1.1 Biodiversity Rating

In order to quantify the sensitivity of the fauna, flora and wetlands, a biodiversity assessment is undertaken.

1.1.1 Biodiversity Assessment Methodology

Each vegetation unit and its associated fauna were subjected to a biodiversity assessment according to the following methodology. The biodiversity of an area is measured as a combination of the variety of species and habitats within the area, as well as the ecological processes and functional value of the site. This can be captured in two broader categories namely conservation status and functional status. The conservation status encompasses species diversity, habitat diversity and ecological processes. The functional status encompasses ecological services and human use services.

It is suggested, due to the number of variables to be considered, that the following scoring system is used to first determine the value of each of the components (conservation status and functional status) from which the overall biodiversity value is determined.

Conservation status

The conservation status of a particular habitat / vegetation unit is determined using the methodology described in Table 1 below. The conservation status encompasses species diversity, habitat diversity and ecological processes. Each of the habitats found on site are rated accordingly in Section 3.11.2 below.

Table 1: Conservation Status Determination

A. How much of the larger vegetation type or system of which the defined area is a representative example, still exists?	**Rating**
Only a small area still exists (< 500km^2)	5
A moderate area still exists (500 to 1000 km^2)	3
A large areas still exist (> 1000 km^2)	1
B. What is (based on a qualitative assessment) the species and habitat diversity of the defined area?	**Rating**
Noticeably high	5
Difficult to assess	3
Obviously low	1
C. What is the condition (qualitative assessment) of the defined area?	**Rating**
Pristine and largely undisturbed	5
Moderately disturbed	3

Highly disturbed	1

The possible results for the conservation status of the defined area are based on a combination of the attributes, as follows.

A (Size) + B (Diversity) + C (Condition) = Conservation Status

Based on the combined score, the conservation status can range from very high to low, as described below in Table 2:

Table 2: Conservation Status Rating

Conservation Status	Rating
High conservation status, needs to be maintained and improved	11 – 15
Moderate conservation status, heavily disturbed and will require improvement	6 – 10
Low conservation status, heavily reduced and of limited value.	3 – 5

Functional status

The functional status encompasses ecological services and human use services. All these elements are rated according to the methodology described in Table 3 below. A detailed rating of each habitat is given in Section 3.11.2 below.

Table 3: Functional Status Determination

A. Are there currently any signs of obvious recreational use of the area, such as walking/hiking, bird watching, mountain biking, fishing etc?	Rating
Obvious signs of regular use	5
Signs of periodic use	3
No noticeable signs of use	1
B. Does the area carry out any ecological service, such as water purification, flood attenuation, riverbank stabilisation, soil stabilisation, etc?	**Rating**
Has an obvious functional role	5
Difficult to determine its functional role	3
Clearly has no to very limited functional role	1
C. Does the area serve an aesthetic role?	**Rating**
Forms part of a larger landscape that is widely visible and has a high aesthetic appeal	5
Forms part of a landscape that has high aesthetic appeal but which is not widely visible	3

Forms part of a landscape that has low aesthetic appeal	1

The possible results for the functional status of the defined area are based on a combination of the attributes, as follows.

A (recreational use) + B (ecological service) + C (aesthetic value) = Functional Status

Based on the combined score, the functional status can range from very high to low as illustrated in Table 4 below:

Table 4: Functional Status Rating

Functional Status	Rating
High service value	11 – 15
Moderate service value	6 – 10
Low service value	3 – 5

Biodiversity value

The perceived biodiversity value of an area to human development is not always easy to describe, but it includes the natural system and its variety of species, the ecological processes and the service or functional value that it provides. The combination of the conservation status and functional status scores provides a ranking of the overall biodiversity value for a defined area, as shown in the matrix in Table 5 below.

Table 5: Biodiversity Value Rating

Conservation status	Functional status		
	High service value	Moderate service value	Low service value
High	High	High	Moderate
Moderate	Moderate	Moderate	Low
Low	Moderate	Low	Low

1.1.2 Biodiversity Rating

The following vegetation units were identified on site:

- Ü Antropogenic grassland;
- Ü Moist grassland;
- Ü Grazed grassland; and

Ü Seepage areas and wetlands.

Each of the abovementioned vegetation units are rated for their biodiversity value below.

Grazed Grassland

This vegetation unit has a **moderate** biodiversity rating as indicated in Table 6 below. The **moderate** conservation value is attributed to the moderate grassland species diversity in the unit and the large area of rocky grassland remaining. The **high** functional rating is attributed to the obvious ecological services and the high aesthetic value of the rocky grassland.

Table 6: Biodiversity Rating for the Grazed grassland unit

Conservation status	Size of vegetation unit	Species diversity	Condition
	3 – Moderate	3 - Moderate	3 – Moderately Disturbed
Functional status	Use	Ecological service	Aesthetic value
	3 – Periodic	5 – Obvious	5 - High
Biodiversity Rating	Conservation status	Functional status	Biodiversity
	9 – Moderate	13 - High	Moderate

Moist Grassland

This vegetation unit has a **moderate** biodiversity rating as indicated in Table 7 below. The **moderate** conservation value is attributed to the moderate grassland species diversity in the unit and the moderate area of moist grassland remaining. The **high** functional rating is attributed to the obvious ecological services and the high aesthetic value of the moist grassland.

Table 7: Biodiversity Rating for the *moist grassland* unit

Conservation status	Size of vegetation unit	Species diversity	Condition
	3 – Moderate	3 – Moderately Disturbed	3 – Moderately Disturbed
Functional status	Use	Ecological service	Aesthetic value
	1 – none	5 – Obvious	5 - High
Biodiversity Rating	Conservation status	Functional status	Biodiversity
	9 - Moderate	11 - High	Moderate

Antropogenic Grassland

This vegetation unit has a **low** biodiversity rating as indicated in Table 8 below. The **low** conservation value is attributed to the low grassland species diversity in the unit and the large area

of disturbed grassland remaining. The **low** functional rating is attributed to the lack of ecological services provided by the disturbed grassland.

Table 8: Biodiversity Rating for the *disturbed grassland* unit

	Size of vegetation unit	Species diversity	Condition
Conservation status	1 - Large	1 - Low	1 - Disturbed
	Use	Ecological service	Aesthetic value
Functional status	1 - None	3 - Undetermined	1 - Low
	Conservation status	Functional status	Biodiversity
Biodiversity Rating	3 - Low	5 - Low	Low

Drainage Areas and Wetlands

This vegetation unit has a **high** biodiversity rating as indicated in Table 9 below. The **high** conservation value is attributed to the high grassland species diversity in the unit and the small area of wetlands remaining. The **high** functional rating is attributed to the obvious ecological services and the high aesthetic value of the wetlands and seepage areas.

Table 9: Biodiversity Rating for the *drainage areas and wetlands*

	Size of vegetation unit	Species diversity	Condition
Conservation status	5 – Small	5 – High	3 – Moderately Disturbed
	Use	Ecological service	Aesthetic value
Functional status	1 – none	5 – Obvious	5 - High
	Conservation status	Functional status	Biodiversity
Biodiversity Rating	13 – High	11 - High	High

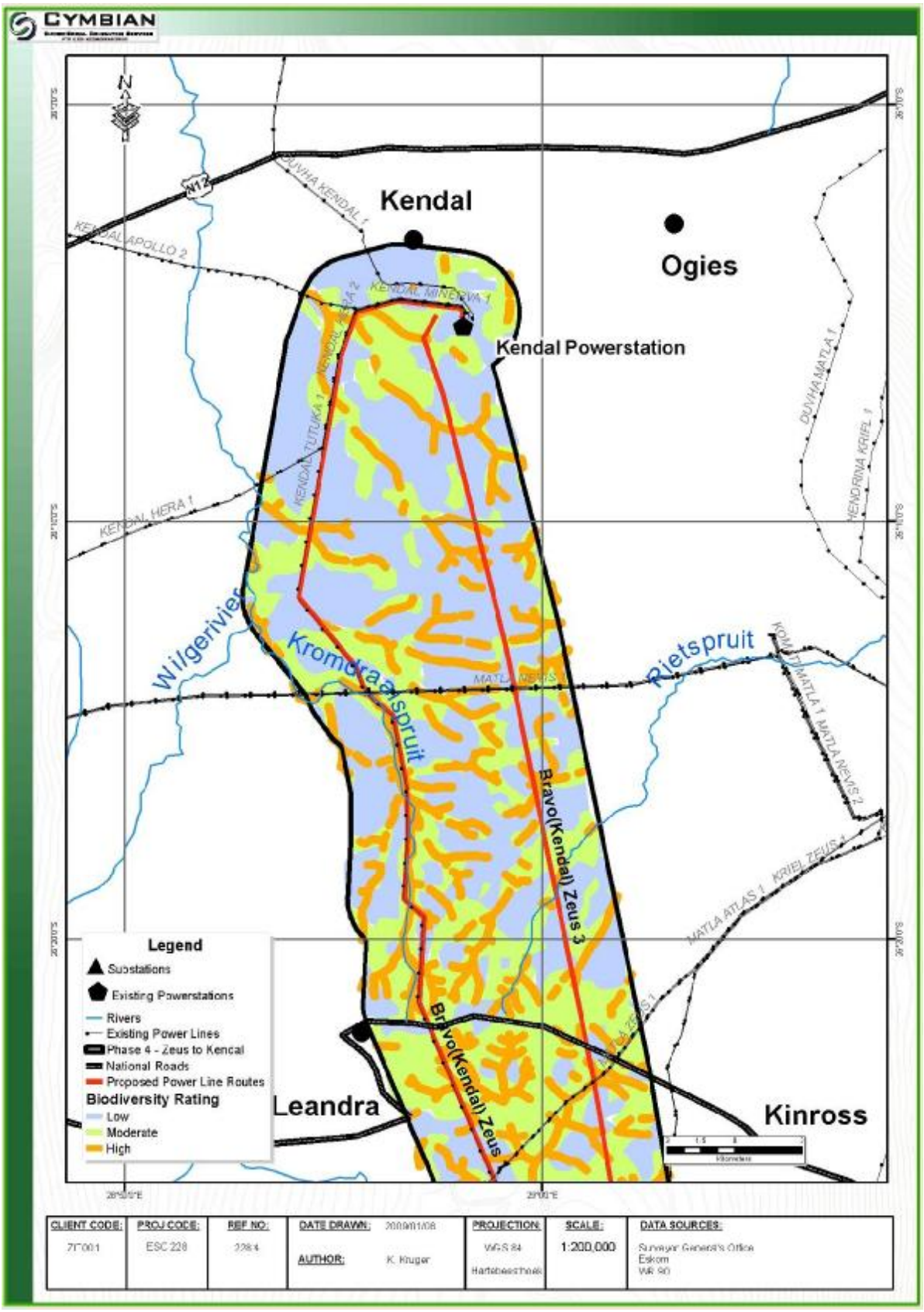


Figure 1: Biodiversity Rating Map of the northern part of the site

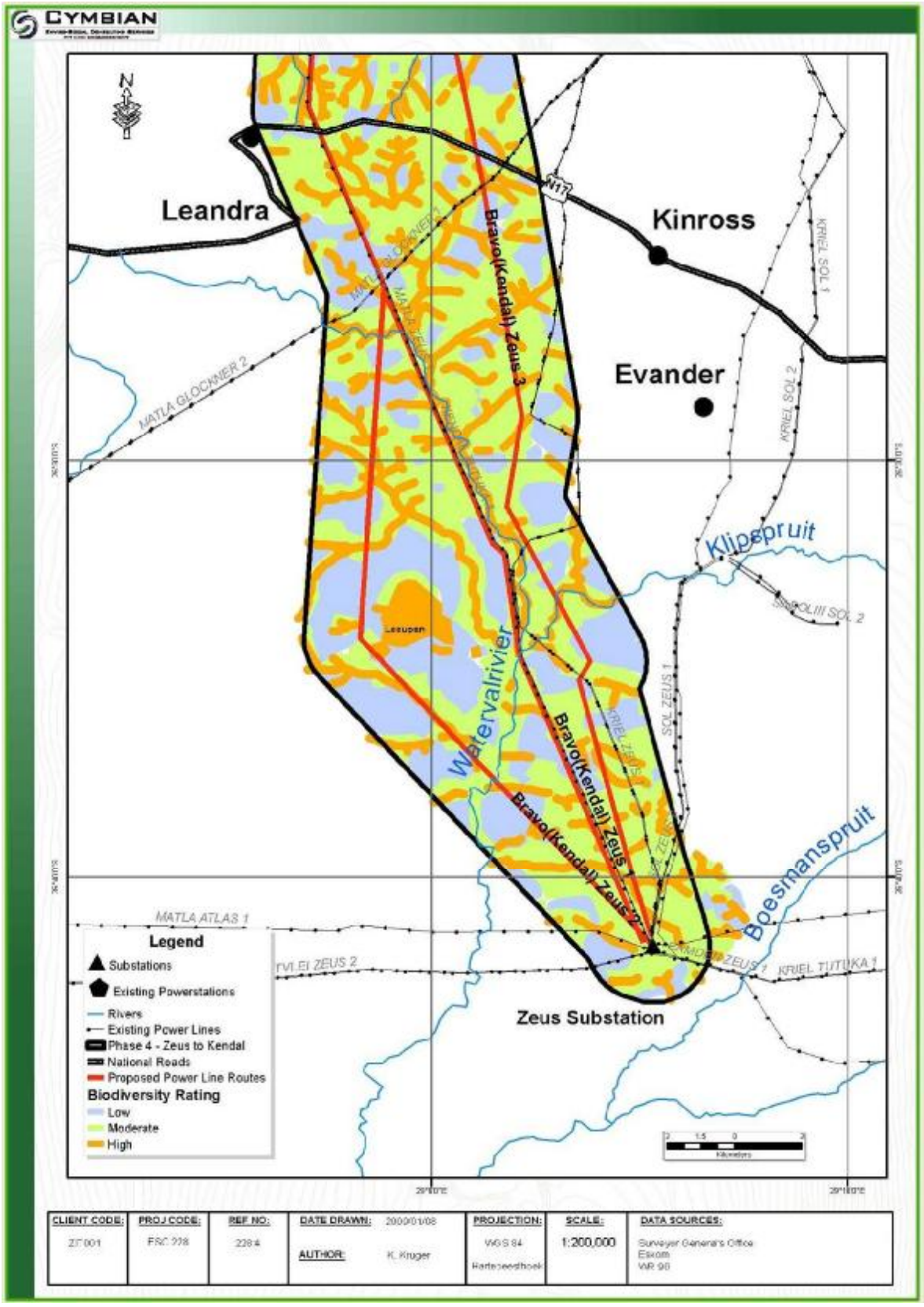


Figure 2: Biodiversity Rating Map of the southern part of the site

2.0 VISUAL IMPACT ASSESSMENT

2.1 Introduction

The site and surrounding area may be characterised as agricultural land utilised mainly for the grazing of cattle. The topography of the region and study site is gently undulating to moderately undulating landscape of the Highveld plateau.

The proposed power lines are located in the area immediately adjacent to the Bravo Power Station with the power station construction site and other existing power lines featuring prominently in the landscape.

2.2 Methodology

The methodology adopted for the visual assessment includes the following tasks:

- Ü Examine the baseline information (contours, building dimensions, vegetation, inter alia);
- Ü Determine the area from which any of the upgrade may be visible (viewshed);
- Ü Identify the locations from which views of the upgrade may be visible (observation sites), which include buildings and roads;
- Ü Analyse the observation sites to determine the potential level of visual impact that may result from the upgrade; and
- Ü Identify measures available to mitigate the potential impacts.

Each component of the assessment process is explained in detail in the following sections of the Report.

2.2.1 The Viewshed

The viewshed represents the area from which the proposed site would potentially be visible. The extent of the viewshed is influenced primarily by the combination of topography and vegetation, which determine the extent to which the site would be visible from surrounding areas.

The viewshed was determined by Cymbian through the following steps and presumptions:

- Ü The likely viewshed was determined by desktop study (ArcGIS) using contour plans (20 m interval); and
- Ü An offset of 2 m (maximum) for the observer and an offset of 30 m (maximum) for the proposed power lines were utilized during the spatial analysis.

2.2.2 Visibility Assessment

Site visibility is an assessment of the extent to which the proposed upgrade would potentially be visible from surrounding areas. It takes account of the context of the view, the relative number of viewers, duration of view and view distance.

The underlying rationale for this assessment is that if the proposed upgrade (power lines) is not visible from surrounding areas then the development will not produce a visual impact. On the other hand if one or more power lines are highly visible to a large number of people in surrounding areas then the potential visual impact is likely to be high.

Based on a combination of all these factors an overall rating of visibility was applied to each observation point. For the purpose of this report, categories of visibility have been defined as high (H), moderate (M) or low (L).

2.2.3 Assessment Criteria

For the purpose of this report, the quantitative criteria listed in Table 10 have been determined and used in the Visibility Assessment. The criteria are defined in more detail in the subsection following.

Table 10: Visual Impact Assessment Criteria

CRITERIA	*DEFINITIONS*
Category of Viewer	
Static	***Farms, homesteads or industries***
Dynamic	***Travelling along road***
View Elevation	
Above	***Higher elevation then proposed upgrade.***
Level	***Level with upgrade view***
Below	***Lower elevation then upgrade viewed***
View Distance	
Long	***> 5 km***
Medium	***1 – 5 km***
Short	***200 m – 1000 m***
Very Short	***< 200 m***
Period of View	
Long Term	***> 120 minutes***
Medium Time	***1 – 120 minutes***
Short Term	***< 1 minute***

Category Viewer

The visibility of the upgrade will vary between static and dynamic view types. In the case of static views, such as views from a farmhouse or homestead, the visual relationship between an upgrade

and the landscape will not change. The cone of vision is relatively wide and the viewer tends to scan back and forth across the landscape.

In contrast views from a moving vehicle are dynamic as the visual relationship between the upgrade / structures is constantly changing as well as the visual relationship between the upgrade and the landscape in which they are seen. The view cone for motorists, particularly drivers, is generally narrower than for static views.

View Elevation

The elevation of the viewer relative to the object observed, which in this case is the upgrade / structure, significantly influences the visibility of the object by changing the background and therefore the visual contrast. In situations where the viewer is at a higher elevation than the building/structure it will be seen against a background of landscape. The level of visual contrast between the upgrade and the background will determine the level of visibility. A white/bright coloured structure seen against a background of dark/pale coloured tree-covered slopes will be highly visible compared to a background of light coloured slopes covered by yellow/brown dry vegetation.

In situations where the viewer is located at a lower elevation than the proposed upgrade it will mostly be viewed against the sky. The degree of visual contrast between a white coloured structure will depend on the colour of the sky. Dark grey clouds will create a significantly greater level of contrast than for a background of white clouds.

View Distance

The influence of distance on visibility results from two factors:

- **Ü** With increasing distance the proportion of the view cone occupied by a visible structure will decline; and
- **Ü** Atmospheric effects due to dust and moisture in the air reduce the visual contrast between the structure and the background against which they are viewed.

Period of View

The visibility of structures will increase with the period over which they are seen. The longer the period of view the higher the level of visibility. However, it is presumed that over an extended period the level of visibility declines as people become accustomed to the new element in the landscape.

Long term views of the upgrade will generally be associated with rest camps located within the viewshed. Short term and moderate term views will generally relate to tourist moving through the viewshed mostly by vehicle.

Site Visibility

The procedure followed by Cymbian to assess Site Visibility involved:

- **Ü** Generate a viewshed analysis of the area utilizing ArcGIS 9.
- **Ü** Determine the various categories of observation points (e.g. Static, Dynamic).

2.2.4 Impact Assessment Methodology

Visual impact is defined as the significance and/or severity of changes to visual quality of the area resulting from a development or change in land use that may occur in the landscape.

Significance or severity is a measure of the response of viewers to the changes that occur. It represents the interaction between humans and the landscape changes that they observe. The response to visible changes in the landscape may vary significantly between individuals.

Perception results from the combination of the extent to which the proposed upgrade is visible (level of visibility) and the response of individuals to what they see. A major influence on the perception of people/tourist in relation to the proposed upgrade will be the visual character and quality of the landscape in which it would be located. Natural landscape areas such as national parks, mountain areas or undeveloped sections of coast are valued for their high visual quality. The introduction of buildings and associated infrastructure may be seen as a negative impact on these areas of high visual quality. In the case of rest camps many people perceive them in a positive manner because they represent tourism/conservation infrastructure usually elegantly designed, non-conspicuous and contributing the local and national economy.

The potential visual impact of the proposed upgrade will primarily result from changes to the visual character of the area within the viewshed. The nature of these changes will depend on the level of

the visual contrast between buildings/structures and the existing landscape within which they would be viewed.

The degree of contrast between the upgrade and the surrounding landscape will result from one or more of the following visual characteristics:

- **Ü** Colour;
- **Ü** Shape or form;
- **Ü** Scale;
- **Ü** Texture; and
- **Ü** Reflectivity.

2.3 Visual Character

2.3.1 Landscape Character

The site and the surrounding area can be described as an agricultural landscape with intermittent mining and power generation activities. All the power line alternatives are located on rolling slopes with very little screening from topography or vegetation. Please refer to **Error! Reference source not found.** for the topography of the site.

The major rivers in the south of the site are the Klipspruit and the Waterval River, with several smaller tributaries. In the northern section the Wilge River is the main watercourse that drains northwards. Alternative 1 follows the Waterval River as well as the Kromdraaispruit, Alternative 2 crosses the Waterval River before joining the same alignment as Alternative 1, also following the Kromdraaispruit. Alternative 3 does not traverse along any major water courses but does cross over the Rietspruit and the Klipspruit.

The landscape surrounding the proposed power lines can be described as open grassland with numerous cultivated fields. The natural vegetation does not provide any substantial screening of the power lines. There are several existing power lines throughout the site, and in deed the intention of the project is to connect the existing power lines with the new power station. Figure 3 below provides a view of some of the existing power lines on site.

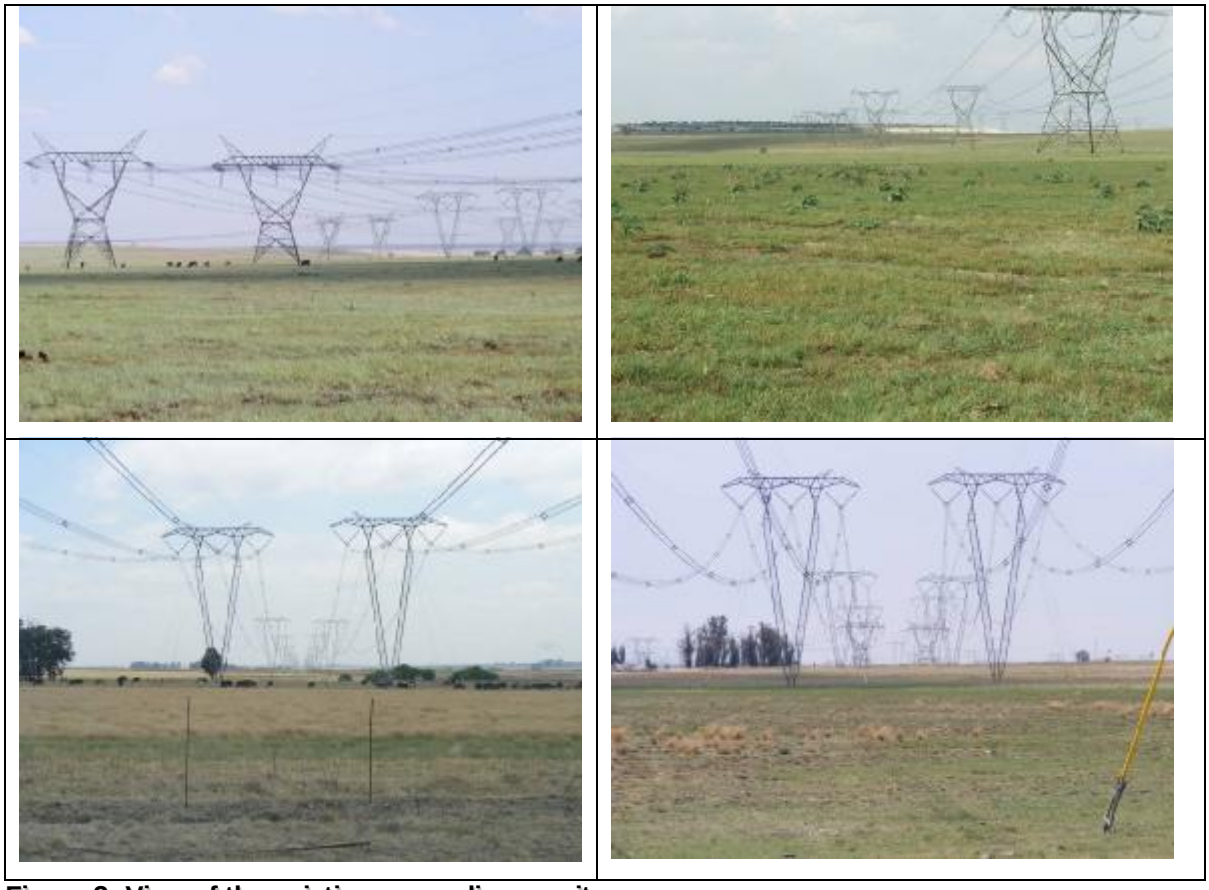


Figure 3: View of the existing power line on site

The study area is relatively devoid of any other infrastructure, with the exception of several farm houses, fences and roads. In a few isolated areas the power lines traverse close to areas used for mining, urban settlements and power generation.

2.3.2 Viewshed

It should be noted that the viewshed for each of the alternatives, which is plotted on Figure 4, Figure 5 and Figure 6, is an approximation that may vary in some locations. Potential views to the proposed upgrade are likely to be blocked in some localised situations by buildings, vegetation or local landform features at specific locations within the viewshed. Similarly, glimpses of the proposed upgrade may be available from some isolated high-elevation locations outside the plotted viewshed. The figures illustrate the visibility of each of the alternatives. The coloured areas indicate areas that are visible with the red areas having very high visibility and the blue having lower visibility. It should be noted that Alternatives 3 is more visible than Alternative 1 and 2 due to the fact that it is located along the higher altitudes and is not aligned along drainage lines like the other two alternatives.

Notable features of the viewshed are summarised by the following points:

- **Ü** The viewshed extends approximately 50 km to the northwest of the proposed upgrade;
- **Ü** In a easterly direction the viewshed is generally limited by a ridgelines approximately 40 km from the site at Bethal;
- **Ü** To the west the viewshed extends approximately 70 km with isolated views on high outcrops; and
- **Ü** Potential views from the south are blocked by the flowing ridges located south from the proposed site, and the viewshed extends about 5 km.

2.4 Impact Assessment

The visual simulations prepared by Cymbian illustrate the extent to which the upgrade will be visible from key observation points (static and dynamic views). The vertical form/dimensions of the buildings/structures would be hidden by their location among existing buildings and within a well vegetated area. The visual contrast is increased by the "shape" and scale of the buildings/structures, which generally will not be viewed along the skyline.

Static Views

The upgrade would potentially be visible from the surrounding farmland and several towns in the region as listed in Table 11. The potential number of viewers from this area could vary as the farmlands are quite sparsely populated while the towns have denser populations. The views would vary greatly depending on site specific conditions like the orientation of the homes as well as the location of other buildings, fences, vegetation and localized landforms. All these elements have the potential to block views to the proposed upgrade. It should be noted that a viewing distance of more than 5 km reduces the visibility as atmospheric effects reduce the contrast between the power lines and the surrounding landscape. In addition several existing power lines traverse the site, reducing the impact of an additional line.

Table 11: Static views

Town	Alt 1 Distance (km)	Alt 2 Distance (km)	Alt 3 Distance (km)
Kendal	0	0	0
Leandra	2	2	10
Kinross	15	15	10
Evander	7.5	10	7.5
Devon	15	15	20
Secunda	15	20	15
Greylingstad	25	20	25
Delmas	20	20	30

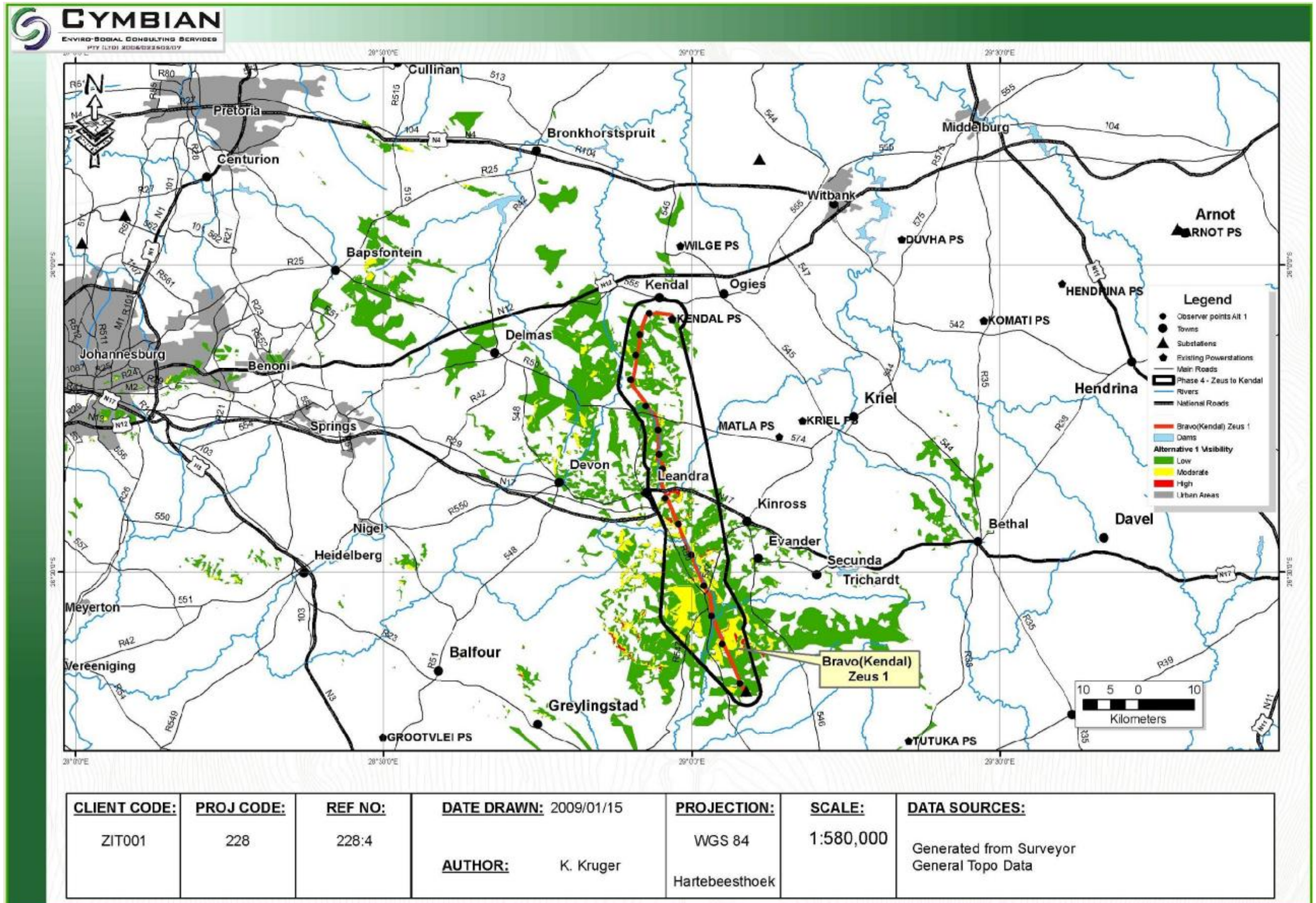
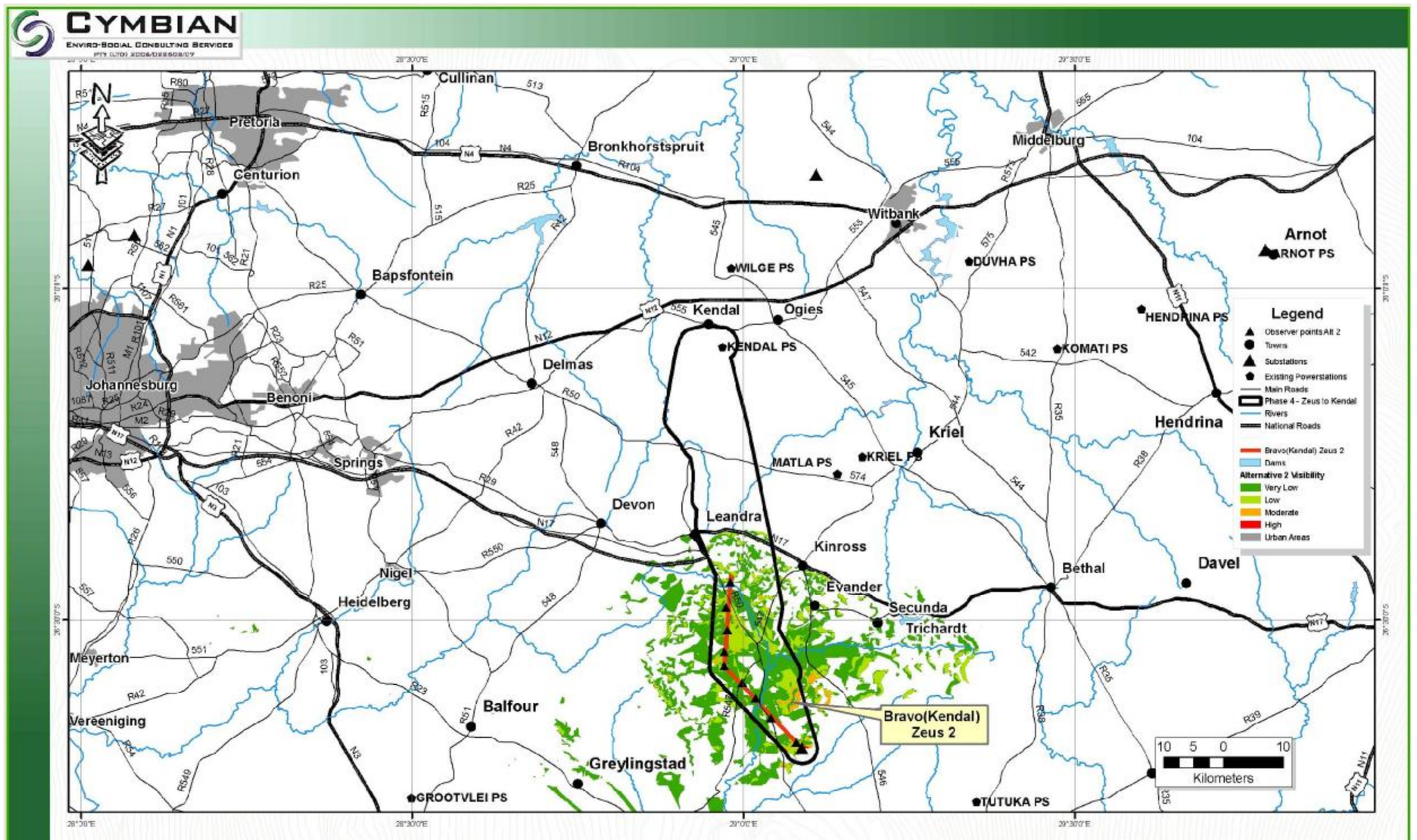
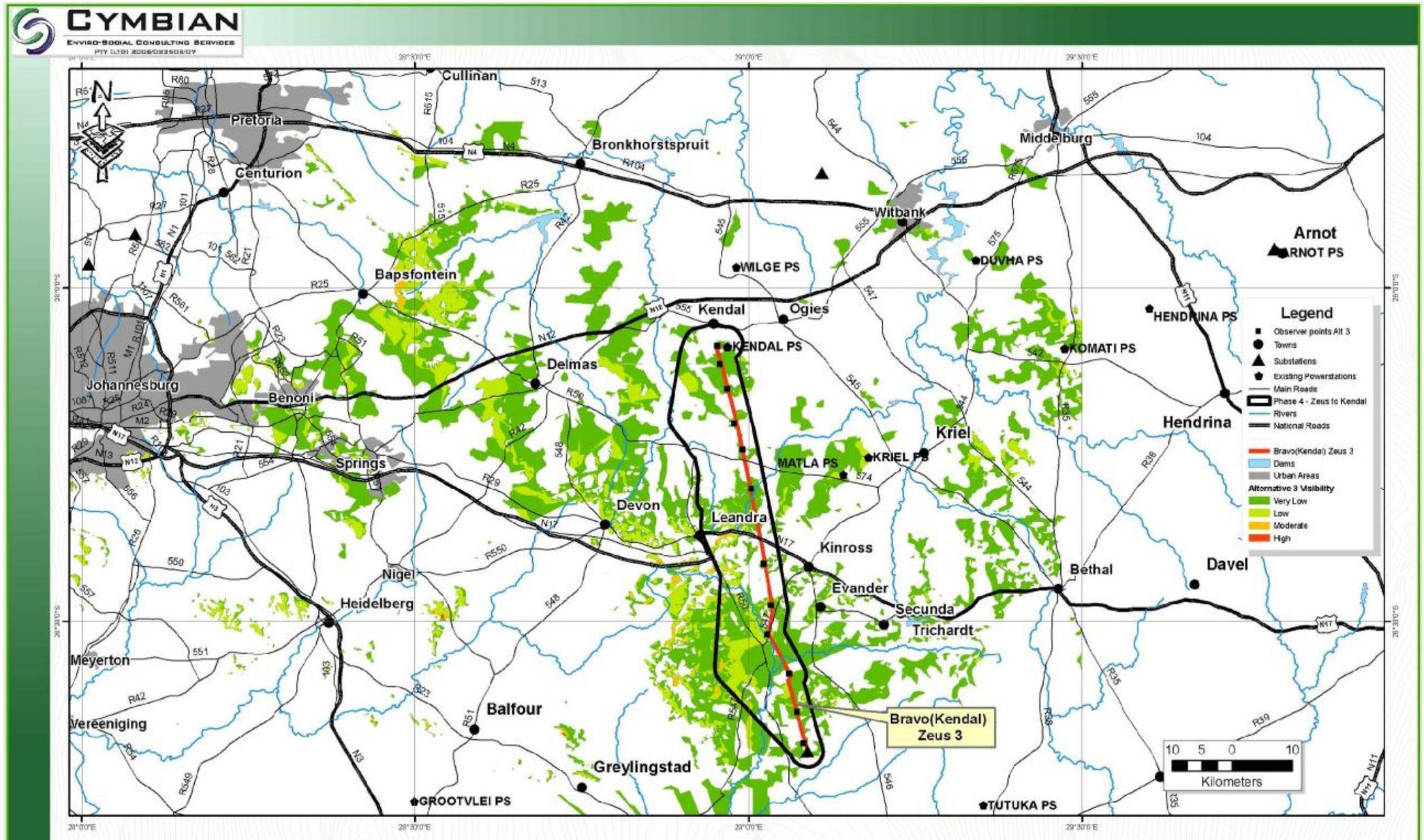


Figure 4: Viewshed from the Alternative 1 alignment.



CLIENT CODE:	PROJ CODE:	REF NO:	DATE DRAWN: 2009/01/15	PROJECTION:	SCALE:	DATA SOURCES:
ZIT001	228	228:4	AUTHOR: K. Kruger	WGS 84 Hartebeesthoek	1:580,000	Generated from Surveyor General Topo Data

Figure 5: Viewshed from the Alternative 2 alignment



CLIENT CODE:	PROJ CODE:	REF NO:	DATE DRAWN: 2009/01/15	PROJECTION:	SCALE:	DATA SOURCES:
ZIT001	228	228:4	AUTHOR: K. Kruger	WGS 84 Hartebeesthoek	1:580,000	Generated from Surveyor General Topo Data

Figure 6: Viewshed from the Alternative 3 alignment

Dynamic Views

The power lines will be visible to a moderate number of viewers, mainly those travelling along the highways and other main routes in the area. The level of visibility of the power lines reduces as a result of a view distance of more than 5 km and the resulting atmospheric effects that reduce the contrast between the power lines and the surrounding landscape. Please refer to Table 12 for a summary of the dynamic impacts of all three alternatives on the main roads in the study site. The power line upgrade would also be visible from several farm roads which are located around the proposed site.

As the table below illustrates, the power lines will be visible from a number of roads in the area, and exposures to the view will range from 40 seconds to 17 minutes. The R50 and the R547 runs through the study area and the power lines will be most visible along these roads. Although the lines will also be visible for ling periods along the N12 and N17 highways, these are from further away and hence the impact will not be as high.

Table 12: Dynamic Impact Table

Road	Speed limit	Length (km)	Visibility (min)	Distance from power line (km)
N12	120	31.53	15.77	5 – 30
N17	120	27.53	13.77	0 - 45
N3	120	1.29	0.64	50 – 60
N4	120	8.02	4.01	30 – 40
R547	100	25	15	0 – 10
R50	100	35	17.5	0 – 15

Conclusion

Table 13 lists the observation points together with the category of viewer, context of view, relative numbers of viewers and approximate distance of observation point to the proposed site. The location of these observation points are shown in Figure 4 and Figure 5.

Table 13: Visual Impact Matrix

Potential Observation Point	*Category of Potential Receptor*	*Context of View*	*Approximate View Distance*	*Period of View*	*Visibility Rating*
Surrounding Farmland	*Static*	*Above & below*	*0 – 50 km*	*Long Term*	*Medium*
Towns	*Static*	*Above & below*	*0 - 30 km*	*Long Term*	*Medium*
Gravel Roads	*Dynamic*	*Above & below*	*0 – 20 km*	*Medium*	*Medium*
Tar Roads	*Dynamic*	*Level - Above*	*0 – 40 km*	*Medium*	*Medium*

It should however be noted that there are a number of existing power lines in the study area as shown in the Figures above. Viewers in the viewshed have become accustomed to these power lines in the landscape and an additional power line will not increase the impact significantly. In terms of the preferred alternative, there is very little to choose between the alternatives from a visual standpoint. But it should be noted that the impact along Alternatives 1 and for sections along Alternative 2 is existing, while the bulk of Alternative 3 will be a new visual impact.

3.0 ALTERNATIVE SENSITIVITY ANALYSIS

This section provides a short sensitivity matrix, which compares the three different alternatives and their associated environmental sensitivities.

Table 14: Alternative Sensitivity Matrix

Sensitivity	Alternative 1	Alternative 2	Alternative 3
Geology	None	None	None
Climate	None	None	None
Topography	None	None	None
Surface Water	Most river crossings, traverses along several major streams.	Traverses along several major streams and in close proximity to Leeuwpan.	Avoids the bulk of the surface water bodies.
Soils & Land Capability	Clay soils dominate	Clay soils dominate	Agricultural soils dominate
Flora	Traverses through sensitive vegetation	Traverses through sensitive vegetation	Limits interaction with sensitive vegetation.
Fauna	Potential high impact on avifauna	Potential high impact on avifauna	Smallest impact to avifauna
Wetlands	Traverses along wetlands and streams	Traverses along wetlands and streams	Limits interaction with wetlands
Visual	Existing impact	Limited existing impact	New impact
Total Sensitivities	**5**	**6**	**2**

On the basis of the matrix presented above, it is suggested that the Bravo 4 Alternative 3 be utilised as the preferred alternative for the proposed project, as it has the least sensitive features associated with the alignment.

4.0 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology was utilised so that a wide rage of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Ü significance;
- Ü spatial scale;
- Ü temporal scale;
- Ü probability; and
- Ü degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 15.

Table 15: Quantitative rating and equivalent descriptors for the impact assessment criteria

Rating	Significance	Extent Scale	Temporal Scale
1	VERY LOW	*Isolated sites / proposed site*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

4.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 16 below.

Table 16 : Description of the significance rating scale

Rating		Description
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	Very low	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

4.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 17.

Table 17 : Description of the significance rating scale

Rating		Description
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
3	Local	The impact will affect an area up to 5 km from the proposed study area.
2	Study Area	The impact will affect an area not exceeding the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the power line alignments.

4.3 Duration Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 18.

Table 18: Description of the temporal rating scale

Rating		Description
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of plant.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

4.4 Degree of Probability

Probability or likelihood of an impact occurring will be described as shown in Table 19 below.

Table 19 : Description of the degree of probability of an impact occurring

Rating	Description
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

4.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in Table 20. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 20 : Description of the degree of certainty rating scale

Rating	Description
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.
Don't know	The consultant cannot, or is unwilling, to make an assessment given available information.

4.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment

criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below:

Table 21 : Example of Rating Scale

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
	LOW	*Local*	Medium-term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the table below.

Table 22 : Impact Risk Classes

Rating	Impact Class	Description
0.1 – 1.0	**1**	**Very Low**
1.1 – 2.0	**2**	**Low**
2.1 – 3.0	**3**	**Moderate**
3.1 – 4.0	**4**	**High**
4.1 – 5.0	**5**	**Very High**

Therefore with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

4.7 Cumulative Impacts

It is a requirement that the impact assessments take cognisance of cumulative impacts. In fulfilment of this requirement the impact assessment will take cognisance of any existing impact sustained by the operations, any mitigation measures already in place, any additional impact to environment through continued and proposed future activities, and the residual impact after mitigation measures.

It is important to note that cumulative impacts at the national or provincial level will not be considered in this assessment, as the total quantification of external companies on resources is not possible at the project level due to the lack of information and research documenting the effects of existing activities. Such cumulative impacts that may occur across industry boundaries can also only be effectively addressed at Provincial and National Government levels.

Using the criteria as described above an example of how the cumulative impact assessment will be done is shown below:

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Initial / Existing Impact (I-IA)	**2**	**2**	**2**	*1*	0.4
Additional Impact (A-IA)	**1**	***2***	**0**	*1*	0.2
Cumulative Impact (C-IA)	**3**	***4***	**2**	*1*	0.6
Residual Impact after mitigation (R-IA)	**2**	***1***	**2**	*1*	0.3

As indicated in the example above the Additional Impact Assessment (A-IA) is the amount that the impact assessment for each criterion will increase. Thus if the initial impact will not increase, as shown for temporal scale in the example above the A-IA will be 0, however, where the impact will increase by two orders of magnitude from 2 to 4 as in the spatial scale the A-IA is 2. The Cumulative Impact Assessment (C-IA) is thus the sum of the Initial Impact Assessment (I-IA) and the A-IA for each of the assessment criteria.

In both cases the I-IA and A-IA are assessed without taking into account any form of mitigation measures. As such the C-IA is also a worst case scenario assessment where no mitigation measures have been implemented. Thus a Residual Impact Assessment (R-IA) is also made which takes into account the C-IA with mitigation measures. The latter is the most probable case scenario, and for the purpose of this report is considered to be the final state Impact Assessment.

4.8 Notation of Impacts

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

Significance or magnitude- IN CAPITALS
Temporal Scale – in underline
Probability – *in italics and underlined*.
Degree of certainty - **in bold**
Spatial Extent Scale – *in italics*

5.0 ENVIRONMENTAL IMPACT ASSESSMENT

The Impact Assessment will highlight and describe the impact to the environment following the abovementioned methodology and will assess the following components:

- Ü Geology;
- Ü Climate;
- Ü Surface Water;
- Ü Topography;
- Ü Soils;
- Ü Land Capability
- Ü Land Use;
- Ü Flora;
- Ü Fauna; and
- Ü Visual Assessment.

The impact assessment was undertaken for the construction, operational and decommissioning phases of the project. The impact of each line/route alternative was also assessed separately, however, where the impact was not significantly different, only one impact assessment was undertaken. Also, at the time of writing this report, no technical data was available as to the type of tower to be used for the construction of the transmission lines. Therefore, it is assumed that the Self-supporting strain and suspension tower type would be used. Contained in this assumption is that the maximum distance between towers would be 300 m and that the tower would be erected on concrete footings with dimensions of 2 x 2 x 2 m (area = 4 m^2 and volume = 8 m^3).

5.1 Construction Phase

During the construction phase, the 400 kV power lines will be erected. A 400 kV transmission line requires a servitude width of 55 m. Where there are physical constraints such as other power lines adjacent to the new servitude, a minimum of 35 m-separation distance from such lines is required. Without physical constraints, parallel lines will have at least 55 m-separation distance. The power line cables are strung between pylons / towers, which are steel structures erected on concrete footings fixed in the substrate (soil or rock) below the pylon.

The major impacts during construction are the construction activities associated with the erection of the power lines and include, amongst others, heavy vehicle movement, construction of an access road and any wastes generated.

5.1.1 Geology

Initial Impact

Impacts that could occur to geology are limited to the physical removal of geological strata, resulting in permanent damage to those strata. There are no present indications that any existing impacts to geology have ocurred and therefore there is no initial impact rating.

Additional Impact

The additional impact resulting from the power line construction could occur on rocky ridges or places of shallow geology. The impact would be limited to the construction of the pylon footings, and should be a maximum of $8m^3$ of geological strata per footing. It should be noted that the erection of the pylons require a firm foundation, and this is achieved by casting a concrete slab under the soil surface. This VERY LOW impact **could** *probably* occur in *isolated sites* over the long term. This results in a final impact class of **Low** as rated in the table below.

Table 23: Geology Additional Impact Assessment

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Geology	VERY LOW	*Isolated sites*	Long Term	*Probably*	Low
	1	**1**	**4**	**4**	**1.6**

Cumulative Impact

Since there is no initial impact, the cumulative impact is the same as rated for the additional impact above.

Mitigation Measures

- **Ü** No blasting is undertaken on site without a suitable blast design, compiled in line with relevant SANS codes and approved by an appropriately qualified professional;

Residual Impact

Although mitigation measures will not reduce the significance of impact to geology they will ensure that the impacts are contained. Mitigation measures will ensure that the likelihood of secondary impacts occurring is significantly reduced. The residual impact to geology at the completion of the construction phase will be the same as for the additional impact assessment.

5.1.2 Topography

Initial Impact

The topography throughout the site has been left relatively unimpacted. The only impacts to topography were the establishment of mine dumps at the gold mining activities south of Kinross and the coal mining activities throughout the site. Please refer to the figure below for an illustration of the mine dump. This impact is limited to a very small area of the site, and as such is too small to be rated. Therefore the initial impact is rated as **no impact.**

Figure 7: Mine dump on site

Additional Impact

The construction of the power lines should not impact on the topography and therefore there is no additional impact.

Cumulative Impact

The cumulative impact is the same as assessed for the initial impact.

Mitigation Measures

No mitigation measures are required as there is no impact to topography from the proposed development.

Residual Impact

The residual impact remains **no impact** as assessed for the initial impact.

5.1.3 Soils, Land Capability and Land Use

Initial Impact

The bulk of the study area comprises agricultural and transitional soils. These soils can and in most cases are used for agricultural activities. The areas with existing power lines are usually on soils that are not suitable for agriculture, thereby ensuring that optimal land use is practised. The farming and especially ploughing of the soils breaks down the soil structure and increases the potential for erosion, which in turn could reduce the land capability.

The initial impact to soils and land capability is **probably** a LOW negative impact acting over the long term, and is *presently occurring* in the *study area*. As indicated in Table 24 below the impact rating class is a Moderate Impact.

Table 24: Soil and Land Capability Initial Impact Assessment

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Soils	LOW	*Study Site*	Long Term	*Is occurring*	Moderate
	2	**2**	**4**	**5**	**2.67**

Additional Impact

The additional impact from the new power lines will mainly be as a result of the construction of the power line pylons and their footings. The route alternatives are approximately 70 km in length and each will have a double power line. Therefore if using the average pylon distance of 300 m it can be assumed that there would be 467 pylons constructed. At the time of writing this report, the proponent has not determined which of the various pylon designs will be utilised, and therefore the actual impact could vary. For this analysis it is assumed that pylons similar to the existing power lines will be utilised. This will result in 4 footings impacting on the soils per pylon.

In addition to the pylon footings the soils will also be disturbed by the establishment of a construction road as well as the movement of construction vehicles. The impact from each of the routes are summarised below.

Table 25: Soil Impact

Soil Type	Alternative 1 (km)	Alternative 2 (km)	Alternative 3 (km)
Clay	35.2	40.1	31.8
Transitional	21.7	18	11.9
Disturbed	1.5	1.5	0.5
Agricultural	12.2	13.6	19

As indicated in Table 25 above, Alternatives 1 and 2 crosses more sensitive soils than Alternative 3. That said, the impact rating class between the two alternatives differ and is therefore rated separately.

For Alternative 3 the additional impact to soils and land capability is **probably** a LOW negative impact acting over the long term, and *will definitely occur* at *isolated sites*. As indicated in Table 26 below the impact rating class is a Moderate Impact.

Table 26: Soil and Land Capability Additional Impact Assessment – Alternative 1

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Soils	Low	*Isolated Site*	Long Term	*Will occur*	Moderate
	2	**1**	**4**	**5**	**2.3**

For Alternatives 1 and 2 the additional impact to soils and land capability is **probably** a MODERATE negative impact acting over the long term, and *will definitely occur* at *isolated sites*. As indicated in Table 27 below the impact rating class is a Moderate Impact.

Table 27: Soil and Land Capability Additional Impact Assessment – Alternatives 2 and 3

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Soils	Moderate	*Isolated Site*	Long Term	*Will occur*	Moderate
	3	**1**	**4**	**5**	**2.67**

Cumulative Impact

Due to the fact that the two impacts (power station and the power lines) are in adjacent locations, the cumulative impact remains as rated for the initial impact i.e. a High impact class.

Mitigation Measures

- Ü Take land use into consideration when choosing pylon types, it is recommended that smaller footprint pylons be used in cultivated areas;
- Ü Avoid placement of pylon footings in the clay soils;
- Ü Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling area in the hard park;
- Ü Oil-contaminated soils are to be removed to a contained storage area and bio-remediated or disposed of at a licensed facility;
- Ü If soils are excavated for the footing placement, ensure that the soil is utilised elsewhere for rehabilitation/road building purposes; and
- Ü Ensure that soil is stockpiled in such a way as to prevent erosion from storm water.

Residual Impact

The residual impact remains a Moderate Impact, as the mitigation measures will not reduce the overall impact of the power station construction.

5.1.4 Surface Water

Initial Impact

Due to the size of the site and the numerous drainage lines and streams on site, the estimation of the potential initial impact to surface water is almost impossible. That said, all the watercourses observed on site was in good health. The largest potential impact in the area is the industrial complex of Secunda as well as the open cast coal mines near Kendal. The impact to surface water would be limited to contaminated storm water runoff and sediment entering the streams. This is also the case for the various towns in the district, that discharge their stormwater runoff into the natural systems. The impact is assessed in Table 28 below.

Table 28: Surface Water Initial Impact Rating

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Surface water	LOW	*Study Site*	Medium Term	*Could happen*	Low
	2	***2***	**3**	**3**	**1.4**

The initial impact to surface water is LOW, occurs in *Isolated sites / proposed site* and will be Medium Term and *It's going to happen / has occurred*. This results in a rating of 1.4 or a Low impact class.

Additional Impact

During the construction phase there should be limited impacts to surface water features as the placement of the pylons will be done in such a way as to avoid the surface water features on site.

Waste generated during the construction phase may enter the environment through surface water runoff i.e. litter or pollution such as hydrocarbons can be washed into aquatic systems affecting those systems negatively. Storm-water flowing over the site will also mobilise loose sediments, which may enter the surface water environment affecting water quality. Storm-water containing sediment can be discharged to grassland buffers to ensure sediments fall out prior to water entering surface water bodies. Care must be taken that storm-water containing hydrocarbons and other pollution sources are not discharged.

Impacts will be felt as wide as the *study area* when storm-water flows from the power line sites into the study area. The impact to the surface water will **probably** be of a VERY LOW negative significance, and will act in the short-term. This impact *could happen*. This results in a Very Low impact class as assessed in Table 29.

Table 29: Surface Water Additional Impact Rating

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Surface water	VERY LOW	*Study area*	Short Term	*Could happen*	Very Low
	1	***2***	**2**	**3**	**1.0**

Cumulative Impact

The cumulative impact of the current activities and the future activities will not increase the impact rating from a Low Impact as rated in the initial impact assessment.

Mitigation Measures

- **Ü** Demarcated areas where waste can be safely contained and stored on a temporary basis during the construction phase should be provided at the hard park;
- **Ü** When adequate volumes of wastes (not more than 1 month) have accumulated, all waste is to be removed from site and disposed of at a licensed facility;
- **Ü** Waste is not to be buried on site;
- **Ü** Hydro-carbons should be stored in a bunded storage area;
- **Ü** All hazardous materials *inter alia* paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment;

- Ü Spill-sorb or similar type product must be used to absorb hydrocarbon spills in the event that such spills should occur;
- Ü Care must be taken to ensure that in removing vegetation adequate erosion control measures are implemented;
- Ü No construction vehicles or activities will be allowed to work within 100 m of any of the streams or wetlands on site.
- Ü If possible utilise Alternative 3 as the preferred alternative.

Residual Impact

The mitigation measures proposed will reduce the risk of the additional impact occurring, but it will not reduce the residual impact class, which remains at a Low impact as rated in the initial impact assessment.

5.1.5 Flora

Initial Impact

The initial impacts to flora include extensive grazing, cultivation and within the mines and towns, large areas of vegetation have also been cleared. Of the total area on site only an estimated 30 % of natural vegetation remains. The initial impact to flora is **probably** a HIGH negative impact acting over the long term, and is *presently occurring* in the *study area*. As indicated in Table 30 below the impact rating class is a High Impact.

Table 30: Flora Initial Impact Assessment

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Flora	HIGH	*Study Site*	Long Term	*Is occurring*	High
	4	**2**	**4**	**5**	**3.33**

Additional Impact

The additional impact to flora during the construction phase will be as a result of vegetation clearance for access roads and the removal of vegetation in the areas of the pylon footings. Table 31 below illustrates the length that each route alternative will cross the vegetation types identified. Alternatives 1 and 2 traverse a much longer section of the sensitive moist grassland and seepage area vegetation units when compared to Alternative 3.

Table 31: Flora Impact

Soil Type	Alt 1 (km)	Alt 2 (km)	Alt 3 (km)
Cultivated Fields	22.4	29.2	27.2
Moist Grassland and Drainage areas*	22	24.7	13.5
Eastern Highveld Grassland	7.3	7.3	4.7
Rand Highveld Grassland	3.3	3.3	1.5
Soweto Highveld Grassland	19.5	14.8	18.9
Disturbed Grassland	2	1.5	0.5

* Indicates sensitive vegetation types

The additional impact from the Alternative 3 alignment to flora is **probably** a MODERATE negative impact acting over the short term, and *will occur* in *isolated sites*. As indicated in Table 32 below the impact rating class is a Low Impact.

Table 32: Flora Additional Impact Assessment – Alternative 3

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Flora	Moderate	*Isolated Site*	Short Term	*Will occur*	Low
	3	**1**	**2**	**5**	**2**

Due to the alignment of Alternatives 1 and 2 in line with the sensitive vegetation types, the impact is higher and will be active for a longer period. As there is sensitive species along this alignment the additional impact from the Alternatives 1 and 2 to flora is **probably** a HIGH negative impact acting over the long term, and *will occur* in *isolated sites*. As indicated in Table 33 below the impact rating class is a Moderate Impact.

Table 33: Flora Additional Impact Assessment – Alternatives 1 and 2

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Flora	High	*Isolated Site*	Long Term	*Will occur*	Moderate
	4	**1**	**4**	**5**	**3**

Cumulative Impact

The cumulative impact to flora will remain as assessed for the initial impact assessment with a High impact class.

Mitigation Measures

- Ü All construction areas should be demarcated prior to construction to ensure that the footprint of the impacts are limited (including areas where vehicles may traverse);
- Ü The sensitive vegetation unit should be avoided and construction limited to 100 m from the edge of the wetlands and streams;
- Ü Alternative 3 should be considered as the preferred alternative;
- Ü All alien invasive species on site should be removed and follow up monitoring and removal programmes should be initiated once construction is complete;
- Ü Adhere to the ESKOM vegetation management guideline (Appendix 4).

Residual Impact

If the mitigation measures are implemented and Alternative 3 is constructed then the residual impact to flora is **probably** a MODERATE negative impact acting over the medium term, and *will occur* in the *study area*. As indicated in Table 34 below the impact rating class is a Moderate Impact.

Table 34: Flora Residual Impact Assessment

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Flora	MODERATE	*Study Site*	Medium Term	*Will happen*	Moderate
	3	**2**	**3**	**5**	**2.33**

5.1.6 Fauna

Initial Impact

As described in the habitat assessment in Section 3.9 the site is relatively disturbed with the Soweto, Rand and Eastern Highveld grasslands, the moist grassland and the drainage areas the main habitat still available for fauna. The site is 61.7 % disturbed and the habitat available for fauna is limited. The suitable habitats did show low species diversity, indicating that the impact of cultivation has limited faunal activity throughout the site. The bulk of the faunal species observed were limited to a game farm to the north of the Zeus Sub Station.

The study area is criss crossed with existing high voltage power lines that could potentially impact on the faunal life. While there appears to be no negative impacts associated with electro magnetic fields generated by the power lines, Eskom's document, *Transmission Bird Collision Prevention Guideline* (Ref. no.: TGL41-335)[5], the major impact to birds or avi-fauna is in the form of collisions

with power lines. According to the document, it was found that the majority of birds affected are large flighted birds, which are also often endangered or threatened species.

These large flighted birds are also long lived, with low breeding rate and often mate for life. Therefore, a single mortality due to a collision with a power line should be viewed as a high impact. In addition some of the most sensitive species to power line collisions such as Blue Crane are found in the study site in addition to other sensitive species such as White-Bellied Korhaan and Secretary Birds. As shown in **Error! Reference source not found.** above, several birds have been found dead under the exisitng power lines.

The current impact on fauna on site is **probably** of a HIGH negative significance, affecting the *region*, and acting in the long-term. The impact can *likely occur*. The impact class is classified as a High impact.

Table 35: Fauna Initial Impact Assessment

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Fauna	HIGH	*Region*	Long Term	*Likely*	High
	4	**4**	**4**	**4**	**3.2**

Additional Impact

The impact to fauna during the construction phase of the power lines will mostly be in the form of disturbance from the construction workers and vehicle noise. Due to the fact that the area is habitat to sensitive species, the impact could be quite high. Once again Alternatives 1 and 2 are significantly closer to the habitat for the sensitive species and therefore the impacts are assessed separately.

The additional impact from the Alternative 3 alignment to fauna is **probably** a MODERATE negative impact acting over the short term, and *will occur* in *isolated sites*. As indicated in Table 36 below the impact rating class is a Low Impact.

Table 36: Fauna Additional Impact Assessment – Alternative 1

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Fauna	MODERATE	*Isolated Site*	Short Term	*Will occur*	Low
	3	**1**	**2**	**5**	**2**

The additional impact from the Alternative 1 and 2 alignments to fauna is **probably** a HIGH negative impact acting over the short term, and *will occur* in *isolated sites*. As indicated in Table 36 below the impact rating class is a Moderate Impact.

Table 37: Fauna Additional Impact Assessment – Alternative 1

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Fauna	High	*Isolated Site*	Short Term	*Will occur*	Moderate
	4	**1**	**2**	**5**	**2.3**

Cumulative Impact

The cumulative impact to fauna should remain as assessed for the initial impact assessment as the impacts are identical. Therefore the impact remains a High impact to Fauna.

Mitigation Measures

- Ü All construction areas should be demarcated prior to construction to ensure that the footprint of the impacts are limited (including areas where vehicles may traverse);
- Ü The sensitive habitat should be avoided and construction limited to 50 m from the edge of the wetlands and streams;
- Ü Alternative 3 should be considered as the preferred alternative;
- Ü All alien invasive species on site should be removed and follow up monitoring and removal programmes should be initiated once construction is complete;
- Ü Adhere to the ESKOM vegetation management guideline (Appendix 4); and
- Ü Install power lines according to the ESKOM bird collision prevention guideline.
- Ü Demarcate the sections of line that need to be mitigated once the alignment has been finalized
    - o only through a combination of physical inspection of the entire length of the final alignment, and
    - o detailed analysis of high resolution satellite imagery.
    - o It is standard procedure by the Eskom Transmission Group to perform this procedure with the help of a suitably experienced ornithologist once the line has been pegged.
- Ü All construction and maintenance activities should be undertaken in accordance with Eskom Transmission's environmental best practice standards.
- Ü Care should be taken not to unnecessarily disturb any birds along the servitude.
- Ü The Environmental Control Officer should identify any breeding birds along the servitude, particularly large terrestrial species such as cranes, korhaans or Secretary birds and notify

the avifauna specialist of these so that advice can be given on how to best deal with the situation.

- Ü The construction of new access roads in particular should be limited to a minimum.
- Ü All vehicle and pedestrian movement should be restricted to the actual construction site and, in the case of maintenance patrols, to the actual servitude.

Residual Impact

The mitigation measures proposed above will ensure that the construction of the proposed power line remains a Moderate impact but the Residual Impact remains High. If the mitigation measures were to be extended into the existing power lines and bird flappers be installed, the residual impact could be mitigated to a Moderate Impact Class.

5.1.7 Wetlands

The impact assessment for wetlands is the same as assessed for the surface water component in Section 6.1.4.

5.1.8 Visual Impact

Initial Impact

At present the viewers in the viewshed are seeing the Zeus Sub Station, Kendal Power Station, coal mines and cultivated fields. In addition to the abovementioned impacts there are numerous power lines already traversing the landscape. The initial impact to the visual environment is HIGH negative acting in the long term, and *has already occurred*. The impact has **definitely** impacted on the *local region*.

Table 38: Visual Impact Assessment – Initial Impact

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Visual	High	*Local*	Long Term	*Has occurred*	High
	4	**3**	**4**	**5**	**3.6**

As illustrated in Table 38 above the initial impact to the visual environment is rated as a High impact.

Additional Impact

The additional impact from the power lines as described in Section 4.4 indicated that the additional impact to the visual environment is **probably** a LOW negative impact acting in the short term and impacting on the *local region*. This impact *will definitely occur*.

Table 39: Visual Impact Assessment – Additional Impact

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Visual	Low	*Local*	Short Term	*Will occurr*	Moderate
	2	**3**	**2**	**5**	**2.3**

From Table 39 above it is clear that the additional impact from the construction of the power lines will be a Moderate impact. It should be noted that Alternative 3 has the least number of existing lines in the vicinity and therefore could be perceived as a higher impact by a observer.

Cumulative Impact

There are a high number of existing industrial and agricultural activities present on site as well as a high number of power lines on site. The cumulative impact from the developments will remain as assessed for the initial impact above; therefore the impact remains a High negative impact.

Mitigation Measures

- Ü Only the footprint of the proposed power line should be exposed. In all other areas, the natural vegetation should be retained;
- Ü Dust suppression techniques should be in place at all times during the construction phase;
- Ü Access roads should be minimised to prevent unnecessary dust.

Residual Impact

The mitigation measures proposed above will ensure that the construction of the proposed power line remains a High impact to the visual environment.

5.2 Operational Phase

The main impacts during the operatational phase are the electro magnetic field associated with the power lines and the occurrence of the physical structures in the landscape. See *Electric and Magnetic Fields – A summary of Technical and Biological Aspects* (2006)[1] for a detailed discussion regarding the impact of electro magnetic fields (Appendix 5).

5.2.1 Geology

The impact assessment does not change from that of the construction phase, refer to Section 7.1.1 above.

5.2.2 Topography

The impact assessment does not change from that of the construction phase, refer to Section 7.1.2 above.

5.2.3 Soils, Land Capability and Land Use

The impact assessment does not change from that of the construction phase, refer to Section 7.1.3 above.

5.2.4 Surface water

The impact assessment does not change from that of the construction phase, refer to section 7.1.4 above.

5.2.5 Vegetation

The impact assessment does not change from that of the construction phase, refer to section 7.1.5 above.

[1] *Electric and Magnetic Fields – A summary of Technical and Biological Aspects*, Empetus cc, 2006.

5.2.6 Fauna

Initial impact

The initial impact remains as assessed in Section 7.1.6, a High impact.

Additional impact

During the operational phase the proposed development will add approximately 70 km of high voltage power lines to the existing network of power lines in the area. Sensitive avifauna were identified right under the potential alignments and a single death of one of these protected species would be seen as a high impact.. The additional impact to faune will **probably** be a HIGH negative impact, acting in the long term, and affected the *local area* and this impact *could occur*. This calculates to a Moderate impact class as illustrated in Table 40 below.

Table 40: Fauna Additional Impact Rating – Operations

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Fauna	HIGH	*Local*	Long Term	*Could occur*	Moderate
	4	***3***	**4**	**3**	**2.2**

Cumulative impact

During the operational phase the proposed development will add approximately 70 km of high voltage power lines to the existing network of power lines in the area. The addition is moderate in comparison with the approximately 300 km of existing high voltage powerlines in the area. The cumulative impact to fauna remains a High impact as assessed in the initial impact assessment.

Mitigation Measures

- **Ü** The sensitive habitat should be avoided and power lines limited to 50 m from the edge of the wetlands and streams;
- **Ü** Adhere to the construction phase mitigation measures;
- **Ü** Alternative 3 should be considered as the preferred alternative;
- **Ü** Adhere to the ESKOM vegetation management guideline (Appendix 4); and
- **Ü** Install power lines according to the ESKOM bird collision prevention guideline.

Residual impact

In order to prevent power line collisions from birds, anti-collision devices can be installed to the power lines. These include static, dynamic, reflective and illuminated devices. As mentioned in Appendix 3 these devices have resulted in a 60% reduction in bird collisions but they will not completely eliminate the impact risk to birds. In addition this reduction will only be effective if the anti-collision devices are installed on all the power lines in the region. If the anti collision devices are only installed for the proposed 70 km of new power line, the impact would remain a High impact. If the devices are to be installed on all the regional power lines the impact to fauna would **prabably** be a HIGH negative impact, acting on the *regional scale* in the long term. The prabability would however be reduced to *unlikely*.

Table 41: Fauna Residual Impact Rating

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Impact to Fauna	HIGH	*Regional / Provincial*	Long Term	*Unlikely*	Low
	4	***4***	**4**	**2**	**1.6**

The residual impact to fauna as calculated in Table 41 above has a rating of 1.6 and a Low impact class.

5.2.7 Visual

The impact assessment does not change from that of the construction phase, refer to Section 7.1.7 above.

5.3 Decommisioning Phase

5.3.1 Geology

The impacts to geology during the decomissioning phase of the development remain as assessed in the construction phase in Section 7.1.1 above.

5.3.2 Topography

The impacts to topography during the decomissioning phase of the development remain as assessed in the construction phase in Section 7.2.2 above.

5.3.3 Soils, Land Capability and Land Use

The impacts to soils during the decomissioning phase of the development remain as assessed in the construction phase in Section 7.2.3 above.

5.3.4 Surface water

The impacts to surface water during the decomissioning phase of the development remain as assessed in the construction phase in Section 7.2.4 above.

5.3.5 Vegetation

The impacts to vegetation during the decomissioning phase of the development remain as assessed in the construction phase in Section 7.2.5 above.

5.3.6 Fauna

Even though the removal of the 70 km of proposed power lines will reduce the number of power lines in the area that could impact on fauna, the impact after decomissioning will remain as assessed in Section 7.2.6 above due to the remaining network if high voltage power lines.

5.3.7 Visual

Even though the removal of the 70 km of proposed power lines will reduce the number of power lines in the area that could impact on the visual environment, the impact after decomissioning will remain as assessed in Section 7.2.7 above due to the remaining network if high voltage power lines.

6.0 ENVIRONMENTAL MANAGEMENT

This section describes the suggested commitments that should be included in the Environmental Management Plan (EMP) to be compiled by the environmental consultant responsible for the EIA.

6.1 Geology and Soils

Management Component	***Geology and Soils***
Primary Objective	
To ensure that the soils are stockpiled in the correct manner to prevent erosion and contamination of surface water runoff.	
Core Criteria:	***Monitoring Criteria***
No blasting is undertaken on site without a suitable blast design, compiled in line with relevant SANS codes and approved by an appropriately qualified professional.	***Site Development Plan, EMP monitoring and Intermittent observation***
Avoid placement of pylon footings in the clay soils on site	
Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling area in the hard park	
Oil-contaminated soils are to be removed to a contained storage area and bio-remediated or disposed of at a licensed facility	
If soils are excavated for the footing placement, ensure that the soil is utilised elsewhere for rehabilitation/road building purposes	
Ensure that soil is stockpiled in such a way as to prevent erosion from storm water.	

6.2 Fauna

Management Component	*Fauna – especially red data birds*
Primary Objective	
To ensure that the development minimises the potential impact to endangered species and their habitat.	
Core Criteria:	***Monitoring Criteria***
All construction areas should be demarcated prior to construction to ensure that the footprint of the impacts are limited (including areas where vehicles may traverse)	***Site Development Plan, EMP monitoring and Intermittent observation***
No construction activity and disturbance will be permitted in the seasonal seepage zone where the red data birds were observed.	
Bird flappers are to be installed on all power lines in order to prevent bird collisions.	
Construction activities, people and vehicles will not be allowed outside of the area demarcated for construction.	
No hunting, snaring or collection of eggs will be allowed.	
If any Blue Crane nests or young are found, contact the Mpumalanga Parks Board for assistance. Also avoid the area at all cost (250m buffer)	
If adult birds are observed on site, avoid startling the birds, as they could fly into the already existing power lines.	
No animals/pets will be allowed in the construction site.	
Adhere to the ESKOM bird collision prevention guideline (Appendix 3)	
Poisoning of any sort is strictly forbidden.	
Remove all food wastes daily and discard at a licensed waste facility	
Provide vermin-proof bins for construction workers	
Designate eating areas and prevent food and waste build up	
No cooking fires will be permitted, the grassland is highly susceptible to veld fires and these destroy bird eggs	

6.3 Vegetation

Management Component	*Vegetation*
Primary Objective	
To ensure the control of alien invasive species and that the rehabilitation of indigenous vegetation to as close to the original state as possible.	
Core Criteria:	***Monitoring Criteria***
All construction areas should be demarcated prior to construction to ensure that the footprint of the impacts are limited (including areas where vehicles may traverse)	***Site Development Plan, EMP monitoring and Intermittent observation***
Take appropriate remedial action where vegetation establishment has not been successful or erosion is evident.	
Control of alien invasive species in line with the requirements of Conservation of Agricultural Resources Act will be undertaken.	
Alien invasive plant material will be preferentially removed in entirety through mechanical means (e.g. chainsaw, bulldozer, hand-pulling of smaller specimens). Chemical control is only required as a last resort.	
If during the establishment period, any noxious or excessive weed growth occurs, such vegetation will be removed.	
No construction activity and disturbance will be permitted in the seasonal seepage zone.	
It is the developer's responsibility to implement a monitoring programme that will be instituted to ensure that re-growth of alien invasive plants species does not occur, or that such re-growth is controlled.	
The sensitive vegetation unit should be avoided and construction limited to 50 m from the edge of the wetlands and streams	
Adhere to the ESKOM vegetation management guideline (Appendix 4)	

6.4 Rivers, wetlands and Streams

Management Component	*Rivers and streams*
Primary Objective	
To ensure that the rivers and streams are protected and incur minimal negative impact from the development as possible.	
Core Criteria:	***Monitoring Criteria***
The Contractor will minimise the extent of any damage to the flood plain that is necessary to complete the works, and will not pollute any river as a result of construction activities.	***Storm water Management Plan, Site Development Plan, EMP monitoring and Intermittent observations***
The Contractor will not cause any physical damage to any aspects of a watercourse, other than that necessary to complete the works as specified and in accordance with the accepted method statement.	
No construction vehicles or activities will be allowed to work within 50 m of any of the streams or wetlands on site	
Demarcated areas where waste can be safely contained and stored on a temporary basis during the construction phase should be provided at the hard park	
When adequate volumes (not more than 1 month) have accumulated all waste is to be removed from site and disposed of at a licensed facility	
Waste is not to be buried on site	
All hazardous materials inter alia paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment	
Spill-sorb or similar type product must be used to absorb hydrocarbon spills in the event that such spills should occur	
Care must be taken to ensure that in removing vegetation adequate erosion control measures are implemented	

7.0 CONCLUSION

In conclusion the proponent in proposing the construction and operation of two high voltage power lines in order to connect the Kendal Power Station to the existing Zeus Sub Station as part of the Bravo integration project.

Cymbian was appointed to investigate the biophysical aspects of the proposed site as well as the potential visual impact of the development. The aspects investigated include topography, soils, land use, land capability, wetland, fauna, flora and the visual environment.

It was found that the major areas of concern were the sensitive wetlands and seepage zones on site, along with the sensitive avifaunal and floral species that occur in these environments. In addition it was noted that the visual impact of the development could be high.

Upon review of the existing procedures and mitigation measures that Eskom have applied in the past and which are based on sound scientific research it was found that the impacts to fauna could be reduced.

The impacts to the wetland and seepage zones could be reduced by utilising the Alternative 3 route alignment, thereby limiting the contact with the wetlands and seepage zones.

The area provides habitat to a number of sensitive avifauna species and potential impacts to these are rated as a High impact. Serious consideration should be made to install collision preventative measures. Furthermore the utilisation of Alternative 3 will reduce the potential impact as the route traverses to less suitable habitat.

The visual impact was found to be moderate, when considering the high number of existing power lines in the area.

In conclusion the proposed development will impact on the environment, but these impacts can be managed and mitigated to the point where they are within acceptable norms. It is suggested that the Alternative 3 route alignment be utilised in order to decrease the risk of impacting in fauna and flora.

Appendix 1: Floral Species List

Download from POSA (http://posa.sanbi.org) on September 30, 2008, 11:24 am - Grid: 2528DD					
Family	Species	Common name	Present	Occurrence	Habitat
Acanthaceae	Hermbstaedtia odorata	Rooiaarbossie	x	Individuals	Distirbed/Grassland
Acanthaceae	Ruellia cordata (Thunb)		x	Individuals	
Amaryllidaceae	Cyrthanthus breviflorus	Yellow Fire lily	x	Individuals	
Amaryllidaceae	Cyrthanthus breviflorus	Fire lily	x	Individuals	Disturbed areas /Ripirain zones
Anacardiaceae	Rhus magalismontana Sond. subsp. magalismontana	Bergtaaibos			
Anacardiaceae	Sclerocarya birrea (A.Rich.) Hochst. subsp. caffra (Sond.) Kokwaro	Marula			
Apiaceae	Afrosciadium magalismontanum (Sond.) P.J.D.Winter	Wild Parsley			
Apiaceae	Heteromorpha arborescens (Spreng.) Cham. & Schltdl. var. abyssinica (Hochst. ex A.Rich.) H.Wolff	Parsley Tree			
Apocynaceae	Asclepias gibba (E.Mey.) Schltr. var. gibba				
Apocynaceae	Asclepias stellifera Schltr.	Spring Stars			
Apocynaceae	Brachystelma rubellum (E.Mey.) Peckover				
Apocynaceae	Pachycarpus schinzianus (Schltr.) N.E.Br.	Bitterwortel			
Apocynaceae	Parapodium costatum E.Mey.				
Aponogetonaceae	Aponogeton natalensis Oliv.	Wateruintjie	x	Individuals	
Aquifoliaceae	Ilex mitis (L.) Radlk. var. mitis	Cape Holly			
Asphodelaceae	Kniphofia ensifolia Baker subsp. ensifolia				
Asclepiadaceae	Asclepias eminens (Harv.) Schltr		x	Individuals	Disturbed/Grassland
Asclepiadaceae	Asclepias fruticosa	Milkweed	x	Individuals	Disturbed Areas
Asteraceae	Tagetes minuta	Khaki weed	x	Common	Disturbed Areas
Asteraceae	Bidens pilosa	Blackjack	x	Common	Disturbed Areas
Asteraceae	Bidens formosa	Cosmos	x	Individuals	
Asteraceae	Crassocephalum x picridifolium (DC.) S.Moore				
Asteraceae	Dicoma macrocephala DC.				
Asteraceae	Denika capensis Thunb.		x	Individuals	Ripirain zones
Asteraceae	Gerbera piloselloides	Swartteebossie	x	Individuals	Disturbed Areas/Grassland
Asteraceae	Haplocarpha scaposa	Tonteldoosbossie	x	Individuals	Disturbed Areas/Grassland
Asteraceae	Helichrysum aureonitens Sch.Bip.		x	Individuals	
Asteraceae	Helichrysum nudifolium (L.) Less. var. nudifolium	Hottentot's Tea			
Asteraceae	Helichrysum pilosellum (L.f) Less.		x	Sparse	Disturbed Areas/Grassland
Asteraceae	Helichrysum setosum Harv.	Yellow Everlasting			
Asteraceae	Helichrysum splendidum (Thunb.) Less.				
Asteraceae	Helichrysum cephaloideum DC		x	Individuals	Grassland
Asteraceae	Nidorella hottentotica DC.				
Asteraceae	Stoebe vulgaris	Bankrupt Bush	x	Sparse	Higly Disturbed Areas
Asteraceae	Cirsium vulgare	Scotish Thistle	x	Sparse	Disturbed Areas
Asteraceae	Tagetes minuta	Khaki weed	x	Common	Disturbed Areas

Download from POSA (http://posa.sanbi.org) on September 30, 2008, 11:24 am - Grid: 2528DD					
Family	Species	Common name	Present	Occurrence	Habitat
Asteraceae	Vernonia poskeana Vatke & Hildebr. subsp. botswanica G.V.Pope				
Asteraceae	Vernonia oligocephala	Bitterbossie	x	Sparse	Disturbed Areas
Asteraceae	Senecio inaequidens DC. (=s. burchellii DC. p.p)	Canary Weed	x	Sparse	Disturbed Areas
Asteraceae	Senecio erubescens Ait. Var. crepidifolius DC		x	Individuals	Grasslans/Riparian Zone
Asteraceae	Sonchus oleraceus	Sow Thistle	x	Individuals	Grassland/Ripiran Zone
Bryaceae	Bryum argenteum Hedw.	Silver Moss			
Capparaceae	Maerua cafra (DC.) Pax	Common bush-cherry, White-wood			
Caryophyllaceae	Corrigiola litoralis L. subsp. litoralis var. perennans Chaudhri				
Caryophyllaceae	Dianthus mooiensis F.N.Williams subsp. mooiensis var. mooiensis	Wild Pink			
Caryophyllaceae	Dianthus transvaalensis Burtt Davy				
Convolvulaceae	Ipomoea crassipes Hook. var. crassipes				
Convolvulaceae	Ipomoea magnusiana Schinz		x	Individuals	Disturbed Areas/Grassland
Convolvulaceae	Ipomoea bolusiana Schinz subsp bolusiana		x	Individuals	
Convolvulaceae	Merremia palmata Hallier f.		x	Individuals	Grassland
Crassulaceae	Crassula setulosa Harv. var. setulosa forma setulosa				
Cyperaceae	Bulbostylis densa (Wall.) Hand.-Mazz. subsp. afromontana (Lye) R.W.Haines				
Cyperaceae	Bulbostylis hispidula (Vahl) R.W.Haines subsp. pyriformis (Lye) R.W.Haines				
Cyperaceae	Cyperus esculentus	Yellow Nutsedge	x	Common	Riparian zone
Cyperaceae	Coleochloa setifera Ridley) Gilly		x	Sparse	Riparian zone
Cyperaceae	Lipocarpha nana (A.Rich.) Cherm.				
Cyperaceae	Mariscus congestus (Vahl) C.B.Cl.		x	Individuals	Grassland/Riparian Zones
Cyperaceae	Pycreus pumilus (L.) Domin				
Cyperaceae	Schoenoplectus corymbosus (Roth. Ex Roem. & Schult.) J. Raynal		x	Individuals	Wetland
Dicranaceae	Campylopus savannarum (Müll.Hal.) Mitt.				
Dipsacaceae	Scabiosa columbaria	Wild scabious	x	Individuals	
Eriocaulaceae	Eriocaulon abyssinicum Hochst.				
Euphorbiaceae	Euphorbia inaequilatera Sond. var. inaequilatera				
Exormothecaceae	Exormotheca holstii Steph.				
Fabaceae	Eriosema psoraleoides (Lam.) G.Don				
Fabaceae	Indigofera arrecta Hochst. ex A.Rich.				
Fabaceae	Indigofera zeyheri Spreng. ex Eckl. & Zeyh.				
Fabaceae	Indigofera hilaris Eckl. & Zeyh		x	Individuals	Grassland
Fabaceae	Lotononis foliosa Bolus		x	Individuals	

Download from POSA (http://posa.sanbi.org) on September 30, 2008, 11:24 am - Grid: 2528DD					
Family	Species	Common name	Present	Occurrence	Habitat
Fabaceae	Rhynchosia monophylla Schltr.		x	Individuals	
Fabaceae	Rhynchosia nervosa Benth. ex Harv. var. nervosa				
Fabaceae	Rhynchosia totta (Thunb.) DC.		x	Individuals	
Fabaceae	Virgilia divaricata Adamson				
Fabaceae	Zornia milneana Mohlenbr.		x	Individuals	
Fabaceae	Erythrina zeyheri ex Harv		x	Sparse	Disturbed Areas (Grazzed Areas)
Fossombroniaceae	Fossombronia gemmifera Perold				
Geraniaceae	Monsonia angustifolia	Crane's Bill	x	Individuals	Disturbed Areas/Grassland
Haloragaceae	Myriophyllum aquaticum (Vell.) Verdc.				
Haloragaceae	Myriophyllum spicatum L.				
Hyacinthaceae	Albuca setosa Jacq.	Slymuintjie	x	Individuals	
Hypoxidaceae	Hypoxis acuminata		x	Individuals	
Hypoxidaceae	Hypoxis filiformis Baker		x	Individuals	
Hypoxidaceae	Hypoxis iridifolia		x	Individuals	
Hypoxidaceae	Hypoxis interjecta		x	Individuals-Sparse	Disturbed Areas (Grazzed Areas)
Hypoxidaceae	Hypoxis argentea Harv. Ex Bak		x	Individuals	Disturbed
Iridaceae	Gladiolus crassifolius Baker		x	Individuals	
Iridaceae	Lapeirousia sandersonii Baker				
Isoetaceae	Isoetes transvaalensis Jermy & Schelpe				
Lamiaceae	Becium angustifolium (Benth.) N.E.Br.				
Lamiaceae	Becium obovatum		x	Individuals	
Lamiaceae	Mentha aquatica L.				
Lamiaceae	Pycnostachys reticulata (E.Mey.) Benth.				
Lamiaceae	Acrotome hispida Benth		x	Sparse	Grassland
Lentibulariaceae	Utricularia arenaria		x	Individuals	
Lentibulariaceae	Utricularia stellaris L.f.				
Liliaceae	Ledebouria ovatifolia (Bal.)Jessop		x	Sparse	Grassland
Liliaceae	Ledebouria cooperi		x	Individuals	Disturbed Areas/Grassland
Liliaceae	Protasparagus setaceus	Asparagus Fern	x	Individuals	
Liliaceae	Urginea depressa Bak		x	Individuals	Grassland
Liliaceae	Anthericum cooperi Bak		x	Sparse	Grassland
Liliaceae	Anthericum fasciculatum Bak.		x	Individuals	Grassland
Liliaceae	Monopsis decipiens		x	Individuals	Grassland
Lobeliaceae	Monopsis decipiens		x	Individuals	
Malpighiaceae	Triaspis hypericoides (DC.) Burch. subsp. nelsonii (Oliv.) Immelman				
Malvaceae	Pavonia transvaalensis (Ulbr.) A.Meeuse	Klapperbossie			
Malvaceae	Triumfetta obtusicornis Sprague & Hutch.	Maagbossie			
Menyanthaceae	Nymphoides thunbergiana (Griseb.) Kuntze				
Mesembryanthemaceae	Delosperma leendertziae N.E.Br.				
Mesembryanthemaceae	Frithia humilis Burgoyne				
Mesembryanthemaceae	Mossia intervallaris (L.Bolus) N.E.Br.				

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Family	Species	Common name	Present	Occurrence	Habitat
Mimosaceae	Elephantorrhiza elephantia (Burch.) Skeels	Elephant root	x	Individuals	Grassland
Molluginaceae	Limeum viscosum (J.Gay) Fenzl subsp. viscosum var. glomeratum (Eckl. & Zeyh.) Friedrich				
Moraceae	Ficus abutilifolia (Miq.) Miq.				
Moraceae	Ficus salicifolia Vahl				
Myrtaceae	Eucalyptus spp	Blue Gum	x	Sparse	
Nymphaeaceae	Nymphaea nouchali Burm.f. var. caerulea (Savigny) Verdc.				
Ochnaceae	Ochna gamostigmata Du Toit				
Onagraceae	Epilobium hirsutum L.				
Onagraceae	Oenothera rosea	Rose Evening Primrose	x	Sparse	Disturbed areas/Ripirain Zone
Orchidaceae	Centrostigma occultans (Welw. ex Rchb.f.) Schltr.				
Orchidaceae	Habenaria clavata (Lindl.) Rchb.f.				
Orchidaceae	Satyrium hallackii Bolus subsp. ocellatum (Bolus) A.V.Hall				
Orobanchaceae	Striga gesnerioides (Willd.) Vatke				
Oxalidaceae	Oxalis obliquifolia	Sorrel	x	Individuals	
Pallaviciniaceae	Symphyogyna brasiliensis Nees & Mont.				
Parmeliaceae	Canoparmelia pustulescens (Kurok.) Elix				
Pedaliaceae	Dicerocaryum senecioides (Klotzsch) Abels				
Phyllanthaceae	Phyllanthus maderaspatensis L.	Kleurbossie	x	Individuals	
Poaceae	Andropogon eucomus Nees	Old Man's Beard	x	Sparse	
Poaceae	Aristida adscensionis	Annaul Tree-awn	x	Individuals	
Poaceae	Brachiaria serrata	Velvet Grass	x	Sparse	Grassland
Poaceae	Calamagrostis epigejos (L.) Roth var. capensis Stapf				
Poaceae	Cymbopogon excavatus	Broad-leaved Turpentine Grass	x	Individuals	
Poaceae	Cymbopogon plurinodes	Trutpentine Grass		Sparse	
Poaceae	Cynodon dactylon	Coch Grass	x	Common	Grassland
Poaceae	Echinochloa jubata Stapf				
Poaceae	Elionurus muticus	Wire Grass	x	Individuals	Disturbed Areas/Grassland
Poaceae	Eragrostis capensis (Thunb.) Trin.	Heart-seed Love Grass	x	Individuals	
Poaceae	Eragrostis chloromelas Steud.	Narrow Curly leaf	x	Common	Grassland
Poaceae	Eragrostis hierniana Rendle				
Poaceae	Eragrostis inamoena K.Schum.				
Poaceae	Eragrostis plana	Tough Love Grass	x	Common	Grassland
Poaceae	Eragrostis racemosa (Thunb.) Steud.	Narow Heart Love Grass	x	Sparse	
Poaceae	Eragrostis tef (Zuccagni) Trotter	Tef	x	Sparse	
Poaceae	Eragrostis lehmannia	Lehmann's Love Grass	x	Sparse	Disturbed Areas/Grassland
Poaceae	Eragrostis pseudosclerantha	Foopath Love Grass	x	Individuals	Disturbed Areas/Grassland
Poaceae	Eragrostis curvula	Weeping Love Grass	x	Common	Disturbed Areas/Grassland

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Family	Species	Common name	Present	Occurrence	Habitat
Poaceae	Harpochloa Falx	Carerpillar Grass		Individuals	Grassland
Poaceae	Heteropogon contortus	Spear Grass	x	Sparse	Grassland
Poaceae	Helictotrichon tugidulum	Small Oats Grass	x	Sparse	Grassland/Riparian Zone
Poaceae	Hyparrhenia hirta (L.) Stapf	Common Thatching Grass	x	Sparse-Common	
Poaceae	Hyparrhenia quarrei Robyns				
Poaceae	Hyparrhenia tamba (Steud.) Stapf	Blue Thatching Grass	x	Common	Disturbed Area/Roadside
Poaceae	Imperata Cylindrica	Cottonwool Grass	x	Sparse	Riparian zone
Poaceae	Hyperthelia dissoluta (Nees ex Steud.) Clayton				
Poaceae	Loudetia simplex	Russet Grass	x	Sparse	
Poaceae	Melinis repens	Natal Red Top	x	Individuals	Grassland
Poaceae	Miscanthus junceus (Stapf) Pilg.	Wireleaf Daba Grass			
Poaceae	Panicum maximum	Guinea Grass	x	Sparse	Riparian zone
Poaceae	Panicum schinzii	Sweet grass	x	Sparse	Grassland
Poaceae	Perotis patens Gand.	Cat's Tail	x	Individuals	
Poaceae	Schizachyrium sanguineum	Red Autumn Grass	x	Sparse	
Poaceae	Setaria nigrirostris (Nees) T.Durand & Schinz				
Poaceae	Setaria sphacelata var. sphacelata	Common Bristle Grass	x	Individuals	
Poaceae	Setaria sphacelata var. torta	Greeping bristle grass	x	Individuals	Disturbed Areas/Grassland
Poaceae	Sporobolus fimbriatus	Dropseed Grass	x	Sparse	
Poaceae	Themeda triandra	Red Grass	x	Individuals	Disturbed Areas/Grassland
Poaceae	Tristachya leucothrix	Hairy Trident Grass	x	Individuals	Grassland
Poaceae	Urochloa Oligothricha	Perrennial Signal Grass	x	Individuals	Disturbed Areas Grassland
Poaceae	Urochloa brachyura (Hack.) Stapf		x	Sparse	
Polygalaceae	Polygala ohlendorfiana Eckl. & Zeyh.				
Polygalaceae	Polygala transvaalensis Chodat subsp. transvaalensis				
Portulacaceae	Anacampseros subnuda Poelln. subsp. subnuda				
Portulacaceae	Portulaca hereroensis Schinz				
Portulacaceae	Portulaca quadrifida L.				
Potamogetonaceae	Potamogeton schweinfurthii A.Benn.				
Pteridaceae	Cheilanthes involuta (Sw.) Schelpe & N.C.Anthony var. obscura (N.C.Anthony) N.C.Anthony				
Ranunculaceae	Ranunculus meyeri Harv.		x	Individuals	
Ranunculaceae	Ranunculus multifdus	Buttercup	x	Sparse	Disturbed Areas
Ricciaceae	Riccia atropurpurea Sim				
Ricciaceae	Riccia okahandjana S.W.Arnell				
Ricciaceae	Riccia volkii S.W.Arnell				
Rubiaceae	Kohautai caespitosa Eckl. & Zeyh		x	Individuals	Disturbed areas/Grassland
Rubiaceae	Richardia scabra L.				
Rubiaceae	Rubia horrida (Thunb.) Puff	Kleefgras	x	Individuals	
Salicaceae	Salix babylonica (Introduced)	Weepiing Willow	x	individual	Ripirain Zone

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Family	Species	Common name	Present	Occurrence	Habitat
Scrophulariaceae	Chaenostoma leve (Hiern) Kornhall				
Scrophulariaceae	Diclis reptans Benth		x	Individuals	Ripirain Zone
Scrophulariaceae	Jamesbrritenai aurantiaca	Cape saffron	x	Individuals	Grassland
Selaginellaceae	Hebenstretia angolensis Rolfe	Katstert	x	Individuals	
Selaginellaceae	Selaginella dregei (C.Presl) Hieron.				
Solanaceae	Solanum mauritianum	Poison apple	x	Individuals	Disturbed areas
Solanaceae	Solanum sisymbrifolium	Wild tomato	x	Individuals	
Solanaceae	Solanum pseudocapsicum	Jerusalem cherry	x	Individuals	Disturbed Areas
Thelypteridaceae	Thelypteris confluens (Thunb.) C.V.Morton				
Thymelaeaceae	Gnidia sericocephala (Meisn.) Gilg ex Engl.				
Verbenaceace	Vebena sp		x	Common	Disturbed Areas
Xyridaceae	Xyris capensis Thunb.				

Appendix 2: Avifauna assessment

Appendix 3: Bird Collision Prevention Guidelines

Appendix 4: Vegetation Management Guideline

Appendix 5: Electric and Magnetic Fields – A summary of Technical and Biological Aspects