Draft Environmental Scoping Report:

Eskom 400kV Transmission Line

Garona-Aries

Assignment No. 0608

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1 EXECUTIVE SUMMARY

As support to social and economic development, Eskom is committed to provide reliable supplies of electricity to all parts of South Africa. In terms of Regulation 4 (6) of the regulations, published in Government Notice. R. 1183, of the Environment Conservation Act (Act No. 73 of 1989), Eskom proposes to construct a 400 kV transmission powerline (155km) from the existing Garona substation to the existing Aries substation, located in the Northern Cape Province.

Due to the increase in demand for electricity in the Cape region, the current transmission network capacity cannot adequately cater for its load. It is for this reason that Eskom is planning to reinforce the power supply to the area by construction of a 400kV Transmission powerline from the Garona to Aries Substations. The proposed transmission powerline will necessitate an extension of the Garona substation to accommodate the 400kV line.

This report will be submitted to the Department of Environmental Affairs and Tourism (DEAT) and will also be made available at various places for Interested and Affected parties (I&AP's) for review and comment.

Four initial alternative routes around sensitive features have been proposed for this transmission powerline. The first two alternative routes are in the North-eastern section of the study area (Alternative Routes 1A & 1B) in order to traverse this mountainous region (Neus se Berg) and the second two alternative routes are in the South-western Section of the study area (Alternative Route 2A & 2B) and are the result of a combination of visual and ecological concerns in that region.

As part of the Scoping process, the key authorities such as DEAT, Provincial and Local Government have been adequately informed of the proposed development.

The following processes have been successfully carried out:

- Consultation of key authorities and stakeholders;
- Two public participation meetings and a key stakeholder meeting;
- Interested and affected parties (I&APs) have been contacted and given the Background Information Document (BID);
- Comments were received from I&APs and summarized in the Issues and Response Report (IRR);
- Specialist studies identifying key environmental issues were completed by relevant specialists. Results have given a clear indication of the preferred alternative.

Environmental Impacts

The four proposed alignments (Northern and Southern) traverse sensitive environments. The issues identified in these environments are highlighted below:

- Social and economic issues;
- ecological constraints;
- visual impacts;
- game farming;
- Tourism; and
- Bird impacts;

Specialist studies undertaken have identified sensitive features across the study area and additional input from I&AP's has resulted in the selection of a preferred alignment of the proposed transmission line. Alternative Route 1A is preferred over 1B as the proposed expansion of the Thuru Game Lodge and associated air traffic (helicopters) renders Alternative Route 1B a potential serious hazard to this activity. Alternative Route 2A is favoured over 2B due to the recommendations from the above mentioned specialist studies. The northern alignment (i.e. 2A) will result in the least potential impacts on the receiving environment. A detailed evaluation of the impacts associated with the transmission powerline as well as the two preferred routes will be undertaken during the EIA phase.

2 ACKNOWLEDGEMENTS

Tswelopele Environmental wishes to thank the following for information provided during the writing of this report:

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- Garry Patterson (ARC)
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- Ilse Aucamp (Strategic Environmental Focus)
- Mark Thornton (ECO Africa)
- National Department of Environmental Affairs and Tourism
- Northern Cape Department of Tourism, Environment and Conservation
- Northern Cape Local Authorities

3 INTRODUCTION

According to section 21 of the Environment Conservation Act (No. 73 of 1989, ECA), and the subsequent Government Notice R1182, an application for facilities for commercial electricity generation and supply (Activity 1a), requires authorization from the competent environmental authority.

This environmental scoping report has been compiled by Tswelopele Environmental (Pty) Ltd. The applicant (Eskom Transmission) would like to construct a 400kV transmission powerline between the existing Garona and Aries substations in the Northern Cape Province. This development will necessitate the expansion of the Garona substation to include the infrastructure necessary for the 400kV line. The study area currently comprises predominantly farmland and the proposed powerline would require a 55m servitude, Eskom will negotiate with the affected landowners for the rights to traverse their farms. This scoping report serves to describe the environment and identify potential environmental impacts associated with the proposed development.

3.1 TERMS OF REFERENCE

Tswelopele Environmental (Pty) Ltd. has been appointed by Eskom Transmission to conduct an independent Environmental Impact Assessment (EIA) for the proposed 400kV transmission powerline in the Northern Cape Province. To enable Tswelopele Environmental to perform the stated duties, a variety of sub-consultants have been appointed to conduct specialist studies pertaining to various aspects of the investigation. The terms of reference for this study are defined by the EIA regulations as well as the Plan of Study for Scoping, approved by the Provincial and National Environmental Authorities.

3.2 AIMS OF THE ENVIRONMENTAL SCOPING STUDY

The aim of the environmental scoping study is to investigate and describe the biophysical, social and economic environment surrounding the proposed development and to determine a preferred route for the line as well as propose suitable alternatives around sensitive features.

4 DESCRIPTION OF THE PROJECT

The proposed development is situated in the Northern Cape Province between the existing Garona and Aries substations. The applicant, Eskom Transmission, would like to construct a 400kV transmission powerline and one of the aims of this scoping study is to determine the most suitable route as well as propose alternatives. An extension of the Garona sub-station is required in order to accommodate the 400kV powerline infrastructure (refer to Appendix J for a schematic diagram of the proposed extension). A study area (refer to

Figure 2) comprising a 15km buffer zone around the direct line between the two substations has been delineated in order to identify the most suitable route for the powerline and to minimise its impact on the biophysical, social and economic environment. For the purposes of this study a route will be defined as a 500m wide corridor, within which the proposed transmission powerline could align.

4.1 NEEDS AND JUSTIFICATION FOR THE PROJECT

Electricity cannot be stored. It is therefore necessary to generate and deliver power over long distances at the very instant it is needed. In South Africa, thousands of kilometres of high voltage Transmission powerlines transmit power, mainly from the Power Stations located at the Mpumalanga coalfields to major substations where the voltage is reduced for distribution to industry, businesses, homes and farms all over the country.

If Eskom Transmission is to honour its commitment to meet the increasing needs of end users, it has to establish and expand its infrastructure of Transmission network and Substations on an ongoing basis. Due to normal load growth as well as possible new Railway loads in the Northern Cape area, it has become necessary to reinforce the existing electrical infrastructure.

Most towns and cities purchases electricity in bulk from Eskom and sell it to households, industrialists and other end users within their areas of jurisdiction, while Eskom also sells electricity directly to end users in some parts of South Africa.

4.1.1 Eskom Transmission in the Cape region

Additional Transmission powerline infrastructure will be required in the future to meet customer load demands in the Cape load centres. Installation of a new 400kV injection at Aries substation via the Ferrum (Kimberly) corridor would defer the construction of the more expensive 765kV line in the Southern corridor (which runs from De Aar to the Cape Peninsula).

This introduction is concerned only with the section between Ferrum and Aries substations (refer to Figure 1 below). This Scoping Report which, forms part of a full Environmental Impact Assessment (EIA), refers only to the proposed Garona to Aries 400kV Transmission line (and upgrade to the Garona sub-station). A separate EIA application will be lodged for the Ferrum to Garona Transmission line.

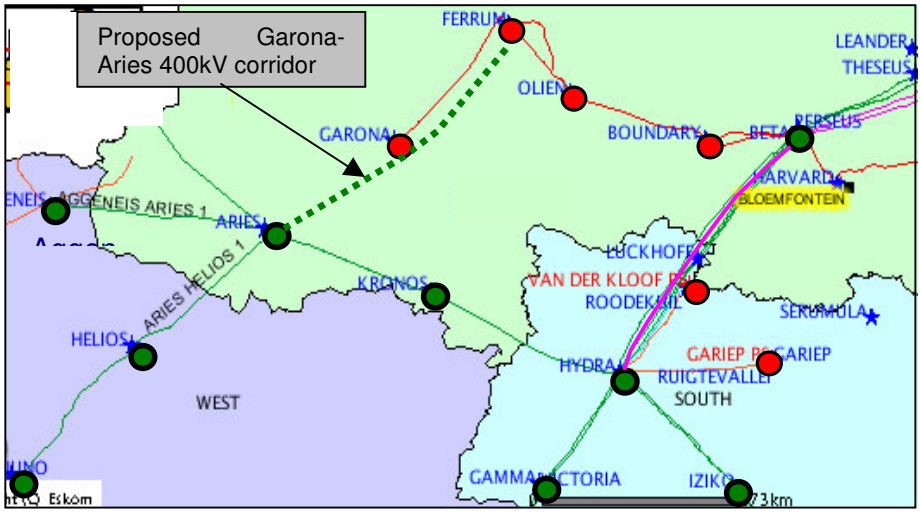


Figure 1. Proposed future network showing the Garona to Aries sub-station link with a 400kV Transmission line.

Eskom has a mandate to satisfy potential customer needs, which implies certain responsibilities. One of the most significant of these is to find and maintain the balances between satisfying the needs of society and remaining within the capabilities of the environment. In order to achieve this Eskom must continually re-assess its present infrastructure and take into account new developments to ensure that there is a continued supply of electricity, without negatively impacting on the environment.

4.1.2 The need for additional transmission capacity in the corridor supplying the Cape area

The Cape 400kV Transmission network system, in the Northern Cape area supports customer loads in the Southern Cape, West Coast, Peninsula and Namaqualand load centres. These four load centres had a combined 2004 peak load demand of 3540 MW. This peak load does not include the supply to Namibia, which can amount to 250 MW.

Local generation in the Cape region is limited to the Koeberg Nuclear Power Station (1800MW but only 900MW during refuelling) and the Palmiet Pumped Storage scheme 400MW (near Grabouw). This leaves around 2450MW (3540MW + 250MW - 1300MW) of load that presently needs to be fed from sources in Mpumalanga during system healthy conditions. This also needs to be taken into account when developing the network.

The forecasted average load growth, based on historical data, is around 2.5% per annum. The steady growth in electricity demand is expected to continue, as a result of electrification, increased housing densities, railway transport (possibly on the Sishen-Saldanha railway line) and commercial development.

The existing Transmission lines are becoming heavily loaded and are predicted to reach their full capacity around 2009/2010. These Transmission powerlines cannot supply the increased normal load demand in the long-term. New Transmission powerline extensions and substations upgrades are currently under consideration and will be constructed in the near future. This EIA application includes an extension to the Garona substation in order to accommodate the 400kV transmission powerline.

It is becoming very difficult to manage with one powerline out of service or the loss of generation, since the other powerlines have to carry the entire load. This makes it difficult to carry out routine maintenance, the condition of the operating lines can deteriorate and this will result in poor line performance (faults etc.).

Studies have shown a steady 2.5% per annum average load growth for the area. It is a sign of good economic growth in this area. The load forecasters predict that this load growth will continue - which will result in the need for additional power lines around the year 2008/9.

A definite need has been identified, viz.: need for additional capacity towards the Cape area.

By increasing the supply into the Cape area, the foreseen load growth can be addressed in a suitable and economical way. Optimisation of the current system is currently underway (Cape Strengthening Western Grid project), and would alleviate some problems in the system. The short to medium term needs will be addressed by the increased supply due to the new Transmission powerlines.

5 DESCRIPTION OF THE ENVIRONMENT AND ISSUES IDENTIFIED

In order to ensure that this Scoping Study is effective, a full description of the biophysical and socio-economic environment is presented. Research on transmission powerline construction as well as previous experience in transmission powerline EIA applications revealed that the key environmental components relate to impacts on the agricultural potential, avifaunal presence, general ecology, heritage impacts, social impacts, tourism impact and visual impacts on the receiving environment.

5.1 LOCATION

The proposed transmission line would be constructed between the existing Garona and Aries substations in the Northern Cape Province. The Garona substation lies approximately 18.5 km North of the town of Groblershoop while the Aries substation is situated approximately 43.5 km South-west of the town of Kenhardt.

The study area (

Figure 2) between the Garona and Aries substations (Figure 3 and Figure 4 respectively) consists of a 155 km direct powerline with a 15 km buffer zone on either side (tapering off towards the substations). This buffer zone includes a variety of landscape features that needed to be assessed for the implementation of the powerline. Sensitive features, based on detailed investigations, have been delineated and appropriate buffer zones inserted around them (see

Figure 2 below) in order to ensure that the line does not cause unnecessary disturbances to the biophysical and/or socio-economic environment.

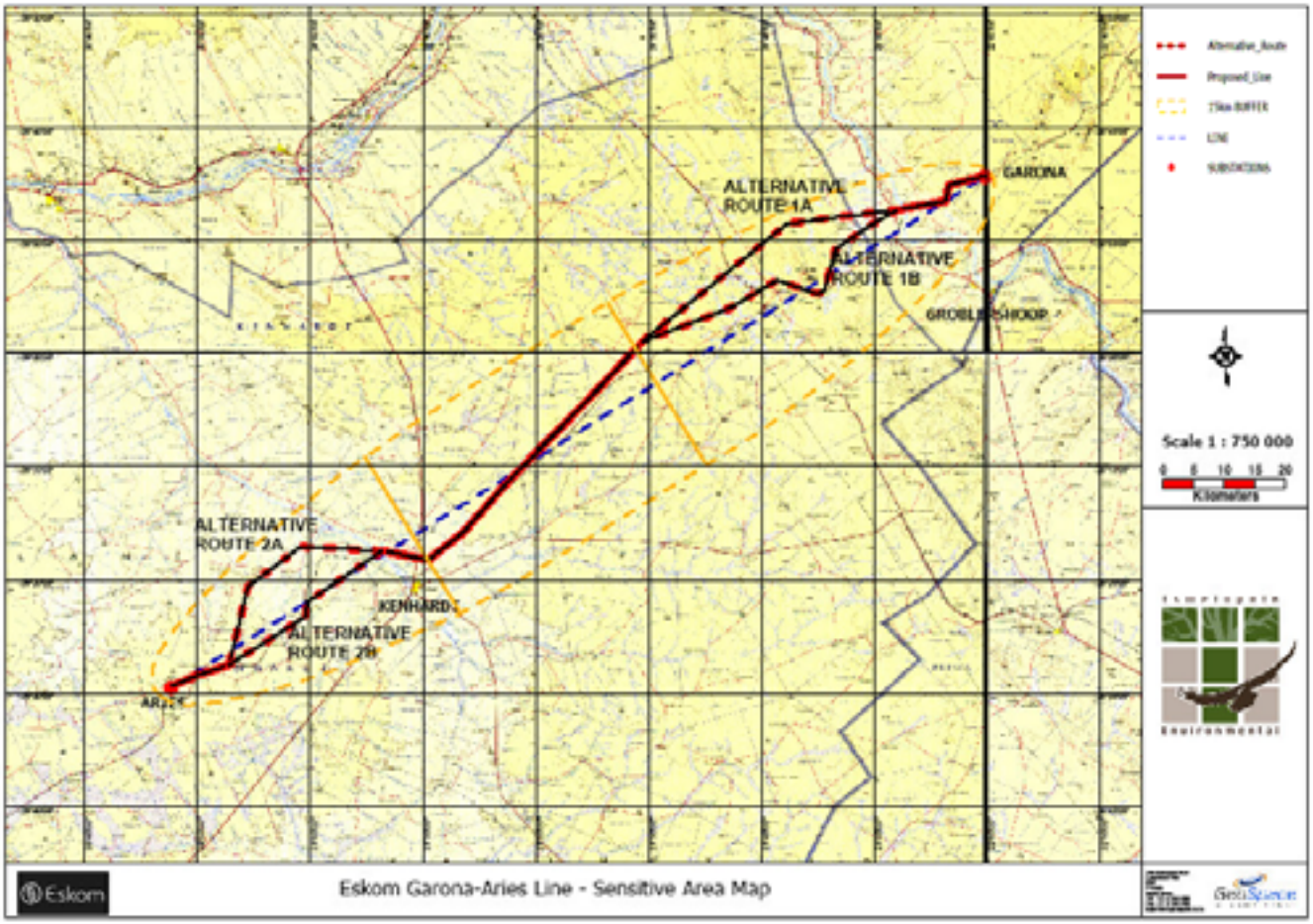


Figure 2. A 1:750 000 map of the study area showing the proposed transmission line, study area and sensitive areas delineated.

Figure 3. An aerial view of the Garona Substation located in the northern section of the study area (showing the location of the proposed extension).

Figure 4. An aerial view of the Aries Substation located in the southern section of the study area.

5.2 TOPOGRAPHY

Due to the linear nature of the proposed powerline, there are a variety of topographical features that make up the study area. The majority of the topography consists of a flat, sparsely vegetated landscape as can be seen in Figure 6 below. Within the study area, there exist farmsteads, rivers, powerlines, a railway line, rocky outcrops, hills, sand dunes and vineyards. These features are by no means the predominant landscape feature as the study area consists of approximately 3652 km^2.

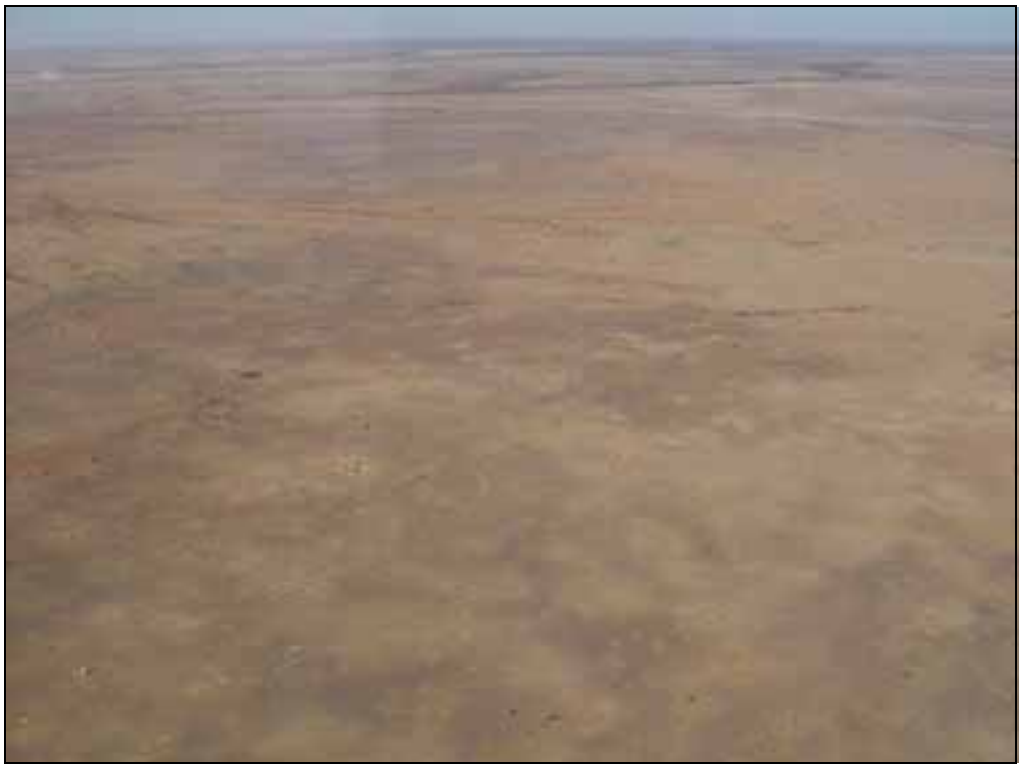


Figure 6. An aerial view of the general topography of the study area (sparsely vegetated, flat landscape).

A Spoornet railway line (Figure 7 and Figure 8) spans the length of the study area (refer to map in Appendix I). The ideal positioning of the powerline would be as near to the railway line as possible due to the existing access road adjacent to the railway line as well as minimising the visual impact of the line by inserting it in an already visually "polluted" area. A minimum buffer zone of 300 m is required between the railway line and the powerline.

The majority of the study area consists of a very flat topography. The only hilly terrain occurs in the north-eastern section (Figure 9 and Figure 10) which the powerline will need to traverse. Alternatives routes in this area have been recommended.

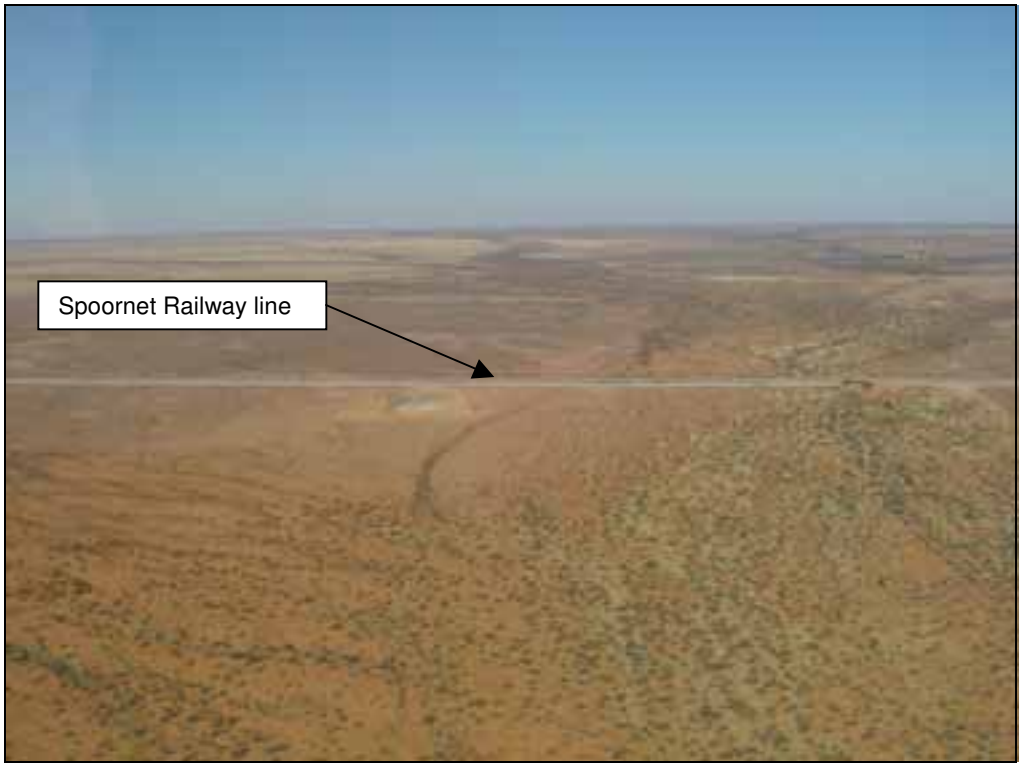


Figure 7. An aerial view of the railway line located within the study area.

Figure 8. A southerly view along the railway line showing the adjacent service road.

Figure 9. An aerial view of the mountainous region in the north-eastern section of the study area (Neus se Berg).

Figure 10. A ground view of the mountainous region (Neus se Berg) in the north-eastern section of the study area.

The main topographical obstacle that the powerline will need to traverse is the area around Groblershoop and the Orange River. This area is dominated by vineyards along the banks of the Orange River (Figure 11 and Figure 12) with numerous farmsteads along the bank of the river. A 55m wide servitude strip will be negotiated with the affected farmer/s and this land will still be available for agricultural purposes although the pylons may provide restrictions in certain instances (i.e. the pylons will restrict the movements of large irrigation structures and structures taller than 3m under the power line).

The powerline will be required to traverse the Orange River and all possible options for the location have been investigated in detail. Currently, the most viable option is for the powerline to cross the river in the location of the railway crossing (Figure 13). This location should result in the least visual concern to the surrounding residents. The service road adjacent to the railway line can also be used for routine servicing of the powerline and thus no additional roads would need to be constructed in this area.

Figure 11. An aerial view of the Orange River with associated vineyards and the town of Groblershoop in the far ground.

Figure 12. An aerial view of the Orange River. Note the vineyards along the southern bank of the river.

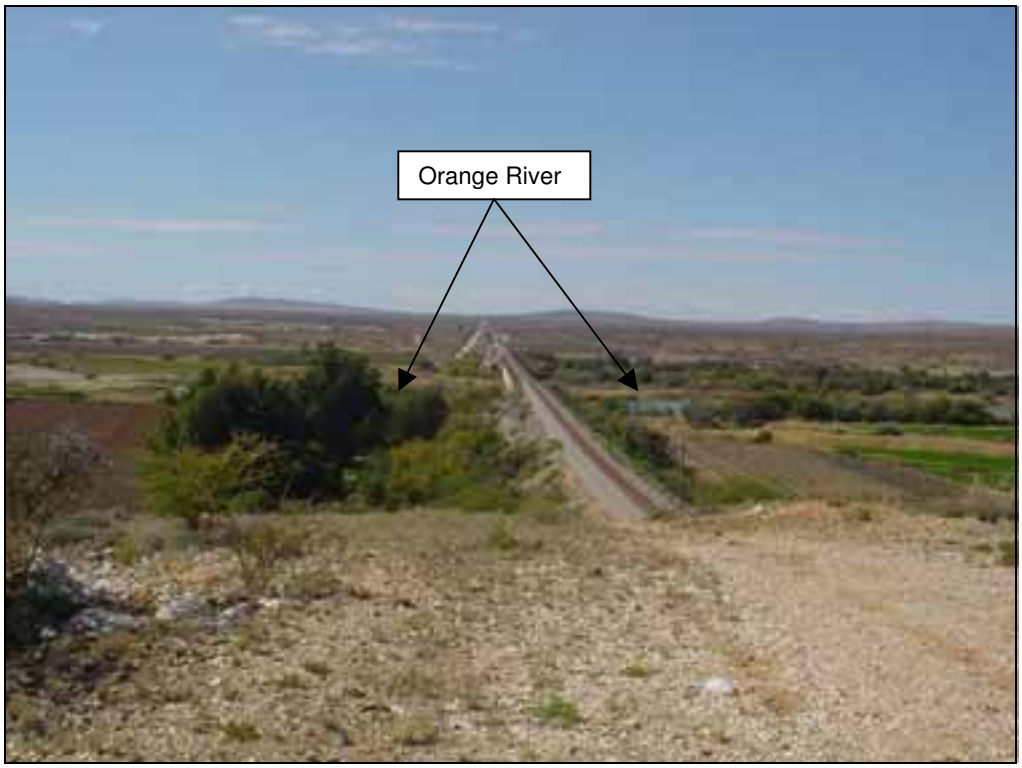


Figure 13. The proposed crossing of the transmission powerline across the Orange River will follow the railway bridge crossing.

5.3 CLIMATE

Although the Northern Cape is mainly semi desert, the western areas of the Northern Cape, including Namaqualand, a small section of the Green Kalahari and Calvinia, Nieuwoudville and Loeriesfontein in the Karoo fall into the winter rainfall area from April to September.

The eastern summer rainfall areas experience thunderstorms that resonate across the wide plains and powerful bolts of lightning puncture the earth. The Northern Cape's weather is typical of desert and semi desert areas. This is a large dry region of fluctuating temperatures and varying topographies. The annual rainfall is sparse, only 50 to 400 mm per annum. In January, afternoon temperatures usually range from 34 to 40ºC. In 1939 an all time high of 47.8ºC was recorded at the Orange River. Summer temperatures often top the 40ºC mark.

Winter days are warm. The onset of night bringing dew and frost to supplement the low rainfall of the region. Sutherland in the Karoo is one of the coldest towns in South Africa. It's average minimum is -6ºC. In winter snow often blankets the surrounding mountains.

The average climatic information (obtained from the South African Weather Service) is detailed in Table 1 below (http://www.weathersa.co.za/Climat/Climstats/UpingtonStats.jsp).

Table 1. Average climatic data from the Upington weather station (28º24'S; 21º16'E, 836m in elevation) for the period 1961-1990.

Month	Temperature (ºC)				Precipitation		
	Highest Recorded	Average Daily Maximum	Average Daily Minimum	Lowest Recorded	Average Monthly (mm)	Average Number of days with > 1mm	Highest 24 Hour Rainfall (mm)
January	42	36	20	10	24	4	33
February	42	34	20	9	35	6	59
March	41	32	18	5	37	6	46
April	38	28	13	2	26	5	52
May	34	24	8	-2	10	2	26
June	29	21	5	-5	4	2	13
July	29	21	4	-6	2	1	7
August	33	23	6	-7	4	1	40
September	39	27	9	-2	4	2	19
October	40	30	13	2	9	3	22

November	41	33	16	5	17	3	51
December	43	35	19	6	17	4	42
Year	**43**	**29**	**13**	**-7**	**189**	**37**	**59**

Due to the uniformity of the topography it is not anticipated that the area will be significantly affected by localised micro-climates.

5.4 HYDROLOGY

5.4.1 Surface Water Hydrology

The major surface water hydrological features within the study area consist of the perennial Orange River in the northern section (travelling past the town of Groblershoop), numerous non-perennial pans and drainage lines scattered all over the site, as well as the non-perennial Hartbeesrivier in the southern section (travelling past the town of Kenhardt). The proposed transmission powerline will need to cross both of these rivers.

Due to the nature of the proposed development (i.e. a transmission line) it is not anticipated that major impacts will occur on these hydrological features. The avifaunal specialist has raised the concern regarding aquatic bird species in the vicinity of the Orange River crossing. Measures have been proposed to mitigate this possible impact.

5.4.2 Geohydrology

Geohydrology is not anticipated to be of concern with regards to this development.

5.5 GEOLOGY

According to the council for Geosciences (http://www.geoscience.org.za/upington/geology.htm) the simplified geology of the Upington region consists of the Namaqualand Metamorphic Province.

This province includes a group of schistose and gneissic metasedimentary, metavolcanic and intrusive rock types in an area along the Orange River from Prieska in the east which is bordered by the Kaapvaal Craton, to the Atlantic coast in the west. To the north and to the south the province is overlain by younger sequences like the Nama Group and the Karoo Supergroup.

Statutory mapping programmes in recent years have concentrated the attention of the Northern Cape Unit on the Namaqualand Metamorphic Complex. Due to the complex history of intense deformation and metamorphism, many aspects concerning the province are still controversial and revision of stratigraphic correlations and genetic models is an ongoing process.

The province comprises supracrustal rocks that have been intensely deformed and metamorphosed, and a wide variety of intrusive rock types which are predominantly granitic. Metamorphism that has reached granulite facies, as well as deformation by folding and fluxion in a plastic state during metamorphism, characterise especially the western and central parts of this province.

Rocks of the Brulpan Group structurally overlie the Olifantshoek Supergroup. They comprise a succession of highly folded schists, with minor greenstone and quartzite. The western margin of the Kaapvaal Craton is marked by three volcano-sedimentary successions; the 1300 Ma old Wilgenhoutsdrif and Arachap Groups and the undeformed 1100 Ma old Koras Group.

The northern part of the eastern boundary zone is intensely deformed by east-directed folding and thrusting, and is metamorphosed to lower greenschist facies. The boundary between the Namaqualand Metamorphic Province and the Kaapvaal Craton is characterized by a number of normal, reverse and wrench faults as well as a sharp transition in the grade of metamorphism and the tectonic pattern.

The floor to the Namaqualand Metamorphic Province has not been recognised (although some investigators in the past have claimed the recognition of such a floor). The volcanic Orange River Group in the Vioolsdrif area with its related intrusives of the Vioolsdrif batholith, are dated between 2 000 to 1 800 million years. Many rock types in the province are dated at around 1 200 million years, which most likely do not display their true age but rather the age of metamorphic resetting of the radiometric clock by extreme metamorphic conditions. The end of the Namaqua orogenesis is marked by intrusion of the mafic Koperberg Suite (1 100 Ma), as well as the formation of the pegmatite belt, which is dated at around 1 000 million years.

5.6 SOILS

Mr. D.G. Patterson of the Agricultural Research Council (ARC), under the Institute for Soil, Climate and Water was sub-contracted by Tswelopele Environmental to conduct a soils investigation of the entire study area. The complete soils report is included in Appendix A. Upon elucidation of a preferred route, a detailed geotechnical investigation of the pylon locations will need to be undertaken to ensure that suitable foundation material exists to support such an activity.

As can be seen on the broad soil pattern map (Figure 14), the study area comprises a number of broad soil patterns. These various broad soil patterns are listed in Table 2 below, along with their chief limitations. It is important to bear in mind that, due to the scale of the land type survey, and the fact that the land types have been further combined, the broad soil pattern deals only with the ***dominant*** soil(s) occurring, and that significant areas of different soils can, and will occur within each land type and within each broad soil pattern zone.

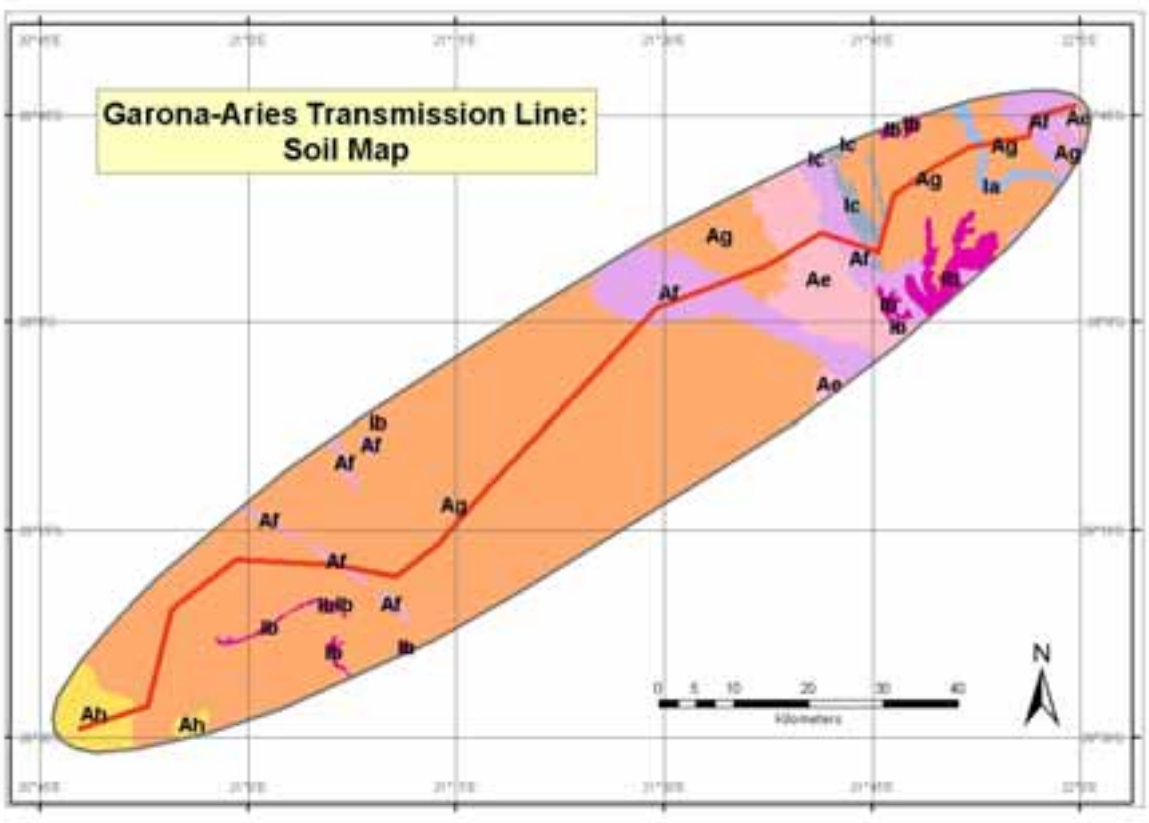


Figure 14. The broad soil pattern for the study area.

Table 2. Broad soil patterns occurring in the Garona-Aries study area.

Map Symbol	General dominant soil characteristics	Soil limitations
Ae	Red, freely-drained soils with high base status, occasionally calcareous. Dominant soils: *Hutton*	Restricted soil depth in places
Af	Red, freely-drained sandy soils with high base status, including dunes; occasionally calcareous. Dominant soils: *Hutton*	Restricted soil depth in places; Excessively freely-drained
Ag	Shallow, red soils with high base status, occasionally calcareous. Dominant soils: *Hutton, Mispah*	Shallow soils, often stony/rocky.
Ah	Red and yellow, freely-drained sandy soils with high base status, occasionally calcareous. Dominant soils: *Hutton, Clovelly*	Restricted soil depth in places; Excessively freely-drained
Ia	Alluvial soils close to Orange River. Variable textures. Dominant soils: *Dundee, Oakleaf*	Occasional flooding

Ib	Dominantly rocky areas, often with steep slopes. Dominant soils: *Glenrosa, Mispah* Usually little soil is present	Little soil available
Ic	Dominantly very rocky areas, often with steep slopes. Dominant soils: *Glenrosa, Mispah* Usually very little soil is present	Very little soil available

In general, most of the area has red, shallow to very shallow, often calcareous soils on rock. There are small areas of deeper red and yellow soils in the south-west as well as a larger area of deeper red soils (some with dunes) in the north-east.

The various broad soil patterns will have different **dominant** potential as far as farming systems and types of agriculture are concerned (although this will obviously vary with slope angle and soil depth). These are summarized below:

Ae: Moderate to high potential soils, support most types of agriculture ***where rainfall is sufficient***

Af: Low potential soils, support little agriculture where dunes are present.

Ag: Low potential soils, support only grazing due to shallow soils

Ah: Moderate to high potential soils, support most types of agriculture ***where rainfall is sufficient***

Ia: High potential soils near river, support most types of agriculture **where irrigated**

Ib: Very rocky, usually steep. Only supports grazing at best.

Ic: Very rocky, usually steep. Usually not enough soil for vegetation for grazing.

5.6.1 Soil Capability

This involves dividing land into one of eight classes of ***soil*** capability from an agricultural perspective, whereby Classes I-IV are arable and Classes V-VIII are non-arable. This is done by allocating a number of defined terrain/soil factors (flooding hazard and erosion hazard) and soil factors (soil depth, soil texture, internal drainage, mechanical limitations, other soil properties) to an area of land, according to

Table 3 below.

Table 3. Terrain, soil and climate factors constituting soil capability classes I to VIII.

TERRAIN/SOIL FACTORS		SOIL FACTORS					SOIL CAPA-BILITY CLASS
Flooding hazard	Erosion hazard	Soil depth	Soil texture	Internal drainage	Mech. limitations	Other soil Props.	
F1, F2	E1; E5	D1	T1	W2	MB0	P1	I
F1-F3	E1-E2; E5	D1, D2	T1, T2	W2, W3	MB0	P2	II
F1-F4	E1-E3; E5	D1-D3	T1-T3	W1-W4	MB0-MB1	P2	III
F1-F4	E1-E4; E5	D1-D4	T1-T3	W1-W4	MB0-MB1	P2	IV
F1-F5	E1-E5	D1-D4	T1-T3	W1-W5	MB0-MB1	P2	V
F1-F5	E1-E6	D1-D4	T1-T3	W1-W5	MB2-MB3	P2	VI
F1-F5	E1-E7	D4-D5	T1-T3	W1-W5	MB2-MB4	P2	VII
F1-F5	E1-E8	D4-D5	T1-T3	W1-W5	MB2-MB4	P2	VIII

The table should be applied from the top downwards. To qualify as soil capability Class I, for example, a polygon must have the following assigned to it: either F1 or F2; E1or E5; D1; T1; W2; MB0 and P1. If not, the polygon is tested for subsequent rows until it qualifies.

Each entry for each land type was tested against the above criteria, and the percentages of each land type with each soil capability class were calculated. The **dominant** soil capability class of each land type was determined and this distribution appears on the map. This classification **excludes** climate factors, so areas with soils of arable capability may well occur in zones with unfavourable climatic factors for agriculture.

5.6.2 Land Capability

Once the soil capability determination per land type is done as in

Table 3 above, a combined climatic factor (Schoeman *et al*, 2000) is applied, according to

Table 4 below. In this way, the combination of ***soil*** capability class and climate class produces the ***land*** capability class.

Table 4. Terrain, soil and climate factors constituting land capability classes I to VIII

SOIL CAPABILITY CLASS	CLIMATE CLASS	LAND CAPABILITY CLASS
I	C1	I
I, II	C1, C2	II
I-III	C1-C3	III
I-IV	C1-C4	IV
I-V	C1-C5	V
I-VI	C1-C5	VI
I-VII	C1-C6	VII
I-VIII	C1-C6	VIII

Table 4 should also only be applied from the top downwards. The land capability class is determined by the lowest of the soil capability and the climate class.

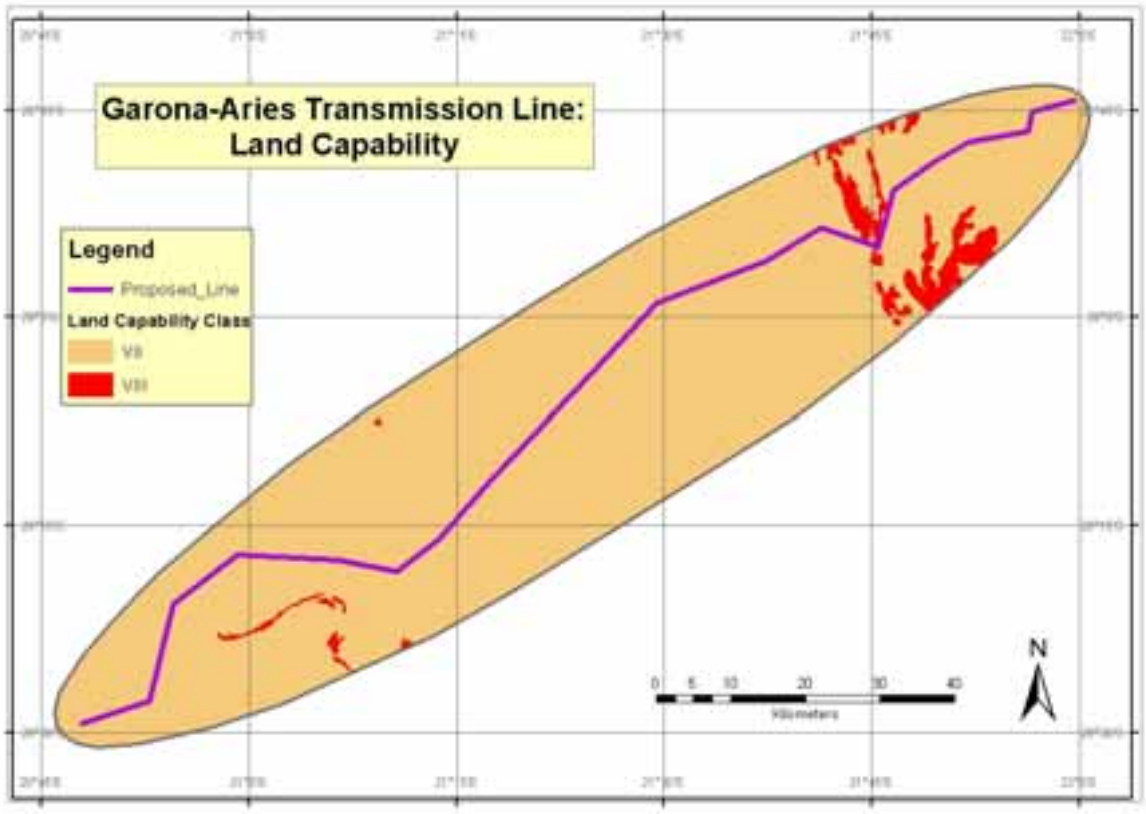


Figure 15. The land capability classes within the study area.

The final land capability map of the route (Figure 15 above) thus divides the area, per land type, into one of eight classes of **dominant** land capability, whereby Classes I-IV are arable and Classes V-VIII are non-arable (in fact, no land types with **dominant** land capability class I were encountered, although smaller areas of land capability class I will certainly occur within several of the individual land types).

If one compares the maps showing broad soil pattern and land capability, it can be seen that the harsh climate of the area (200 mm rainfall per year, hot temperatures) is the main restricting factor for agriculture in the study area, no matter how favourable the soils might otherwise be. The entire area is classed as Land Capability Class VII or VIII, due almost entirely to the shallow soils and dry climate.

The only area with agricultural possibilities is the zone of alluvial soils along the Orange River, where irrigation is applied. Numerous vineyards occur along the riverbank as can be seen in Figure 16 below.

Figure 16. The dominant form of agriculture along the bank of the Orange River consists of vineyards for the production of wines.

5.7 ECOLOGY

The general ecology of the study area was assessed by a specialist ecologist (David Hoare Consulting) to determine the existing ecological status as well as to identify and map sensitive areas. The detailed ecological report can be found in Appendix C of this Scoping Report.

The study area falls within Orange River Nama-Karoo, extending slightly into Bushmanland Nama-Karoo and Karroid Kalahari Bushveld (Low & Rebelo, 1998). According to the most recent vegetation map of South Africa (Mucina & Rutherford 2005), this area includes a number of vegetation types, the most common of which is Bushmanland Arid Grassland, but also including small amounts of Gordonia Duneveld, Lower Orange Broken Veld, Lower Gariep Alluvial Vegetation, Bushmanland Vloere, Kalahari Karroid Shrubland and Bushmanland Basin Shrubland. Orange River Nama-Karoo covers a surface area of approximately 53 000 km^2 within South Africa, only about 1.5% of which is currently conserved (Low & Rebelo, 1998). Orange River Nama-Karoo is characterized by the presence of the species, *Aloe dichotoma, Euphorbia avasmontana, E. gregaria, Acacia mellifera, Rhigozum trichotomum, Boscia albitrunca, B. foetida, Stipagrostis uniplumis* (dominant on the plains, especially after good rains)*, Tamarix usneoides* and *Ziziphus mucronata*.

Acocks (1953) describes this area as Orange River Broken Veld, extending just into Arid Karoo in the south-west and Kalahari Thornveld in the north-east. According to Acocks (1988), there are three variations of Orange River Broken Veld, the typical one occurring in the study area. Typical Orange River Broken Veld occurs on a variety of rocks in close proximity (within 50 km) to the permanently flowing Orange River. Typical tree and shrub species include *Aloe dichotoma*, *Euphorbia avasmontana*, *Sarcostemma viminale*, *Acacia mellifera*, *Acacia karroo*, *Acacia erioloba*, *Rhus lancea*, *Rhus laevigata*, *Rhus burchellii*, *Tarchonanthus camphoratus*, *Phaeoptilum spinosum*, *Ziziphus mucronata*, *Rhigozum trichotomum*, *Rhigozum obovatum, Lycium oxycarpum*, *Ehrhertia rigida*, *Boscia albitrunca, Cadaba aphylla*, *Putterlickia pyracantha*, *Nymania capensis*, *Ficus ingens, Olea europea* subsp. *africana* and *Grewia flava*. There is a rich though sparse flora of smaller plants as well as a number of important grasses, including *Aristida diffusa*, *Digitaria erianthe*, *Cenchrus ciliaris*, *Cymbopogon plurinodis*, *Enneapogon scaber*, *Enneapogon scoparius*, *Eragrostis nindensis*, *Eragrostis curvula*, *Eragrostis lehmanniana*, *Fingerhuthia africana*, *Eustachys paspaloides*, *Panicum stapfianum*, *Sporobolus fimbriatus*, *Oropetium capense* and *Tricholaena capensis*.

This part of the Karoo Biome has not been studied in detail recently and the only information comes from the original study by Acocks (1988). The study area falls primarily within the Af and Ag land-types, a land-type being an area that is uniform with respect to terrain form, soil patterns and climate (Land Type Survey Staff 1985), with some Ah, Ia and Ic land-type in places. The study area enters the Griqualand West Centre of Plant Endemism (van Wyk & Smith 2001) close to Groblershoop, where it includes the Orange River. It is also close to the Orange Centre of Plant Endemism (van Wyk & Smith 2001) to the west. The features of potential sensitivity include the Griqualand West Centre as well as the Orange River and its tributaries.

5.7.1 Flora

Most of the study area consists of untransformed natural vegetation. Vegetation type names and descriptions given below follow those given in Mucina et al. (in press), supplemented by additional data collected during the field survey.

5.7.1.1 Vegetation of the study area

Bushmanland Arid Grassland

This is the most common vegetation in the study area. It occurs on extensive, relatively flat plains and is sparsely vegetated by tussock grasses, including *Stipagrostis ciliata*, *Aristida adscensionis*, *Aristida congesta*, *Enneapogon desvauxii*, *Eragrostis nindensis*, *Schmidtia kalahariensis* and *Stipagrostis obtusa*. In some years after good rains there are abundant displays of annual herbs (Mucina et al. in press).

There are no known endemics in this vegetation (Mucina et al. in press). At a national scale this vegetation type has been transformed only a small amount and 27% is conserved in Augrabies Falls National Park; it is not therefore considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is considered to have a LOW sensitivity to disturbance by the proposed development taking the following into consideration:

1. the vegetation structure is low and sparse and therefore will not be affected by overhead powerlines.
2. pylons, access roads and disturbance due to construction may cause some local disturbance and/or transformation, but this is insignificant relative to the untransformed extent of the vegetation type
3. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including the Beaked Blind Snake, Sclater's Lark and Ludwig's Bustard;
4. the vegetation contains endemics belonging to the Griqualand West or Orange Centres of Endemism (van Wyk & Smith 2001), namely *Aizoon asbestinum*, *Maerua gilgii*, *Ruschia muricata* and *Aloe gariepensis*.
5. the vegetation contains the protected tree species, *Acacia erioloba, Acacia haematoxylon* and *Boscia albitrunca*.

Despite the low sensitivity rating, localised features may need to be considered, e.g. the location of populations of the protected tree species.

Lower Orange Broken Veld

This consists of sparse vegetation dominated by shrubs and dwarf shrubs, with annuals conspicuous, especially in spring, and perennial grasses and herbs occurring in low amounts. On the slopes of koppies groups of widely scattered low trees such as *Aloe dichotoma* occur and in the sandy soils of foot slopes *Acacia mellifera* occurs.

Known endemics in this vegetation include the tall shrub *Caesalpinia bracteata* and the succulent shrub *Ruschia pungens* (Mucina et al. in press). At a national scale this vegetation type has been transformed only a small amount and is also conserved in Augrabies Falls National Park. It is not considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is considered to have a HIGH sensitivity to disturbance by the proposed development for the following reasons:

1. the vegetation structure is medium and sparse and therefore could be affected by overhead powerlines.

2. pylons, access roads and disturbance due to construction may cause some local disturbance and/or transformation, but this is insignificant relative to the untransformed extent of the vegetation type
3. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including the Black Spitting Cobra and the Beaked Blind Snake, as well as the sensitive plant species, *Hoodia gordonii and Aloe dichotoma* subsp. *dichotoma*.
4. two endemic plant species are found in this vegetation type;
5. the vegetation contains endemics belonging to the Griqualand West or Orange Centres of Endemism (van Wyk & Smith 2001), namely.*Digitaria polyphylla* and *Crassula corallina* subsp. *macrorrhiza*

Kalahari Karroid Shrubland

This vegetation only occurs around the site of the north-eastern extreme of the proposed line; otherwise it will not be affected. It is a low karroid shrubland occurring on flat gravel plains. Dominant species include the small trees, *Acacia mellifera*, *Parkinsonia africana* and *Boscia foetida*, the tall shrub, *Rhigozum trichotomum*, the low shrubs, *Hermannia spinosa* and *Phaeoptilum spinosum*, the herbs, *Dicoma capensis*, *Chamaesyce inaequilatera* and *Limeum aethiopicum*, and the grasses, *Aristida adscensionis*, *Enneapogon desvauxii*, *E. scaber*, *Stipagrostis obtusa* and *Aristida congesta*.

There are no known endemics in this vegetation, but the grass *Dinebria retroflexa* has its south-western distribution limit in this vegetation type in this area (Mucina et al. in press). At a national scale this vegetation type has been transformed only a small amount, but it contains the preferred routes of many roads and about a quarter of the vegetation type is invaded by *Prosopis* sp. Although only a small amount is conserved in Augrabies Falls National Park, it is not considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is considered to have a LOW sensitivity to disturbance by the proposed development for the following reasons:

1. the vegetation structure is low and sparse and therefore will not be affected by overhead powerlines;
2. pylons, access roads and disturbance due to construction may cause some local disturbance and/or transformation, but this is insignificant relative to the untransformed extent of the vegetation type;
3. only a small amount of this vegetation type will be affected by the proposed powerline;

4. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including Ludwig's Bustard.

Bushmanland Basin Shrubland

This vegetation only occurs around the site of the south-western extreme of the proposed line, Kenhardt representing the northern extreme of the distribution of this vegetation, otherwise it will not be affected. It is a dwarf shrubland occurring on irregular plains dominated by sturdy, sometimes spinescent and succulent dwarf shrubs, grasses (mostly *Stipagrostis*) and, in years with good rains, some annuals (Mucina et al. in press). Dominant species include the tall shrubs, *Lycium cinereum* and *Rhigozum trichotomum*, the low shrubs, *Aptosimum spinescens*, *Hermannia spinosa*, *Zygophyllum microphyllum* and *Pentzia spinescens*, the succulent shrubs, *Salsola tuberculata*, the herb, *Leysera tenella*, and the grasses, *Aristida adscensionis*, *Enneapogon desvauxii*, *Stipagrostis obtusa* and *Stipagrostis ciliata*. This vegetation contains within it a number of endorheic pans and river channels.

Known endemics in this vegetation include the herb, *Cromidon minutum*, *Ornithogalum bicornutum* and *O. ovatum* subsp. *oliverorum* (Mucina et al. in press). At a national scale this vegetation type has not been transformed, but there are scattered invasions by *Prosopis* sp. (Mucina et al. in press). Although none of this vegetation is conserved, it is not considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is considered to have a MEDIUM sensitivity to disturbance by the proposed development for the following reasons:

1. the vegetation structure is low and sparse and therefore will not be affected by overhead powerlines;
2. pylons, access roads and disturbance due to construction may cause some local disturbance and/or transformation, but this is insignificant relative to the untransformed extent of the vegetation type;
3. only a small amount of this vegetation type will be affected by the proposed powerline;
4. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including Sclater's Lark.
5. the vegetation contains endemics belonging to the Orange Centre of Endemism (van Wyk & Smith 2001), namely.*Aloe striata* subsp. *karasbergensis*;
6. the vegetation contains species that are endmic to the unit.

Bushmanland Vloere

This vegetation occurs in patches throughout the study area in the flat areas in pans and the broad bottoms of seasonal rivers. Often the centre of the pan or the river drainage channel itself are devoid of vegetation. It is a loosely patterned scrub dominated by *Rhigozum trichotomum* and various species of *Salsola* and *Lycium*, in combination with a mixture of non-succulent dwarf shrubs of Nama Karoo origin. In places loose thickets of *Parkinsonia africana, Lebeckia linearifolia* and *Acacia karroo* can be found as well (Mucina et al. in press).

There are no known endemics in this vegetation type, although a current taxonomic revision of some plant families may result in some South African representatives of the genus *Salsola*, one of the most important generic components of vegetation of Bushmanland, becoming recognised as endemics (Mucina et al. in press). At a national scale this vegetation type has not been transformed, but there are scattered invasions by *Prosopis* sp. (Mucina et al. in press). Although none of this vegetation is conserved, it is not considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is considered to have a LOW sensitivity to disturbance by the proposed development taking the following factors into consideration:

1. the vegetation structure is relatively low and sparse and therefore will not be affected by overhead powerlines;
2. pylons, access roads and disturbance due to construction may cause some local disturbance and/or transformation, but this is insignificant relative to the untransformed extent of the vegetation type;
3. only a small amount of this vegetation type will be affected by the proposed powerline;
4. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including the Black Spitting Cobra, Kori Bustard and perhaps Sclater's Lark, as well as the sensitive plant species, *Hoodia gordonii*, but all of these species also occur in other habitats;
5. no endemic plant species occur here;
6. the vegetation type is widespread beyond the boundaries of the current study area, has not been transformed to a great extent and is not considered to be threatened at a national scale.

Gordonia Duneveld

This vegetation type occurs in bands running through the study area, often close to ridges. It consists of loose to partially stabilized sand dunes with very sparse vegetation that often only occurs at the footslopes.

There are no known endemics in this vegetation type (Mucina et al. in press). At a national scale this vegetation type has not been transformed (Mucina et al. in press). Although none of this vegetation is conserved, it is not considered to be a threatened vegetation type (Mucina et al. in press). From a natural vegetation perspective this vegetation is considered to have a MEDIUM sensitivity to disturbance by the proposed development for the following reasons:

1. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including the Beaked Blind Snake, as well as the sensitive plant species *Hoodia gordonii*, *Pterothrix tecta*, *Vahlia capensis* subsp. *ellipticifolia* and *Brachiaria dura* var. *pilosa*.
2. the vegetation contains the protected tree species (according to the National Forests Act of 1998, Act 84 of 1998), *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca*.

Lower Gariep Alluvial Vegetation

This vegetation occurs on flat alluvial terraces and riverine islands. The vegetation consists of a complex of riparian thickets dominated by *Ziziphus mucronata, Euclea pseudebenus* and *Tamarix usneoides*), reed beds with *Phragmites australis* and flooded grasslands and herblands along sand banks and terraces within and along the river (Mucina et al. in press). It is found as two strips in the north-west and north-east edges of the study area.

There are no known endemics in this vegetation type (Mucina et al. in press). Little of this vegetation is conserved and it is highly transformed by cultivation (approximately 50%). It is considered to be a threatened vegetation type (Mucina et al. in press) classified on a national scale as Endangered (Driver et al. 2005) with only about 6% conserved. From a natural vegetation perspective this vegetation is considered to have a HIGH sensitivity to disturbance by the proposed development taking the following factors into consideration:

1. the vegetation structure is of intermediate height and relatively dense and therefore may be affected by overhead powerlines;
2. the vegetation type is Endangered on a national scale;
3. pylons, access roads and disturbance due to construction may cause some local disturbance and/or transformation, which may be significant relative to the untransformed extent of the vegetation type;
4. only a small amount of this vegetation type will be affected by the proposed powerline;
5. there is a chance that this vegetation unit would support populations of threatened plant or animal species, including the Kori Bustard,

6. no endemic plant species occur here.

Flora of entire study area

All plant species found during the survey are listed in Appendix 2 of the ecological report (refer to Appendix CAppendix C: Ecological Specialist Report). Due to the fact that the fieldwork component of this survey lacked seasonal coverage, the species list provided is unlikely to be comprehensive, but nevertheless provides a good indication of the species diversity and composition of the study area. From historical data, a total of 553 species are known to occur in the study area.

Figure 17 below shows a general sensitivity map of the study area and surrounding areas. The numerous vegetation types (as detailed in the paragraphs above) have been assessed for sensitivity to the proposed powerline and these sensitivities have been rated as “High”, “Medium” and “Low” by the ecological specialist.

The north-eastern section of the study area contains the majority of the highly sensitive vegetation types (Lower Gariep Alluvial Vegetation and Lower Gariep Broken Veld). As can be seen in Figure 17, the sensitive vegetation surrounding the study area is extensive and hence routing the powerline around this vegetation type is not feasible.

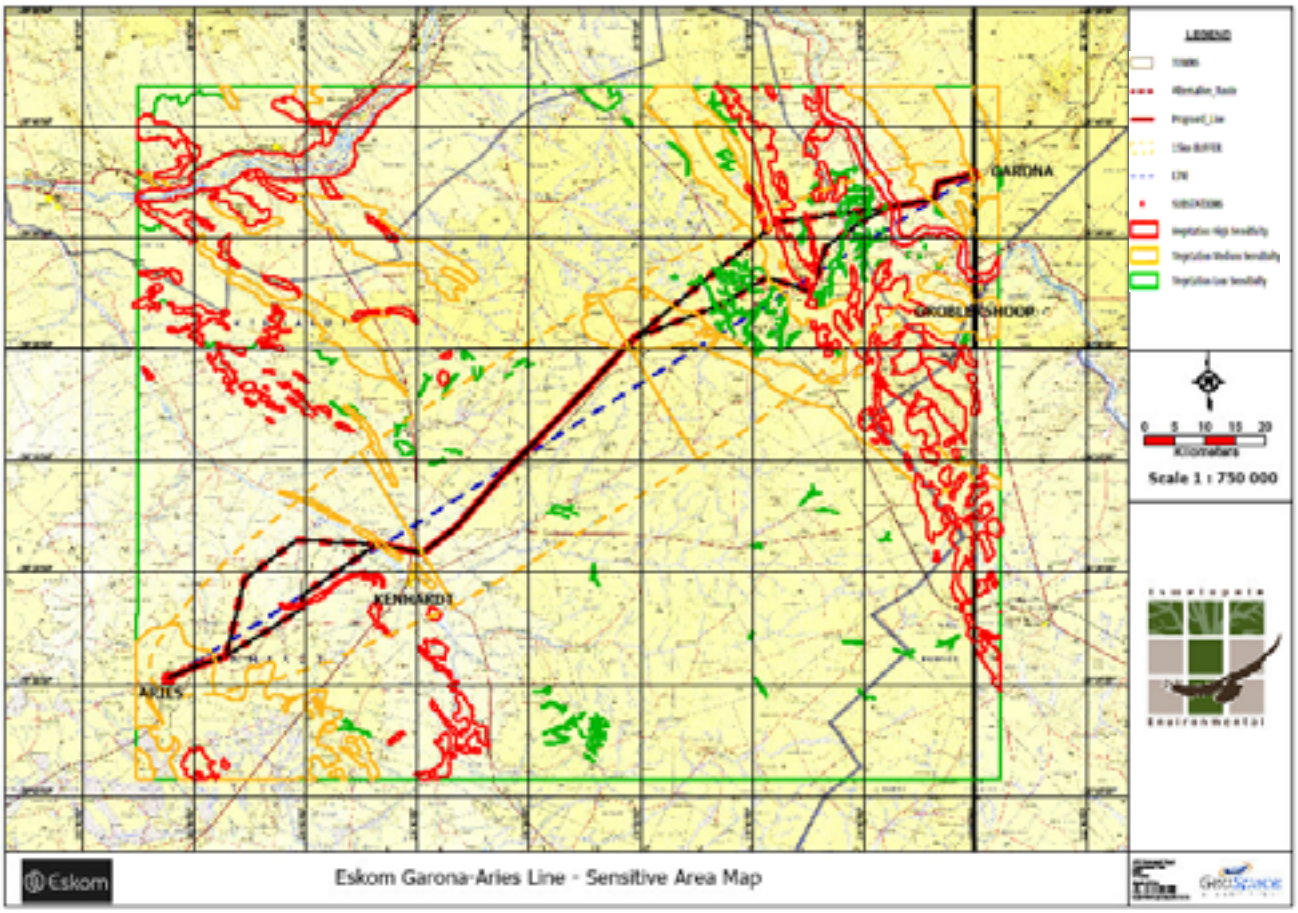


Figure 17. Sensitive vegetation units within and surrounding the study area.

Red List Plant Species and other plant species of special concern

No Red List plant species were recorded in the field during the current survey. Historical records of Red List plant species were consulted in order to determine the likelihood of any such species occurring in the study area.

Lists of plant species previously recorded in the quarter degree grids in which the study area is situated was obtained from the South African National Biodiversity Institute. There were 8 species recorded in the quarter degree grids that include the study area that were listed in the Red List of southern African plants (Hilton-Taylor, 1996). One of these is currently considered to be threatened, namely *Aloe dichotoma* subsp. *dichotoma*, classified as Vulnerable. In the study area, this species is found on rocky outcrops, which fall within the vegetation type Lower Orange Broken Veld. A further four species are considered to be of some conservation concern due to declining populations, lack of information or due to the fact that they are naturally rare, including *Hoodia gordonii*, *Brachiaria dura*

var *pilosa*, *Pterothrix tecta* and *Vahlia capensis* subsp. *ellipticifolia*. The succulent *Hoodia gordonii* has been recorded during previous vegetation studies undertaken in the area and therefore has a high chance of occurring in the study area. It is also considered to be an Orange Centre of Endemism near-endemic species (see below). It is found in a number of habitats, including within Gordonia Duneveld, Lower Orange Broken Veld and Bushmanland Vloere. The remaining species, *Brachiaria dura* var. *pilosa*, *Vahlia capensis* subsp. *ellipticifolia* and *Pterothrix tecta* have been previously recorded in dune sand or between dunes and are therefore most likely to occur in Gordonia Duneveld vegetation.

It is clear from the quantity and quality of data for the study area that this general geographic region is poorly known. There are few taxonomic collections and relatively little floristic information for the area (van Wyk & Smith 2001). There are 13 species listed as being endemic or near-endemic succulents for the nearby Griqualand West Centre of Endemism (van Wyk & Smith 2001). Only one of these, *Aizoon asbestinum*, has been recorded in the current study area, found throughout the study are in Bushmanland Arid Grassland. A number of non-succulent species are also endemic / near-endemic to the Griqualand West Centre of Endemism (van Wyk & Smith 2001). One of these, *Digitaria polyphylla*, has been recorded just outside the study area in Lower Orange Broken Veld. There are over 400 succulent species listed as being endemic or near-endemics for the nearby Orange Centre of Endemism as well as a long list of non-succulents (van Wyk & Smith 2001). Seven of these have been recorded in the current study area, namely *Aloe gariepensis*, *Aloe striata* subsp. *karasbergensis*, *Crassula corallina* subsp. *macrorrhiza*, *Hoodia gordonii*, *Maerua gilgii*, *Ruschia muricata* and *Sarcocaulon patersonii*. *Aloe gariepensis*, *Ruschia muricata* and *Maerua gilgii* are found in Bushmanland Arid Grassland, *Aloe striata* subsp. *karasbergensis* is found in Bushmanland Basin shrubland, *Crassula corallina* subsp. *macrorrhiza* is found in Lower Orange Broken Veld. *Sarcocaulon patersonii* is found in a variety of vegetation types, including Bushmanland Vloere, Lower Orange Broken Veld, Bushmanland Arid Grassland, Bushmanland Basin shrubland and, in one instance, in Gordonia Duneveld. The Orange Centre is centred along the Orange River and includes part of Acocks's Orange River Broken Veld, thus promoting the extension of species ranges further inland of the Centre into parts of the current study area. Areas associated with calcareous soils and heavy metals are likely to have high numbers of species of restricted distribution, the probability high that there are unknown species from these sites.

Tree species that have been recorded in the study area that are protected in terms of the National Forests Act of 1998 (Act 84 of 1998) are *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca*. The tree *Acacia erioloba* occurs in dry woodland along watercourses in arid areas where underground water is present as well as on deep Kalahari sands (mostly Bushmanland Arid Grassland and

Gordonia Duneveld), *Acacia haematoxylon* on deep Kalahari sand between dunes or along dry watercourses (Bushmanland Arid Grassland and Gordonia Duneveld) and *Boscia albitrunca* in semi-desert areas and bushveld, often on termitaria, but common on sandy to loamy soils and calcrete soils (mostly Bushmanland Arid Grassland, but also found in Gordonia Duneveld). *Acacia erioloba* is relatively common in the study area, whereas *Acacia haematoxylon* and *Boscia albitrunca* occur more sparsely.

5.7.2 Fauna

No species of threatened animals were recorded during this survey. Four reptiles and amphibians, nine birds and no threatened mammal species have a geographical distribution and habitat preference which coincides with that of the study area. The Lesser Kestrel, Secretary Bird, Peregrine Falcon, Desert Mountain Adder and Giant Bullfrog have a low chance of occurring on the site, due to the fact that their geographical range is marginal to the study area or the preferred habitat of these species is not available or uncommon in the study area. The species with a medium to high chance of occurring in the study area are discussed in more detail below.

Black Spitting Cobra (Rare)

The Black Spitting Cobra occurs in rocky terrain in arid areas, on rocky outcrops and in dry watercourses. It has been previously recorded in the study area and is, therefore, likely to occur in available habitats. The proposed powerline is unlikely to have a significant negative impact on the global conservation status of this species.

Beaked Blind Snake (Peripheral)

The Beaked Blind Snake is not well-known. It occurs in arid areas in the Northern Cape, including the study area, and probably burrows in hard ground. It occurs in the Augrabies Falls National Park and is protected by Provincial Ordinance. The proposed powerline is unlikely to have a significant negative impact on the global conservation status of this species

Black Harrier

The Black Harrier occurs in open grassland, scrub, semi-desert and mountain areas and is endemic to southern Africa, mostly in South Africa. It is reliant on private farmland and is vulnerable to changing land use. It is not reported to be affected by powerlines (Barnes 2000) and the proposed powerline is therefore unlikely to have a negative impact on the conservation status of this species.

Kori Bustard

The Kori Bustard occurs in dry savanna and moist to semi-arid woodland in South Africa. Threats to this species include habitat destruction, agriculture, bush encroachment, hunting, collision with

overhead transmission lines and poisoning (Barnes 2000). In the study area the Kori Bustard favours tree-lined watercourses, but this habitat is becoming less favourable due to being invaded by alien *Prosopis* spp. (Barnes 2000). The proposed powerline may have an impact on this species due to increased collisions.

Martial Eagle

The Martial Eagle is widespread and tolerates a wide variety of vegetation types. It relies on tall trees and/or electricity pylons to provide nesting sites. The main threats to this species are direct persecution (shooting & trapping), poisoning and drowning in sheer-walled reservoirs, especially in the arid Northern Cape. Lesser threats include electrocution on electricity structures and collision with overhead powerlines. The proposed powerline may therefore have an impact on this species due to increased collisions.

Ludwig's Bustard

Ludwig's Bustard occurs in open plains of the semi-arid Karoo (Barnes 2000). They are highly susceptible to collisions with overhead powerlines and telephone wires, the single most important threat to this species. The proposed powerline is therefore likely to have a significant impact on local populations of this species.

Lanner Falcon

The Lanner Falcon occurs in a wide range of habitats, usually avoiding thick forests (Sinclair 1988). There is a high incidence of fatalities and injuries in this species due to collisions with overhead powerlines and fences. The proposed powerline is therefore likely to have a significant impact on local populations of this species.

Sclater's Lark

Sclater's Lark occurs in gravelly or stony, semi-desert plains with stunted Karoo scrub (Sinclair 1988). It is endemic to southern Africa and the current study area is at the centre of its known distribution range. Populations in the Bushmanland area are considered to be relatively sedentary and return to the same nesting patch each year (Barnes 2000). The proposed powerline may therefore have an impact on this species if electricity pylons affect nesting sites.

Invertebrates

Most invertebrate groups are very poorly known and also considered to be extremely species rich – approximately 70% of species, including plants and animals, are invertebrates. The Animal Kingdom consists of 11 phyla, of which invertebrates comprise 10 of these, 4 of which are wholly marine (Rothschild 1965). In many cases, especially with insects (Phylum Arthropoda, Class Insecta), it is

almost impossible to have specimens identified to beyond family level. This makes evaluation of threatened status very difficult and is usually only possible for better-known groups, such as butterflies. No official published threatened species lists exist for any invertebrates. An aggravating circumstance in the current study area, is that it is generally poorly known for all groups of organisms. The current study therefore only considers a single well-known group – the butterflies.

Of 54 species of butterfly that have a geographical range that includes the study area (out of a total of 666 for South Africa), only 3 have a slightly restricted range. None are rare or truly restricted and, in the absence of a threatened species list for butterflies, it is assumed that none are threatened.

5.7.3 Avifauna

The Endangered Wildlife Trust undertook a detailed investigation of the possible effects the transmission line would have on the natural populations of birds in the study area. His complete report can be found in Appendix B of this Scoping Report.

Whilst much of the bird species distribution in the study area can be explained in terms of the above broad vegetation description (based on the quarter degree squares), there are many differences in bird species distribution and density that correspond to differences in habitat at the micro level. These "bird micro habitats" are evident at a much smaller spatial scale than the broader vegetation types or biomes and are determined by factors such as land use, vegetation and manmade infrastructure. They can largely only be identified through a combination of field investigation and experience and it is therefore extremely important to visit the study area first hand (as was undertaken).

The following bird microhabitats were identified during the field investigation:

Arable lands

Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. In this study area, this is particularly the case, as the remainder of the landscape is so arid and devoid of surface water or greenery of any type.

The only arable lands in this study area are along the Orange River, almost all under irrigation and as such most definitely represent almost the only source of "green" and moisture in this landscape for much of the year. Whilst some crops are more suitable than others for birds, most of these lands are under a rotational system whereby at some point in the year or over several years a crop will be planted that is suitable to birds. The exception to this is the vineyards, which are obviously a long

lived crop that is unlikely to change for a long time. Since the vineyards are interspersed with other crops types, the entire arable area along the river is considered extremely sensitive from a bird perspective.

Bird species likely to make use of these areas include the White and Abdim's Stork, and various non Red Data species such as geese, water birds, Helmeted Guineafowl and many others.

Plains or flats – including wetlands

These areas are conspicuously flat and may hold water in places after rainfall events. Drainage lines and river courses generally bisect the plains, and sometimes these drainage lines have been dammed. Large bare patches of partially exposed soil are often evident. In this study area, the plains are often bisected by wetland systems.

From a bird collision perspective, the plains or flat areas are important for a number of reasons: they are often surrounded by ridges or kopjes, which are higher and form a dark background, against which the earth wires of a power line are obscured; many collision sensitive species such as bustards prefer these areas. Studies on existing 400kV power lines elsewhere in the Karoo found almost all carcasses of birds (Ludwig's Bustards and Blue Cranes) had collided with the lines on these flat areas (Smallie & van Rooyen, 2003).

Rocky ridges/kopje

These areas are extremely rocky and are usually derived from dolerite. In this area of the Karoo, the koppies are relatively small in size. Extensive populations of Quiver Trees (*Aloe dichotoma* var*. dichotoma*) occur on these koppies, particularly just south of Kenhardt.

In terms of collision these areas are much less important that the plains. However these koppies form an important habitat for species such as the Black Eagle. It has been shown elsewhere in the Karoo that both Black and Martial Eagles favour breeding on or adjacent to these ridges (Smallie & van Rooyen 2003). Further, a number of collisions of Black Eagles have been reported in the past, on power lines crossing ridges, most likely due to this species habit of hunting low along the rock line on these ridges.

The proposed alignment should avoid crossing koppies entirely. Potential options include, passing through a narrow gap in the ridge just south of Groblershoop ("Neus se Berg"). This is not anticipated to be a particularly sensitive area since it is adjacent to the road, and disturbance levels are likely to be relatively high.

Rivers/drainage lines

Most rivers in southern Africa are in the east and extreme south, in the higher rainfall areas. Thirteen species of water bird are mostly restricted to riverine habitat in southern Africa. The map distribution of these species correlates with the river courses in southern Africa.

In this arid Karoo/Kalahari landscape, although the watercourses seldom contain water, these systems are important, as they have a different vegetation composition to the remainder of the plains, often including woody species such as *Acacia spp.* These drainage lines also serve as important flight paths for many bird species even when dry.

Dams

Many thousands of earthen and other dams exist in the southern African landscape. Whilst dams have altered flow patterns of streams and rivers, and affected many bird species detrimentally, a number of species have benefited from their construction. The construction of these dams has probably resulted in a range expansion for many water bird species that were formerly restricted to areas of higher rainfall. These include the African Fish Eagle, pelicans, darters and cormorants. Many species from these families occur in this study area.

Most importantly, in this arid landscape, dams are used as roost sites by some bird species. This has serious implications for their interaction with power lines, as the birds would then leave the roost in the early morning during low light conditions, and arrive at the roost in the late evening, again during low light conditions. During these conditions, the earth wires of a power line are almost invisible and the chance of collision is much greater.

The current proposed alignment does not pass close to any dams within the study area and thus no alternative routes have been proposed in this regard, however a few small dams do exist in the study area and must be considered if the alignment changes at all.

Bushland and thicket

As discussed above, this occurs mainly along drainage lines and watercourses, and also on the ridges and broken ground. It is clear that bushlands and thickets are in the minority in this area.

Bird species likely to make use of these areas include the Martial Eagle, Kori Bustard and Secretary bird.

5.7.3.1 Bird species present in the study area

Table 2 of the Specialist Avifaunal Report (refer to Appendix B) shows the Red Data bird species reported for each quarter degree square in the study area (Harrison *et al* 1997). The report rates are essentially a percentage of the number of counts conducted in the square that recorded that particular

species. A total of 8 (3 Vulnerable and 5 Near-threatened) Red Data species have been recorded, and the White and Abdim's Stork have been included here as they are internationally protected under the Bonn Convention on Migratory Species. Of these 10 species, all except one, the Sclater's Lark, are known to interact directly with power line infrastructure. All of the 10 species, including the Sclater's Lark could potentially be impacted on through habitat destruction and disturbance.

Of particular concern for this study are the species known to be vulnerable to collision with overhead cables namely the Kori and Ludwig's Bustard, Secretarybird, Greater Flamingo, and the 3 storks species, namely Black, Abdim's and White Stork. Both bustard species have been fairly well recorded in the study area, whilst the storks have only been recorded in 2921AC.

It must be stressed again that the squares in this study area have not been well counted during the data collection phase of the Atlas of southern African Birds Project (Harrison *et al* 1997). Many of the report rates must therefore be viewed with some caution, and it is possible that some species were missed altogether. One glaring example is that the White Stork has not been recorded in 2821DD, the square through which the Orange River flows. One would certainly expect to find White Storks along the river in the arable lands, particularly the Lucerne lands that exist. Despite the uncertainty regarding the species lists and report rates, the assessment of impacts and the proposed mitigation measures are unlikely to be affected since fortunately most sensitive areas are sensitive due to the presence of more than one species. For example, this study will recommend the marking of the earth wires on the section of line crossing the Orange River due to the abundance of non Red Data water bird species in this area. If in fact White Storks do occur there (contrary to the data) they will obviously also be safeguarded by the proposed mitigation.

Another species that will interact with the proposed power line in a slightly different manner is the Sociable Weaver, which is known to make use of electrical and telephonic infrastructure for nesting substrate. These nests can become massive and place a large weight on the pole. Numerous nests were seen in this study area, particularly from just south of Groblershoop to the Garona Substation. Whilst this nesting poses no threat to the Sociable Weaver, it has been speculated that it may compromise the structural integrity of towers in some extreme cases. The nests also pose a fire risk as they consist of a huge amount of very dry material. Interestingly, in other areas these nests have been seen to be used for nesting by Pygmy Falcons, and larger raptors have been seen to nest on top of these nests.

5.8 AREAS OF HISTORICAL/CULTURAL SIGNIFICANCE

Dr. David Morris of the McGregor Museum undertook a desktop survey supported by limited field inspection of the route of a proposed transmission line from Garona to Aries. The complete Heritage Impact Assessment (HIA) report can be found in Appendix D of this Scoping Report.

The archaeology of the Northern Cape is rich and varied, covering long spans of human history. The Karoo is particularly bountiful. Concerning Stone Age sites here, C.G. Sampson has observed: "It is a great and spectacular history when compared to any other place in the world" (Sampson 1985). Some areas are richer than others, and not all sites are equally significant. Heritage impact assessments are a means to facilitate development while ensuring that what should be conserved is saved from destruction, or adequately mitigated and/or managed.

The HIA report also provides background information on the archaeology of the wider region against which observations along the servitude may be assessed. Detailed assessment and recommendations can only be made once the exact route including tower positions is known and areas of higher sensitivity inspected.

5.8.1 Archaeological resources in the Karoo

The significance of sites encountered in the study area may be assessed against previous research in the region and subcontinent. Humphreys' evaluation remains true, that "*the amount of archaeological research that has been undertaken in the Karoo is in no way proportional to its importance in terms of area in South Africa*" (1987:117; refer to HIA report – Appendix D)). The region's remoteness from research institutions accounts for this.

The area has probably been relatively marginal to human settlement for most of its history, yet it is in fact exceptionally rich in terms of Stone Age sites and rock art, as relatively few but important studies have shown.

Sparse as previous studies have been, the information to hand (in this case from the Seekoei Valley specifically) enabled Sampson (1985:107; refer to HIA report – Appendix D) to declare that:

"The South African central plateau is unique in the world...in that it supported large numbers of non-farming people who were also prolific makers of stone tools until very recent times. A brief comparison of surveys conducted elsewhere in the world reveals promptly and unambiguously that South Africa is richer in Stone Age remains than any other place on earth."

Against this background, any and every conservation effort is significant.

5.8.2 Relevant observations

From the Groblershoop end of the study area, the route of the line crosses areas of Aeolian sand dune. The crests of dunes not infrequently were favoured activity/dwelling locales in Later Stone Age times and it is possible that traces of these activities may be found there. The approaches to the Orange River are also areas of potentially higher archaeological visibility.

The line traverses the plain south westwards from the Orange River to a poort through the Nous se Berg: minimal traces of archaeological materials were noted alongside the road that runs near to the route of the line. West of the poort there is again an area of red dunes that may have been a focus of past habitation, but beyond the dunes at Kleinbegin only very sparse surface traces of Stone Age material were noted.

From here the terrain towards the vicinity of Kenhardt is relatively uniform, with the route of the line traversing plains with shallow soils and occasional leegtes (shallow depressions, non-perennial water courses). Archaeological sites are known to occur in this kind of terrain, for example Later Stone Age sites documented at Arbeidsvreug to the south and Middle Stone Age material at Kalkgaten to the north. In pan depressions there could well be preservation of ancient bone, such as at Bundu near Marydale.

Isolated inselbergs and rocky outcrops in the region are known to have been a focus of past human activity and both finger paintings and rock engravings are known to occur on some of them. None appears to be directly on the route of the line.

Northwest of Kenhardt the line traverses the Hartebeest River, the vicinity of which may have slightly higher archaeological visibility. The northern and southern alternative routes were inspected where they cross roads: in neither instance was there anything more than an extremely low density of stone tools.

In the vicinity of Olywen Kolk and Klein Zwart Bast, the farms at the south western most end of the proposed line, the terrain is characterized by Dwyka tillite, known to be a favoured source of raw materials in Earlier Stone Age times. In the vicinity of the Aries substation, indeed, several artifacts were noted amidst the strewn stones that typify the surfaces here.

Inspection of the proposed tower positions may reveal further sites, once these positions are known.

5.9 VISUAL IMPACT

Newtown Landscape Architects undertook a Visual Impact Assessment (VIA) for the proposed transmission line (refer to Appendix G for the full VIA report). The aims of the Visual Assessment are to determine the aesthetic value of the visual resource (receiving environment) and to identify issues

that need to be addressed in the impact assessment phase. The primary visual concern is of the potential impact from the physical presence of the power transmission line and associated impacts on views to residents, tourists and people passing through the study area.

5.9.1 Land use

The proposed transmission powerline follows a general southwest (Aries) to northeast (Garona) orientation. The majority of the land in the study area is privately owned and managed. Although other lands, primarily a state owned railway and road servitudes, are crossed.

The proposed route is aligned north of and roughly parallel to an existing railway corridor. Primary land uses within the buffer zone include farmland, a tourist facility and its associated game farm (Thuru Lodge), mineral extraction (stone quarry), roads, agricultural small-holdings and the towns of Kenhardt and Groblershoop.

Residential

Residences are concentrated in the town of Kenhardt and along the Orange River in Groblershoop, Wegdraai and along the banks of the river, north and south of the proposed route. Widely dispersed farmsteads are found throughout the buffer zone, some of which have been abandoned.

Tourism

Bed and breakfast businesses have been established at the farms along the Orange River within the buffer zone and on either side of it. Kenhardt also has a few bed and breakfast facilities. The Thuru Lodge and game farm, lies in the Swartberg hills approximately 22km directly east of Groblershoop and directly south of the proposed power line route (refer to the map in Appendix I). Alternative Route 1A (refer to Figure 2) is proposed in order to mitigate the possible negative impacts of the line traversing the game farm. A series of low hills to the southwest of Kenhardt on the R27, sustains a forest of Quiver Trees, which was a major tourist attraction in the area. But in recent years there appears to have been a decline in interest to this area as the trees suffer from drought conditions and are slowly dying off.

Agricultural

The majority of the study area comprises of vast tracks of marginal farmland, used primarily for small stock grazing. A concentration of cultivated land occurs along the banks of the Orange River. The presence of water and deeper alluvial soils have enabled extension crop irrigation, the most important being cotton, lucerne, grapes and sultanas.

Transportation systems

Two main transportation systems provide access to and through the study area, and comprise national, provincial and local (farm) road systems and railway servitudes. The proposed transmission line crosses the R27 provincial road north of Kenhardt and the N10 national road near Wegdraai north of Groblershoop. A farm road connects Kenhardt to Wegdraai at the N10, south of the proposed power line route.

Two railway servitudes cross the study area. One runs south (and roughly parallel) of the proposed power line route and the other intersects with the study area approximately 38 km west of the Aries substation.

5.9.2 Landscape character

Landscape character types are landscape units refined from the regional physiographic and cultural data derived from 1:50 000 maps and information gathered on the site visit. Dominant landform/land use features (e.g., hills, rolling plains, valleys and urban areas) of similar physiographic and visual characteristics typically define landscape character types.

The study area consists of three dominant natural landscape types: rocky hills and koppies, flat rolling plains, the Orange River valley and its associated drainage lines. Two other types, mainly derived from man-made intervention, also occur within the study area. They are the built up areas (towns) and cultivated farmland. The study area occurs within the Nama Karoo biome and therefore is hot and dry.

The visual character of the study area is largely natural with concentrations of man made features along the Orange River and in the towns of Kenhardt and Groblershoop and the Wegdraai settlement. Other man-made interventions include the existing railway and road servitudes, as well as the infrastructure and buildings associated with the farmsteads.

The western section of the study area consists primarily of a vast ‘undisturbed’, flat to rolling landscape that affords panoramic vistas. The landscape has a rocky to sandy appearance with a sparse cover of grass and dwarf shrubland with the grasses dominant in the depressions (drainage lines) and on sandy soils (dunes). The Aries substation is located at the far western end of the study area and a series of power lines emanate from it to the north and south.

To the west and southwest of Kenhardt the topography is ‘broken’ into a series of rocky hills, which protrude above the horizon line. Quiver Trees (*Aloe dichotoma*) and *Euporbia* species being the most noticeable large vegetation type associated with the steep slopes of the hills. At a ‘kloof’ in the hills, through which the existing railway line runs, an alternate routing for the power line is proposed, a stone quarry has been mined, presumable for material used in the construction of the railway line. The quarry has not been rehabilitated.

For the most part however, the landscape is featureless and flat with tall elements such as the railway electricity poles and lines often protruding above the horizon line.

The landscape character of the eastern section of the study area tends to be more interesting than the western section. The dominant natural feature is a range of high rocky hills, which can be seen from miles around. The hills cross the study area in a general north-northwest to south-southeast orientation, west of the Orange River. At the base of the hills on the western side, are red sand dunes that run parallel with the hills. The remainder of the landscape around the hills tends to be flat to gently rolling, with a sparse cover of grass and short scrubland. Taking advantage of the general pleasing aesthetic of this rugged landscape type, located south of the proposed power line route, is the Thuru Lodge and Game Farm. It is one of few tourist destinations within the study area.

East of the Orange River and to the south and west of the proposed power line route, lies a series of low hills. The area between them and the Orange River is also flat to gently rolling, with a sparse cover of grass and short scrubland.

The Orange River is the most interesting visual feature in the study area and has great aesthetic value. It is the natural focal element of a hot, arid drainage basin and the only source of significant surface water within the study area. Water in an arid environment is a very attractive element. The river provides water to irrigate the lands cultivated in its flood plain and also attracts tourism opportunities along the banks of the river. The Orange River is perhaps the most important and viable (in the long term) tourist attraction within the study area. A number of Bed and Breakfast facilities have already been established at the farms located on the banks of the river.

5.9.3 Visual Resource

Landscapes with greater diversity or containing "distinctive" features are classified as having a higher scenic value than landscapes with low diversity, few distinctive features, or more “common" elements. Generally, the greater the diversity of form, line, texture, and colour in a landscape unit or area, the greater the potential for high scenic value. Scenic quality classifications are:

- High - distinctive landscape and strong sense of place
- Moderate - common landscape
- Low - minimal landscape and weak sense of place

The landscape can be divided into five basic landscape character types each with its own set of physical, visual and aesthetic characteristics.

Scenic quality ratings were assigned to each of the homogeneous landscape units. The *highest* value is assigned to the Orange River, Hartbeesrivier valley and the rocky hills and koppie areas. The

combination of natural features, characteristic of these areas, stand out within the context of the region and evoke distinct and unique images to produce a strong sense of place.

The landscape type with the lowest scenic quality rating is the built up areas associated with settlements of Kenhardt, Groblershoop and Wegdraai.

The remainder of the study area, spatially the largest component, comprises gentle undulating 'natural' land. This landscape type has moderate aesthetic appeal and is not rated as high as the Orange River and rocky hills. The presence of the existing railway line and power lines/substations compromises the beauty of these areas.

Based on the discussion in this section, the specialist experience of the author (Mr. Graham Young) and the criteria in Appendix A of his attached report, scenic quality values for the various landscape types are rated in Table 5 below.

Table 5. Value of the visual resource - scenic quality.

High Orange River, Harbeesrivier valley and rocky hills and koppies	**Moderate** Gently sloping grassy/dwarf scrubland and cultivated farmland	**Low** Built up/settlements
This landscape type is considered to have a *high* value because it is a:	This landscape type is considered to have a *moderate* value because it is a:	This landscape type is considered to have a *low* value because it is a:
Distinct landscape that exhibits a very positive character with valued features that combine to give the experience of unity, richness and harmony. It is a landscape that may be considered to be of particular importance to conserve and which has a strong sense of place. It may be sensitive to change in general and may be detrimentally affected if change is inappropriately dealt with.	Common landscape that exhibits some positive character but which has evidence of alteration /degradation/erosion of features resulting in areas of more mixed character. It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with but change may not require special or particular attention to detail.	Minimal landscape generally negative in character with few, if any, valued features. Scope for positive enhancement could occur.

5.9.4 Views

In the larger context, the vast flat undisturbed areas and the presence of distinctive natural landscape elements (hills and river valley) generally create a setting for expansive panoramic views, albeit from low vantage points. There are however no public roads that offer elevated views over the landscape. The only places where the public has access to elevated views, is from the Quiver Tree forest immediately south west of Kenhardt and to a lesser degree, from the west bank of the Orange River looking in an easterly direction.

There are a number of public roads from which the power line would be visible. The powerline crosses the R27 north of Kenhardt and the N10 north of Wegdraai. It is routed adjacent a farm road east of the Aries substation and crosses another road immediately east of the Orange River near the Garona substation.

Views from Thuru Lodge are orientated towards the south away from the power line corridor, which is separated from the lodge by a low ridge. Distant and elevated views of the proposed power line would be available to people visiting the Quiver Tree Forest hills southwest of Kenhardt.

Residences are spread nearly throughout the study area buffer zone, although they are generally concentrated along the Orange River and in residential clusters at Wegdraai, Kenhardt and Groblershoop. Views from residences would depend on the distance from the residence to the power line and the location of each residence relative to it.

Sensitive viewer locations

Views from residences and tourist facilities are typically more sensitive of the transmission line, since views from a residence or a tourist facility are considered to be frequent and of long duration. Residences, farmsteads and tourist facilities, including the Orange River, are regarded as high sensitivity viewpoints. The N10 is regarded as a scenic travel route and is therefore also considered a high sensitivity viewpoint. The hills on which the Quiver Tree forest grows is also considered as high sensitive viewpoints. Other viewpoints, such as those from the N10 and R27 and local farm roads dispersed throughout the study area, are considered moderate sensitivity viewpoints (refer to Figure 18 below for a visual representation of sensitive viewing areas).

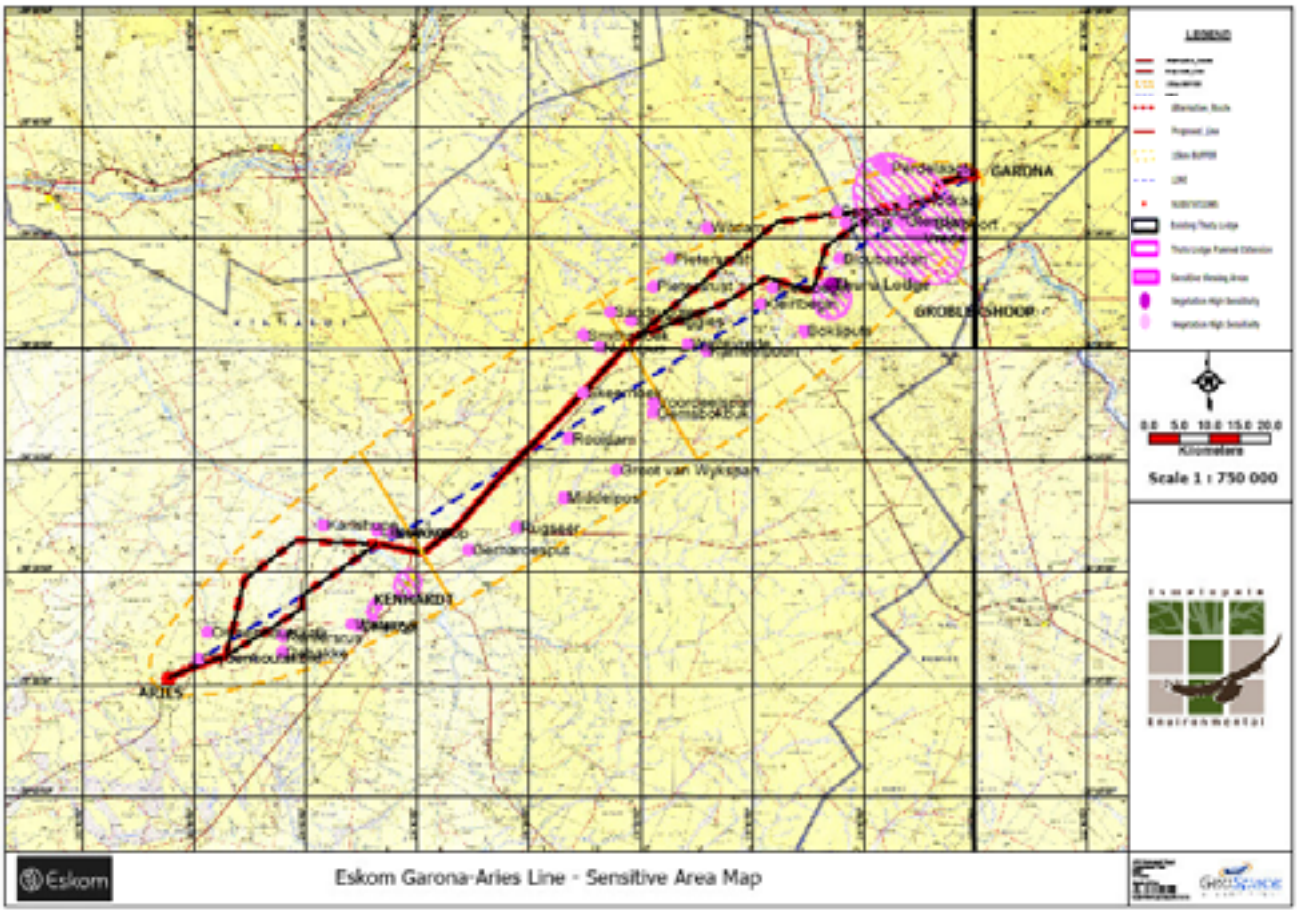


Figure 18. Sensitive viewing locations within the study area.

5.9.5 Visual Resource Management (VRM) resources

Visual Resource Management (The United States Department of the Interior Bureau of Land Management) classes provide management objectives and are used to set limits to the amount of contrast, which will be allowed in an area between a management activity (e.g., roads, power lines, mine, development, etc.) and the existing landscape. The objectives are put forward in the scoping phase of the project as a basis for discussion and to determine management objectives acceptable to the public, authorities and the applicant. Once confirmed the management objectives must inform mitigation measures proposed in the assessment phase.

Visual resource inventory classes are generally defined as follows:

Class I Objective. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II Objective. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, colour, and texture found in the predominant natural features of the characteristic landscape.

Class III Objective. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objectives. The objective of this class is to provide for management activities, which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

5.9.6 Visual Issues

To evaluate the impacts of the power transmission line it is assumed that the landscape has some inherent scenic value. The existing visual condition of the landscape that would be affected by the proposed power transmission line has been described. Its scenic quality has been rated and highly sensitive viewing areas identified and mapped. The next phase, after the scoping phase, is to assess the impacts on the visual resource.

Visual resource impacts would result from the construction, operation, and maintenance of the proposed power transmission powerline. Specifically, impacts would result from the transmission powerline being seen from sensitive viewpoints and from effects to the scenic values of the landscape. Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from tourism/conservation areas, travel routes, and important cultural features and historic sites, especially in foreground views. The visual impacts that would result from the construction and operation of a transmission line are usually direct, adverse, and long-term and must be addressed in the assessment phase of the project. The following issues will be considered in the assessment phase:

- Establish public concern for scenic quality of the study area and their perception of what constitutes a sensitive viewing site;
- Determine the visibility of the power transmission powerline by conducting view shed analyses from sensitive viewing areas;
- Determine visual intrusion (contrast) of the proposed power transmission powerline by simulating its physical appearance from sensitive viewing areas;
- Rate the impact of the power transmission powerline on views from sensitive viewing areas;
- Rate the impact on the scenic quality and sense of place of the study area;
- Determine visual resource management objectives to set limits to the amount of intrusion (contrast) which will be allowed in the study area between the power transmission line and the existing landscape;
- Establish management measures (mitigation) to reduce the impact of the power line where appropriate.

5.10 SOCIO-ECONOMIC ENVIRONMENT

Specialist input was obtained regarding the socio-economic environment through a detailed Social Impact Assessment (Strategic Environmental Focus (Pty) Ltd.) as well as a Tourism specialist study (ECO Africa). Refer to Appendix E and Appendix F respectively for the complete reports.

5.10.1 Social Impact Assessment

Strategic Environmental Focus (Pty) Ltd undertook a detailed Social Impact Assessment (SIA) for the proposed 400kV Garona-Aries Transmission line. The SIA's aim was to analyse, monitor and manage the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by these interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment. The Inter-organizational Committee on Principles and Guidelines for Social Impact Assessment defines Social Impact Assessment in terms of "efforts to assess, appraise or estimate, in advance, the social consequences that are likely to follow from proposed actions".

Social change processes are set in motion by project activities or policies. Change has a way of creating other changes. Social change processes can lead to several other, second-order social change processes. Depending on the characteristics of the local social setting and mitigation processes that are put in place, social change processes can lead to social impacts. Social change

processes relevant to the project will be discussed before the possible social impacts will be investigated.

A social impact is something that is experienced or felt. It can be positive or negative. Two types of social impacts can be distinguished:

- **Objective** social impacts – i.e. impacts that can be quantified and verified by independent observers, such as changes in population size or composition, in employment patterns, in standard of living or in health and safety.

- **Subjective** social impacts – i.e. impacts that occur "in the heads" or emotions of people, such as negative public attitudes, psychological stress or reduced quality of life.

It is important to include subjective social impacts, as these can have far-reaching consequences in the form of opposition to, and social mobilisation against the project.

For the purpose of this SIA, the following categories were investigated:

- Health and social well-being
- Quality of the living environment
- Economic impacts and material well-being
- Cultural impacts
- Family and community impacts
- Institutional, legal, political and equity impacts
- Gender impacts

Relevant criteria for selecting significant social impacts included the following:

- Probability of the event occurring
- Number of people that will be affected
- Duration of the impact
- Value of benefits or costs to the impacted group
- Extent to which identified social impacts are reversible or can be mitigated
- Likelihood that an identified impact will lead to secondary or cumulative impacts
- Relevance for present and future policy decisions
- Uncertainty over possible effects
- Presence or absence of controversy over the issue.

5.10.2 Historical Background to the towns

The two closest towns to the proposed alignments are Kenhardt and Groblershoop. A brief history of each town is given below.

5.10.2.1 History of Kenhardt

Expansion northwards from the Cape since 1680 stopped at the Hantam (Calvinia) region due to lack of water. Kenhardt and its surrounds became incorporated in the Colony only in 1847. Kenhardt, the oldest town in the lower Orange Region, was 'born' under a camel thorn tree in 1868.

Farmers were harassed by Bushmen and Hottentots living in the region and in 1863 Louis Anthing, the first magistrate, visited the area to find a solution to the problem. He suggested giving the Bushmen goats to farm with, stillborn advice as the Bushmen were hunters, not stockmen. One of his other ideas was more viable - he officially gave Kenhardt its name.

The origin of the name remains a mystery to this day even though many theories have been put forward. The village has been founded in 1876 and the naming of the village remains a deep mystery. Records at the magistrates office revealed a police officer named Kunhardt and most people believe that the village was named after him. However long before the first white people have visited or lived in and around Kenhardt, an aged coloured lady lived on the site of the village. When the first whites ventured into this region they have met her and always remembered her as the friendly and hospitable old lady of the "Ageterwereld" (the land/world beyond). So kind was she that she even built a hut for her visitors and kept it clean and provided them with fresh drinking water. Soon she became well known amongst the hunters, treasure seekers, prospectors and adventurers. When she died she was buried on her land and the visitors that befriended this lovely old lady would often tell strangers "Ek ken haar graf" (I know her grave). It must be remembered that the dialects of the region differ from that of Cape Town and elsewhere and thus it is believed that "Ken Haar" (Know her) the name of the village is supposed to have been derived.

Nonetheless, eventually the two little shacks Anthing erected on the bank of the Hartebeest River grew into a serviceable little town, although not without some turbulence. When on 27th October 1868 special Magistrate MJ Jackson reached Kenhardt with 50 mounted policemen to quell the Korana uprising, he found Anthing's buildings and used them as nucleus for his police post. The troops set up camp at the old camelthorn tree still standing in what is now Gibbon Street. They suffered utter privation as water was scarce and there was no grazing for the horses, which soon started dying of starvation. Not effective in their efforts to submit the warring Korana, the record of the Northern Border Police is a dismal one and the post at Kenhardt not exactly the embodiment of military efficiency. During the second Korana War they were reduced to 25 men and combined with the Frontier Armed and Mounted Police under Inspector DB Hook.

After the wars Kenhardt remained a police post and gradually evolved into a village of town houses where the farmers of the district spent weekends to go to church and buy provisions. Then came the

shops, the hotel, the schools - soon Kenhardt was established as one of those in indispensable country towns which were the backbone of the rural economy.

One of Kenhardt's highlights in world history was when in 1929 Malcolm Campbell in his Bluebird attempted to set the speed record on nearby Verneukpan.

Today this small town in the vast expanse of Bushmanland is known for dorper sheep farming, a unique quiver tree forest and Bushmen paintings. Also, students of history will delight in the beautiful physiognomy of the local people, some of them seemingly untouched by the passage of centuries.

Life in Kenhardt has always revolved around efforts to secure enough water for residential as well as agricultural usage. The construction of the Rooiberg Dam was started in 1898. The dam wall broke in 1900 and was left in disrepair until 1933. Work on the repair of the dam wall was a welcome alternative source of income for farmers who lost their farms due to a severe drought.

The extreme summer heat in Kenhardt creates its own problems. In 1965 the Dutch Reformed Church of Kenhardt built a morgue with cold storage. It was duly handed over to the municipality who continued to manage and maintain the facility. Kenhardt is currently known as the capital of Dorper farming – the Dorper (sheep) being a crossbreed well adapted to the farming conditions of the area and bred for its meat. Since 2000 Kenhardt became part of the Kai !Garib Municipality with its administrative centre in Kakamas.

5.10.2.2 History of Groblershoop

Groblershoop ("Grobler's hope") lies to the east of Upington and dates from 1936. Pioneer farmers settled in the area as far back as the 1870s and agriculture is still the main activity of this part of the Orange River Valley.

The successful stock farming and wine production in the region is built on hard work and pioneering spirit of early residents. Charles Newberry built his historic water turbine in the Orange River on his farm Winstead in 1913. The cement used in the construction of the weir and turbine was shipped in barrels from France. Entering the country through Algoa Bay, it was transported to the site by donkey cart. On the same farm seven graves tell the story of battles fought near by during the Rebellion in 1914.

Development in the region was really kick started by the construction of the Boegoeberg dam and water channels in 1929. The project was used by the government of the time to create jobs for hundreds of very poor white people. Those who lost their jobs on mines and elsewhere flocked to the construction sites and worked like slaves for meager wages and an opportunity to rent some land.

One of the construction camps was situated on the farm Sternham – renamed during the Great Trek Centenary in 1939 to Groblershoop, as a tribute to the Minister of Land Affairs, Mr Piet Grobler.

Groblershoop is currently a main source of export for table grapes and sultana's. A modern abattoir with 130 employees processes livestock from surrounding farms, while the local wine cellars has an annual intake of 12 000 tons of grapes. Since 2000 Groblershoop forms part of the !Kheis Municipality with its offices in Groblershoop.

5.10.3 Baseline description of the socio-economic environment

The proposed alignments will fall within two municipalities namely the Kai!Garib Local Municipality and the !Kheis Local Municipality. Both these municipalities fall within the Siyanda District Municipality (www.**demarcation**.org.za/municprofiles2003/about.html).

The majority of the population in the area is Coloured people, followed by Black people and White people. The population in both areas has increased since 1996, but not significantly. The population density fluctuates during the year due to the influx of seasonal workers active in the agricultural sector. This is a concern, since many seasonal workers eventually settle in the area, and there is a high rate of unemployment in the area. The majority of the population in both areas are in the economically active age bracket between 15 and 64. There is a relatively high dependency rate – children and the elderly who are not economically active, and this is exasperated by the high level of unemployment

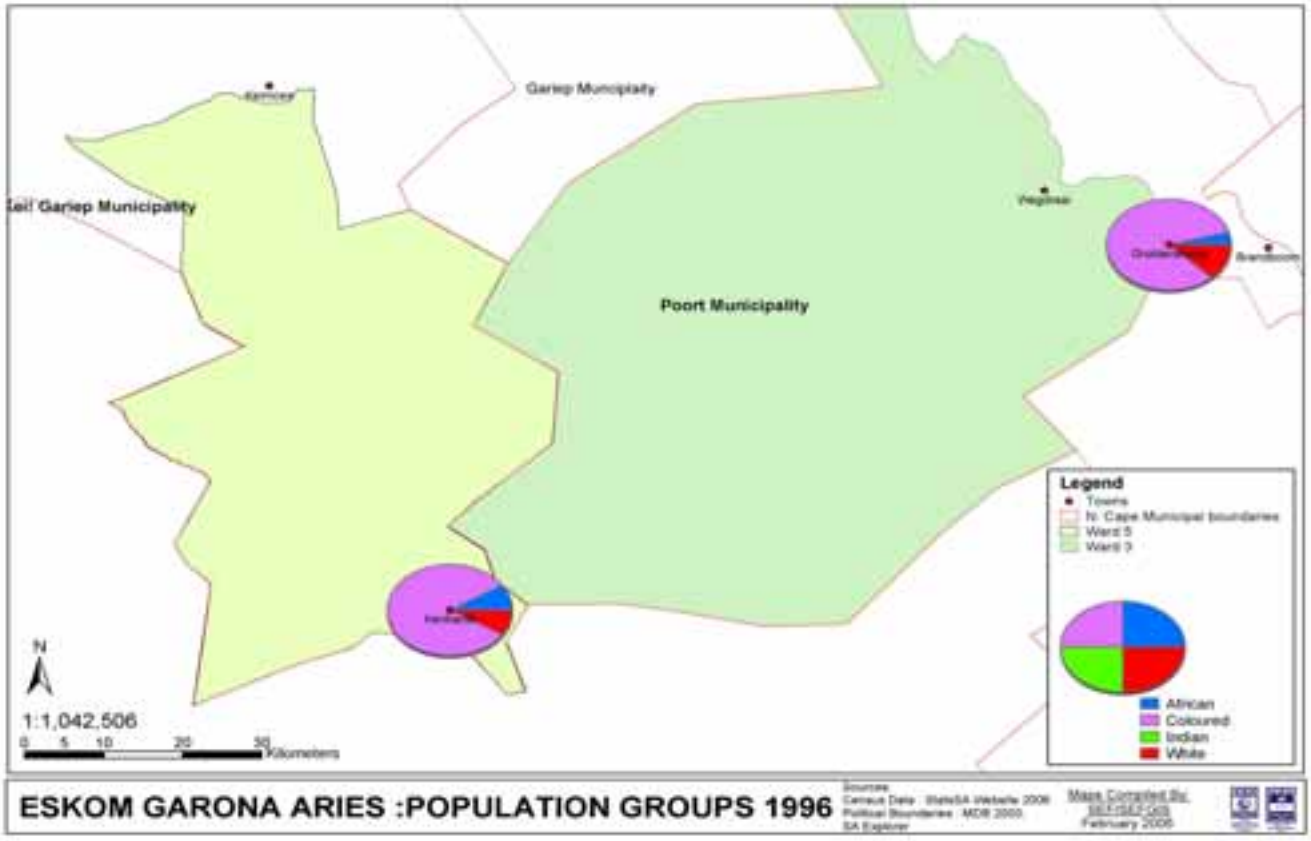


Figure 19. Population of Kai!Garib and !Kheis Municipalities 1996.

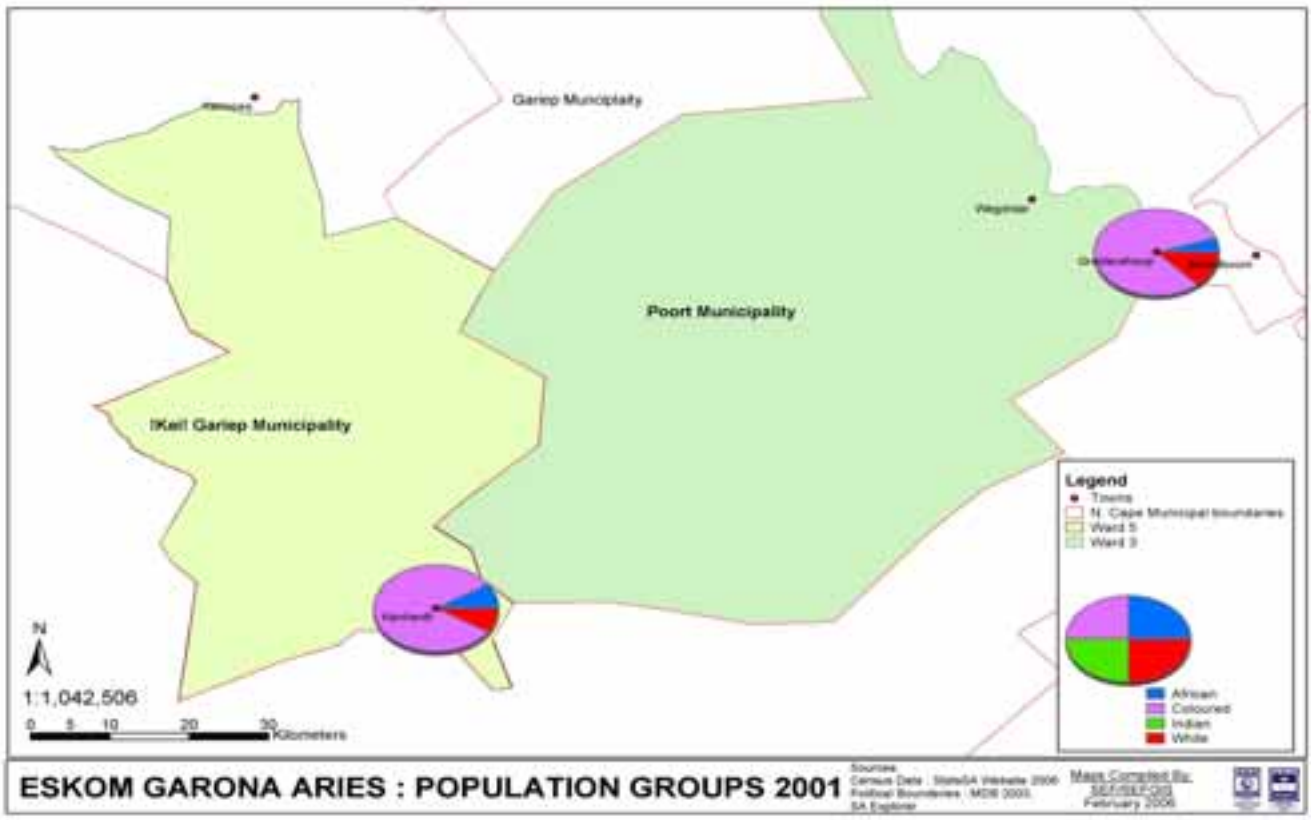


Figure 20. Population of Kai!Garib and !Kheis Municipalities 2001.

The educational profile for the area is poor. There was no significant change in the educational profiles between 1996 and 2001. The majority of the population have some primary and secondary education, but there are also a significant number that have received no schooling. There is an indication that the skills levels in the area are limited to very basic and manual skills.

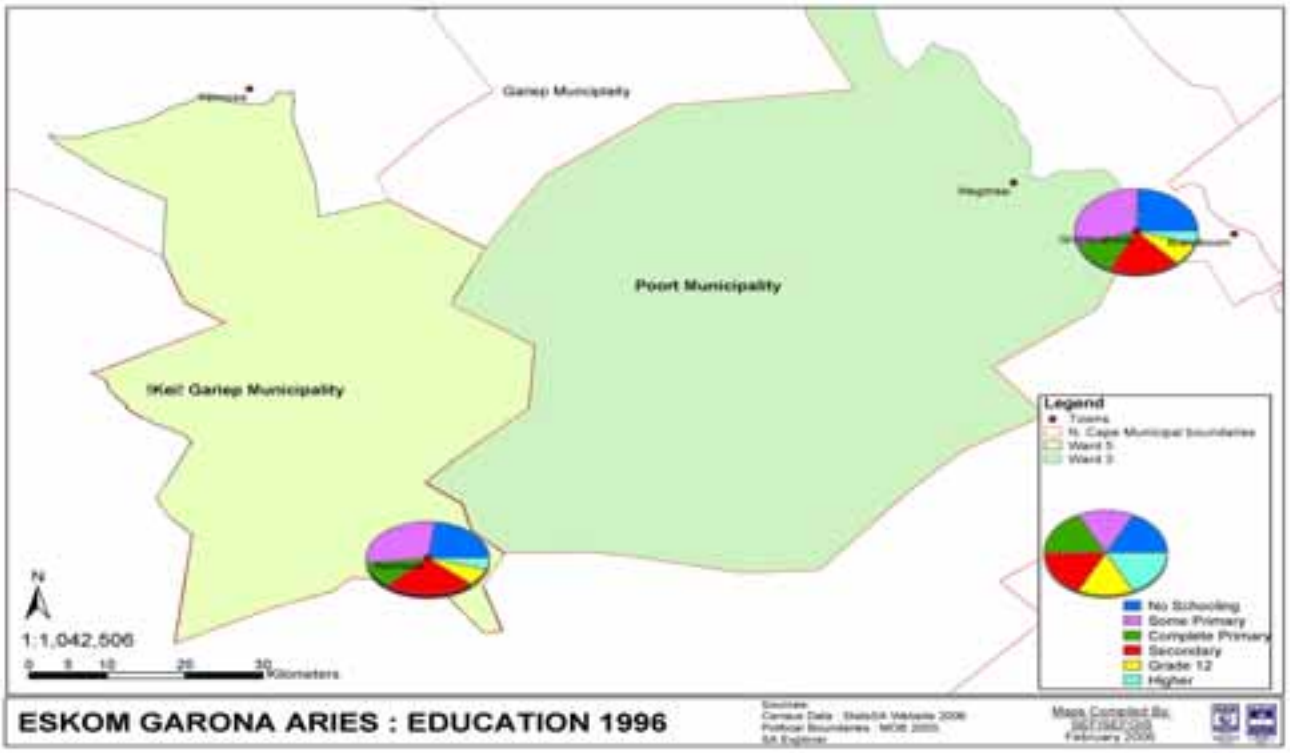


Figure 21. Kai!Garib and !Kheis highest education 1996.

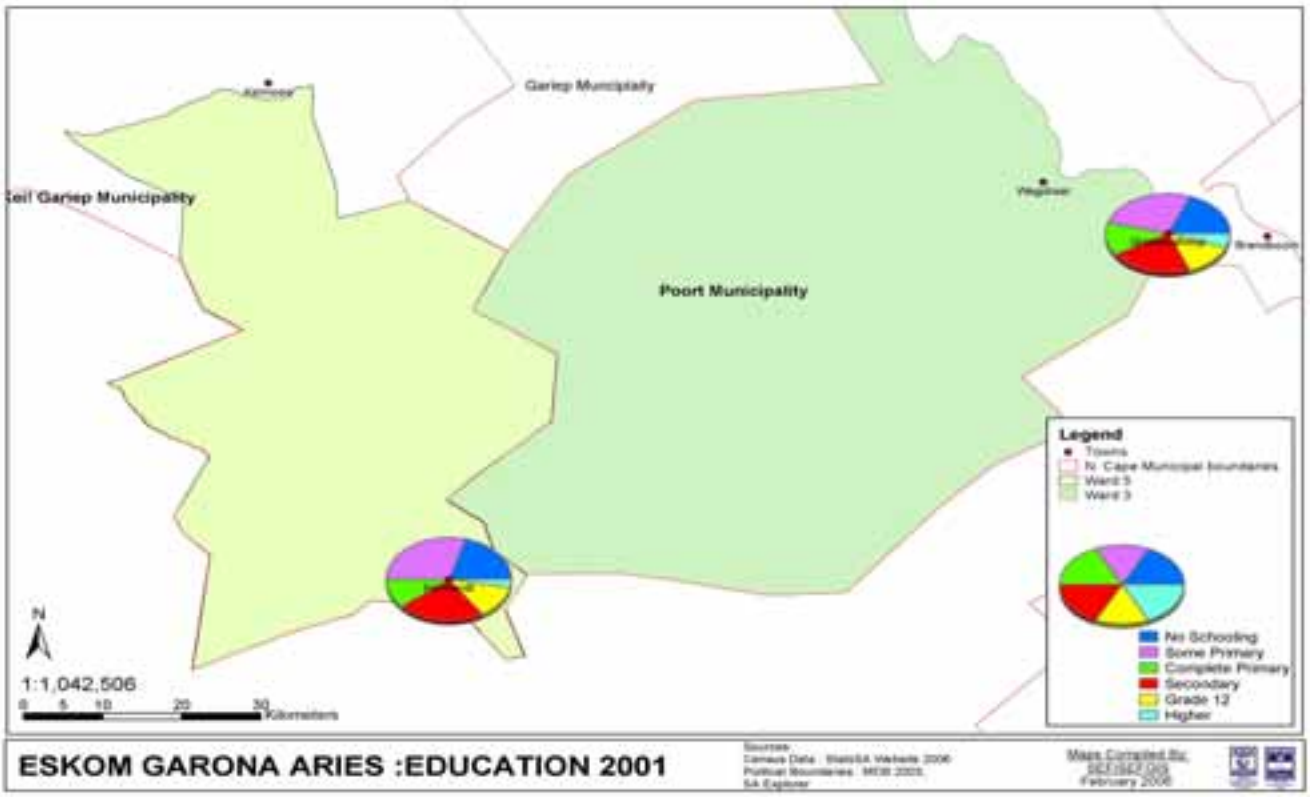


Figure 22. Kai!Garib and !Kheis highest education 2001.

The major economic activities in the region are based on agriculture, which makes it vulnerable to setbacks in the specific commodities. Livestock and grapes are the main commercial farming produce. A number of emerging farmers farm with sheep and goats. Farmers closer to Groblershoop cultivate a number of crops e.g. cotton, corn, wheat, tomatoes, peanuts, musk melons and pumpkins under irrigation, but grapes for the export and sultana market remain the main produce. The professional sector is not well represented and according to the IDP's of both municipalities there is a lack of skills development and capacity within the district. Although the tourism sector has not yet reached its full potential, tourism ventures like game farms and farm stay holidays are becoming increasingly popular in the area. There are also a number of natural and cultural attractions in the area. A large number of households in the area have no or very low income. This indicates that these people need to survive under very poor economic conditions, and have limited buying power, which would reflect negatively on the payment of services. Like elsewhere in the country, the gap between rich and poor is very big.

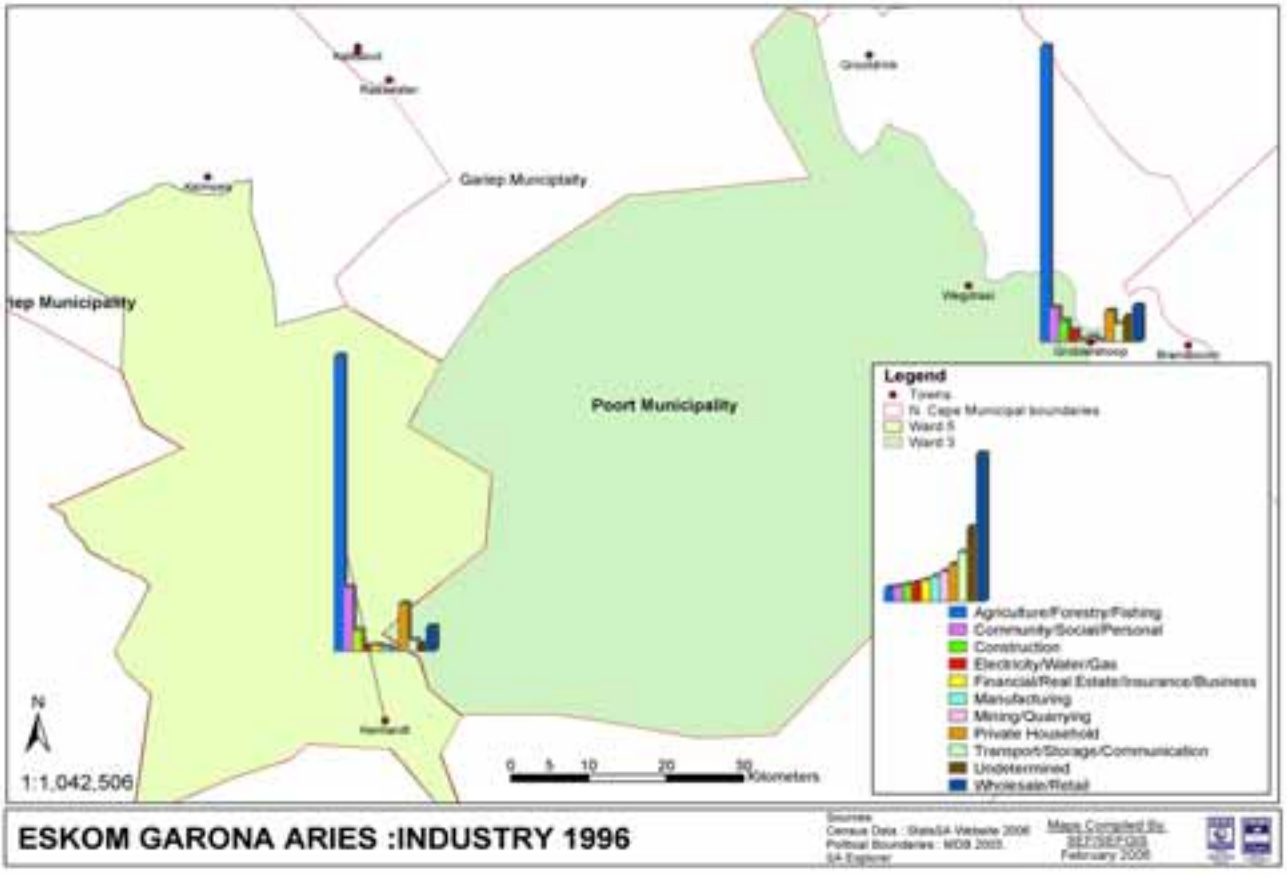


Figure 23. Kai!Garib and !Kheis Industries, 1996.

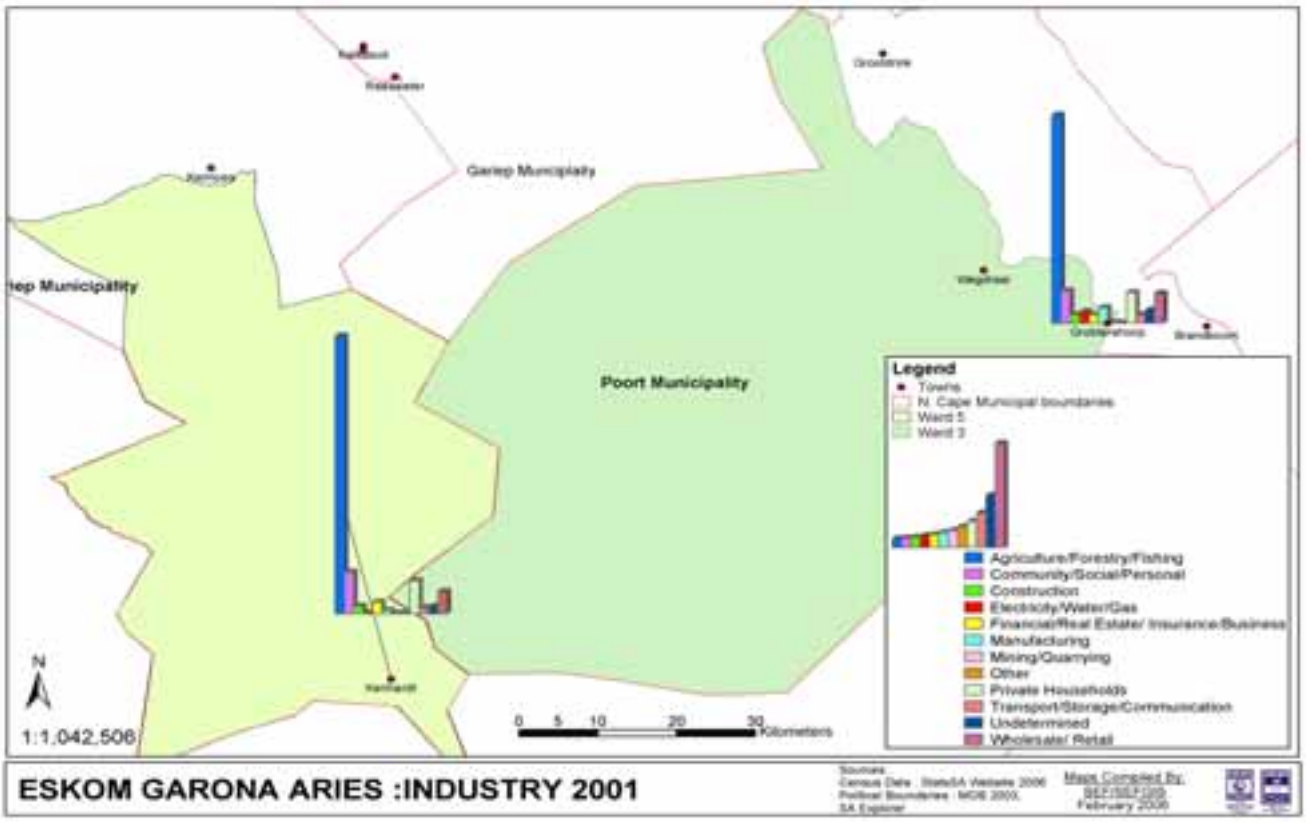


Figure 24. Kai!Garib and !Kheis Industries, 2001.

The number of traditional and informal dwellings has slightly subsided since 1996. The number of people living within such structures remains a concern. The migration of farm workers to the towns and seasonal nature of available labour opportunities might play a role in the number of informal dwellings. The IDP's identified a need for low cost housing, as a number of households do not have their own accommodation and share premises and facilities with family or friends.

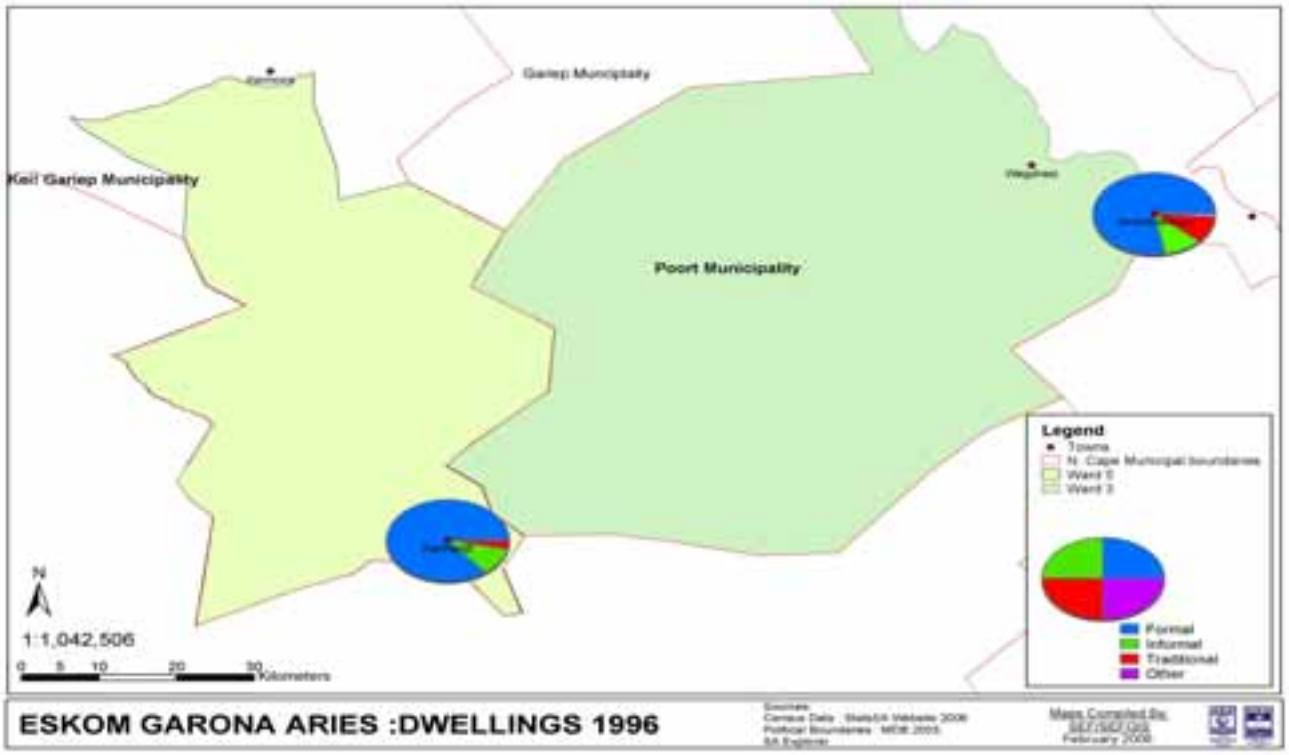


Figure 25. Dwelling types, 1996.

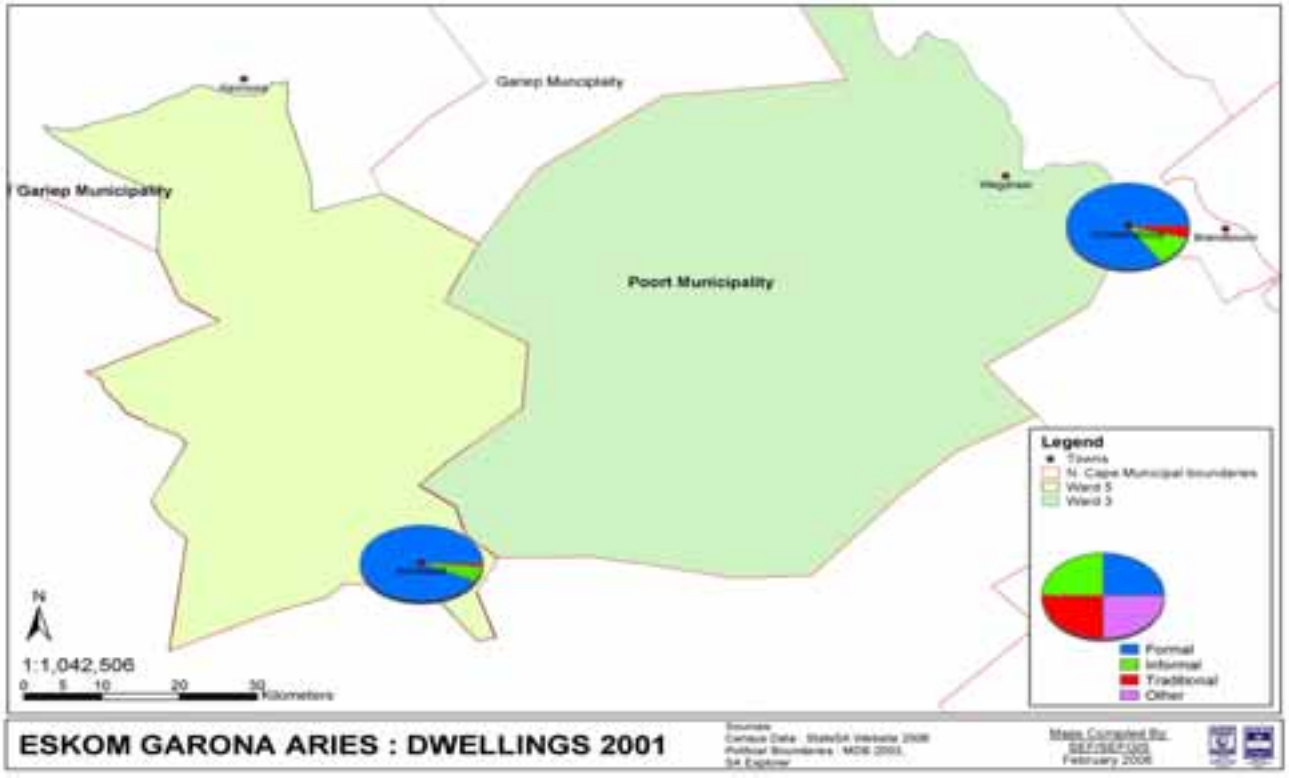
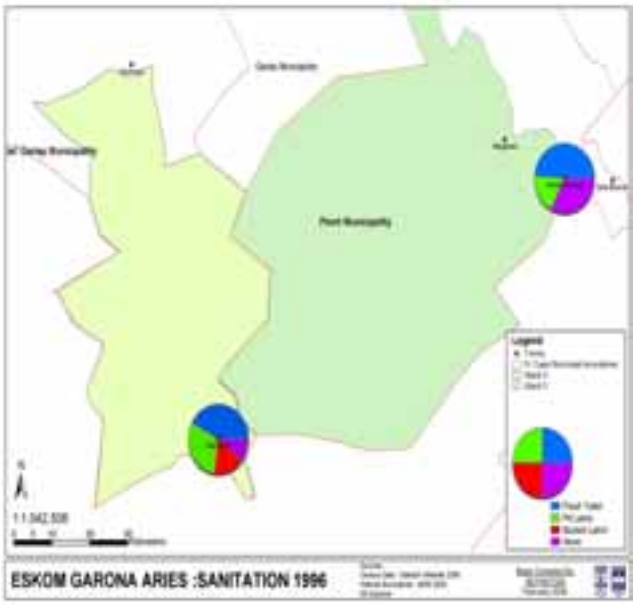
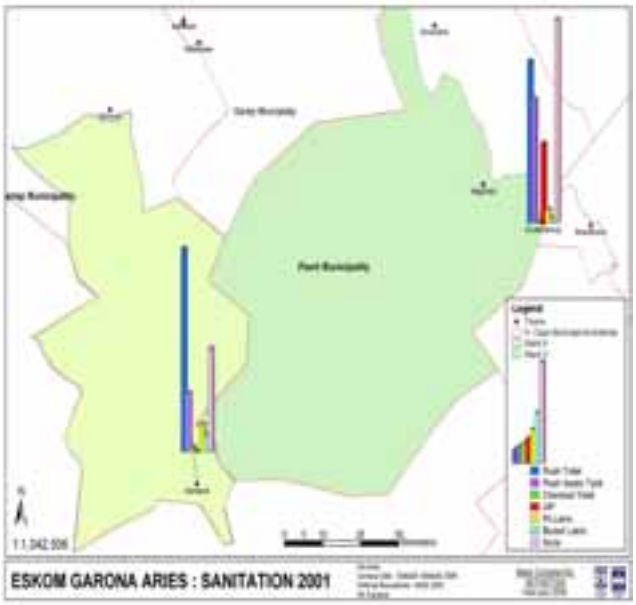
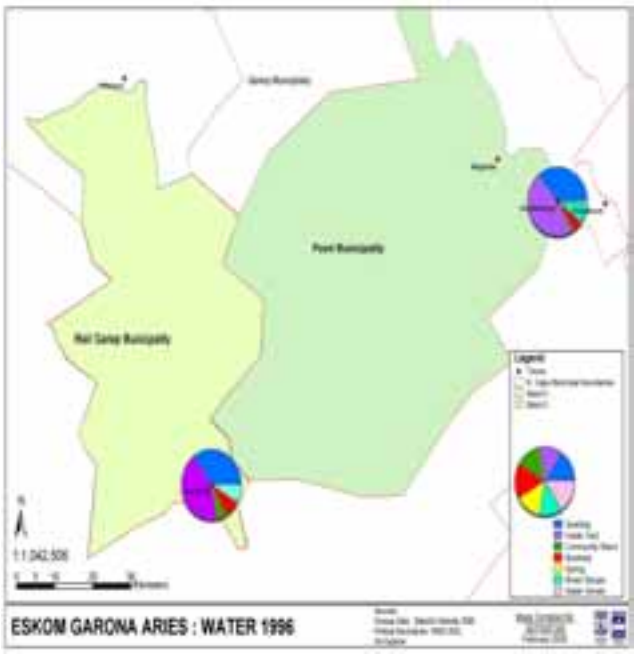


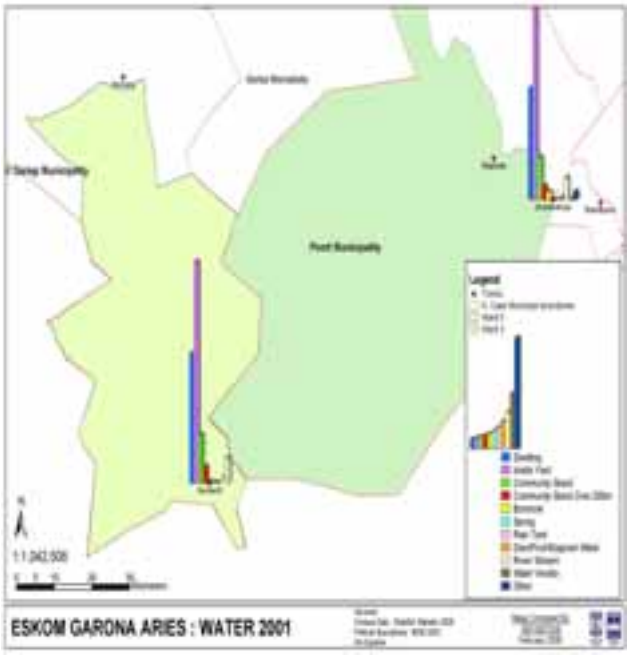
Figure 26. Dwelling types, 2001.

Services like sanitation, water and municipal refuse removal are mainly restricted to urban areas. There was an improvement since 1996, but many programmes put in place by the government and municipalities to address issues have not been completed yet. A number of residents have access to services, but are unable to use it because of the lack of paying power.









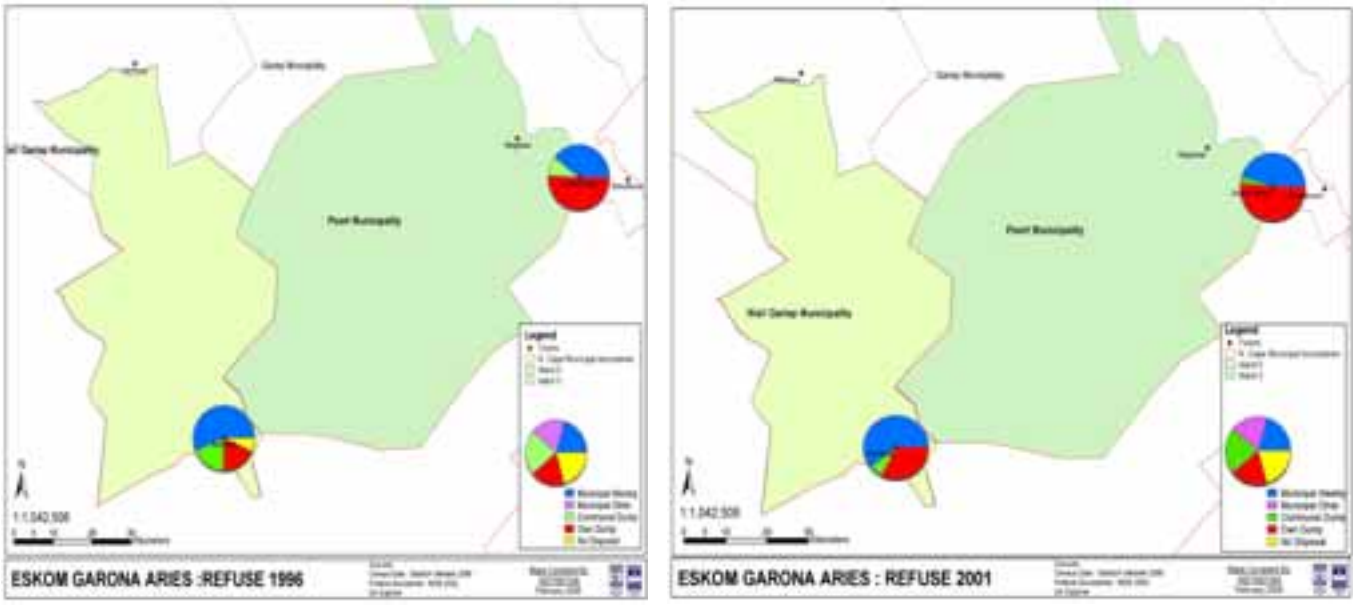


Figure 27. Services, 1996, 2001.

Since 1996 there was an increase in basic electricity supply. The most households utilize electricity for lighting, cooking and heating. The remaining households rely on candles for lightning and paraffin for cooking.

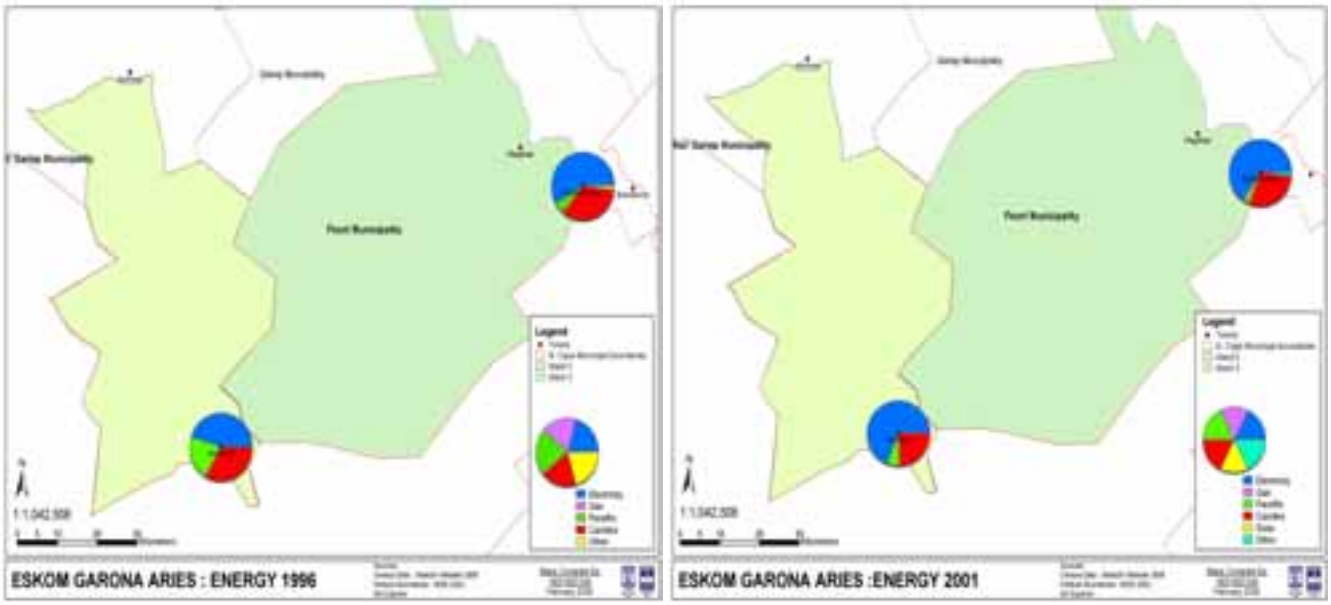


Figure 28. Energy, 1996, 2001.

5.10.4 Social Change Process

The purpose of this chapter is to describe predicted social change processes that the erection of the proposed power line will set in motion. These processes have been divided into four categories:

- Social change processes originating prior to the construction of the power line. Many of these processes pertain to the concerns and objections raised by key stakeholders regarding the proposed development.
- Social change processes expected to set in during the construction phase.
- Predicted social change processes during the operational phase.
- Social change processes expected during the decommissioning phase, if that should occur.

The tables below indicate what processes are predicted to be set in motion, in which phase of the project. Only the relevant processes will be discussed after each table. It is important to remember that social change can be extremely subtle. These social change processes might lead to the social impacts as described above.

5.10.4.1 Demographic processes

		Phase at which process is relevant			
Theme	**Process**	**Prior to Construction**	**Construction**	**Operation**	**Decommission**
Demographic processes	In-migration	√	√		
	Out-migration				
	Presence of newcomers				
	Presence of temporary workers		√		
	Presence of seasonal residents				
	Presence of weekenders				

	Presence of tourists/day-trippers				
	Resettlement				
	Displacement/ dispossession		√		
	Rural to urban migration				
	Urban to rural migration				

Demographic processes are those relating to the movement and composition of people in the region affected by the project. It is predicted that the following demographic processes will take place:

- In-migration

People from other areas will move to the area in search of new opportunities. This process will be especially visible in informal settlements.

- Presence of temporary workers

There will be a short-term influx of construction workers during the construction phase of the project. Another important factor to consider is that in South Africa, with its high levels of unemployment, any new development or rumor of a new development, will lead to an influx of people to the area. It is therefore most likely that the area will experience an influx of people looking for jobs and new opportunities.

- Displacement/dispossession

People depend on the land to make a living. The construction of a power line across their land might cause problems pertaining to access roads and division of land.

5.10.4.2 Economic processes

		Phase at which process is relevant			
Theme	**Process**	**Prior to Construction**	**Construction**	**Operation**	**Decommission**
Economic processes	Waged labour		√		

processes	Conversion & diversification of economic activities				
	Impoverishment				
	Inflation				
	Currency exchange devaluation				
	Concentration of economic activity				
	Economic globalisation				

Economic processes affect economic activity in the region, including the way in which people make a living as well as macroeconomic factors that affect society as a whole.

- Waged labour

Approximately 40 temporary jobs will be created locally during the construction phase. The exact number depends on local circumstances. These jobs will only be for a period of approximately eighteen months, the time it takes to construct such a line. All maintenance will be done by ESKOM Technical Service Centre employees, as it is specialized and requires a high level of skill.

5.10.4.3 Geographic processes

		Phase at which process is relevant			
Theme	**Process**	**Prior to Construction**	**Construction**	**Operation**	**Decommission**
Geographic processes	Conversion and diversification of land use		√		
	Urban sprawl				
	Urbanisation				
	Gentrification				
	Enhanced transportation & rural accessibility				

	Physical splintering		√	√	

Geographic processes are those that affect the land-use patterns of a society.

- Conversion and diversification of land use

The way in which the land is utilised might change slightly. It is currently agricultural land utilised for grazing or cropping. These activities can continue under a power line, but some changes might occur.

- Physical splintering

The transmission corridor will cause a physical divide on some of the farms that it will traverse. This process must be considered cumulatively, taking in account the railway and telephone infrastructure.

5.10.4.4 Institutional and legal processes

		Phase at which process is relevant			
Theme	**Process**	**Prior to Construction**	**Construction**	**Operation**	**Decommission**
Institutional and legal processes	Institutional globalisation and centralisation				
	Decentralisation				
	Privatisation				

Institutional and legal processes are those processes that affect the efficiency and effectiveness of various organisations that are responsible for the supply of the goods and services on which people depends. These organisations include government agencies, non-government organisations and the commercial sector. It is not anticipated that any of these processes will be greatly affected by the project, although the fact that the transmission line will cross an area where people do not have access to electricity must be considered.

5.10.4.5 Emancipatory and empowerment processes

		Phase at which process is relevant			
Theme	**Process**	**Prior to Construction**	**Construction**	**Operation**	**Decommission**

Emancipatory and empowerment processes	Democratisation				
	Marginalisation and exclusion			√	
	Capacity building		√		

Emancipatory and empowerment processes are those that lead to an increase in the ability of local people to contribute to the decision-making that affects their lives.

- Marginalisation and exclusion

This refers to the processes by which various groups in society are denied access to services. The fact that the electricity supplier impact on people's property, but the affected community does not have access to the service might cause social unease. The supplier expects people to make a sacrifice for the good of the greater community and country, but there is little direct benefit for the community as such.

- Capacity building

Capacity building refers to increasing knowledge, networking capacity and increasing skill base among local people. It is predicted that the project could add to capacity building in the community in a minimal way by providing opportunities to learn a new skill.

5.10.4.6 Sociocultural processes

		Phase at which process is relevant			
Theme	**Process**	**Prior to Construction**	**Construction**	**Operation**	**Decommission**
Sociocultural processes	Social globalisation				
	Segregation				
	Social disintegration				
	Deviant social behaviour		√		

Sociocultural processes are those that affect the culture of a society, that is, all aspects of the way that people live together.

- Deviant social behaviour

There is a risk that the presence of the construction workers can lead to deviant social behaviour. A huge portion of the community is very poor and there is a high unemployment rate. An influx of people with disposable money might lead to an increase in prostitution, which can impact on the HIV rate in the area. There can be a number of spin-offs like alcohol abuse and disintegration of families.

5.10.5 Tourism Background

The Northern Cape is the driest and most remote province in South Africa. As a result tourism is not as large a sector as in other parts of the country. However, there are numerous tourism draw cards for the region and several 'flagship' locations. The Province's mantras "Follow the sun, not the crowds", "The land of contrasts where less is more" and "A land of sunny days and starry nights" hone in on the tourism appeal of wide open spaces and big skies. However, while some parts of the province, such as Kgalagadi Transfrontier Park, Augrabies Falls National Park, and the Richtersveld are well known and growing tourism destinations, the majority of Northern Cape's tourism enterprises are small in comparison to the other parts of the country.

5.10.5.1 Green Kalahari Tourism Framework

The Northern Cape is divided into different sections for tourism development. The study area falls into the Green Kalahari Framework, which has comparatively low tourism densities and lacks the larger, better known destinations, such as Augrabies Fall and Kgalagadi, which fall into the Kalahari Framework. It is marketed as a land of contrasts with the Orange River, bushman paintings, history, and the Quiver Tree (Kokerboom) forests as some of its main attractions.

In the Study Area tourism is at very low densities with few exceptions.

Primary tourism attractions in the area include:

- **Quiver Trees**. The area is in some parts blessed with unusually large stands of Quiver Trees. These are located outside Kenhardt at the Quiver Tree Forest National Monument, a stand consisting of up to 5000 individual trees and on several private farms such as Spes Bona Farm, located approximately 15 km north of Kenhardt.
- **Rock art**. Much of the draw to the area rests with the San Rock art on the scattered dolerite boulders in the area. These are located on several private farms in the area including:

  -Spes Bona Farm

-Dwaal Gaesh Farm

-Gaasmond Farm

-N. Rougas de Loop Farm

-Pypklip Farm

-Kruissemond Farm

-Driekop A Farm

-Boksputs Farm

-Sandruggies Farm

In addition, an unusual footprint in stone referred to as the *Matisieng*, is advertised in regional and local tourism materials.

- **War graves**. Located on the Driekop Farm.
- **Sites in Kenhardt Town**. There are several sites advertised as tourism destinations in Kenhardt, such as the old library building, the Obelisk War Memorial and the 600 year old camel thorn tree under which the town was founded.
- **Rooiberg Dam**. Located south of Kenhardt and used occasionally for picnics by locals.
- **Hunting**. Although this is a large industry in the province, most hunting takes place further north of the study area where game densities are higher. However, one tourism hunting enterprise has opened at Thuru Lodge, located near Groblershoop.
- **Wine Tourism**. The wineries open to public viewing and tasting (such as Oranjerivier Wine Cellars) occur along the Orange River, but outside the study area. The wine farms in the study area and possible path of the transmission line are wholly for agriculture to supply wineries with grapes and not as tourism destinations.
- **B&Bs**. There are small guesthouses in the towns or Kenhardt and Groblershoop of varying operational capacity, and there are several B&Bs along the Orange River in between Groblershoop and Upington catering to passing motorists. In the study area, one was located, called the Headmaster's House B&B, located near to the railway crossing at the Orange River. This is the only one identified in the possible path of the transmission line.
- **Outdoor Tourism**. Aside from hunting, there are some tourism activities that are marketed by the region's tourism information centres, such as hiking, bird watching, camping, canoeing, fishing and

other river activities. These activities are undertaken by locals as recreational activities, as well as by some visiting tourists.

- **Transit Tourism**. The areas along the Orange River in the path of the proposed transmission line are crossed by the main road (N10) linking Upington and Kimberly. There is potential and existing transit tourism that takes place, utilizing B&Bs, as well as small shops and local businesses, such as wineries and raisin farms.
- **Stargazing**. Christo Botha of Groblershoop offers services for stargazing.
- **Centenary Monument**. Monument to the Great Trek on the road in between Upington and Groblershoop.

5.10.5.2 Existing and emerging tourism facilities

1. Thuru Lodge and Brulpan Game Ranch. Brulpan is a game ranch of 6000 hectares, located approximately 12 kilometres west of the N10 highway near to the railroad. It has a luxury lodge, Thuru Lodge, offering hunting, photo safaris, horse trails, quad bike activities, spa facilities and game viewing. On the property, there are eland, white rhino, buffalo, giraffe, and gemsbok, all of which are available for hunting. There are plans to re-introduce cheetah and there are plans to expand the game ranch to total 12,000 hectares, all of which is planned to take place north of the existing game farm. The lodge caters to high-end clients for exclusive, luxury experiences focusing on tranquility and serenity. The game ranch and lodge are located near to the railroad, but no public infrastructure traverses the actual property.
2. Spes Bona Farm. This farm is 7000 hectares and is located approximately 15 kilometers north of Kenhardt. There is little tourism activity occurring at present, but plans are being investigated for tourism development. There are several rock art sites and Quiver Tree stands on the property and envisioned activities include abseiling, hiking, biking and the development of a tented camp. There are also possibilities for marble mining.
3. Headmaster's House B&B. This B&B lies off the N10 highway and is located on an operational grape farm along the banks of the Orange River. It is located near to the railroad bridge crossing the Orange River. Activities other than accommodation provision include picnics along the river under the bridge, bird watching and visiting the farm. The building called the "Headmaster's House" is an unofficial historic site. Most of the clientele consist of passing motorists on the N10.

4. Guesthouses in Kenhardt. There are several small accommodation facilities located inside the town limits. Advertised guesthouses include: Bushmanland Guesthouse, Ou Werf Guesthouse, Arbeidsvreugd Guesthouse.

5.10.5.3 Summary of Potential Issues

The potential issues, which will need to be investigated in planning the location of a transmission line linking Garona and Aries substations, are described below. From a tourism perspective **visual impacts** and potential **disruption from construction activities** are the greatest possible issues.

5.10.5.3.1 Visual impacts

Tourism is a sensitive industry based primarily on subjective perspectives of visitors to an area. In destinations where tourism is focused on outdoors or based on natural elements, such as wilderness, sky, rivers, veld and wildlife, the tourism value rests largely on the experience which can be provided. The study area is such an area, and there is potential for negative visual impacts on tourism from the erection of a transmission line. This can potentially be an issue during the day as well as during the night. During the day, the line can potentially obscure views, degrade scenery and decrease the scenic value of the area or part of the area. Additionally, any lighting that may potentially be used may extend the visual impact into the night in a part of the country renowned for its night skies and stargazing.

This depends on whether tourism will be impacted on by the site of large transmission lines across the open veld. For people coming from overseas or even from other parts of South Africa who are seeking a pure experience in the wilderness, it is possible that they will not want the view, which they have sought out, obscured by transmission line. Such visual impacts can be put into perspective based on whether or not other visual impacts already exist. In areas with no such infrastructure, such as pristine areas as found in national parks, infrastructure development such as transmission lines may have significant impacts on the tourism experience and tourism value of an area and pose a threat to local and regional tourism industries. For other areas, where the scenic integrity has already been affected by other developments, the impacts may be acceptable. The Interested and Affected Parties, specifically those owners and managers of existing and emerging tourism facilities, must be consulted as to their sentiments about possible detrimental or acceptable impacts on their businesses.

Cumulative impacts

There may also be cumulative impacts where the acceptable limit of visually unpleasing infrastructure has been breached, reaching a point where the level of scenic degradation becomes unacceptable and damages tourism and its potential revenue. While one railroad, telephone line or electricity line

might be acceptable from a visual point of view, several of them together may become too much and detract from the wilderness character of the environment on which tourism is based.

5.10.5.3.2 Disruption from construction activities

There is also the potential that construction activities carried out in close proximity to tourism enterprises or to places where tourists visit will negatively impact on and detract from the tourist experience. Such impacts could include noise, site disturbance during the construction phase, dust from vehicles and visual and aesthetic impacts from such construction and crew camps on the feeling of tourists having a serene and secluded nature experience. The location of work camps in close proximity to tourism enterprises can also be a potential issue in terms of noise, light, and feelings of solitude that tourists are seeking out.

5.10.5.3.3 Potential positive impacts

There are reports in the area of problems with the reliability and quality the power supply. If developments such as transmission lines can lead to better services for local people and for tourism enterprises seeking to provide a high standard of service, then there is potential for a positive impact, or spin off, from the development. By better servicing areas with electricity, this can create an environment where tourism can emerge or improve. It must however be reiterated; that the proposed Garona-Aries transmission line will not result in immediate local benefit to the community, however the long term strengthening of the power supply to the Cape region may result in spin-off benefits to the tourism industry in the area.

6 ALTERNATIVES CONSIDERED

In terms of this Scoping Report, reasonable alternatives to each aspect of the development have been investigated and compared in order to ensure that the proposed line has the least negative impact on the biophysical and socio-economic receiving environment. The identification of alternatives is a key aspect of the success of the scoping process and were determined based on information obtained from specialist input, public feedback (based on the advertising process as well as public meetings and focus group meetings), information from Eskom Transmission, through discussions with the relevant authorities as well as the professional opinions of Tswelopele Environmental.

Alternatives that are deemed relevant to this study are discussed below.

6.1 STATUS QUO ALTERNATIVE

Eskom Transmission has deemed the construction of a 400kV powerline between the Garona-Aries substation the most feasible option for increasing the power supply to the Cape region. Presently, the Cape region is suffering from numerous energy supply problems, as noted in the press, and thus this problem requires urgent attention to circumvent an energy crisis in the region. An additional 400kV powerline is proposed between Aries-Garona-Ferrum substations (separate EIA application for the Garona to Ferrum transmission line) in order to complete this route. Thus the status quo alternative is not a feasible option to consider as the inability to supply reliable electricity to the Cape region would have significant negative impacts on the economy and living environment of the region.

6.2 ALTERNATIVE LOCATION

Alternative locations could mean an alternative route between the Garona and Aries substations or alternatively, a completely different location within the greater region to provide the necessary power supply to the Cape region. Eskom Transmission has, through intensive studies, deemed the proposed route (i.e. Garona-Aries 400kV Transmission powerline) to be the optimal choice (Need and Justification Studies).

Four alternative routes have been considered within the study area (refer to
Figure 2).

In the north-eastern section of the study area, two alternative routes (regarded as “Alternative Route 1A and 1B”) are proposed based on the findings of the visual impact assessment as well as the tourism specialist study. The topography in the north-eastern section of the study area consists of relatively inaccessible hills (refer to Figure 9 and Figure 10) thus the only locations for the powerline would be to the north or south of these hills. Due to the presence of the Thuru Game Lodge as well as the proposed extensions of this lodge, it is felt that the northern approach (Alternative Route 1A) is

more appropriate as the visual disturbance to this area could detract from the tourism potential of this scenic area. Additionally, through correspondence with the owners of the Thuru Game Lodge the management of the game farm requires the use of helicopters in order to track and dart animals for conservation purposes. The presence of a 400kV transmission line would create a safety hazard to the flight path of the helicopters particularly in lieu of the fact that the Thuru Lodge owners propose expanding the lodge to the north-west, which would result in Alternative Route 1B traversing the game farm (refer to Figure 29). From a visual point of view, the negative aspect of Alternative Route 1A is that it would compromise natural areas, which have scenic value. On the other hand the positive aspect of Alternative Route 1B is that it occurs along an infrastructure 'corridor' within which exist the railway line and its infrastructure and the local farm road connector – structural contrast would therefore be weaker than in the northern alternative. Due to the presence of the Thuru Lodge and the proposed extension of the game farm to the north, it is felt that Alternative Route 1A is the preferred route in this regard. The significance of the ecological and visual impact of this route should be assessed during the EIA phase of this development.

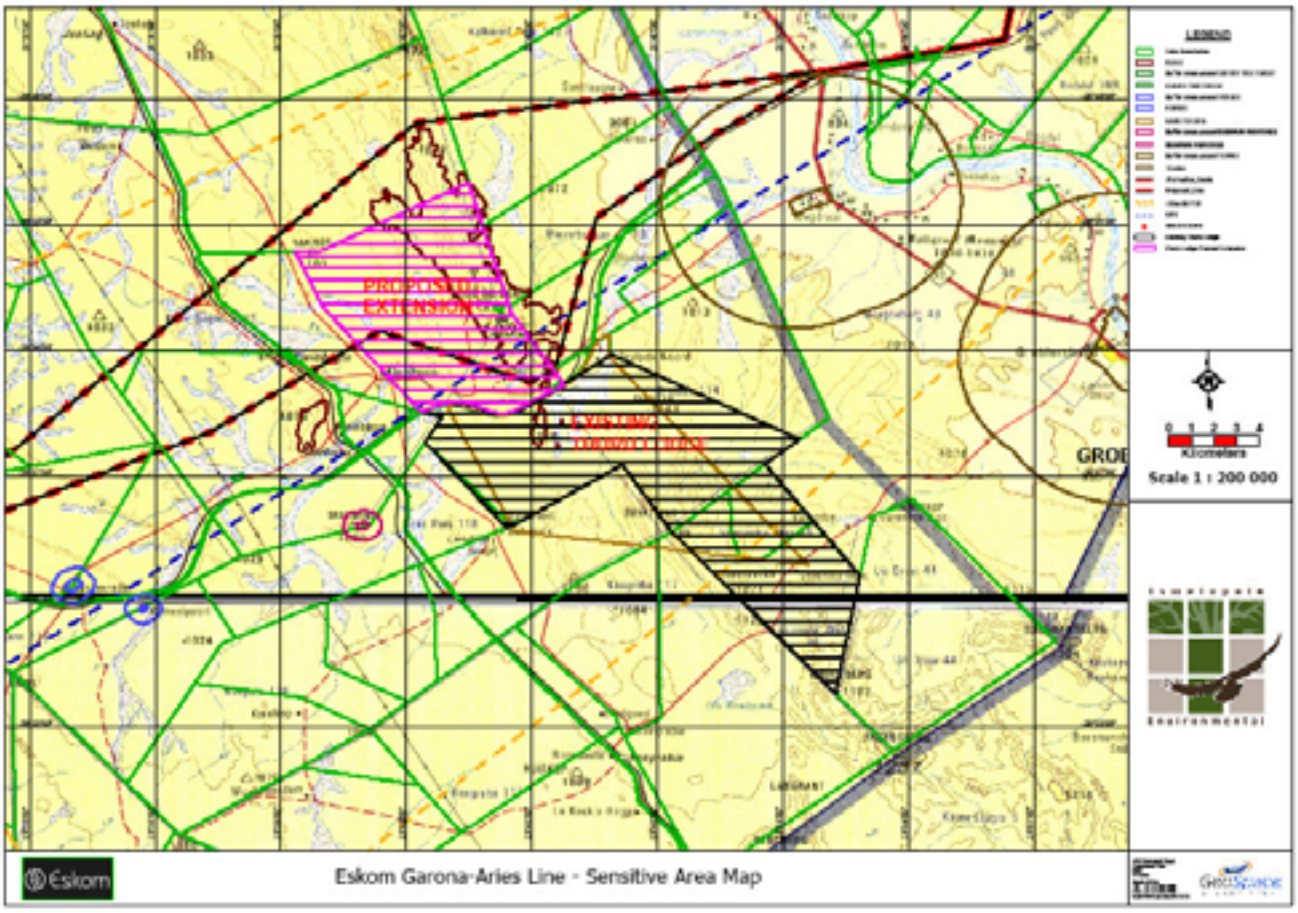


Figure 29. A view of the location of the existing Thuru Lodge showing the proposed extension of the Lodge to the north-west.

In the central section of the study area, no alternatives have been proposed, as the receiving environment contains no major obstacles to merit an alternative route. The current proposed route would ensure that the service road of the railway line could be utilized for regular servicing of the line without the need for further road construction in the area. Secondly, the visual impact of the proposed transmission line would be minimised as the railway line already visually impacts upon this location.

Two alternatives are proposed in the southern section of the study area. Alternative Route 2A is proposed in order to minimise the visual impact of the proposed line on the Quiver Tree Forest (a scenic area of this endangered tree species). The ecological specialist study recommended that the area surrounding the Quiver Tree Forest be regarded as a sensitive area and that Alternative Route 2B should not be the preferred route, as the transmission line would result in a visual disturbance to this natural feature. From a visual perspective, the positive aspect of Alternative Route 2B is that more evidence of human activity and cultural modifications (railway, its structures and service road and a quarry) occur along the route and therefore structural contrast with the landscape would be weaker than in the northern route where there is less evidence of man made intervention. The negative aspect of Alternative Route 2B is that it brings the power transmission line closer to sensitive viewing areas (Kenhardt and the Quiver Tree Forest) and it is routed through a natural feature (rocky hills – “Aasvoëlkop”) that has high scenic value as well as a higher presence of birds of prey. It is thus concluded that Alternative Route 2A is the preferred route in this instance.

During this scoping phase, potential biophysical and socio-economic issues of concern have been identified and preferred routes are put forward for further investigation during the EIA phase.

6.3 ALTERNATIVE LAND USE

The proposed development of a 400kV Transmission powerline is a linear project and does not require a change of land use for the majority of the properties along its length. Eskom will negotiate for a 55m wide servitude strip with the affected landowners; however, the land below the spans will still remain in the current land use (i.e. mainly farming). Only the footprint of the pylon structures will necessitate the land directly below them to be affected. As the pylons are approximately 400m apart it is not foreseen that this small loss of land will negatively affect any property owners. The nature of this application does not depend on land-use and as such this is not a viable alternative to be considered.

6.4 ALTERNATIVE DESIGN / NEW GENERATION SYSTEMS

Electricity can only be transmitted through powerlines. Powerline designs consist of two broad types, i.e. subterranean or above ground. Subterranean power transmission is a hugely costly affair and at

present there are no subterranean high voltage transmission lines in South Africa (due to the cost). Thus the only option for power transmission is above ground using the standard pylon designs with spans of cable between them.

Another alternative design investigated would be upgrading existing transmission lines to carry more power. This option would result in the physical load on the existing towers to increase substantially and thus the towers would be inadequate and require replacement. Furthermore, it would not be possible to remove any transmission lines from service to perform the upgrading work, as the remaining transmission lines would not be able to supply the electrical loads in the region. This option would not optimise the existing infrastructure or permit future growth in the region. Another option would be to utilize existing powerline servitudes and simply upgrade the capacity of these servitudes (i.e. a second transmission line running parallel to existing). Unfortunately there are at present no existing high voltage transmission lines between the Garona and Aries sub-stations, which could be utilized.

Transmitting power through transmission lines is currently the cheapest way to supply the end customers. The permitting process and construction of a new generating facility would require a much greater amount of time prior to supply that a transmission line would. The need for the supply is urgent and therefore there is a requirement to provide supply fairly quickly. It is also important to note that Eskom is at present planning two new peaking power generation facilities in the Western Cape Province as well as recommissioning certain old coal fired power stations.

Alternative designs and/or new generating capacity are therefore not deemed feasible.

6.5 DEMAND SIDE MANAGEMENT

Demand Side Management (DSM) can generally be defined as the activities performed by the electricity supply utility, which are designed to produce the desired changes in the load shape through influencing customer usage of electricity and to reduce overall demand by more efficient use. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. Some of the basic tools are the price signals (such as time of use tariffs) given by the utility and direct load management. This option is practiced to a certain extent, but is currently not considered feasible for expansion in this particular region. Eskom is currently looking at various means to achieve a flatter load profile in this area. However, the increase in energy demand in the region requires additional energy input and not simply adjusting the load profile.

7 PUBLIC PARTICIPATION

A public participation process as required by the National Department of Environmental Affairs and Tourism (DEAT) was carried out. The details of the public participation process are indicated below.

7.1 INTRODUCTION

The public is classified as a group whose interest may be affected positively or negatively by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The public should be adequately engaged in processes that affect their biophysical, social, cultural and economic environment. Democratic governance, the increasing degree of decentralisation in decision-making and the growing influence of NGO, community-based organisations and the private sector, has increased opportunities for this.

Due to the different levels of success achieved thus far in the process of public participation, many different perceptions exist with regard to the value it adds and its effectiveness. To ensure an effective process the objectives with regards to the process should be clearly defined as well as partaker's responsibility, appropriate approaches and techniques. The level of engagement considers the social profile of stakeholders, context-related issue (literacy etc), and spatial scale of the activity.

Public participation contributes to the identification of key issues of concern and possible solutions.

7.2 METHODOLOGY

The methodology used for the public participation was defined by two criteria namely, the requirements of the National Department of Agriculture, Conservation and Environment (DEAT), the Northern Cape Department of Tourism, Environment and Conservation as well as previous experience with scoping studies. The methodology can be summarised as the identification of Interested and Affected Parties (I&AP's), their notification, consultation and involvement.

7.2.1 Identification of Interested and Affected Parties (I&AP's)

Interested and Affected Parties were identified through consultation with the authorities (local and provincial), the property owners and site visits. A database of all I&AP's identified for involvement in this process is included in Appendix H.

7.2.2 Advertisement and Notices

Public notices provide an official announcement of an intent to undertake a certain activity and provide I&AP's with the opportunity to comment. Notices were placed in local newspapers as well as on site.

English and Afrikaans advertisements were placed in The Gemsbok Newspaper on the 16th of January 2006 and an Afrikaans advertisement was placed in the Volksblad Newspaper on the 20th of January

2006 (refer to Appendix H for proof of the advertisements). The registration period for interested and affected parties was 30 days, as per the DEAT requirements. Nine laminated A2 notices were placed in areas frequented by local residents along the proposed route (refer to Appendix H for proof (Figures) of notice placement). A3 notices were placed on notice boards in Kenhardt, Wegdraai and Groblershoop and a flyer pack (containing 30 A4 flyers in English and Afrikaans) accompanied each notice placed. An example of the site notice is included in Appendix H.

7.2.3 Public meetings and Focus Group Meetings

Table 6 below shows the location, date, venue and times for the public meetings and focus group meeting. These meetings were held in order to inform the public of the intended activity as well as to obtain feedback on issues pertaining to the transmission line. A detailed Issues and Response Report (IRR) is included in Appendix H.

Table 6. Schedule of public meetings and the focus group meeting.

Location	Type Of Meeting	Date	Venue	Time
Kenahrdt	Public Meeting	2 February 2006	NG Kerksaal	13h00 – 14h00
Kleinbegin	Focus group Meeting	2 February 2006	Kleinbegin, Property of Louis Kotze	15h00 –16h00
Wegdraai	Public Meeting	3 February 2006	Wegdraai Community Hall	08h00 – 09h00

7.3 RECORDING

I&AP's names and contact details were recorded as well as their relationship to the project and any comment or concerns raised. A copy of the I&AP database is included in Appendix H.

Attendance registers as well as minutes of the public meetings as well as the focus group meeting are included in Appendix H.

7.4 REPORTING

Issues raised during the public participation period are summarised in the Issues and Response Report (Appendix H). The issues were received in writing or raised at public meetings during the Scoping Phase. Issues raised to date include the following:

- Alternatives – Landowners, wishing to protect their properties requested that rigorous consideration of alternative routes should take place
- Request for Power Supply to the farmers and the community of Wegdraai

- Tourism Impact – possible impact of the transmission line in proximity to game farms and nature reserves
- Safety and Security – impact on security of properties, with the inclusion of construction camps and safety of residents
- Job creation
- Conservation concerns – Concern was expressed over the future of sensitive species located within the study area.

The above issues have been recorded in the Issues and Response Report (IRR). Relevant responses to the issues raised, have been included in the IRR. As such, the Issues Report provides a summary of the concerns and/ objections raised by interested and affected parties, with respect to the proposed transmission power line. It also includes the profile of the public participation process, as undertaken during the scoping phase of the EIA process. Consequently, the Issues Report (as well as copies of some of the detailed correspondence received from I/APs) will be submitted with the Draft and final Scoping Report (DSR), to the relevant environmental authority, for decision-making. In this regard, the Scoping Report forms the culmination of the scoping phase of the EIA process.

The Draft Scoping Report has been made available for public review and comment on the 22nd of March 2006 for a period of 30 days. Copies of the Draft Scoping Report will be made available at the following venues for public review:

- Kenhardt Public Library (Park Street, Kenhardt);
- Wegdraai: c/o Tommie Claasen (Ward Councillor);
- Groblershoop Police Station (210 Hoofstraat, Groblershoop);
- Kenhardt Farmers Union (c/o Mr. Michael van Niekerk);
- Kleinbegin Farmers Union (c/o Mr. Louis Kotze – on his farm Kleinbegin);
- Tswelopele Environmental Office (259 Kent Avenue, Ferndale, Randburg, 2194); and
- An electronic copy of the report will also be made available for download on the Eskom Website (www.eskom.co.za/eia).

All comments collected from the various sources have been compiled and are included in the I&AP database as well as a copy of the draft report comment sheet (Appendix H).

8 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this report:

- It is assumed that all information provided by the applicant and the technical team which informed the environmental consultants as well as which is contained within this report is reliable, accurate and up to date.
- All specialists who undertook specialist studies for the Environmental Impact Assessment were qualified and had the necessary experience to undertake the necessary investigations required.
- It is assumed that all information and reports obtained from the specialists have taken into consideration all relevant information pertaining to their specialisation.

9 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the specialist investigations, no major flaws have been identified regarding the proposed transmission line. Possible impacts on sensitive features have been identified and will be assessed for significance during the EIA phase of this development.

Specialist input has investigated the proposed route of the transmission line and the alternatives proposed have been assessed by each of the specialists. From a visual point of view, the preferred route is one that limits further visual intrusion into the surrounding landscape. The alternative route in the southern section of the study area (Alternative Route 2A) is regarded as having the least visual intrusion to the general area in that region while the alternative in the northern section (Alternative Route 1A) is considered less favoured as it would create a visual intrusion in a relatively pristine visual environment.

The ecological specialist input has identified the Lower Gariep Alluvial Vegetation type (a band across the northern section of the study area) as a threatened vegetation type and therefore has a HIGH sensitivity to disturbance. Stringent conditions will be detailed in the construction Environmental Management Plan (EMP) to mitigate any negative impacts foreseen in this area.

An important issue to consider with regards to transmission lines is the impact on birds in the area. Since vineyards are interspersed with other crops types, the entire arable area along the river is considered extremely sensitive from a bird perspective. The current proposed alignments do not pass close to any dams, however a few small dams do exist in the study area and must be considered if the alignment changes at all. The recommendations in the avifaunal study are that the earth wires on the section of line crossing the Orange River be adequately marked due to the abundance of non Red Data water bird species in this area.

The heritage specialist input revealed that once the final route is decided and tower positions known, selections of the latter that are deemed to be in potentially more sensitive locales should be inspected more closely. There are no grounds presently, based on archaeological considerations, for deciding between the northern or southern alternative routes at the southwestern end of the line near Kenhardt. All sites are protected by law: a permit would be required if any site is to be destroyed. Mitigation measures, if necessary, would need to be formulated and acted upon. From a heritage perspective, the proposed transmission line is not expected to have a high negative impact.

No specialist input has deemed the proposed route through the hills in the northern section of the study area as unfeasible as there is already a visual intrusion to this area and the existing service road adjacent to the railway line would double up as a service road for the transmission line.

As far as practically possible, the proposed route would “hug” the railway line in order to make use of the existing service road and to limit further road construction in the area.

No fatal flaws have been identified during the compilation of this Environmental Scoping Report. All specialists involved have identified potential issues resulting from the proposed 400kV transmission line. Alternative routes (to limit the negative impacts and enhance the positive impacts) have been proposed and the significance of these impacts will be rated during the Environmental Impact Assessment (EIA) phase of this application. In conclusion it is recommended that both alternatives 1A and 1B as well as 2A and 2B are assessed in more detail in the EIA phase and a comparison made relating to the potential impacts of these alternatives. At present, Alternatives 1A and 2A are the preferred alternative alignments (Figure 30) however further investigation during the EIA phase will enable a definitive choice of alternatives. No other alternatives will be considered further in the EIA phase.

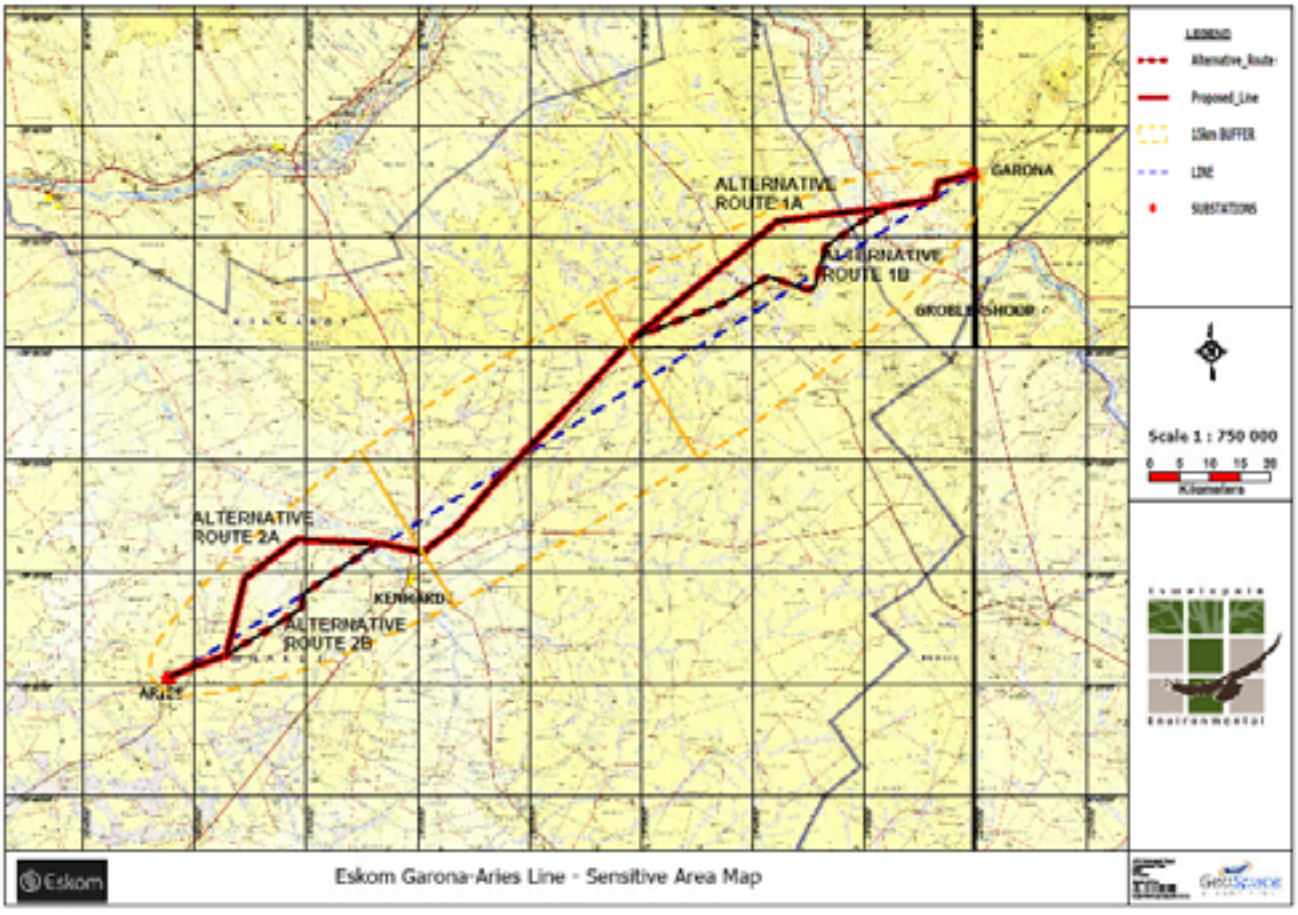


Figure 30. Preferred alternatives based on all investigations undertaken.

10 REFERENCE LIST

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Appendix A: Agricultural Specialist Report

Appendix B: Avifaunal Specialist Report

Appendix C: Ecological Specialist Report

Appendix D: Heritage Impact Assessment

Appendix E: Social Impact Assessment

Appendix F: Tourism Report

Appendix G: Visual Impact Assessment

Appendix H: Public Involvement Process

1. Proof of newspaper advertisements
2. Example of Site Notice
3. Proof of site notice placement
4. I&AP Database
5. Minutes of Public Meetings
6. Issues and Response Report (IRR)
7. Background Information Document
8. Correspondence with WESSA/SAHRA

Proof of site notice placement

Aries substation site notice

Garona substation site notice.

Notice at the police station in Groblershoop.

Notice placed at the General Dealer (Shop) in Kenhardt.

Notice placed at the Municipal Buildings in Kenhardt.

Notice placed at the entrance to the waste disposal site outside Kenhardt.

Notice placed on notice board outside the Kenhardt police station.

Notice placed adjacent to the gravel road between Kenhardt and Wegdraai.

Notice placed along the gravel road between Kenhardt and the Aries substation.

Notice placed along the service road adjacent to the railway line.

Notice placed along the gravel road between Kenhardt and Wegdraai settlement.

Notice placed in the vicinity of the railway crossing over the Orange River.

Notice placed at the T-junction at Wegdraai settlement.

Notice placed at the parking lot of the Quiver Tree Forest

Notice placed at the bottle store in Wegdraai settlement.

Notice placed at the general dealer in Wegdraai settlement.

Notice placed at the entertainment hall (pool bar) in Wegdraai settlement.

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Appendix I: Map of the study area

Appendix J: A schematic representation of the proposed extension of the Garona sub-station.