase the influence of this component in this particular area, especially as three new 132kV power lines would link into the substation. The substation will be visually prominent in this area.

FIGURE 13 – THE EXISTING WOODHOUSE SUBSTATION

There is a receptor location located in relatively close proximity to the substation – the De Neute Dop Guesthouse and associated Homestead. The close location of the receptor location to the proposed substation would entail that it would experience a high degree of visual intrusion. The orientation of the guesthouse and homestead is to the north (towards the R34 road), and thus away from the substation. Due to the exiting presence of the Woodhouse Substation and power lines, the introduction of a new substation would add to an existing electrical infrastructural component, rather than introduce a completely new component. In addition, being located on the

outskirts of Vryburg where a number of smallholdings exist, the visual character is not completely natural and there is a presence of anthropogenic infrastructural development in the landscape. The substation is thus not expected to be associated with a high degree of visual impact, due to the presence of the existing substation and other electrical infrastructure.

4.3.2 Kalplats Substation

The proposed Kalplats Substation would be located in very close proximity to the Morestêr Farmstead. Two alternatives have been provided for assessment and both are located in relatively close proximity to the farmstead – Alternative 1 would be located 680m to the north-west, and Alternative 2 would be located closer at 375m away. The Visual Intrusion Rating Matrix above has assessed that the receptor location would be subject to a high degree of visual intrusion from the proposed power lines. The development of the substation would increase this visual intrusion factor, especially if Alternative 2 was selected as the preferred Alternative. The potential change to the visual context as described above can be considered to be a mitigating factor; as the Morestêr farmstead would be located very close to the proposed mine which the Kalplats Substation would supply. Although the mine is not yet approved, under a 'worst case' scenario in which the mine was developed, the receptor location would be subject to a much greater and intensive visual impact by the mine and associated infrastructure than the proposed power line and substation. While the power lines would be highly visually intrusive from this receptor location, the mine would potentially alter the entire visual character of the immediate area, thus being significantly more of a visual impact than the line and substation. Under the scenario in which the mine would not be developed at all, the power line and substation would provide a high degree of visual intrusion.

Consideration should be given to ensuring the alternative location further away from the receptor be chosen as the preferred alternative, as this would be associated with a lesser degree of visual intrusion than Alternative 1. The high degree of visual intrusion that would be associated with the line and substation is unlikely to be able to be mitigated, but over time these features may become part of the visual baseline at this location, especially if the proposed mine is developed in the nearby vicinity. Lighting at the substation at night-time may be perceived negatively, thus it would be very important to ensure that lighting is minimised as far as possible, and that spot-lighting only be used during emergency night-time operational needs. Lighting should also be placed so as to shine away from the receptor location.

4.4 Comparative Assessment of Alternatives

As discussed in detail above, alternative sections have been presented for comparative assessment along two of the line components. Routing the proposed power line in different alternative segments has significant visual impact implications, and thus the selection of a preferred alignment is important in a visual context.

Tables presented below have been presented to summarise the discussion of the relative impacts of each alternative section as undertaken above.

4.4.1 Bophirima-Kalplats

TABLE 3 – COMPARATIVE ASSESSMENT OF BOPHIRIMA-KALPLATS ALTERNATIVES

Alternative	Number of Receptors potentially affected	Number of Receptor locations subject to a high degree of visual intrusion	Other factors
Alternative 1	5	2	Potential to affect Kudu Hills Nature Reserve on which game drives are undertaken
Alternative 2	8	0	All receptor locations except one would be subject to a low degree of visual intrusion

The above table indicates that Alternative 2 would be responsible for a much lower degree of visual intrusion and thus visual impact, with only one receptor location being assessed to be subject to more than a low level of visual intrusion. Choosing this alternative would avoid two receptor locations which would be likely to be experience a high level of impact, and would also entail that the Kudu Hills Nature Reserve property would be unaffected by the proposed line in this part of the study area. **For this reason Alternative 2 is strongly preferred.**

4.4.2 Kalplats – Edwardsdam

TABLE 4 - COMPARATIVE ASSESSMENT OF KALPLATS-EDWARDSDAM ALTERNATIVES

Alternative	Number of Receptors potentially affected	Number of Receptor locations subject to a high degree of visual intrusion	Other factors
Alternative 1	6	0	All receptor locations except one would be subject to a low degree of visual intrusion.
Alternative 3	6	1	• Potential to affect a number of sensitive receptor locations in the Edwardsdam area, running through areas of woodland with high aesthetic quality as perceived by the residents • Presence of a hunting farm • The R371 is part of a tourism route into the Kalahari, and thus could be considered to be a sensitive road

The above table indicates that Alternative 1 would be responsible for a much lower degree of visual intrusion and thus visual impact, with only one receptor location being assessed to be subject to more than a low level of visual intrusion. Choosing this alternative would avoid the northern-most part of the study area which is highly visually sensitive, as attested to be a number of comments from landowners in this regard. In addition, the R371 along which Alternative 3 would run forms part of the Kalahari Raptor Tourism Route. Although it is not a tourism route that is solely based on the aesthetic quality of the area, this does promote the appreciation of a part of the country that is known for its low human footprint. Lastly, avoiding this alternative (Alternative 3) would result in no significant visual impact for any receptor locations along this part of the route. **For these reasons Alternative 1 is strongly preferred**.

4.4.3 Substations

Bophirima:

The two Bophirima Substations are located in very close proximity to each other, and thus there will be very little difference in terms of the respective visual impact associated with each alternative. There is this no preference from a visual perspective.

Kalplats:

Like Bophirima, both alternative sites are located very close to one another; hence there would be very little difference in terms of their respective visual impact. The only difference from a visual perspective is their relative proximity to the Morestêr Farmstead which has been identified to be a sensitive receptor. Alternative 2 is located slightly closer to the farmstead (200m versus 650m – Alternative 1). As Alternative 1 is located at a slightly further distance away, Alternative 1 is slightly preferred from a visual perspective, although there is little material difference between the two alternatives due to their close proximity.

4.5 EIA Impact Rating Matrix

The EIA requires that an overall rating for visual impact be provided to allow visual impact to be assessed alongside other environmental parameters. The tables below present the impact matrix for visual impacts associated with the proposed development.

TABLE 5 – EIA IMPACT RATING MATRIX

IMPACT TABLE	
Environmental Parameter	Visual Impact
Issue/Impact/Environmental Effect/Nature	The proposed power lines could exert a visual impact by altering the visual environment of the study area. They could be perceived as an unwelcome visual intrusion by sensitive receptors in the area, in particular those receptors within a natural or rural visual setting in the northern parts of the study area. The nature of the degree of visual intrusion associated the power lines is dependent on factors such as the orientation of the receptor location, distance of the lines away from the proposed receptor and the nature of the visual environment.

Extent	Local / District (2)	
Probability	Probable (3)	
Reversibility	Partly reversible (2)	
Irreplaceable loss of resources	Marginal loss of resources* (2)	
Duration	Long term (3)	
Cumulative effect	Low cumulative impact (2)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Low Negative Impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	1
Duration	3	3
Cumulative effect	2	2
Intensity/magnitude	2	1
Significance rating	-28 (low negative)	-12 (low negative)
Mitigation measures	Avoid areas of visual sensitivity as detailed above. Selection of Bophirima-Kalplats Alternative 2 and Kalplats-Edwardsdam Alternative 1	

* - Please note in this context 'resources' has been defined as the visual environment; thus a loss of resource would be defined as the degree of change in the visual environment.

5 CONCLUSIONS

The visual report has assessed the visual impacts associated with the proposed development components, including the various line components and the two proposed substations. Due to the size of the study area, a relatively large number of sensitive visual receptors that could potentially be affected by the proposed power lines have been identified. Large parts of the study area are rural in visual character with a natural component to the landscape. The northern-most parts of the area are much more natural in character and are valued for their aesthetic quality.

A visual impact assessment matrix has been developed to assess the likely visual intrusion factor associated with the proposed power lines on each sensitive receptor location. The results of the matrix showed that a handful of sensitive receptor locations would be subject to a high degree of visual intrusion with the majority of locations only subject to a low degree of visual intrusion. The potential visual impact on the lines would be reduced if certain of

the alternative alignments for the lines were chosen. Choosing these alignments would avoid the visually most-sensitive parts of the route and would significantly reduce the visual impact potential of the lines.

APPENDIX A:
Maps

MOOKODI INTEGRATION PROJECT

SENSITIVE RECEPTORS (KALPLATS SUBSTATION TO EDWARDS DAM SUBSTATION)

Sensitive Receptors

- High Sensitivity
- Medium Sensitivity
- Low Sensitivity

Legend

- National Routes
- Main Arterial Routes
- Main Roads
- Existing Substations
- Proposed Substations
- Substation Under Construction

Proposed Routes

- Bophirima Substation to Kalplats Substation (Alternative 1)
- Bophirima Substation to Kalplats Substation (Alternative 2)
- Bophirima Substation to Existing Vryburg Substation
- Mookodi Transmission Substation to Bophirima Substation
- Kalplats Substation to Existing Edwards Dam Substation (Alternative 1)
- Kalplats Substation to Existing Edwards Dam Substation (Alternative 3)
- 300m Wide Assessment Corridor

EDWARDS DAM SUBSTATION
PROPOSED KALPLATS SUBSTATION (ALTERNATIVE 1)
PROPOSED KALPLATS SUBSTATION (ALTERNATIVE 2)
R377
HEEFERSLUST FARMSTEAD
KLIPPAN NORTH FARMSTEAD
KINDERSDAM FARMSTEAD
KLIPPAN FARMSTEAD
HELPMEKAAR FARMSTEAD
PRESENT FARMSTEAD
ERFENIS FARMSTEAD
JAMES LE ROUX BOSKAMP
WILDEASPUT FARMSTEAD
VREDE FARMSTEAD
STANDHOPE FARMSTEAD
GEMSBOKPAN FARMSTEAD
GOUDKOP FARMSTEAD
MORESTER FARMSTEAD
MEMEL FARMSTEAD
SCHOLTZRUS FARMSTEAD

SOURCE:
BING MAPS, 2012

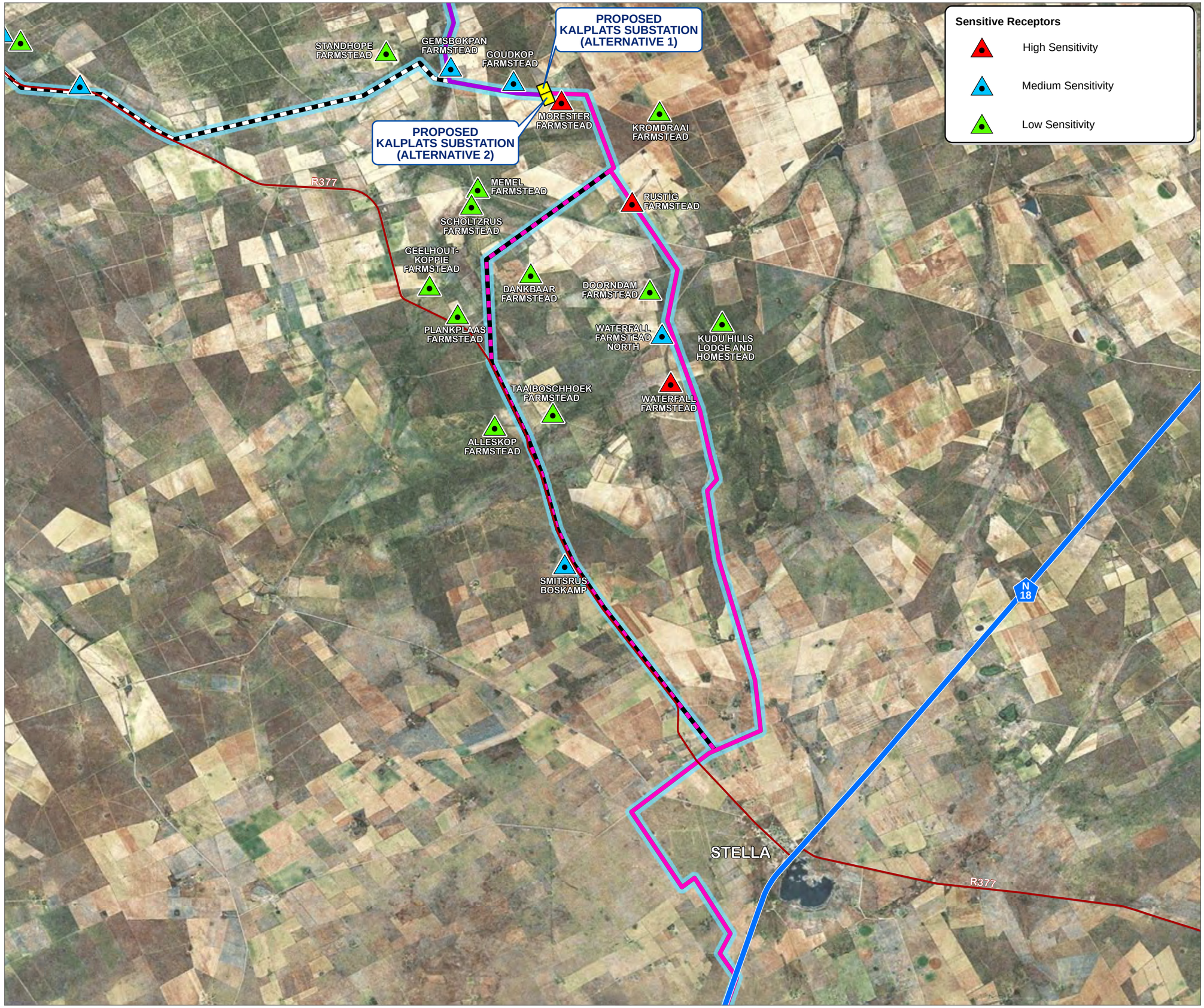
N

0 1 2
Kilometers

SiVEST
ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

Project No	Map Ref No	Prepared By	Date
10466	10466/EIA_08	KLS	27/09/2012



MOOKODI INTEGRATION PROJECT

SENSITIVE RECEPTORS (STELLA TO KALPLATS SUBSTATION)

Legend

- National Routes
- Main Arterial Routes
- Main Roads
- Existing Substations
- Proposed Substations
- Substation Under Construction

Proposed Routes

- Bophirima Substation to Kalplats Substation (Alternative 1)
- Bophirima Substation to Kalplats Substation (Alternative 2)
- Bophirima Substation to Existing Vryburg Substation
- Mookodi Transmission Substation to Bophirima Substation
- Kalplats Substation to Existing Edwards Dam Substation (Alternative 1)
- Kalplats Substation to Existing Edwards Dam Substation (Alternative 3)
- 300m Wide Assessment Corridor

SOURCE:
BING MAPS, 2012

N

0 1.5 3

Kilometers

SiVEST

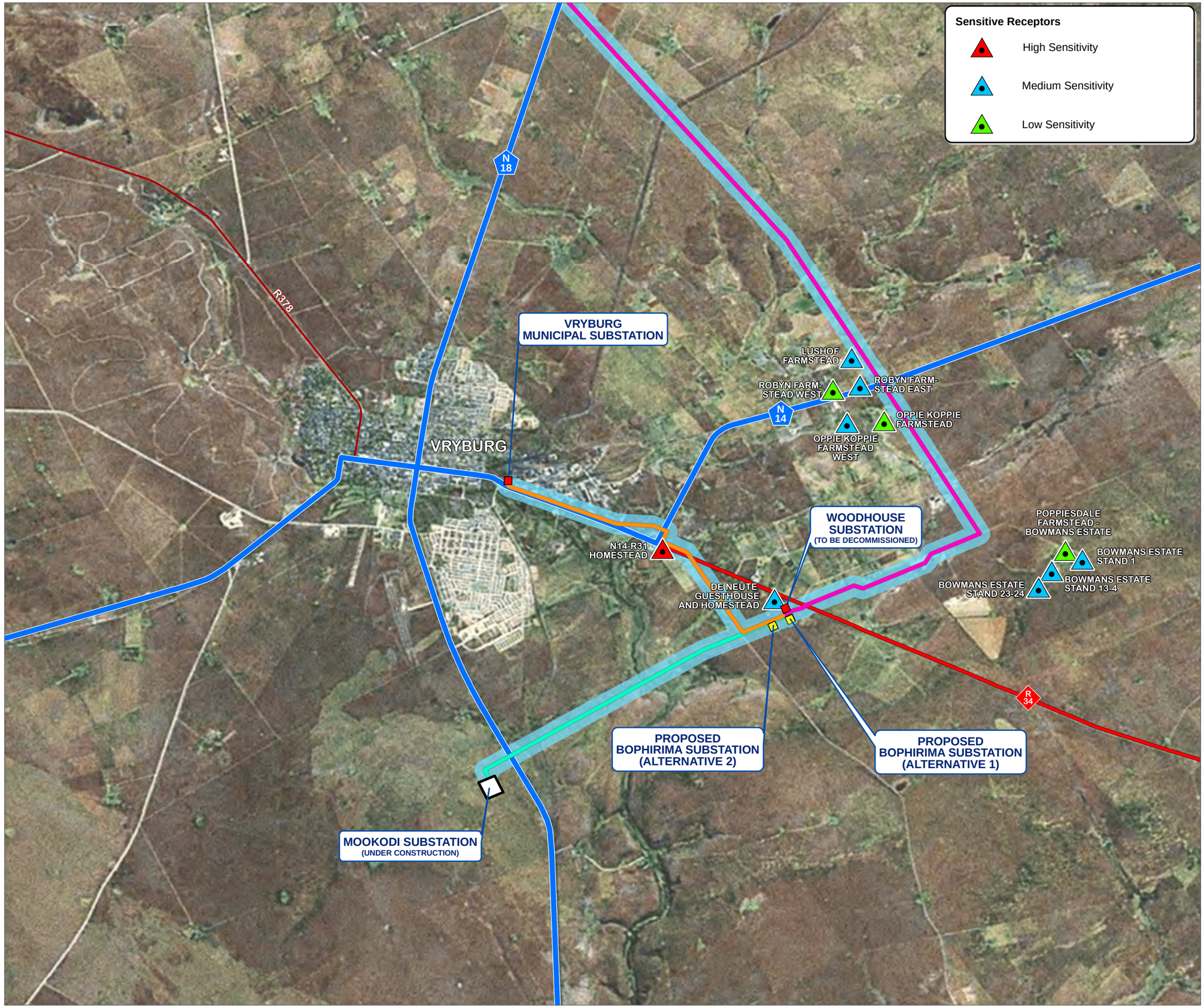
ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

Project No	Map Ref No	Prepared By	Date
10466	10466/VIA_02	KLS	27/09/2012

MOOKODI INTEGRATION PROJECT

SENSITIVE RECEPTORS
(BOPHIRIMA SUBSTATION TO VRYBURG SUBSTATION)



Legend

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- 300m Wide Assessment Corridor

SOURCE:
BING MAPS, 2012

N

0 0.5 1
Kilometers

SiVEST
ENVIRONMENTAL DIVISION
51 WESSELS ROAD
RIVONIA, 2128
JOHANNESBURG
SOUTH AFRICA

Phone: +27 11 798 0600
Fax: +27 11 803 7272
e-mail: info@sivest.co.za

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