Eskom Holdings Limited

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED PERSEUS-HYDRA 765kV TRANSMISSION POWER LINE AND RELATED SUBSTATIONS

Flora – EkoInfo CC Environmental And Wildlife Management Consultancy And
Fauna Assessment – Ecocheck Environmental Services and Art CC

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2 INTRODUCTION

Arcuss Gibb approached EkoInfo CC Environmental And Wildlife Management Consultancy and Ecocheck Environmental Services And Art CC to assist them with the ecological component (flora and fauna) of a proposed 765 kVA power line and its associated infrastructure (sub stations, construction camps, construction roads). This document represents the Environmental Impact Assessment (EIA) component of the EIA process in terms of the Environment Conservation Act (ECA) of 1989. The scoping component had already been completed and is presented in a separate document.

2.1 Scope Of Work

1. To verify the sensitivity status of the four proposed alternative power lines in terms of their associated ecology (flora and fauna):
    a. Western
    b. Centre
    c. Eastern
    d. Existing 765 kVA
2. To assess the significance of the proposed power line's impact on the ecology (flora and fauna) as well of the associated infrastructure (sub stations – expansion/ upgrade of existing sub stations, temporary construction infrastructure – construction camps, construction roads)

2.2 Status Quo

During the scoping component of the EIA process, the available information with regards to the ecology (flora and fauna) was used to model the total ecological sensitivity of the study area. The following factors were used:

1. Geology – sandstone, shale, dolerite
2. Land types – mainly sandy, mainly clay, mainly rocky
3. Land cover – grassland, Woodland, shurbland and transformed areas
4. Regional vegetation units – latest Vegmap version
5. Red Data Flora and Fauna habitat characteristics – wetlands, outcrops, deep sandy soils

The results of the analysis of the four proposed alternatives in terms of the total ecological sensitivity model indicated that the four alternatives transect very similar areas. It was indicated by a slight margin that the western and centre alternatives are more sensitive than eastern and existing alternatives. Therefore except to verify the status of the very high sensitivity areas along the western and centre alternatives, the EIA component of the EIA process was to look in depth at the impacts of the proposed alternatives, especially in comparison to the existing one, using:

1. Visual observations
2. GIS modelling –
    a. 500 m buffer reassessment of the total ecological sensitivity
    b. 500 m buffer analysis of the four alternatives in terms of ruggedness/ biodiversity uniqueness of outcrops
3. How many areas along the proposed would require adjustment in terms of pylons and orientation within the 500 m buffer

3 METHODOLOGY

3.1 Fieldwork

The fieldwork of the ecological component (fauna & flora) of this environmental impact assessment was conducted during two site visits in 2006 (06-08 June and 12-13 July 2006). These site visits were aimed at highlighting potential environmental issues relevant to sensitive plants and animals and habitat of such species; the size of the area and accessibility were constrictions that influenced the methodology and assessments of the fieldwork or site visits. During the two site visits over 100 reference points along the four proposed alternative routes and potential cross-over lines were taken (Figure 1). At these points notes, GPS-waypoints and photos were taken with the aim to record any sensitive habitat and other environmental issues that could influence the potential ecological sensitivity of the four alternatives proposed; also to compare the results obtained with GIS-methods with the actual status of sensitive habitat types in the field (i.e. the testing of models used to predict ecological sensitivity).

3.2 Geographic Information Systems (GIS)

3.2.1 Total Ecological Sensitivity Analysis – 500 m buffer

During the scoping component of the EIA process, a 100 m buffer was used to assess the level of sensitivity of the four alternatives but for the EIA component a re-evaluation using 500 m buffer had to be used. Therefore the existing total ecological sensitivity model was used to determine the percentage of very low, low, moderate, high and very high ecological sensitive area for each alternative. Idrisi Kilimanjaro was used to query the existing data set, while ArcView GIS 9.1 was used to present the results. For an in depth explanation of the total ecological sensitivity model please refer the scoping report for the flora and fauna components.

3.2.2 Ruggedness/ Biodiversity Uniqueness Analysis – 500 m buffer

Due to the very slight variation between the four alternatives, another approached was used. The ruggedness or uniqueness of the outcrops were modelled using the existing Digital Terrain Model (DTM) based on the 20 m contours at 25 m pixel resolution to model:

1. height variation
2. slope variation
3. aspect variation

These three factors were combined to indicate the ruggedness/ biodiversity uniqueness of outcrops (areas with slopes of more than 5°). The derived index was classified into five classes: very low, low, moderate, high and very high.

The modelling was done in Idrisi Kilimanjaro, while the results were presented using ArcView 9.1.

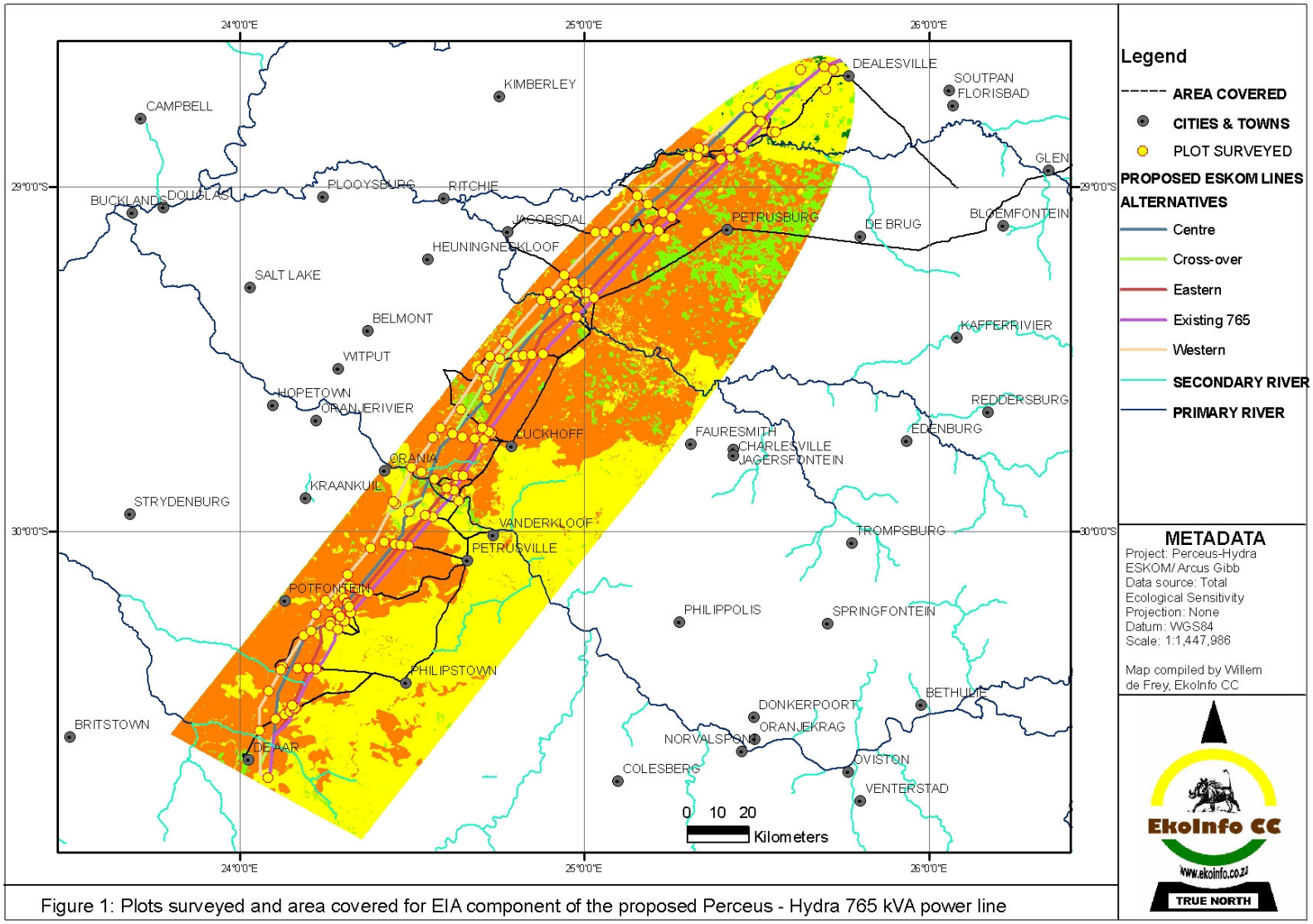


Figure 1: Plots surveyed and area covered for EIA component of the proposed Perceus - Hydra 765 kVA power line

3.2.3 Potential Realignment Issue Assessment – 1: 50 000 scale information

Available 1: 50 000 data sheets from the Surveyor – General were used to asses the need to adjust/ realign the proposed centre lines of the four alternatives in terms of wetlands (pans, streams, rivers) and outcrops within the 500 m buffer area assigned to each alternative. The principle behind this approach is that the line which needs the most adjustment/ realignment has the most sensitive features along it.

4 RESULTS

4.1 Fieldwork

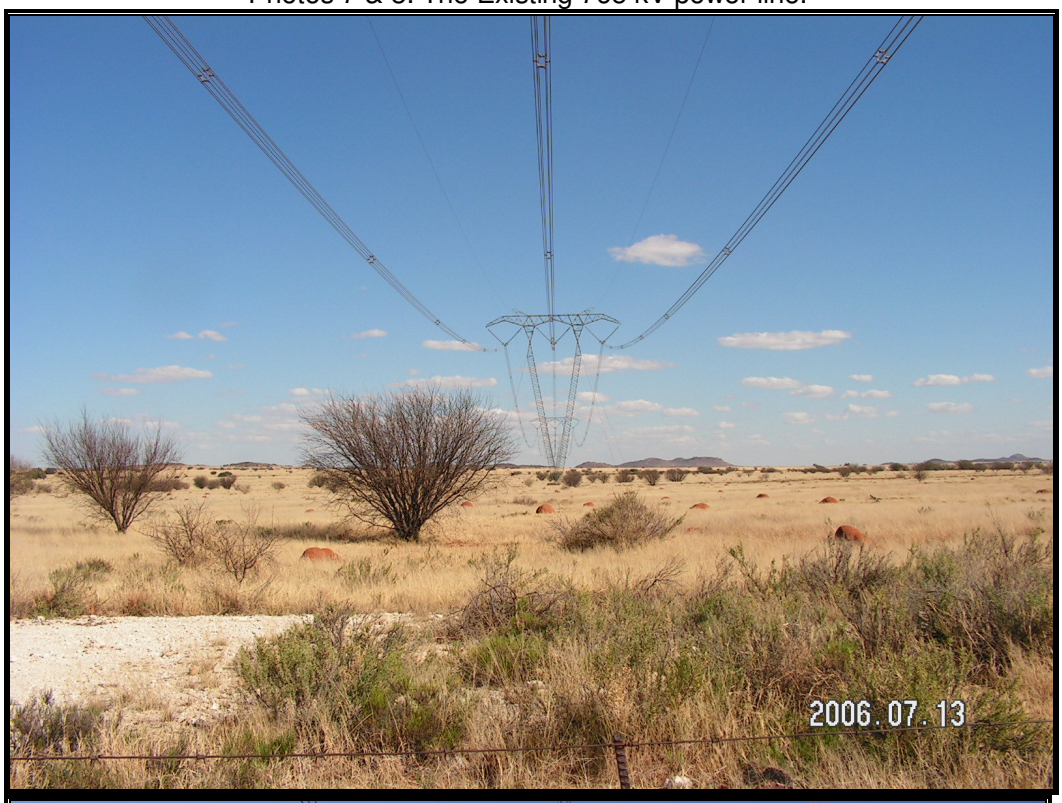
Figure 1 ~ photos 1-8 shows various points along the same road which crosses the four alternative routes proposed. It is evident from the photos that, along this road, very few ecological differences exist between the four routes. Photos 7 and 8 shows the low (visible) impact of a 765 kV power line once construction has finished and the power line is in operation.

Photos 1 & 2: The Western proposed alternative.

Photos 3 & 4: The Centre proposed alternative.

Photos 5 & 6: The Eastern proposed alternative.

Photos 7 & 8: The Existing 765 kV power line.



4.2 Total Ecological Sensitivity Analysis – 500 m buffer

Table 1 ~ sensitivity classes used below were based on combinations of environmental factors (such as slope, aspect, sandiness of soils, etc.) that potentially provide in the habitat requirements of red data animals and plants. It follows the reasoning used in the scoping phase of this project. The least sensitive alternative proposed is the Eastern route (1st choice, 72.70% sensitive) followed by the 2nd choice Existing route (73.28%). Both of these routes do not include areas considered to be of very high sensitivity. The 3rd choice is the Western route (73.40%) and the ecologically most sensitive proposed alternative is the Centre Route (73.41%) (Figure 2 and 3). It must however be noted that the differences between the four alternatives are very small (0.71% between the most and least sensitive) and that these sensitivity differences in terms of red data animal and plant habitat characteristics are **not significant.**

Total Ecological Sensitivity: 500 m buffers				
Sensitivity Classes	Western	Centre	Eastern	Exst765
Very low	0.96%	0.89%	0.67%	0.90%
Low	3.31%	3.43%	4.28%	1.42%
Moderate	23.52%	23.46%	25.95%	28.05%
High	72.20%	72.19%	69.10%	69.63%
Very high	0.02%	0.04%		
Derived sensitivity	**73.40%**	**73.41%**	**72.70%**	**73.28%**
	3rd choice	4th choice	1st choice	2nd choice

4.3 Ruggedness/ Biodiversity Uniqueness Analysis – 500 m buffer

Table 2 ~ the sensitivity classes used in table 2 are based on unique terrestrial animal and plant habitat estimated to include rare habitat characteristic combinations (such as those found in ecotones) and unique animal and plant communities and assemblages. Based on these factors, the Western route is the least sensitive and the 1st choice in terms of ruggedness or biodiversity uniqueness; the 2nd choice is the Centre route. The Eastern route is the second most sensitive (3rd choice) and the Existing route the most sensitive (4th choice) (Figure 4 and 5). The results and derived sensitivity differences between the four proposed alternatives are **reasonably significant**.

Biodiversity Uniqueness Sensitivity: 500 m buffers				
Category	Western	Centre	Eastern	Exst765
Very low	10.7%	0.3%	0.8%	1.7%
Low	4.1%	29.2%	12.3%	6.1%
Moderate	15.7%	0.0%	0.0%	2.6%
High	8.2%	0.0%	0.0%	5.9%
Very high	0.0%	25.5%	65.2%	64.5%
Derived sensitivity	**38.7%**	**55.0%**	**78.3%**	**80.8%**
	1st choice	2nd choice	3rd choice	4th choice

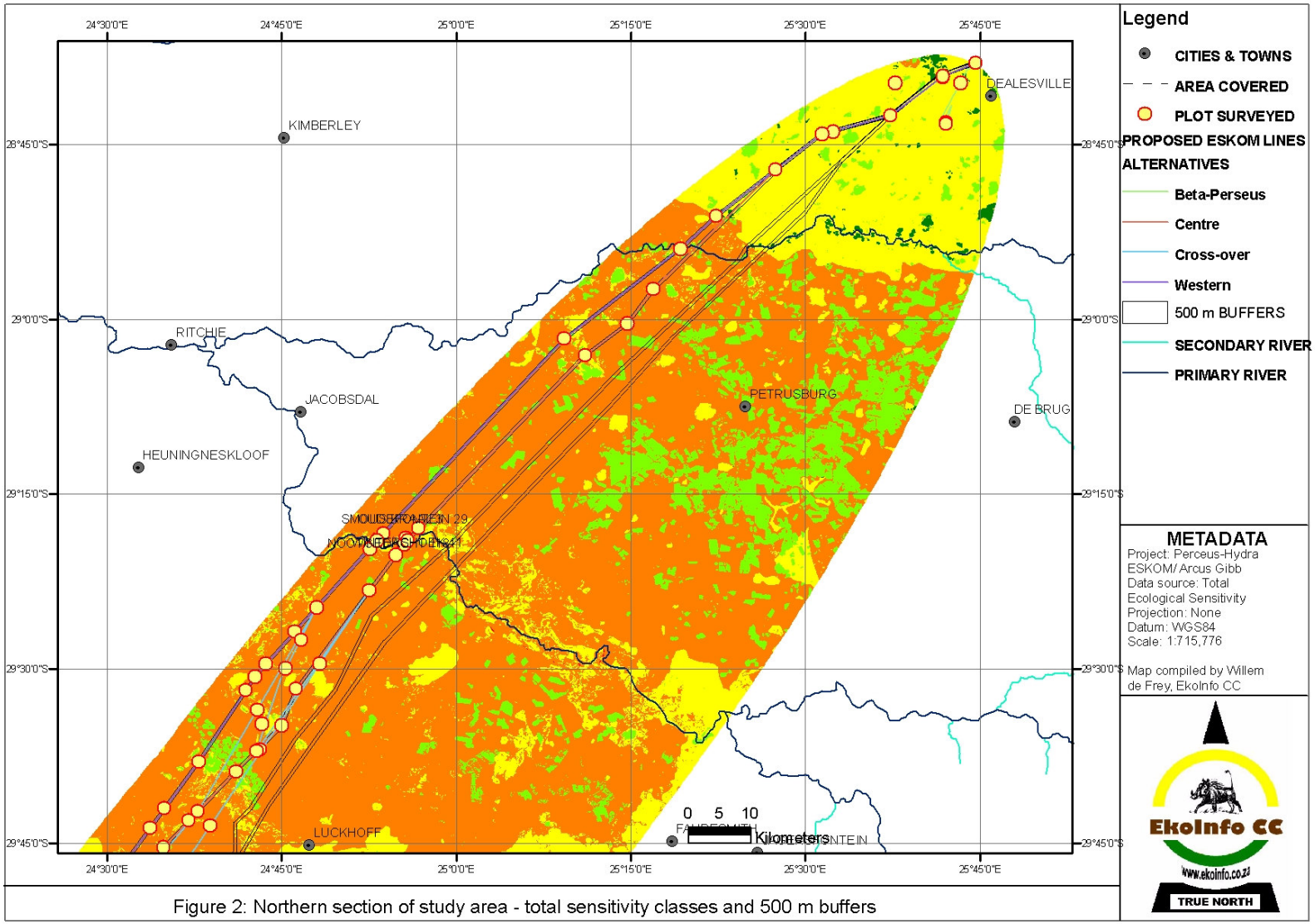


Figure 2: Northern section of study area - total sensitivity classes and 500 m buffers

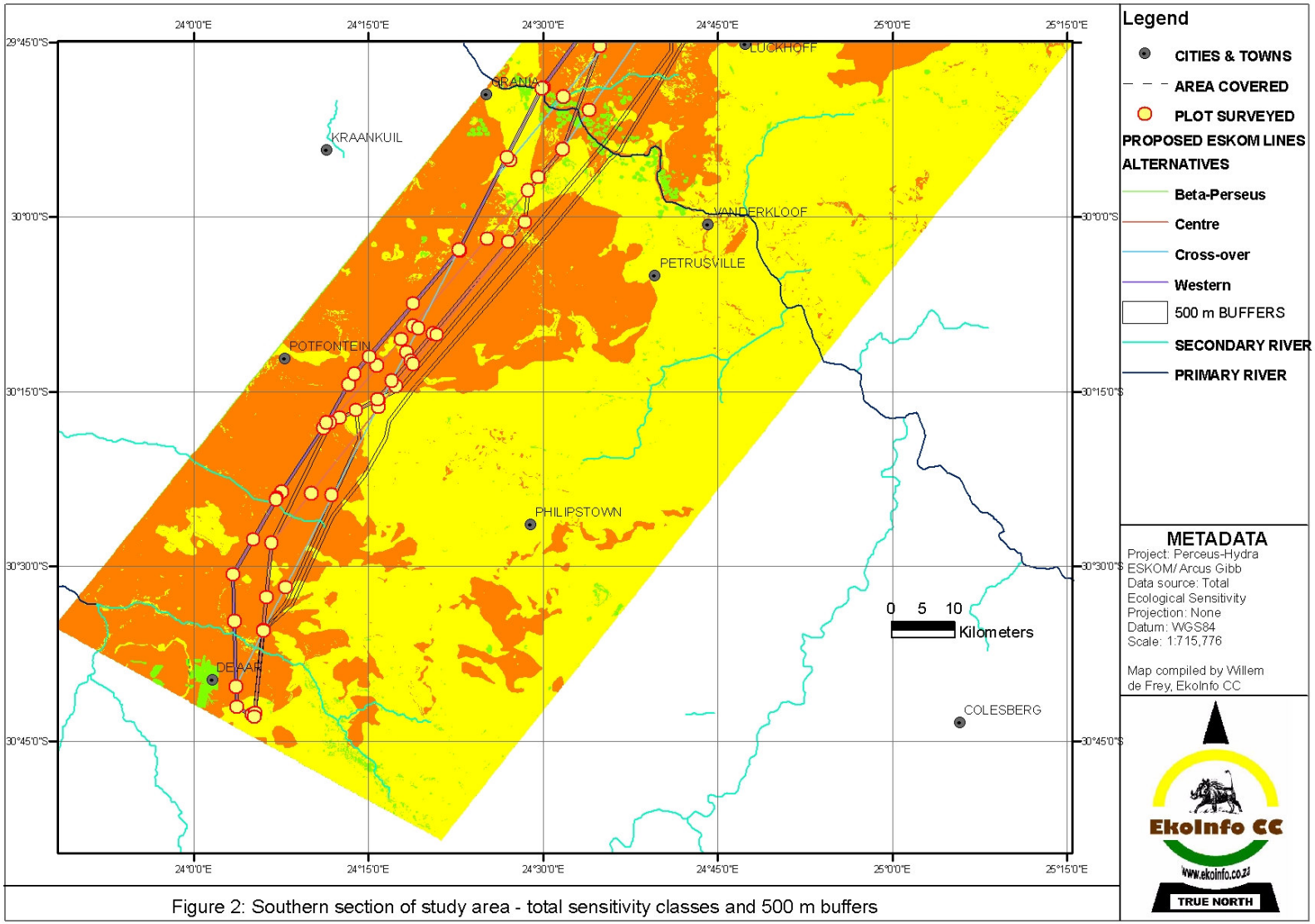


Figure 2: Southern section of study area - total sensitivity classes and 500 m buffers

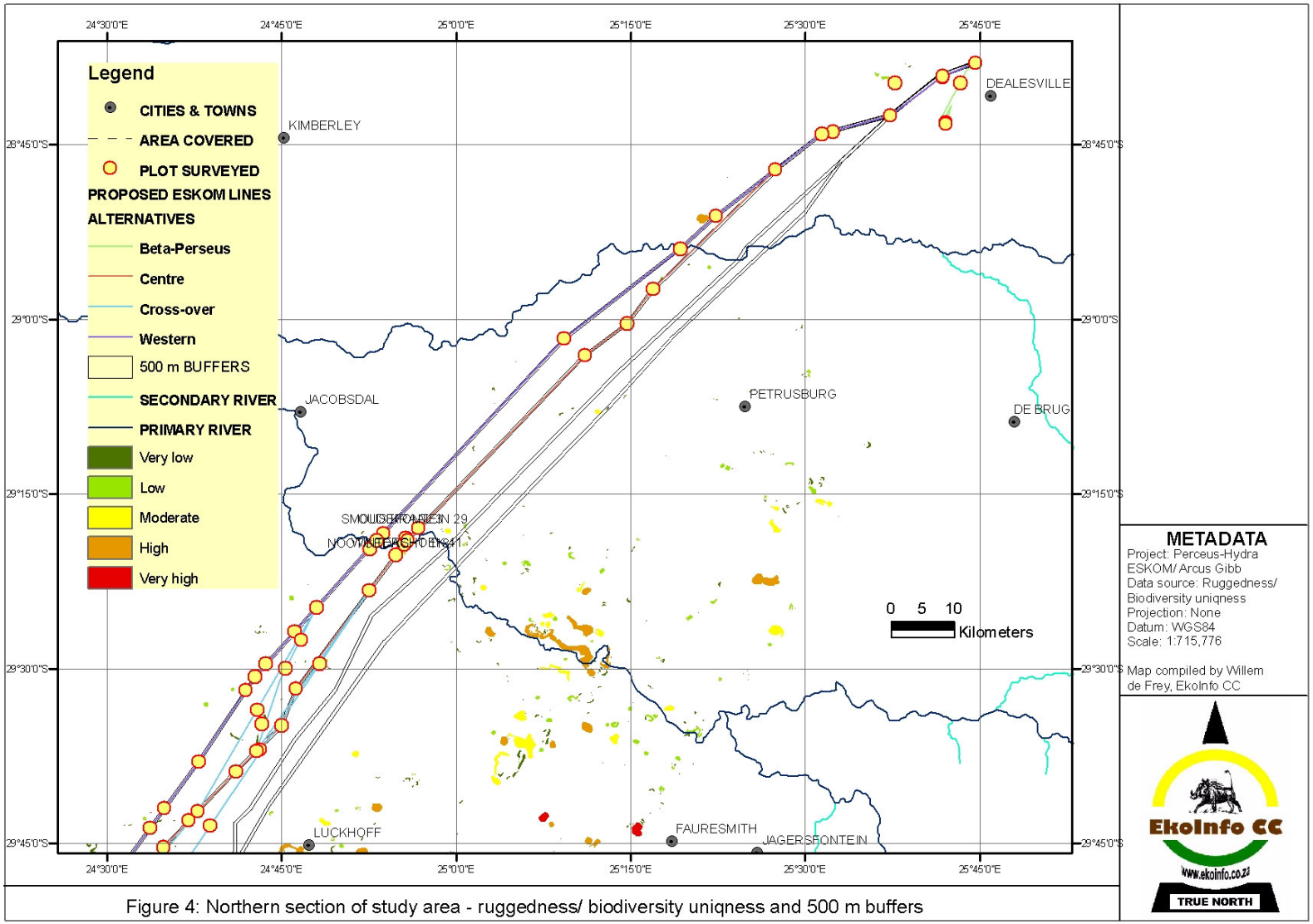


Figure 4: Northern section of study area - ruggedness/ biodiversity uniqness and 500 m buffers

Figure 5

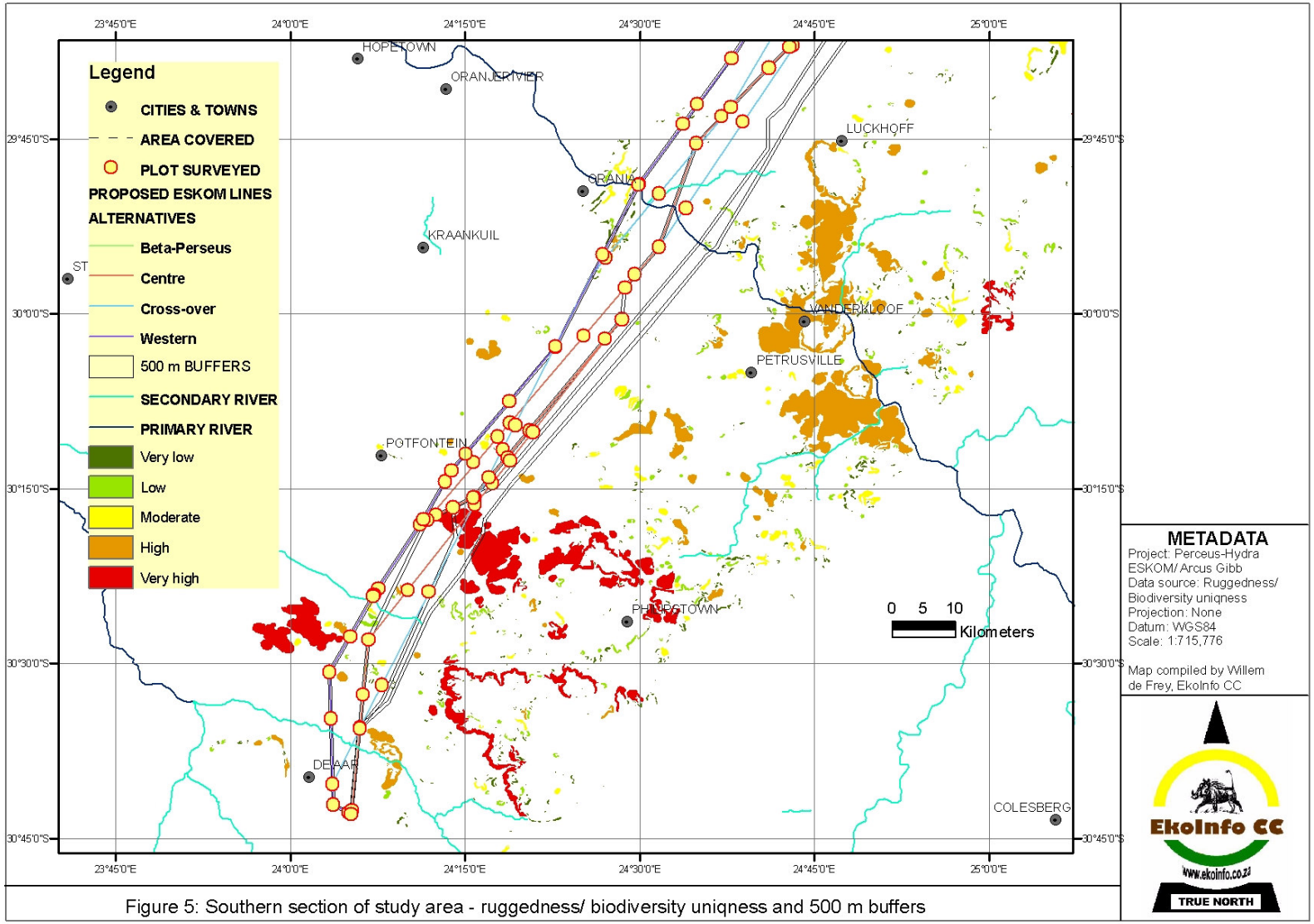


Figure 5: Southern section of study area - ruggedness/ biodiversity uniqness and 500 m buffers

4.4 Potential Realignment Issue Assessment – 1: 50 000 scale information

Table 3 ~ based on 1:50 000 maps, the potential realignment issues of each proposed alternative route were totalled to provide an indication of the "realignment sensitivity" of each alternative. The results link closely with those of the Ruggedness/Biodiversity Uniqueness Analysis (**4.3 - above**); the most sensitive alternative of the ruggedness analysis (Existing route) also has the most potential realignment issues (108) and the second most sensitive alternative (Eastern route) has the second most potential realignment issues (107). The two least sensitive routes (ruggedness analysis) have the least potential realignment issues (97 and 99).

Potential Realignment Issues: 1:50 000				
Issues	Western	Centre	Eastern	Existing 765
Canal	3	5	3	4
Dam	2	0	7	6
Pan	16	14	11	13
Ridge	8	4	5	5
River	3	3	4	5
Irrigation	3	6	4	2
Stream	64	65	72	73
Wind pump	0	0	1	0
Totals	**99**	**97**	**107**	**108**

5 IMPACT ASSESSMENT

5.1 Flora component

5.1.1 Substations

No landscape features (wetlands, outcrops) associated with ecological sensitive habitats for Red Data flora occur in the vicinity of either Perceus and Beta sub stations near Dealsville in the Free State (Photo 9) or Hydra sub station near De Aar in the Northern Cape (Photo 10).

Cultivated land occurs to the north and west of Perceus sub station, the only untransformed/ vacant/ natural grassland remains to the east and south. The extent of similar moderate sensitivity areas is throughout the study area (Figure 1). Therefore the impact of the proposed expansion/ upgrade of the Perceus sub station is considered definitely low and permanent with high potential for mitigation during the construction phase. Mitigation involves keeping within the proposed footprint, control the spread of invasive vegetation.

The same applies to the Beta sub station although specific attention should be given to the invasive plants present within the area. The invasive vegetation should be removed within the guidelines of the Conservation of Agricultural Resources Act.

Although no cultivated land is present within the vicinity of Hydra sub station, the sub station is also located in a moderately sensitive area. No invasive plants were observed within its immediate vicinity but the establishment of invasive plants during the operational phase within the disturbed areas due to the construction should be monitored.

It is therefore concluded that the upgrade/ expansion of the existing sub stations will have a **definitely low impact** on the vegetation within the study area in the **long term**. The main mitigation objective should be to control the edge effects of construction in terms of:

1. exceeding the proposed footprint
2. unauthorised off-road driving
3. the removal of medicinal or aesthetic appealing plants outside the footprint.

During operational phase the establishment and control of invasive plants should be monitored and control, emphasis should be place to species from the Cactus family.

The potential to mitigate the area to is original status during decommissioning phase is definitely very low in the long term and therefore the edge of effect during construction should be strictly controlled.

Photos 9: Perceus sub station near Dealsville, Free State

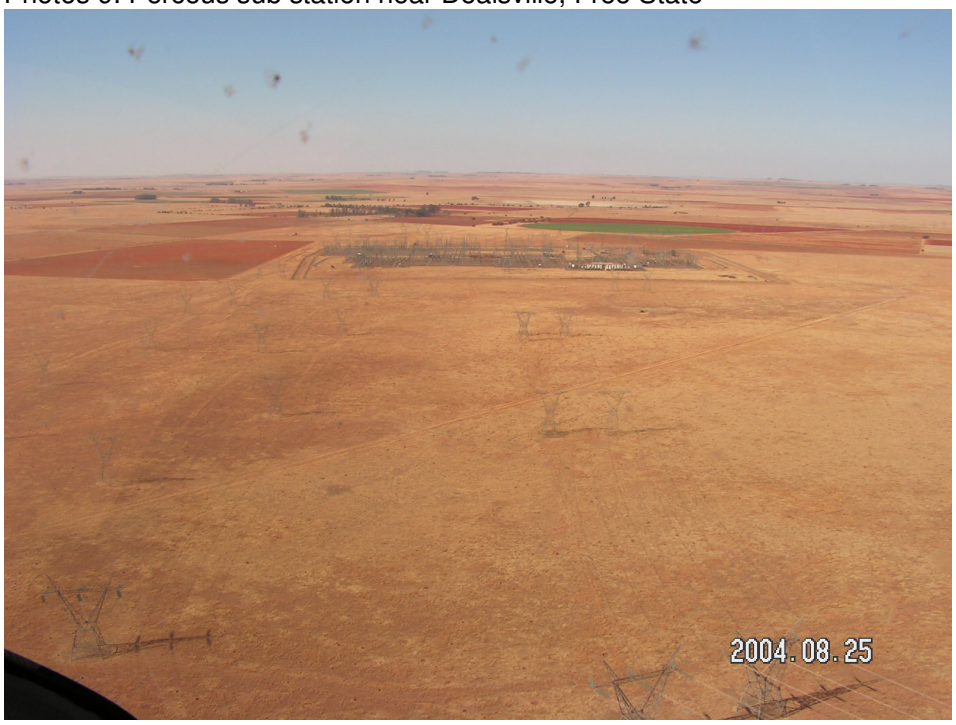
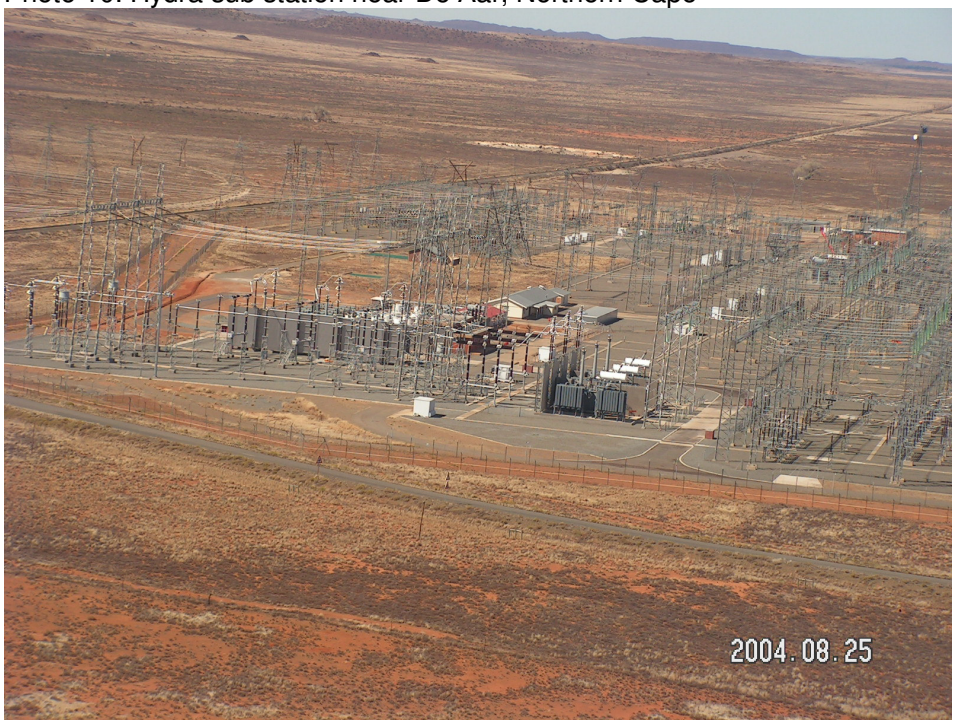


Photo 10: Hydra sub station near De Aar, Northern Cape



5.1.2 Power Line

It is the conclusion that once established the power lines have none to very low impact on the vegetation within the study area. This had been confirmed during the EIA studies of the existing power line. No evidence of soil erosion or other disturbance due to the power line was observed, exploitation of the veld in terms of grazing and quarries has much more significant impact than the established power line. Similar to the sub stations, the major concern is in terms of the edge effects of the construction phase:

1. Unauthorised off-road driving
2. Removal of medicinal or aesthetic plants
3. The harvesting of wood from drainage lines for warming and cooking

If these activities could be strictly controlled, the mitigation will be highly effect and the impact of the proposed power lines, irrespective of the alternative will be **definitely very low** in the **long term**.

5.2 Fauna component

5.2.1 Substations

The impact assessment discussed here is relevant to three substations: Perseus, Beta and Hydra. As a result of the impact assessment being identical for all three substations, they are not discussed singly but rather as a whole. There are no variations between the substations in terms of the faunal impact assessment.

No sensitive or endangered faunal habitat exists next to any of the three substations. This includes habitat types such as wetlands, ridges or any other unique habitat type relevant to the study area and areas in which the substations occur. Due to the nature of power line substations, most of the immediate habitat surrounding the substations have been degraded to a greater or lesser degree; the loss of these areas as faunal habitat is therefore acceptable and not deemed to be significant. It implies that no matter the direction of entrance and exit of the new proposed power line, the impact on fauna and faunal habitat remains the same – not significant. Therefore no mitigatory measures are proposed to conserve sensitive faunal habitat, species or biodiversity rich areas.

5.2.2 Power Line

In considering the potential impacts of the proposed power line on fauna and faunal habitat, four alternative routes were considered as potential final alignments for the power line (as outlined in the scoping assessment document). These alternatives were an alignment along the existing 765kV power line; an eastern route, a central route and a western route. After various GIS-based analyses, the conclusion remains the same: very little difference exists in terms of sensitivity or potential impacts between the four alternatives. It should however be mentioned that all the analyses indicated that (however small the differences) the existing and eastern routes are likely to have less of an impact on the ecology of the area than the central and western routes. However, any significant impacts of the proposed power line are easily mitigated.

Firstly, the largest potential impact of the proposed power line on fauna and faunal habitat is the construction camps. These camps have the potential to destroy sensitive faunal habitat and influence sensitive faunal species (including red data species). It is therefore critical that these camps are placed in areas that are not sensitive; also the surrounding environment next to these camps should be respected and not degraded in any manner (such as the removal of plants for firewood or medicinal purposes) – this is likely to result in the unnecessary loss of faunal habitat that is easily avoided. Such removal of plants also has potential erosion complications which in turn might have larger scale impacts on the natural environment – especially influencing pans and other wetlands such as the larger rivers (Orange – and Modder Rivers) which are sensitive faunal habitats. The best places for these construction camps (where-ever possible) would be areas already transformed by agriculture or other human-related activities; these camps should not be located anywhere near a wetland or significant ridge to reduce the risk to these sensitive faunal habitats.

Secondly, mitigation in terms of realignment of the finally accepted proposed route could easily mitigate almost all potentially significant impacts of the proposed power line. The avoidance of sensitive faunal habitat (specifically wetlands and ridges) will

ensure a minimal disturbance of sensitive and red data listed animals and biodiverse areas which could harbour unique faunal communities. Where-ever such realignments are not possible (due to construction or other restrictions) sensitive areas (especially wetlands) should be spanned (i.e. no tower within the boundaries of these areas) where-ever possible.