DRAFT ENVIRONMENTAL IMPACT REPORT

FOR PUBLIC REVIEW:

KUDU INTEGRATION PROJECT FOR TRANSMISSION POWER-LINES AND SUBSTATIONS

Prepared for:

Eskom Transmission
PO Box 1091
Johannesburg
2157
Tel: (011) 800 2465
Fax: (011) 800 3917
E-mail: jgeeringh@deat.gov.za

Prepared by:

PD Naidoo & Associates
in association with
Strategic Environmental Focus (Pty) Ltd
P.O. Box 74785
LYNNWOOD RIDGE
0040
Tel. No.: (012) 349-1307
Fax. No.: (012) 349-1229
e-mail: sef@sefsa.co.za

November 2006

EXECUTIVE SUMMARY

1 INTRODUCTION

P.D. Naidoo & Associates (PDNA) in association with Strategic Environmental Focus (SEF), as independent consultants, were appointed by Eskom Transmission to undertake the appropriate environmental process for the proposed development of a 400 kV line for the provision of bulk power supply from the Kudu Combined Cycle Gas Turbine (CCGT) power station in Namibia to the Western Cape. The intention is that this power station will supply power to the Eskom and the Namibian (NamPower) grids.

This is the second stage of the EIA process, which involves a comprehensive environmental impact assessment aimed at evaluating all the significant environmental and socio-economic impacts of the proposed transmission line on the surrounding environment. This report investigated the study area, and evaluates various alternative corridors for the transmission line.

The EIA was undertaken in terms of the old EIA Regulations (Government Notice No's R 1182, 1183 and 1184 of 1997) in terms of Sections 21 and 26 of the Environment Conservation Act, 1989 (Act No. 73 of 1989). Although new EIA Regulations in termsof the National Environmental Management Act, 1998 (Act No. 107 of 1998) have replaced these old regulations and have been in effect since July 2006, the current EIA process was started in terms of the old regulations in May 2005, and must continue under the requirements of the old EIA Regulations.

2 PROJECT MOTIVATION

Most of the power supply to the greater Cape area is provided by the coal-fired power stations on the Highveld, mainly in Mpumalanga. As a result, a Transmission network from Mpumalanga to the Cape has grown over the years as demand has increased. Much of this network is now over two decades old and is approaching its peak operational capacity. In addition to the natural growth in electricity demand in the Greater Cape Region, a 'step load' (i.e. a rapid jump in electricity demand) is anticipated by May 2009 for the planned steel and aluminium smelters in the Coega Industrial Development Zone (IDZ) near Port Elizabeth in the Eastern Cape.

In order to meet the increasing demand as the South African population and its need for electricity grows, Eskom proposes to import power from Namibia from the 800MW Kudu CCGT power station at Uubvlei, 15km north of Oranjemond. The 800MW Kudu CCGT power station will supply 200MW to Namibia and the balance will be available for integration into the South African grid.

3 GENERAL PROJECT DESCRIPTION

Eskom proposes to integrate the power from the Kudu CCGT power station into the South African grid via Transmission power-lines from the Namibian border. A number of alternative integration options and routes have been proposed to connect to the Western Grid of Eskom and supply the increasing demand in the Cape. This Transmission power-line will boost the supply to the Western Cape, which has been plagued by outages in the last number of months.

Various alternatives with regards to how the power will be integrated into the South African grid have been proposed. These alternatives – fully discussed in section 5 – will involve constructing one Transmission power-line from the Namibian border to Gromis substation, parallel to an existing 220kV servitude. From Gromis the Transmission power-line will be constructed along a new servitude to connect to the Western Grid at Juno substation near Vredendal in the Western Cape.

Within this integration option*, five* route alternatives were proposed during the scoping process. Four of these alternatives were determined through the involvement of key stakeholders, including *SANParks*, *CapeNature* and other conservation NGO's. The findings of the scoping report and public participation process, as well as the preliminary findings of the various specialists involved in the scoping process, determined that alternative routes E and C were the most suited for construction of a transmission power-line. During the EIA phase two further route alternatives were proposed. Refer to sections 1.6 and section 5 for a broader discussion of the available integration and route alternatives.

The second Transmission power-line will run from the Namibian border directly to Oranjemund substation, where minor adjustments need to be effected to the substation itself for construction of the line bays to accommodate the new line.

Construction will last approximately 15 months. The 400kV Transmission power-line will provide power to the Western Grid for the entire operational lifespan of the Kudu CCGT power station, which is estimated at twenty years.

4 PUBLIC PARTICIPATION

Public participation plays an important role in the compilation of an Environmental Impact Assessment as well as the planning, design and implementation of the project.

Public participation is a process leading to informed decision-making, through joint effort by the:

- Proponent; Technical experts; Governmental authorities; and Interested and Affected Parties (I&APs)

Public participation is a vehicle for public input, which achieves the following:

- Facilitates negotiated outcomes;
- Creates trust and partnership;
- Minimises negative effects;
- Maximises positive effects; and
- Provides an indication of issues

Through the public participation process, SEF endeavoured to involve potential I&APs. The issues arising from the public participation process during the Scoping process have been incorporated into the EIR and used in determining mitigation measures for the project.

I&APs were identified and notified of the proposed development, in accordance with legislation. Comments / concerns received were incorporated and addressed in this Environmental Impact Report.

Assessing the comments / concerns received during the public participation process, it is evident that the main concerns are:

- Biophysical impacts of the proposed Transmission line, specifically on the Knersvlakte and the proposed expansion of Namaqua National Park;
- Perceived lack of benefits to communities living in the affected area; and
- Visual effects with regards to tourism in the area.

These concerns have been carefully considered and appropriate mitigation measures are suggested to address these concerns.

This report is available for review and comment by all interested and affected parties. Once the review period has lapsed, all comments made will be incorporated in the comments and response report (forming part of this report) and will be considered and responded to. The final report will then be submitted to the environmental decision-making authorities and copies of the final report will also be made available to interested and affected parties for information.

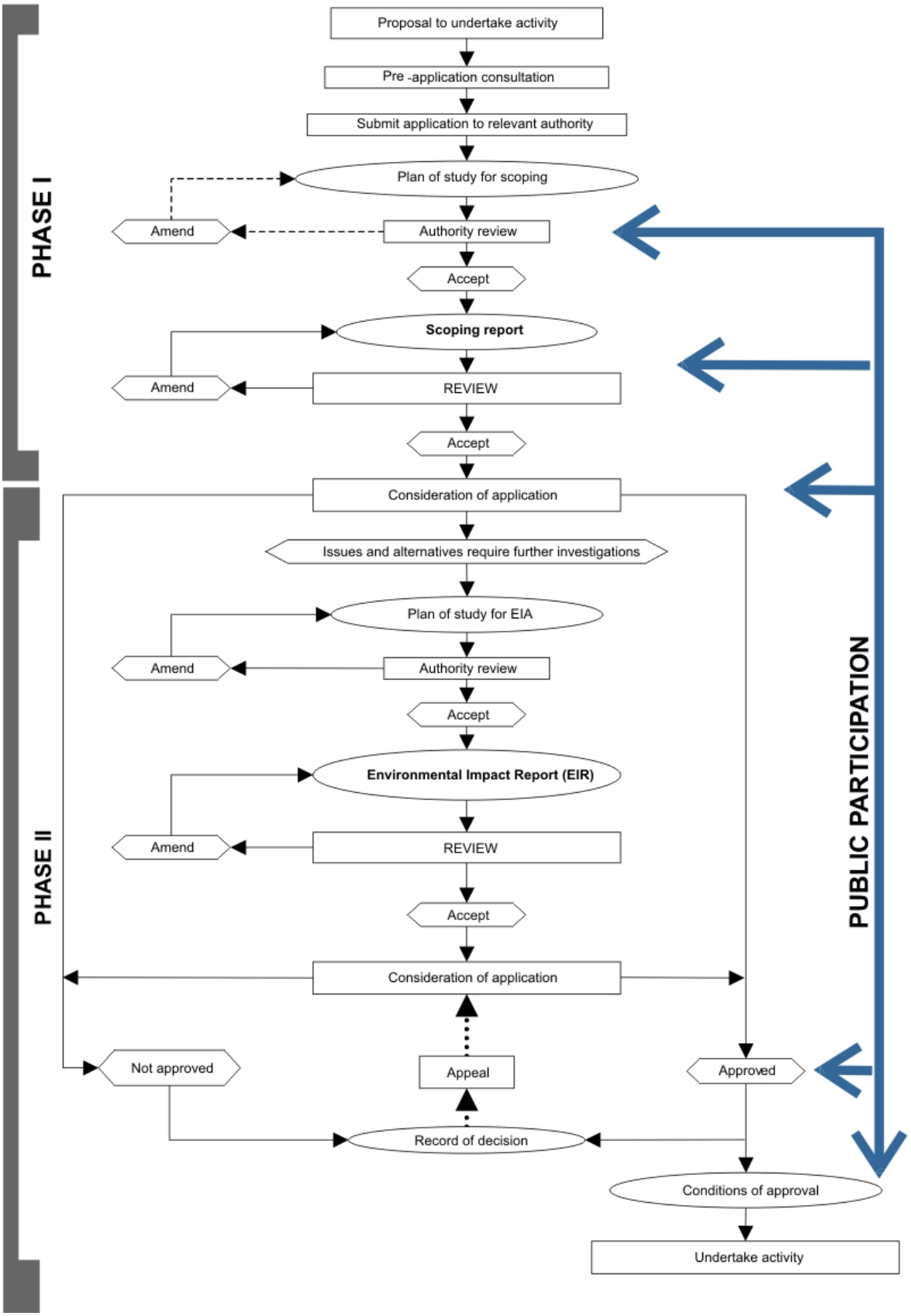

Figure 1 Application procedure as prescribed by the Department of Environmental Affairs and Tourism

5 KEY IMPACTS

Site visits conducted by SEF identified a number of key issues for the purposes of the Environmental Impact Assessment. These key issues will be explored and investigated further in the final Environmental Impact Report.

5.6.1 Key issue 1: The physical and biological environment

The issues identified here are based on an overview of the entire study area that was obtained from the site visit. This entailed an assessment by a team of specialists that were commissioned to assess the environment and the likely impacts that the Transmission power-line could have on it. In this regard, the chosen Route will need to bear in mind key impacts such as:

- Visual intrusion;
- Floral impacts in a highly sensitive area, where tourism is dependent upon the annual blooms of desert ephemerals;
- Wind erosion;
- Water erosion;
- Loss of high potential arable land;
- Habitat destruction and disturbance;
- Faunal impacts, the most significant being bird impacts such as, electrocutions, collisions, habitat destruction and disturbance; and
- Destruction of heritage/historical sites.

5.6.2 Key issue 2: The social environment

It must be ensured that the environment surrounding the development is safe and secure, and in all respects acceptable to the affected I&APs. In this regard the social issues flagged during the site visit, (including and especially the tourism issues) as well as the concerns raised in the public consultation process must be taken into account.

The impacts of sufficiently high significance to warrant mitigation measures and management during the construction of the Transmission line are as follows:

- Visual intrusion as a result of the building and eventual operation of the Transmission line.
- Floral destruction through vegetation clearing and earthworks during the construction phase, and maintenance activities during the operational phase.
- Loss of tourism potential as a direct result of the visual intrusion and floral destruction listed above.
- Loss of sources of livelihood as a result of the decline in tourism potential.

- Loss of arable land as a result of the demarcating the servitude along current farm lands.
- Impacts on bird life as a result of collisions with the transmission line.
- Destruction of heritage / historical sites.
- Impacts related to the social environment e.g. farm owners and other I&APs.

6 ALTERNATIVES

The IEM procedure stipulates that an environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, DEAT requires that a number of possible proposals or alternatives for accomplishing the same objectives be considered. Alternatives can be categorised into the following: Strategic, Scheduling and Location alternatives, further divided into integration and route alternatives. These alternatives are fully discussed in Section 5, but primary attention will be given to the location alternatives.

In terms of the location alternatives, the means of integrating the transmission power-line on a broad scale must be determined. Based on a preliminary identification of physical, biological and social constraints of the plausible options during the Scoping Phase, involving the public participation process, several criteria supported the selection of Route 2 as the preferred alignment. This route, the most suited means of integration, runs from the Namibian border at Oranjemond to Gromis substation and then to Juno substation. This option will connect into the Eskom grid at the Juno substation near Vredendal. It will involve constructing a Transmission power-line from the Namibian border close to Oranjemond substation and follow an existing 220kV line to Gromis substation. The Transmission power-line would then be constructed along a new servitude to link with the Cape network at Juno substation. This is the preferred option due to the benefits of linking the supply more directly to the load centre of Cape Town.

Five route alternatives were described during the Scoping Phase, of which two were identified as being the most suited through consultation with key stakeholders and specialists. These two route alternatives are designated C and E. Two further alternatives were proposed during the EIA phase, designated F and G.

These Alternative Routes are given on the locality map (see Figure below).

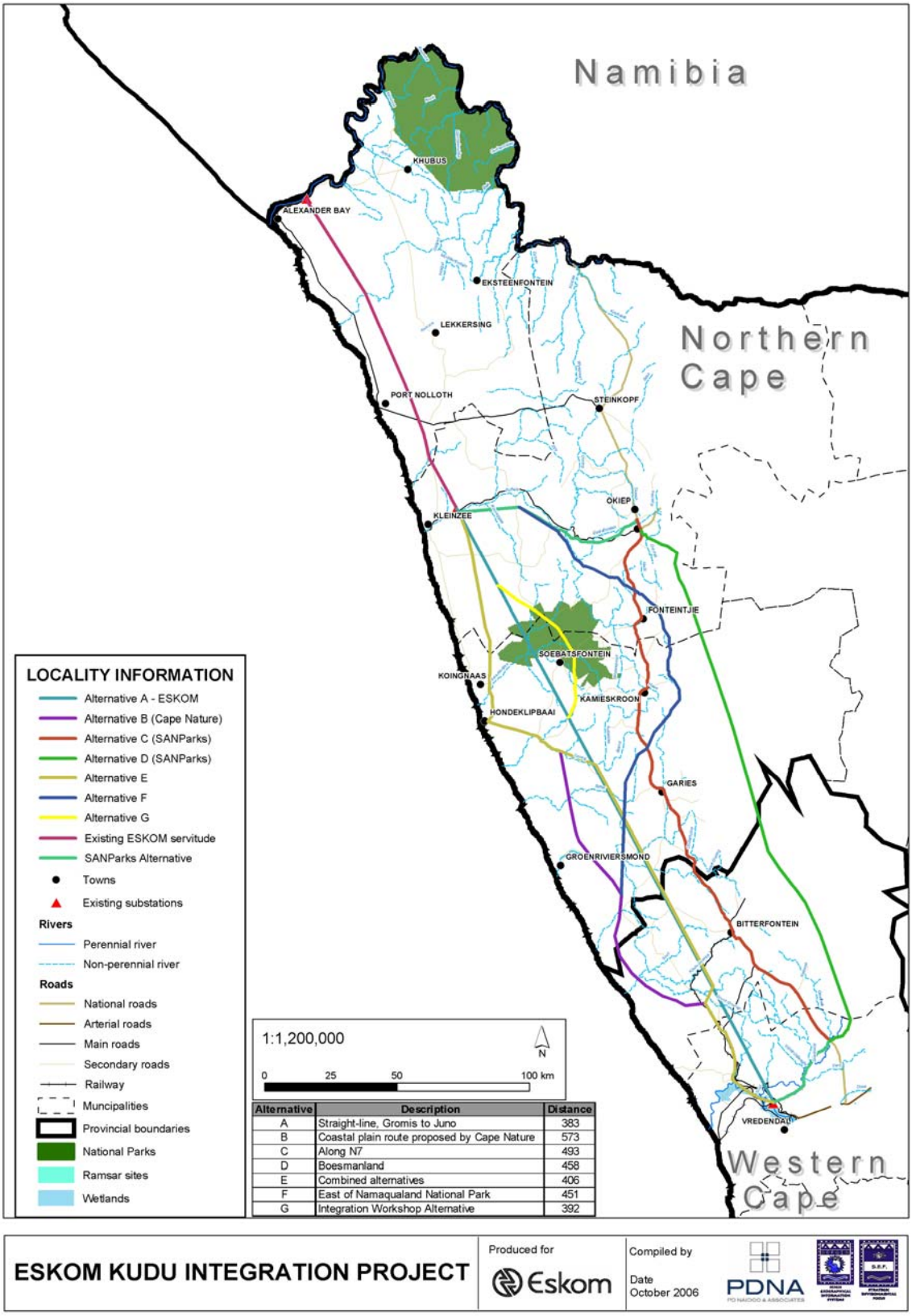
Namibia
Northern Cape
Western Cape
KHUBUS
ALEXANDER BAY
EKSTEENFONTEIN
LEKKERSING
PORT NOLLOTH
STEINKOPF
OKIEP
KLEINZEE
FONTEINTJIE
SOEBATSFONTEIN
KOINGNAAS
KAMIESKROON
HONDEKLIPBAAI
GARIES
GROENRIVIERSMOND
BITTERFONTEIN
VREDENDAL
LOCALITY INFORMATION
Alternative A - ESKOM
Alternative B (Cape Nature)
Alternative C (SANParks)
Alternative D (SANParks)
Alternative E
Alternative F
Alternative G
Existing ESKOM servitude
SANParks Alternative
Towns
Existing substations
Rivers
Perennial river
Non-perennial river
Roads
National roads
Arterial roads
Main roads
Secondary roads
Railway
Muncipalities
Provincial boundaries
National Parks
Ramsar sites
Wetlands
1:1,200,000
N
0 25 50 100 km
Alternative | Description | Distance
A | Straight-line, Gromis to Juno | 383
B | Coastal plain route proposed by Cape Nature | 573
C | Along N7 | 493
D | Boesmanland | 458
E | Combined alternatives | 406
F | East of Namaqualand National Park | 451
G | Integration Workshop Alternative | 392
ESKOM KUDU INTEGRATION PROJECT
Produced for
Eskom
Compiled by
Date
October 2006
PDNA

Figure 2

There is no single alternative that is preferable in terms of all (or even most) categories of impact.

Alternative G is preferable in terms of the botanical impacts and impacts on soils and agriculture. Alternative G is considered particularity preferable from a botanical point of view due to the fact that is does not cross any unique botanical features. In terms of agricultural impact, Alternative E is the next most preferable route and in terms in botanical impact, alternatives Alternatives D and E are next most preferable.

From a social point of view, alternatives C (parallel to the N7) and alternative F (Kamieskroon) are preferred. From a visual point of view, Alternatives C and F are recommended as most suitable, due to the higher ability of the mountainous landscape along these routes to absorb the visual impact. In terms of birdlife, Alternatives C and F are rated the most preferable, with C being slightly more preferred than F. However, Alternative F is considered an absolute no-go alternative from a botanical point of view owning to its impacts on the Kamiesberg Highlands Centre of Endemism. Thus, taking social, visual and birdlife considerations into account, Alternative C is the only viable alternative that it not disqualified by other factors.

Therefore, in considering the alternatives, botanical and agricultural factors (in favour of Alternative G) are in conflict with social impacts, visual impacts and impacts on birds (in favour of Alternative C). As far as impacts on birds are concerned, although the different alignments are expected to result in different levels of impact due to concentrations of conservation-important species, mitigation (making the power line more visible to birds) can be effectively applied to any of the alternatives. Mitigation will entail installing sufficient marking devices on the line in particular habitats (e.g. close to wetlands, rivers and agricultural lands). From a botanical point of view, Alternative C is also considered unacceptable, since it traverses the important Knersvlakte Quartz Vygieveld and the proposed Knersvlakte Biosphere Reserve. This effectively also eliminates C as a viable alternative.

The two factors of lowest importance in making a decision on the preferred route are heritage impacts and the geotechnical suitability for the power line. The conclusion of the heritage study was that other factors could take precedence over heritage impacts in deciding on a preferred route, since there are no confirmed heritage features that would be affected. Geotechnical considerations are also considered relatively unimportant, since although geotechnical factors present constraints for construction, they can be overcome by more expensive construction.

> Thus, it is concluded that Alternative G is the preferred alternative. Unfortunately, this alternative will result in significant visual and social impacts, which will affect people's ability to make their livelihood from the scenic quality of the landscape. In spite of the extensive search for other viable alternatives (viz. alternatives C and F) around the Namaqua National Park to avoid these impacts, neither of these were found to be suitable due to their very high impact on endemic species.

7 CONCLUSIONS AND RECOMMENDATIONS

The most significant impacts are expected to be:

- Visual intrusion as a result of the building and operation of the Transmission power-line, especially within the Namaqua National Park;
- Floral destruction through vegetation clearing and earthworks during the construction phase, and maintenance activities during the operational phase;
- Loss of tourism potential as a direct result of the visual intrusion and floral destruction listed above;
- Loss of sources of livelihood as a result of the loss of tourism potential;
- Loss of small portions of arable land as a result of the demarcating the servitude along current farm lands;
- Destruction and displacement of birds as a result of the construction activities; and
- Impacts related to the social environment e.g. farmers.

It is recommended that the application for this power line be authorised subject to the following conditions:

- It is recommended that Alternative G should be authorised, on condition that the southern portion of the route in the Olifants River valley avoids all high potential agricultural land.

- The creation of offset conservation areas as defined in the ecological specialist report must be implemented to mitigate the loss of ecologically sensitive areas in the northern part of the route between the Oranjemond Substation and Gromis substation. A possible option would be to increase the servitude width in the 12.5km south of Oranjemund substation, to at least 1000m. This area should then be rezoned Open Space 3 if possible, and registered as a Private Nature Reserve, in order to secure some conservation status for this very vulnerable area. Alternatively, a portion of the farm Grootderm 10, not less than 100ha in extent should be purchased immediately south of the Oranjemund substation. Eskom Transmission must identify a suitable area in consultation with the provincial and national nature conservation authorities.

- Construction must be done during the dry season (Oct – April) in all areas of high sensitivity identified by the botanical specialist, in order to minimise damage to rare or localised bulbs and annuals which grow and/or are above ground only during the autumn to spring period. This refers particularly to the driving of vehicles over natural veld, and is especially important in this highly seasonal area.

- It is recommended that Eskom Transmission must, in consultation with SA National Parks, purchase a suitable area for the expansion of the Namaqua National Park to compensate for the impacts on the park. This must be a suitable area with potentially high tourism potential where local people can make their livelihoods through tourism.

- Existing erosion of the access road along the current servitude in the vicinity of the Holgat River (and any other portion of the proposed route) must be mitigated during the construction of the new power line.

- Immediately following authorisation and well prior to construction, Eskom Transmission and/or other relevant Eskom divisions must enter into negotiations with local authorities and communities regarding the provision of electricity to communities close to the power line. Eskom Transmission must provide proof of having reached agreements in this regard to DEAT before the commencement of construction.

- A walk through site inspection of the proposed route must be undertaken by an archaeologist, a bird specialist and a botanical specialist in order to optimise the route from an environmental perspective so as to ensure that there are no sensitive environmental features that will be affected by either the positions of the pylons or the access roads and associates areas like material storage and laydown areas. The advice of these specialists must be followed in the placing of the pylons, access roads and associated infrastructure. The end product of this inspection must be the development of a Construction Environmental Management Plan (CEMP) which contains detailed site-specific requirements for mitigating impacts during the construction phase. DEAT must approve this CEMP prior to construction.

- At least one independent Environmental Control Officer (ECO) must be appointed for the duration of construction. Due to the long length of the power line, more than one ECO may have to be appointed should construction take place concurrently in more than one area. The ECO(s) must be responsible for checking the contractors' adherence to the CEMP and reporting on compliance to the provincial and national environmental and conservation authorities.

- Due to the large footprint caused by construction of the deadweight concrete anchors in the areas of loose sand along the route, the pylons in these sections must be positions as far apart as possible so that as few pylons as possible are necessary in these areas. A plan in this respect must be submitted as part of the CEMP.

- All pylons and the entire power line must be removed as soon as possible once the Kudu power station has reached the end of its life in order to avoid permanent visual impacts in the study area.

- It is recommended that the Record of Decision authorise the power line on the basis of a 3km wide corridor within which the power line position can be moved, to cater for environmental constraints identified during the walkthrough inspection and to cater for the results of negotiations with landowners.

TABLE OF CONTENTS

GLOSSARY OF TERMS

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Alternative Route: Refers to a specific route with local re-alignment along the route to avoid sensitive sites.

Applicant: Any person who applies for an authorisation to undertake an activity or to cause such activity to be undertaken as contemplated in section 22 (1) of the Environment Conservation Act, 1989.

Arable potential: Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

Compensation: A sum of money paid by Eskom to a landowner as agreed in a document specifying that he or she grants rights in favour of Eskom's servitude.

Ecology: The study of the interrelationships between organisms and their environments.

Environment: all physical, chemical and biological factors and conditions that influence an object.

Environmental Impact Assessment: assessment of the effects of a development on the environment.

Environmental Management Plan: A working document on environmental and socio-economic mitigation measures that must be implemented by several responsible parties during all the phases of the proposed project.

Local relief: The difference between the highest and lowest points in a landscape. For this study, it is based on 1:50 000 scale.

Proposed servitude: Refers to the proposed final route that the Transmission power-line should follow.

Servitude: A strip of land within which Eskom will construct and maintain the Transmission power-line. The right to use this piece of land is obtained through negotiation with the landowners.

Study area: Refers to the entire study area encompassing all the alternative routes as indicated on the study area map.

Succession: The natural restoration process of vegetation after disturbance.

ABBREVIATIONS

Abbreviation	*Explanation*
CCGT	Combined Cycle Gas Turbine
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DEAT	Department of Environmental Affairs and Tourism (National)
DTEC	Department of Tourism, Environment and Conservation (Northern Cape)
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EWT	Endangered Wildlife Trust
I&AP	Interested and Affected Party
kV	Kilovolts
kW	Kilowatts
MW	Megawatts
SANParks	South African National Parks
SANRAL	SA National Roads Agency Limited

SECTION 1: INTRODUCTION

1.1 INTRODUCTION

In terms of the Environment Conservation Act (Act 73 of 1989), developments which fall within the ambit of the activities listed in Schedule 1 of Regulation 1182 of 1997 are subject to an environmental impact assessment (EIA). The first phase of the EIA is the Scoping Report. The Act identifies the proposed development as an activity which may have significant detrimental effects on the environment, (Section 26: Listed Activity Schedule 1 clause 1(a), the construction or upgrading of facilities for commercial electricity generation and supply).

The purpose of this study is to assess the impact of the proposed development on the surrounding environment, conduct relevant specialist studies and to determine the issues or concerns of relevant authorities as well as interested and/or affected parties. This report considers the environmental constraints and relevant alternatives to address these constraints. It should be noted, that although this report gives recommendations regarding this development, the Department of Environmental Affairs and Tourism (DEAT) will make the final decision as to whether the proposed project should proceed. The relevant provincial authorities – Department of Environmental Affairs and Development Planning (DEA&DP) in the Western Cape and the Department of Tourism, Environment and Conservation (DTEC) in the Northern Cape Province – will act as commenting authorities and provide comment prior to the approval by DEAT. As part of this process and predecessor to this report, DEAT approved the Scoping Report and the Plan of Study for EIA on 1 August 2006. This EIR has been drawn up in terms of the conditions contained within that approval.

P.D. Naidoo & Associates (PDNA) in association with Strategic Environmental Focus (SEF), as independent consultants, were appointed by Eskom Transmission to undertake the environmental impact assessment for the proposed development of a 400 kV line for the provision of bulk power supply from the Kudu Combined Cycle Gas Turbine (CCGT) power station in Namibia to the Western Cape. This power station will supply power both to the Eskom and NamPower grids. The process that was followed complies with Sections 21 and 26 of the Environment Conservation Act, 1989 (Act No. 73 of 1989). An identification of the major issues associated with the development was undertaken along *five* proposed Alternative routes A to E during the Scoping Process. The Scoping Report identified alternatives E and C as being the most suited for construction of a power-line. The need and justification for the proposed Transmission power-line are outlined in section 2.4. During the Impact Assessment phase of the project, two further alternatives were proposed, designated F and G. These alternatives are investigated further below.

1.2 TERMS OF REFERENCE

Eskom Transmission requested that an Environmental Impact Assessment (EIA) for the proposed 400 kV Transmission power-line be carried out. The Environmental Impact Assessment together with the public consultation had to be undertaken in accordance with the EIA Regulations (Government Notice No's 1182, 1183 and 1184 of 5 September 1997, as amended) as per Sections 21, 22 and 26 of the Environment Conservation Act, 1989. (Act no. 73 of 1989)

It is the intention of Eskom Transmission to obtain a Record of Decision to proceed with the proposed construction of the 400 kV Transmission power-line in the short term and, in the medium to long term to secure servitude rights for the proposed line.

As part of the environmental process, a Scoping exercise was conducted to determine the issues or concerns of the relevant authorities as well as interested and / or affected parties (I&APs). Strategic Environmental Focus, as independent environmental consultants, undertook to facilitate the implementation of the Integrated Environmental Management process by adopting the following terms of reference:

- Registering the project with the relevant environmental authorities;
- Compiling a plan of study for Scoping;
- Undertaking a preliminary evaluation of the study area facilitated by a site visit with several specialists and a desk top analysis;
- Identifying the possible interested and affected parties (I&APs);
- Co-ordinating the necessary Public Participation Process. This entailed preparing the Background Information Document (BID), advertising and requesting that I&APs register their concerns;
- Identifying the issues, impacts and alternatives, and determining specific guidelines for the Impact Assessment phase; and
- Compiling a detailed Scoping Report.

The Scoping Report included a description of the environment as well as the possible issues and impacts that may arise from the proposed development. Consultation with the I&APs and the relevant authorities was used to identify issues that are of particular concern. Furthermore, the experience SEF has gained through working on similar applications required that the following issues be assessed:

- Ecological impacts;
- Social impacts;
- Service provision; and
- Cumulative impacts.

1.3 STUDY APPROACH

The EIA regulations stipulate that a Scoping Study and EIA should be undertaken in applying for authorisation to proceed with the proposed activity. The main objectives of the EIA are to:

- inform the broadest possible range of I&APs about the proposed project and the IEM process to be followed;
- obtain contributions of I&APs (including the client, consultants, relevant authorities and the public) and ensure that all issues, concerns and queries raised are fully documented and addressed in this report;
- gather the issues and concerns of I&APs in the vicinity of the site in order to identify, screen and evaluate critical path impacts (i.e. potential "fatal flaws") in the proposals;
- identify and provide a rating of significant impacts associated with the proposed development;
- formulate mitigation measures in consideration of identified concerns and technical input from appointed specialists; and
- produce a Final Environmental Impact Report (EIR) which will help DEAT to decide whether (and under what conditions) to authorise the development.

In a more generic sense, the purpose of the report is to:

- ensure that the environmental considerations are explicitly addressed and incorporated into the development decision making process;
- anticipate and avoid, minimise or offset the significant adverse biophysical, social and other relevant effects of the development;
- protect the productivity and capacity of natural systems and the ecological processes, which maintain their functions;
- promote development that is sustainable and to optimise resource use and management opportunities.

1.4 ASSUMPTIONS AND LIMITATIONS

1.4.1 Stage of Project

Adequate timing has been allowed for the Impact Assessment exercise. Particular note should however be made of the fact that this Environmental Impact Report has been compiled during the conceptual stages of development. The report has considered the two alternative route alignments that were decided upon during the Scoping exercise. The selection of location alternatives were based on a careful examination of the pros and cons of each alignment. Two alignments were identified as being the most suited during the Scoping process and thus, references to two different alignments are made. The technical details of the design components had however, been determined before the Scoping Report was compiled. These technical details were used to make the decision regarding how integration was to take place.

1.5 STUDY TEAM

The team of specialists who conducted the studies in the area affected by the proposed transmission line were selected on grounds of their experience with similar projects as well as in the area. The study team was led by Reuben Heydenrych of Strategic Environmental Focus (SEF) (B.L. Pr. L. Arch; M. Phil Environmental Science), with Guillaume Nel (B. Env Man; B. Env Man & GIS Hons.) managing the public participation. Collectively they command a total of seventeen years experience in environmental impact assessment practices.

The specialists for the various aspects studied for the powerline are as follows:

Demos Dracoulides	Air quality
Ilse Aucamp	Social Impact
JJN Lamprechts & F Ellis	Soils and Agricultural potential
Jon Smallie	Avifauna
Mader van den Berg	Visual Impact
Mark Richter	Geotechnical
Nick Helme	Botany
Tim Hart	Heritage

SECTION 2: DEVELOPMENT PROPOSAL

2.1 PROPOSED ACTIVITY

Electrical supply constitutes a complex system of generation facilities, substations and Transmission power-lines. The system operates on a demand-supply structure. The power is generated and transmitted at the moment it is needed. As electricity cannot be stored it must be generated and delivered –often over long distances – at the very instant it is needed. In South Africa, thousands of kilometres of high voltage lines transmit power, mainly from the power stations located at the coal fields in the Mpumalanga Province, to major substations at different locations in the country, where the voltage is reduced for distribution to industry, businesses, homes and farms all over the country.

The proposed development ("the development") is the construction of a 400 kV Transmission power-line, approximately 390 km long, between the Namibian border and Oranjemond substation in the Northern Cape and Juno substation near Vredendal in the Western Cape. The servitude required for the development is an area of about 2145ha in extent, 55m across and 390 km in length. The bulk of this study is concerned with the route for the line to Juno and the proposed substation expansion at Oranjemund, and includes the expansion of Oranjemond substation to include a 400kV yard and connect a second 400kV line to the substation.

Eskom suggested a number of possible integration options (1-3) of which the option designated "number 2" was identified as being technically the most feasible in Eskom's pre-engineering steady state analysis. Within this integration option, *five* Alternative Routes for the corridor of the Transmission power-line were identified for the purposes of the Scoping exercise. Through public participation, involvement of key stakeholders and the opinions of various specialists, two alternatives, namely C and E, were recommended at the end of the Scoping phase. The Scoping Report was approved by DEAT, who recommended that the EIA process continue with an in-depth analysis of these two alternatives, as well as further alternatives east of the Namaqua National Park. As such, two further route alternatives were proposed, designated F and G.

2.2 THE SITE

2.2.1 Site Description

The proposed development falls within the Northern and Western Cape provinces. The Transmission power-lines will run from the north bank of the Orange River, close to Oranjemond substation, via Gromis substation to Juno substation. Two lines will be constructed from the Namibian side. The one line will run only to Oranjemond substation and will be operated at 220kV until it is necessary to upgrade it to 400kV. The other line is proposed to be constructed directly from the Namibian border via Gromis to Juno substation.

Small changes need to be effected to Oranjemond substation to accommodate the 220kV transmission line. Oranjemond substation is situated on the banks of the Orange River, and is linked to Gromis substation – in the vicinity of Kleinzee – in the south via an existing 220kV

Transmission power-line in an existing servitude. There is no direct link at this point in time between Gromis and Juno substations. Juno substation is in the vicinity of Vredendal. From Juno substation there are existing 400kV lines to the load centre in Cape Town. All alterations to the Juno substation will occur within the existing Eskom property, adjacent to the existing bays.

Between the border and Gromis, the line will cross or pass in close proximity of the towns of Alexander Bay and Port Nolloth. South of Gromis substation, where the line will be constructed along a new servitude, the line will then cross or pass in close proximity of the towns of Springbok, Fonteintjie, Koiingnaas, Garies, Hondeklipbaai, Bitterfontein, Brand se Baai, Nuwerus and Lutzville, depending on the final alignment.

The Municipalities which will be affected include:
Northern Cape: Richtersveld & Kamiesberg
Western Cape: Hantam & Matzikama

In the northern part of the study area a large amount of the land on the coastal plain has been disturbed by diamond mining activities to the west. Nature conservation initiatives include the Richtersveld National Park to the east of the study area and the Alexander Bay Lichen Hill Heritage Site, immediately south of Alexander Bay. To the south of Gromis, between the proposed route alternatives, the land is largely used for extensive stock farming. Nature conservation initiatives include the Namaqua National Park, Skilpad Flower Reserve and a proposed reserve in the Knersvlakte. There is arable land in the vicinity of the Olifants River Valley and Lutzville.
The point at which the Namibian transmission power-line will end on the northern bank of the Orange River is: 28.5301°S, 16.5948°E.
The Juno substation is at: 31.608°S, 18.443199°E.

2.3 PROJECT DESCRIPTION

2.3.1 Timing

The project involves a number of major activities that will span over a period of three years. The initial activities entail pre-construction procedures such as the environmental impact study, negotiations for the servitude to determine the final route – in view of special conditions stipulated by landowners etc. These activities will take about twelve months to complete, while the construction activities will take 24 months. The final inspection for the release of the Contractors' guarantee is scheduled for one year after completion of the project. The line will be in operation immediately after completion of the project and will stay operational for the lifetime of the Kudu CCGT power station. Subsequent maintenance and refurbishment would normally occur during the operational lifetime of the line.

Accordingly, construction of the line is planned for the year 2007 and the commissioning of the line is planned for 2008 (i.e. fifteen months after construction commences). Various factors need to be considered in the execution of the environmental investigation at present, namely:

- Firstly, the reliability of the existing power supply to the Western Cape is under increasing pressure, which means that a new line will contribute to strengthening of this supply.
- Secondly, the prediction for the growth in demand for additional electricity in the Western Cape shows that the current system – where power is fed from the coal-fired stations in Mpumalanga – will not be able to cope with the predicted demands, especially when the proposed Coega development in the Eastern Cape commences in 2009.
- Thirdly, Eskom Transmission aims to develop the national electricity grid in such a manner as to secure uninterrupted power supply to different parts of the country. This requires that the national grid should be based on a system whereby the supply to a specific area comes through more than one route.

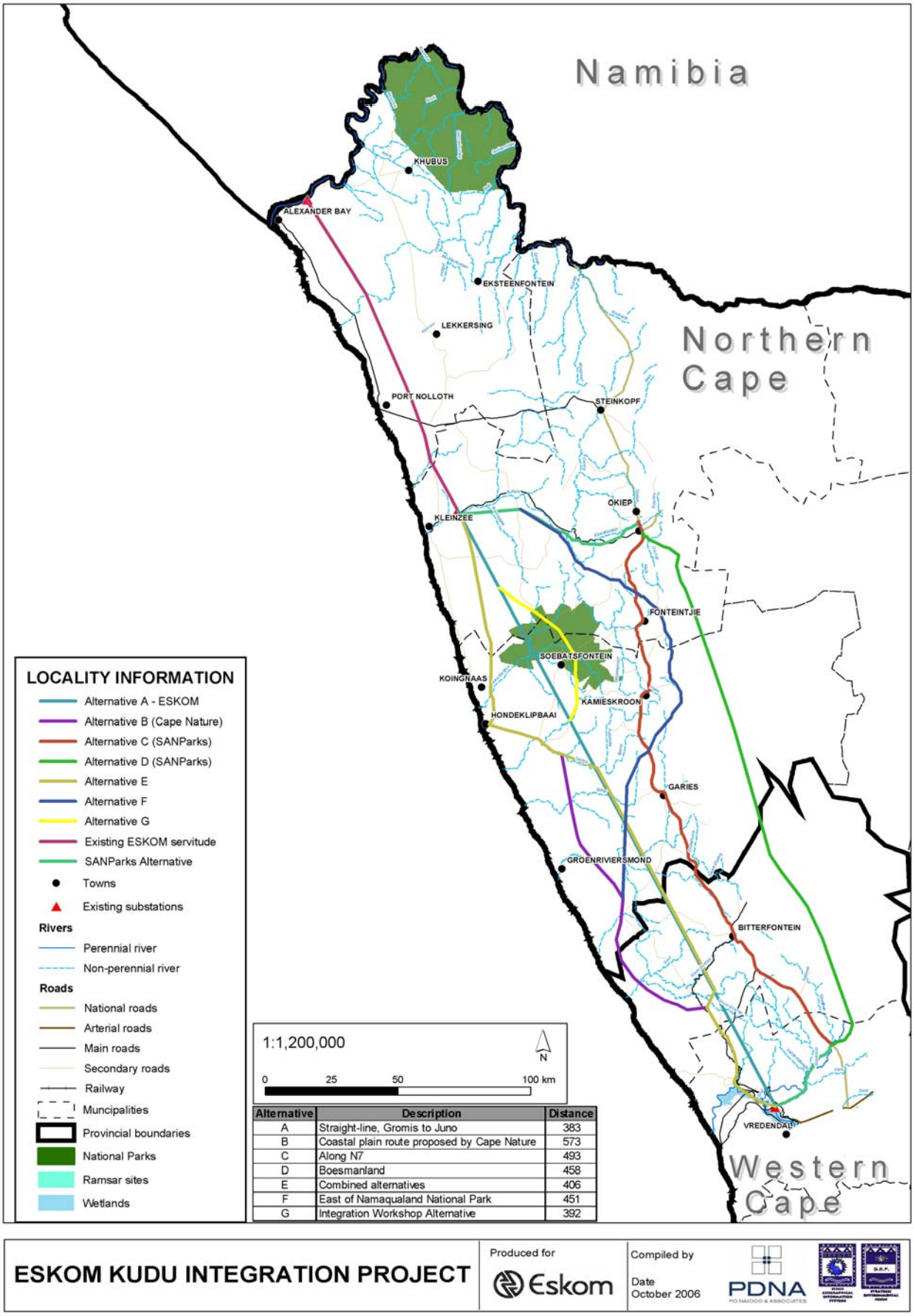

Figure 2 *Locality map and alternatives*

2.3.2 Construction activities

This phase refers to all construction and construction-related activities that will occur within the servitude area until the project is completed. The construction activities will take approximately 18 months. The construction process will involve:

- Contractor site establishment;
- Survey and pegging of tower positions;
- Access road negotiation and construction;
- Gate installation;
- Vegetation clearing for pylon bases, if required;
- Foundation excavation and installation;
- Tower assembly and erection;
- Conductor stringing and tensioning; and
- Servitude clean-up and rehabilitation.

The construction phase will be treated as an integrated whole as dictated by the nature of the activities and impacts under discussion.

2.3.3 Operational activities

This phase will commence once the Transmission power-line has been commissioned and is fully operational. All post-construction activities, including the operation and maintenance of the proposed development are included here. Such activities will require routine maintenance work that necessitates using access roads that will be established along the servitude of the Transmission power-line.

2.3.4 Technical Details of the Transmission power-line

Details of the 400 kV Transmission power-line, including the architectural and structural information as well as the electromagnetic fields (EMF) that will be generated around the power line are discussed below.

2.3.4.1 Types of Towers / Pylons

The following types of towers may be used on this project:

- Cross-rope suspension;
- Compact cross-rope;
- Guyed suspension;
- Self-supporting; and
- Self-supporting strain tower.

2.3.4.2 Architectural Details of the 400 kV Transmission power-line

Tower spacing	**420 m average**
Tower height	**25-40m**
Conductor attachment height	**18-33 m**
Conductor type	**Typically 3xTern to 3xBeresfort**
Minimum ground clearance	**8.1 m at maximum sag**

.

2.3.4.3 Servitude Required for Proposed Transmission power-line

For the purpose of this report a servitude should be understood as: the area demarcated for the Transmission power-line itself, including the areas required for routine maintenance activities that are carried out on it, for instance an access road. Construction will be limited to the 55m servitude in which the line will be constructed. Any extra space outside the servitude shall be negotiated with the relevant landowner and approved by Eskom. All areas marked as no-go areas inside the servitude shall be treated with the utmost care and responsibility.

2.3.4.4 Electromagnetic Fields of the Transmission power-line

The environmental effects of the prospective Kudu 400 kV Transmission power-line are linked to the possible physiological or biological effects of low frequency electric and magnetic fields produced by the power lines. The electric and magnetic fields involve rather abstract concepts. Two of these notions are ionising and non-ionising radiation. Electric and magnetic fields have a non-ionising effect on the surrounding environment because of their relatively low intensity.

Table1: Electric fields for Transmission power-lines

Voltage (kV)	Max. E-field (kV/m)	E-field at servitude boundary	Servitude width from centreline
765	7,0	2,5	40,0
400	4,7	1,5	27,5
275	3,0	0,5	23,5
132	1,3	0,5	15,5
88	0,8	0,3	15,5

Table2: Magnetic fields for Transmission power-lines

Voltage (kV)	Current (A)	Max M-Field (uT)	M-Field at Servitude Boundary (uT)	Servitude width from centreline
765	560	6,0	1,5	40,0
400	650	10,5	2,5	27,5
275	350	6,0	1,0	23,5
132	150	4,0	1,0	15,5
88	60	1,3	0,2	15,5

2.3.4.5 Road Access for Maintenance of Transmission power-line

Road access will be required as part of the servitude along the power line for annual inspections and maintenance / repair of the Transmission power-line. The road will not be any more than a jeep track. Access will be obtained to the servitude through existing roads. No new roads will be constructed to obtain access to the servitude. The final alignment of the road will be the same as for the Transmission power-line and will be discussed fully in Section 4 of this report.

2.4 PROJECT MOTIVATION

The motivation and acceptability of the project needs to be evaluated taking into account the demographic profile, the surrounding economic centres and their projected growth as well as current power demand and use patterns.

In terms of the need for the Transmission power-line, studies have shown, based on a variety of sources, that the project is needed for a number of reasons, the most significant of which are:

- Current scarcity of power in the Western Cape;
- Future growth in the Greater Cape region will further stimulate the *demand* for more uninterrupted electrical power; and
- Diversification of supply of electricity from alternative generation sources.

The foregoing reasons are corroborated by considering the great demand and corresponding supply problems encountered in the Western Cape as of late.

Electricity needs to be transported over long distances from the few locations where it is generated. Hundreds of kilometres of 765 kV and 400 kV Transmission power-lines feed electricity from the Mpumalanga Region, where most of the coal-powered generation plants are found, to Transmission substations in the Greater Cape Region. Only two 765kV and three 400kV Transmission power-lines feed electricity to the Greater Cape Region south of Bloemfontein. These Transmission power-lines are becoming heavily loaded and are already reaching their transfer capacity, over and above being over two decades old in some cases. The full capacity of the current network also limits the possibility for upgrading certain servitudes until such time as alternative supply lines are available.

Although Eskom does have an electricity surplus in the northern reaches of the country, the Transmission power-lines from Mpumalanga to the Greater Cape Region are approaching their peak operational capacity. Therefore sufficient electricity is currently not available in the Western Cape to supply the expected increases in load demand in the Region, exacerbated by the problems experienced at Koeberg power station of late. It is also problematic to carry out routine maintenance on these power-lines due to the fact that it is very difficult to manage the frequent outages. Furthermore, the condition of these power-lines can deteriorate and this will result in poor Transmission power-line performance.

The Western Cape has suffered a great number of power outages in the last number of months. In November 2005 Jacob Maroga, the Eskom MD for Transmission, stated that rolling blackouts or selective power cuts could be with the Western Cape and Eastern Cape until end 2007, at least until a R1,1bn project to upgrade Transmission power-lines from Mpumalanga to Koeberg is finished. The Cape Times, on 28 November 2005, wrote that measures would have to be taken in "…helping to fend off the type of crisis that the Koeberg blackouts seem to suggest will, sooner or later, inevitably become a routine part of life in the province." Therefore, the present situation in the Western Cape is clearly untenable from an electricity perspective, both for the user and the supplier.

The natural growth for electricity demand has increased at a steady 2% per annum average load growth for the area to Greater Cape Region south of Bloemfontein. Compounding this growth, a 'step load' (i.e. a rapid jump in electricity demand) is anticipated by May 2009 for the planned aluminium and steel smelter plants in the Coega Industrial Development Zone (IDZ) near Port Elizabeth in the Eastern Cape. The steel smelter will consist of three arc furnaces, steel mills and a steel beneficiary plant. When fully operational the steel smelter is expected to consume about 500 megawatts of electricity. In so far as the aluminium smelter is concerned, aluminium smelting is a very energy-intensive process. On average, it takes some 15.7 kWh of electricity to produce one kilogram of aluminium from alumina (www.world-aluminium.org 2006). The Coega Smelter Project is expected to produce up to 660kt of aluminium per annum (www.alcan.inc 2006), roughly translating to a demand of 1,04 x 107MWh per annum or 1500MW constantly for the aluminium smelter alone, excluding other industries and the predicted growth for the area.

As such, it is expected that the demand for power in South Africa will exceed supply in 2009, which has obvious implications for the entire Cape region and for the South African economy as a whole. The economic cost to the Greater Cape region as a whole could amount to millions of Rands should there be deterioration in the quality and reliability of the electricity supply. It is also Eskom's intention to provide more reliable power supply to the Western Cape by providing an alternative Transmission power-line to the province. At this stage, all the power from Mpumalanga to the Western and Northern Cape runs through the Hydra substation near De Aar. Eskom is also planning to construct a 765kV transmission power-line from Hydra substation to the proposed Omega substation near Koeberg, as well as two peaking gas-fired generation plants at Atlantis and Mosselbay in order to supply the necessary power to the Western Grid.

In order to meet these needs, Eskom proposes to import power from the 800MW Kudu CCGT (Combined Cycle Gas Turbine) power station at Uubvlei, 15km north of Oranjemond in Namibia. NamPower will only require 200MW to secure their domestic supply, of which

the balance will be made available to Eskom for integration. It is proposed that the power from the Kudu CCGT power station will be integrated into the Eskom grid via a 400kV Transmission power-line from the Namibian border to Oranjemond, Gromis and Juno substations to supply the increasing demand in the Western Cape. As such, it is clear that a new Transmission power-line will be needed in order to exploit the power supply now available. This power produced by the Kudu CCGT power station will increase the reliability of power supply in the Western Grid, which encompasses substantial portions of the Northern and Western Cape Provinces and reduce the sensitivity of the Koeberg power station. The new Transmission power-line will be brought into operation at the time when the Kudu power station becomes operational. It is, however, required to secure the necessary servitudes beforehand to ensure this will be possible.

SECTION 3: STATUS QUO OF THE ENVIRONMENT

3.1 PHYSICAL ENVIRONMENT

3.1.1 Geology

The geology of Namaqualand is extremely complex (Meadows and Watkeys *in press* in www.gouritz.com). The Richtersveld comprises a varied sequence of rocks that were extensively intruded by granite and gneiss of the Namaqua Metamorphic Province.
The escarpment zone to the south is almost entirely composed of the majestic bornhardts, nubbins and castle koppies derived from the erosion of these metamorphic rocks. This region is locally known as the Hardeveld.

Sedimentary rocks deposited in a proto-South Atlantic Ocean basin after continental rifting are extensively exposed in the south. Here they form the wide floor of the palaeo-Orange River delta where weathering of quartz veins has deposited large expanses of white pebbles in an area known as the Knersvlakte. The Orange, southern Africa's largest river, now enters the sea several hundred kilometres to the north where it forms the border between Namibia and South Africa. The valuable load of gem diamonds carried in the ancient river was transported northwards by the Benguela Current and deposited in marine terraces along the coast. These terraces are now the source of Namaqualand's diamond wealth.
The level coastal plain (the Sandveld) consists of a complex sequence of marine and wind-blown sands ranging from weathered and fine-grained deposits of late Tertiary age to the recent white sands of the coastal margin.
The rocks of the Southern Karoo are younger than those of Namaqualand. Karroid vegetation occurs on the finer-grained shales of the bottomlands; fynbos grows on the resistant sandstone of the wetter mountains. Conglomerates and mudstones have accumulated in faulted basins adjacent to the mountains.
The Tanqua Karoo is underlain by rocks of the Mesozoic Karoo Sequence. The escarpment zone of the Western Mountain Karoo is structured by erosion-resistant dolerite and Karoo sandstone (source: www.gouritz.com)

3.1.2 Soils

The soils in the study area are characteristic of the soils of the Succulent Karoo Biome: lime-rich and weakly developed soils on rock (Low & Rebelo 1998). Due to the very low rainfall, this area has a limited agricultural potential. In the vicinity of Lutzville, though, the soils are of high arable potential and the Transmission power-line must be located away from these areas.

3.1.3 Topography

Namaqualand is generally characterised by flat to gently undulating topography. The ground slope is gentle (<5°) over the majority of the study area. In the vicinity of Kamieskroon, however, the coastal plain gives way to broken granite ridges and outcrops with large granite boulders dotting the landscape. Certain slopes exceed 20% in this area. The study area varies from 50m in the west to 1000m above mean sea level in the east.

3.1.4 Hydrology

The area is bounded by the perennial Orange and Olifants rivers in the north and south respectively. There are few perennial rivers within the study area, but water from the Droërivier is used for irrigation purposes. Within the study area there are a plethora of small non-perennial rivers, including the Arkoep, Augabies, Bitter, Bloubos, Brand, Doring, Droëkraal se Leegte, Eenklipbok, Eselsfontein, Goerap, Haas, Holgat, Horees, Kamma, Komaggas, Kys, Outeep, Rooiberg, Sannagas, Skaap, Sout, Stinkfontein, Stry, Swartdoring, Swartlintjies, Wolwepoort and Rivers. The larger non-perennial rivers that reach the Atlantic Ocean in the west include the Buffels, Spoeg, Groen rivers.

3.1.5 Climate

3.1.5.1 Temperature & Precipitation

The Succulent Karoo – where most of the proposed development will take place – is determined by low winter rainfall and extreme summer aridity. Rainfall throughout the study area is of a cyclonic nature, and as such has far less erosive power than rain in similarly arid areas where rain falls in summer. Rainfall varies between 20 and 290mm per year. Summer temperatures in excess of 40ºC are common. Fog is common near the coast – upon which many plants depend for water – and frost is infrequent. Desiccating, hot Berg winds may occur throughout the year. Upland Succulent Karoo is characterised by rainfall of 150 to 300mm p/a, and Lowland Succulent Karoo 50 to 200mm p/a.

Renosterveld is part of the Fynbos biome, characterised by rainfall between 250 and 600mm of rain per year, of which 30% falls in winter. The rainfall of North-Western Mountain Renosterveld, specifically, varies from 250 to 350mm and above per year where Fynbos becomes dominant (Low & Rebelo 1998).

3.1.5.2 Wind

Wind roses are provided for 2 weather stations, one in the south at Lutzville and one in the centre of the proposed development at Namaqua National Park.

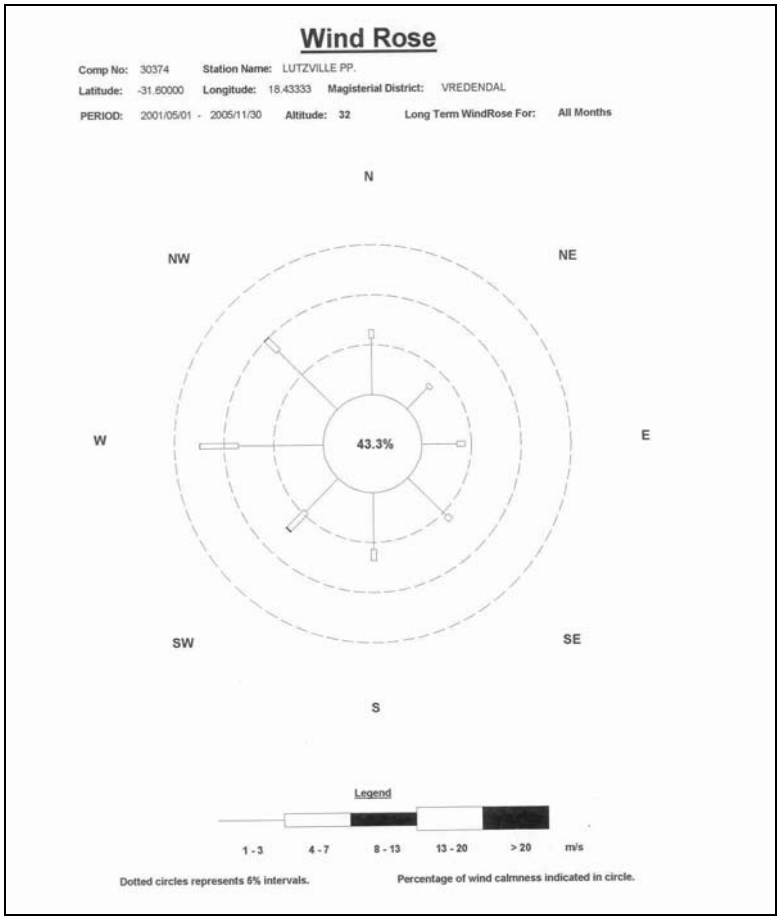

Figure 3 Wind rose for Lutzville

As can be seen on the wind rose, the wind blows in a westerly to north-westerly direction for most of the year, with there being no wind 43.3% of the time.

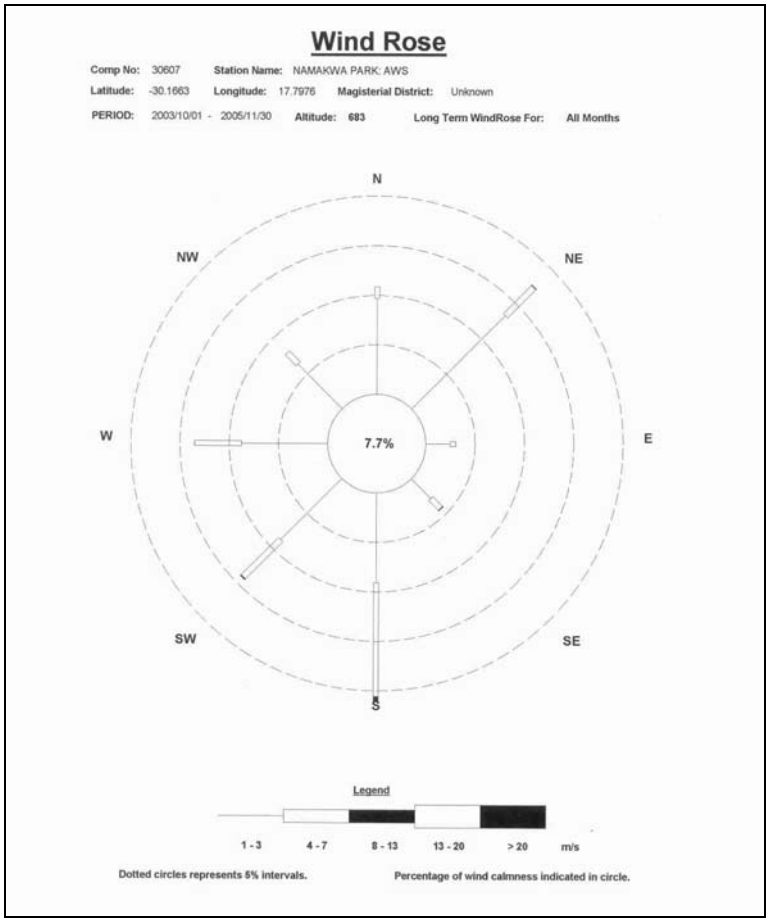

Figure 4 Wind rose for Namaqua National Park

As can be seen on the wind rose, the wind direction varies greatly, from north-easterly to southerly to south-westerly. There is no wind for 7.7% of the year.

3.1.6 Land Use

Due to the size of the study area, there are a range of current land uses, ranging from mining practices in the north and west (Alexcor, De Beers, Namaqua Sands) to agriculture in the south, with the bulk of the area being used for extensive stock farming. There is also a range of nature conservation activities, most notably the Namaqua National Park in the centre of the study area.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Flora

Namaqualand is a winter-rainfall desert of some 60 000km^2 extent, where most areas receive less than 150 mm of actual rain per year. Plant geographers define Namaqualand as that part of southern Africa's Succulent Karoo that is strongly influenced by winter rainfall and fog. The region is conveniently and naturally divided into five subregions. To the south lies the Knersvlakte, a vast, undulating plain that formed the swampy delta of an ancient river. The predominant vegetation is vygieveld, a dwarf shrubland dominated by leaf-succulent shrubs, mostly mesembs (these are known locally as vygies or small figs). The hallmark of the Knersvlakte is the extensive patches of white quartz gravel. The region is a recognized centre of endemism, harbouring at least 150 endemic species – with frequent new discoveries being made – including all ten species of *Argyroderma* and all three species of *Oophytum*, both miniature mesemb genera (Cowling & Pierce 2000).

To the north of the Knersvlakte lies the Hardeveld, a broken granite landscape. The Hardeveld represents the south-western sector of Southern Africa's Great Escarpment, an arc of mountainous terrain that separates the elevated inland plateau, or highveld, from the coastal forelands. Owing to the higher rainfall and cooler conditions experienced in these uplands, the vegetation is more luxuriant than on the lower-lying areas. Here the matrix of succulent shrubs is broken by scattered trees, principally species of *Rhus, Ozoroa* (both Anacardiaceae) and *Ficus* (Moraceae), as well as the quiver tree (*Aloe dichotoma*, Asphodelaceae) (Cowling & Pierce 2000).

The highest part of this escarpment zone comprises a cluster of massive granite domes, rising to over 1700 m and known as the Kamiesberg. Here the rainfall on the coast-facing slopes is sufficient to support fynbos, the vegetation that is typical of the Cape Floral Kingdom. Elsewhere evergreen shrubs, mostly members of the daisy family represented by *Tripteris, Euryops, Elytropappus, Eriocephalus, Berkheya* and *Didelta*, dominate the plant life. Succulents, especially miniatures, are largely restricted to fissures in the granite bedrock (Cowling & Pierce 2000).

Like the Knersvlakte, the Kamiesberg is also a recognised centre of plant endemism. No fewer than 86 species are endemic to the region. Most are bulbs, especially irids in the genera *Babiana, Moraea, Romulaea* and *Lapeirousia*. The area also has its share of dwarf succulent endemics, including species of Cheiridopsis and Conophytum (Cowling & Pierce 2000).

The western margin of Namaqualand, bounded by the cold Atlantic Ocean, comprises an extensive coastal plain, the Sandveld. The most widespread vegetation is strandveld, a tallish shrubland of leaf-succulent and summer-deciduous shrubs associated with sands of marine origin. The wind-blown acid sands of the Sandveld – derived from river-borne sediments – support a very dry form of fynbos, remote from the Cape Floral Kingdom stronghold (Cowling & Pierce 2000).

There are a number of aspects regarding the flora of Namaqualand that have to be emphasised. Firstly, the diversity of species is unparalleled. Namaqualand has a flora of about 3000 species distributed among 648 genera and 107 families. This is a very large number of species, at least four times richer than for similar-sized areas of winter-rainfall deserts elsewhere. The region also has an extraordinarily high level of endemism, with about half of its plant species found nowhere else. Another noteworthy aspect of Namaqualand's flora is the extraordinarily high number of succulents, especially leaf succulents. There are about 1000 succulent species in the region, comprising about one third of the flora and 10% of the world's succulents. A third feature is the

diversity of tiny, often contracted miniature perennials, less than 10 cm tall. There are at least 250 miniatures in the Namaqualand flora, most mesembs but also crassulas and euphorbias, as well as bulbous plants. Fourthly, Namaqualand has, for a desert, a uniquely rich bulb flora. The region is home to 480 species, distributed across 100 genera and 19 families. This tally represents about 16% of the total flora, five to ten times more than any other winter rainfall desert. Finally, the feature most commonly associated with Namaqualand is the colourful floral display that begins in autumn and peaks in early spring. What is peculiar about Namaqualand is that these blooms of desert ephemerals appear, at least somewhere, every year (Cowling & Pierce 2000).
Along the coast in the north of the study area there are large areas that have been disturbed by mining practices. Further inland, however, the vegetation is largely undisturbed, especially within the Namaqua National Park and Skilpad Flower Reserve. Despite these initiatives, much of Namaqualand's biodiversity will remain unconserved. It has been estimated that some two-thirds of the region is needed to protect at least one population of each of Namaqualand's 456 Red Data Book plant species (Cowling & Pierce 2000).
The Transmission power-line will cross through Lowland and Upland Succulent Karoo in the Succulent Karoo Biome and – depending upon the exact placing of the line – North-Western Mountain Renosterveld, which is part of the Fynbos biome (Low & Rebelo 1996). The sensitive environments that the proposed power-line crosses through include the Jaagleegte quartz patch and the Knersvlakte Quartz Vygieveld (Helme, 2006).

3.2.2 Fauna

The Succulent Karoo does not support a large biomass of terrestrial fauna, Unlike the summer rainfall karroid areas of southern Africa, the fauna of the Succulent Karoo is rich in endemics, especially among arachnids, hopliniid beetles, aculeate hymenoptera and reptiles (Vernon in press in www.gouritz.com).

The predictable rainfall appears to have selected for resident forms of invertebrates and small vertebrates, thus resulting in isolation and speciation. There are 78 mammals in the Succulent Karoo of which four are endemic. At 269 species, the bird fauna of the Succulent Karoo is not especially rich. It does, however, include 24 arid-adapted species (also occurring in adjacent arid biomes) and one endemic (the recently described Barlow's lark *Certhilauda barlowi*). The reptile fauna is particularly speciose. 60% of the herpetofauna from Namaqualand are endemic to the area (Loubser, Mouton and Nel, 2001). Thirty of the 72 species of lizard are endemic (the genus *Cordylis* is especially rich with seven endemics). Six of the world's 40 tortoise species are found in the Succulent Karoo, including the endemic speckled padloper (*Homopus signatus*). There are four endemic snakes (out of a total of 38 spp.) and four endemic frogs (out of 10). Among the invertebrates, 22 of the 50 scorpions in the Succulent Karoo are endemic (Vernon in press in www.gouritz.com). Monkey beetles (Rutelinae: Hopliini), a group largely endemic to southern Africa, are concentrated in the Succulent Karoo where some genera are important pollinators of daisies and mesembs (Aizoaceae: Mesembryanthema). Hymenoptera are important pollinators during the short spring-flowering season. Masarine wasps as well as colletid, fideliid and melittid bees all have centers of diversity and endemism in the region. Among the last-mentioned are species of *Redviva*, oil-collecting bees which pollinate species of *Nemesia* and *Diascia*. All of these pollinators have played an important role in shaping flower morphology and hence, driving speciation in the Succulent Karoo. The endemic fauna of the Succulent Karoo is mostly

inconspicuous. Girdled lizards (*Cordylis spp.*) of which seven are endemic to the Succulent Karoo, are characteristic of the region and readily observed (Lovegrove 1993 in www.gouritz.com). The armadillo girdled lizard *Cordylis cataphractus,* an inhabitant of Namaqualand's rocky outcrops, has a well-armored body and spiny tail. It is renowned for its defensive habit of rolling into a tight ball.

Two large and conspicuous birds, both endemic to southern Africa, are most commonly seen in the Succulent Karoo. The Black Harrier *Circus maurus*, with its distinctive black-and-white plumage, has the most restricted range of the world's 13 harrier species (Harrison et al. 1997 in www.gouritz.com). This striking bird is frequently observed hunting over the Namaqualand plains. The black korhaan *Eupodotis afra* is a near-endemic to the Succulent Karoo; its range extends marginally into the drier areas of the adjacent Cape region. It is especially common in the arid Sandveld of the Namaqualand coastal plain.
(source: www.gouritz.com)

3.3 VISUAL QUALITY

On a macro-scale, the area is characterised by the largely flat coastal plain in the west which ends at the foothills of the Kamiesberg Mountains in the East. These broken granite hills and ridges give way to the inland plateau and Great Karoo further to the east. On a micro-scale the area is characterised by the low succulent vegetation, with substrates varying from quartz pebbles to dark ilmenite streaks in red sand to bare granite. The lack of trees throughout most of the study area implies that the area receives its vertical definition from the hills and mountains. Keystone visual stimuli include the distinctive kokerboom (Aloe dichotoma) and the annual colourful blooms of desert ephemerals. The general lack of infrastructure in the area has as result that the area is characterised by its sense of openness and wilderness.

The landscape character changes considerably through the study area. The study area is divided into distinct landscape types which are areas within the study area that is relatively homogenous in character (Swanwick, 2002). Landscape types are distinguished by differences in topographical features, vegetation communities and patterns, land use and human settlement pattern.

Generally, the study area is vacant and uninterrupted, covered with a uniformly textured vegetation layer. Extensive landscape disturbance originate from mining activities and is visible in a narrow strip along the coast line. Isolated occurrences of agriculture are found between the coast and the Kamiesberg Range which become more intense further south and around Vredendal. Human settlements are far apart and portray a remote country lifestyle.

For ten months of the year the landscape of the Northern Cape is a dry and semi-arid desert landscape. This rapidly changes after the first rains when the landscape bursts into an array of rainbow colours during August and September. The Namaqualand is renowned for its abundant flower display in the spring season (see Figure 5). The vegetation diversity in the study area is exceptional and unique. For a few months each year the area in and around the NNP is a hotspot for tourists experiencing the floral marvel. The following broad scale landscape types have been delineated in the study area. The assessment is done on a macro-scale and discusses the predominant landscape conditions and visual characteristics found in a particular landscape type. Each landscape type is given a descriptive name which relates to the vegetation type, topography and/or land use of the region (Adapted from Van Riet *et al,* 1997);

Figure 5 Spring flowers in Goegap Nature Reserve

- Orange River Valley;
- Strandveld Coast Line;
- Disturbed Strandveld Coast Line;
- Lowland Succulent Karoo plains;
- Kamiesberg Succulent Karoo;
- Vredendal Agricultural; and
- Olifants River Valley.

3.3.1 Orange River Valley

The Orange River meets the ocean at Alexander Bay and forms a natural border between South Africa and Namibia. Its wide flood plain and curving movement carves a sinuous path through an arid, desert-like landscape. A striking contrast is created between the white desert sand dunes and the sinuous green corridors flanking the brown water of the Orange River.

Stunted succulent grow in the whitish sand causing a distinct mottled texture on the undulating sand dunes. Rocky outcrops are visible on the steeper slopes and create shelter for slightly higher growing succulent plants.

The smooth rounded shapes of the sand dunes dictate the flow of the river through a barren landscape. The interactive motion of these two natural features are harmonised and evokes the impression of an aged and mature landscape.

The Orange River Valley is generally free from human intervention. A border post outside Alexander Bay provides a bridge over the river. A few kilometres east, a transmission line crosses the river from the Namibian side to meet with the Oranjemond Substation situated among the sand dunes.

3.3.2 Strandveld Coast Line and Disturbed Strandveld Coast Line

The Strandveld Coast Line is a low lying coastal plain parallel to the cold and windy Atlantic Ocean. Sandy beaches create a white edge along the grey-blue ocean. The sand dunes extend into the landscape creating a rolling topography fading out into the Lowland Succulent Karoo plains. Low growing vegetation creates a homogenous dappled texture on the dunes which is for most parts of the year a dark brown to grey colour.

Large parts of the coast line are highly disturbed resulting from mining activities. Remnants of the mining activities can be seen from Alexander Bay to Kleinzee and again near Koingnaas and Hondeklipbaai. The mining created scars in the landscape that is devoid of vegetation and exposes the pure white sand that lies beneath. The mining activity is declining and it is expected that rehabilitation will follow. Rehabilitation of the disturbed areas may take several years as the local vegetation takes an exceptional long time to re-establish.

The hostile weather conditions and limited freshwater supplies are responsible for a mostly vacant coastline. Large parts of the coast line have mining rights and public access to the seashore is restricted. The R382 is the only tar road that connects Alexander Bay and Port Nolloth from where it turns east to Steinkopf and joins up with the N7 national highway. Isolated towns are widely spaces along the coast line and are usually found next to river outlets or at the convergence of main roads. The towns are small of which a strong fisherman influence dictates the architecture. White, lime painted buildings accommodates the simple subsistence lifestyles of the inhabitants and can be described as elementary but typical of the west and north coast.

The proposed expansion of the NNP extents south of Hondeklipbaai to Groenriviersmond further south. This will include an estimated 50 km stretch of the Strandveld Coast line in the park's management boundaries. This part of the coast line is relatively unspoilt and are classified as a protected area, hence the proposed NNP expansion.

3.3.3 Lowland Succulent Karoo plains

The Lowland Succulent Karoo plains are a transition zone between the Strandveld Coastline and the elevated topography of the Kamiesberg Range. This landscape type extends in a north-south direction from the Orange River Valley to the Vredendal Agricultural landscape types, parallel to the coast line.

The wind struck landscape is slightly undulating with the occasional river corridor engraved in the plains. The predominantly rolling plains become noticeably elevated towards the east as it extends into the foothills of the Kamiesberg Range. The transition between the Lowland Succulent Karoo plains and the Kamiesberg Succulent Karoo is gradual and the distinction rather ill-defined. The hilly terrain of the Lowland Succulent Karoo plains can be described as moderately varied with the hills gradually folding towards the drainage lines and covered in a homogeneous vegetation layer.

The vegetation is sparse but becomes noticeably denser to the south as one move into a higher rainfall zone. Vegetation appears dark brown for most of the year with the exception during late winter and spring when the earth becomes alive with vibrant flower masses after

the rain. This spectacular floral burst can be appreciated over most of the Lowland Succulent Karoo plains but is concentrated in and around the NNP.

The undulating plains are mostly undisturbed covered with the typical stunted vegetation layer. Fallow farming fields are present from time to time and cause large rectangular blocks, cleared of vegetation and exposing the light brown sandy soil of this semi-arid region. Dirt roads leave distinct white streaks over the plains and are visible from great distances due to the discrete colour contrast.

3.3.4 Kamiesberg Succulent Karoo

The Kamiesberg Mountain Range defines the eastern side of the study area and forms an escarpment between the Namaqualand on the western Karoo on the east. The topography is highly variable and deeply fissured canyons are overlooked by steep rocky cliffs. Repetitive dome shaped hills extent into the horizon. The architectural Quiver Tree (*Aloe dichotoma*) is often seen on the side slopes of the rocky hills and is distinct feature of the Richtersveld, in the northern parts of the Kamiesberg Mountain Range. Karroid vegetation is restricted to the crests and side slopes of the hills amongst the rocks. The sandy river beds are often recognised for dense Acacia-type shrubs, weaving through the harsh and dry landscape.

Human settlements are far apart and are usually single or a small cluster of buildings. Gravel roads are lined with sheep fences with the occasional cultivated farm land on the flatter areas. The N7 traverses this landscape and is a main connection route from the Western Cape to Namibia.

3.3.5 Vredendal Agricultural

The higher rainfall conditions in the south of the study area and the sandy soils on the plains make this area highly suitable for agriculture. A definite increase in agricultural activity is evident as one approach Vredendal, converting the unspoilt plains of the Lowland Succulent Karoo into a cultivated landscape.

The Juno substation is located on the outskirts of Vredendal among the cultivated cropland and is clearly visible. A convergence of transmission lines and vertically jutting steel structures are foreign elements and contrasts with the horizontal lines in the landscape.

3.3.6 Olifants River Valley

The Olifants River is the second largest river in the study area and is some 400 km south of the Orange River. The historic floodplains are utilised for the production of grapes and the regular spacing of the vineyards create a picturesque scene on the banks of the Orange River leading to the town of Vredendal. The town flanks the Olifants River and appears as a conglomeration of light coloured buildings surrounded by the rectangular shaped vineyards. The plains fold around the drainage lines creating the typical rolling and undulating landscape found in the Lowland Succulent Karoo.

Visual quality is a qualitative evaluation of the composition of landscape components and their excellence in scenic attractiveness. Many factors contribute to the visual quality of the landscape and are grouped under the following main categories (Table 1) that are internationally accepted indicators of visual quality (FHWA, 1981):

Table 1: Criteria of Visual Quality (FHWA, 1981)

INDICATOR	CRITERIA
Vividness	The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.
Intactness	The integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.
Unity	The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony of inter-compatibility between landscape elements.

The landscape is allocated a rating from an evaluation scale of 1 to 7 and divided by 3 to get an average. The evaluation scale is as follows: Very Low =1; Low =2; Moderately Low =3; Moderate =4; Moderately High =5; High =6; Very High =7;

The landscape types are assessed against each indicator separately. All three indicators should be *high* to obtain a *high* visual quality. The visual quality is assessed on a regional scale and therefore expresses the predominant visual quality of each landscape type. The evaluation is summarised in Table 2.

Table 2: Visual Quality of the regional landscape

LANDSCAPE TYPE	VIVIDNESS	INTACTNESS	UNITY	VISUAL QUALITY
Orange River Valley	7	6	5	High
Strandveld Coast Line	5	4	4	Moderate
Disturbed Standveld Coast Line	3	1	1	Low
Lowland Succulent Karoo plains	6	6	5	High
Kamiesberg Succulent Karoo	7	6	6	High
Olifants River Valley	5	4	4	Moderate
Vredendal Agricultural	3	3	3	Moderate low

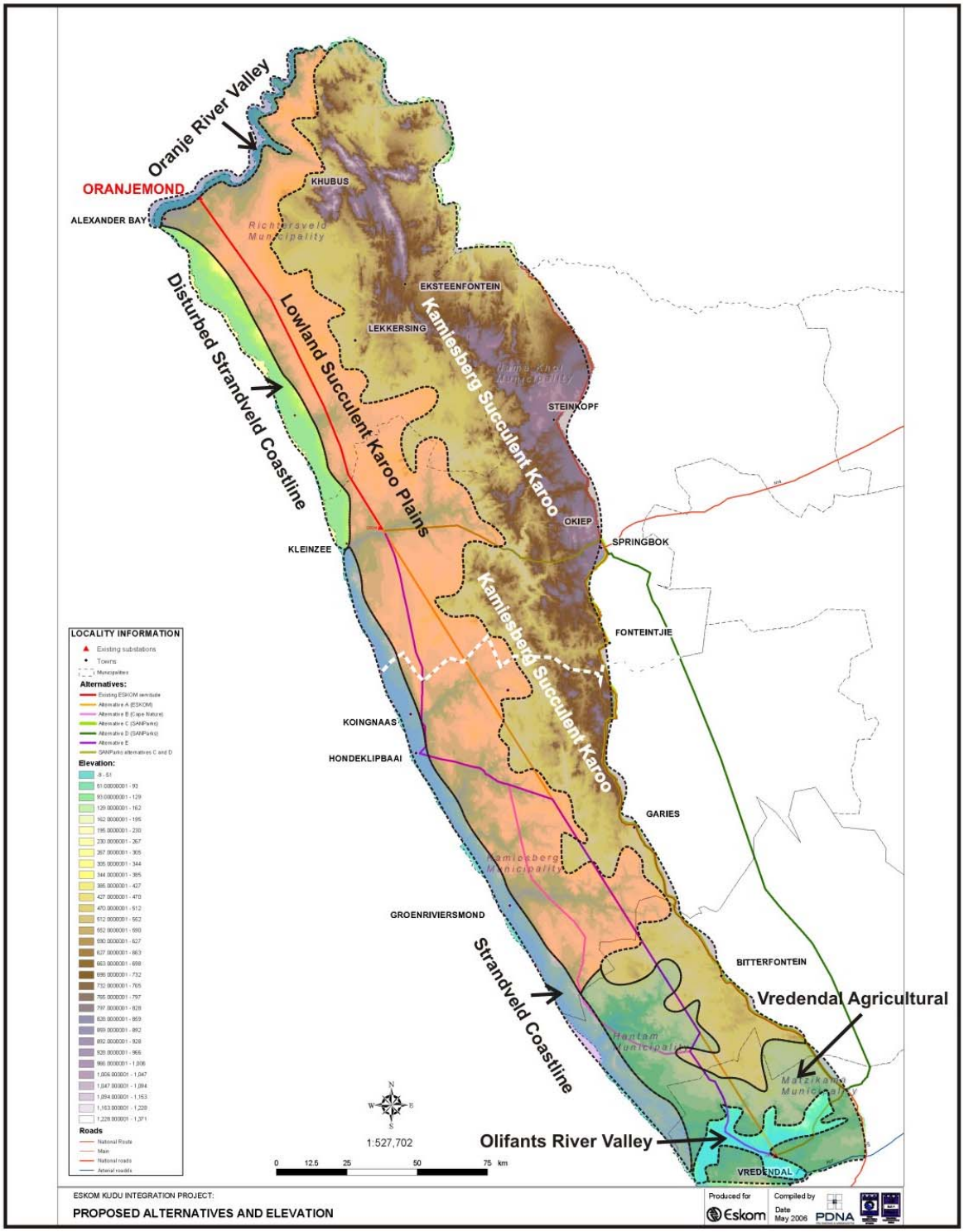

Figure 6 Vegetation types and elevation

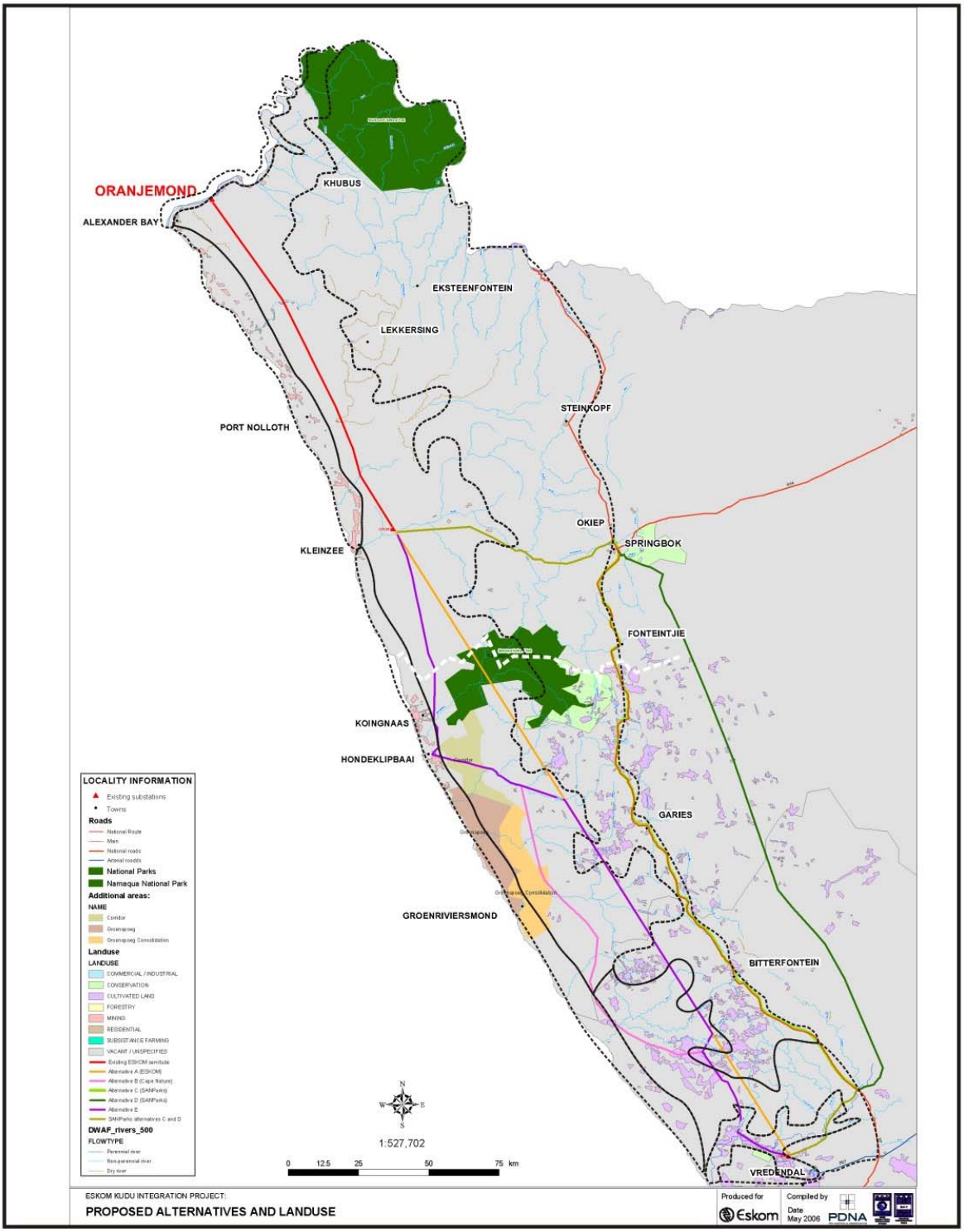

Figure 7: Land use

3.4 HERITAGE RESOURCES

Since the proposed route covers a variety of landscapes between the Gariep River (Oranjemond substation) and Vredendal (Juno substation), the specialist team was shown the area from the air. The findings of this study are therefore extrapolated from aerial observations, prior experience, work of colleagues and others. While the coastal areas and to some extent the Kamiesberg Mountains are relatively well understood in terms of heritage, no work has taken place on the coastal plains.

While no specific preferences are given in terms of the corridor, it is suggested that rocky outcrops, low hills and ridges be avoided as this is where the predominant heritage of the area (archaeological sites) are likely to occur. It will also be necessary (where appropriate) to consult with Nama communities where the route passes close to their grazing lands. It is also suggested that the route be kept away from the N7 so as not to impact its visual amenity value.

Impacts to heritage are likely to low due to the sparse nature of human settlement away from the coast. It is recommended that the route be ground-proofed (and mitigation applied through minor adjustment or recording and sampling) once other environmental and economic considerations allow for design of a proposed route.

3.5 SOCIO-ECONOMIC ENVIRONMENT

Unemployment is prevalent throughout the study area and remains a strong interest amongst interested and affected parties regarding potential job creation and economic spin-offs that the project might bring about. Unfortunately most of the work that needs to be done is of a skilled nature and is, as such, not a great source of employment.

Although official figures were not available at the time of writing this report, HIV is prevalent in the study area and I&APs expressed concerns about the potential risk of exposure that could result from the presence of construction camps.

Directly affected landowners raised concerns regarding the negotiation and compensation for land and infrastructure, as well as the impact of the Transmission power-line on the future development of land-based enterprises, such as game and tourism operations.

The Kudu integration project is not intended for nor does it propose to provide power for the many towns in the study area. This, in conjunction with the fact that the Northern Cape and the northern reaches of the Western Cape are sparsely populated, the long-term effects on the socio-economic environment are less than would have been the case for a distribution project. The greatest beneficiaries of the project are remote from the study area, namely the inhabitants and businesses in the Western Cape and, to a lesser degree, the Coega development in the Eastern Cape.

Tourism in the region is largely based upon the seasonal blooms of desert ephemeral flowers. 6152 tourists visited the Namaqua National Park during the 1999 season (05/08/99 - 26/09/99)

SECTION 4: PUBLIC PARTICIPATION

4.1 INTRODUCTION

Public participation plays an important role in the compilation of an environmental impact assessment as well as the planning, design and implementation of the project.

Public participation is a process leading to informed decision-making, through joint effort by the:

- Proponent;
- Technical experts;
- Governmental authorities; and
- Interested and Affected Parties (I&APs)

Public participation is a vehicle for public input, which achieves the following:

- Facilitates negotiated outcomes;
- Creates trust and partnership;
- Minimises negative effects;
- Maximises positive effects;
- Provides an indication of issues, which may
    - Prevent the project continuing;
    - Cause costly delays later; and
    - Result in enhance and shared benefits.

Through the public participation process, SEF endeavoured to involve potential I&APs. The issues arising from the public participation process have been incorporated into the draft Scoping Report and used in determining mitigation measures for the project.

4.2 PROCESS FOLLOWED

The following process was undertaken to facilitate the public participation for the proposed project, which commenced on 23 January 2006.

4.2.1 Newspaper Advertisement

An advertisement, notifying the public of the EIA process and requesting I&APs to register their comments with SEF, was placed in Die Burger on 24 January 2006 and Ons Kontrei and Volksblad on 27 January 2006.

4.2.2 Site notices, information pamphlets and Background Information Documents (BIDs)

In order to inform surrounding communities and immediately adjacent landowners of the proposed development; site notices were erected at visible locations within towns throughout the area of the proposed Transmission power-line from the 24 – 27 January 2006. The numbers of site notices erected within each town are tabulated in Table 3, as well as the number of packages containing information pamphlets (IPs) and BIDs that were placed within each town.

Table 3 Site notice, IP and BID notifications per locality

TOWN NAME	NUMBER OF SITE NOTICES[1]	NUMBER OF IP & BID PACKAGES[2]
Vanrhynsdorp	2	30
Nuwerus	2	20
Bitterfontein	1	20
Garies	2	40
Kammieskroon	1	20
Springbok	4	90[3]
Nababeep	1	20
Okiep	1	20
Steinkopf	1	20
Eksteenfontein	1	20
Kuboes	1	20
Alexanderbaai	2	40
Port Nolloth	4	50
Kleinzee (at security entrance)	1	20
Gromis Substation	1	0
Buffelsrivier	2	40
Kommagas	1	20
Soebatsfontein	1	20
Koiingnaas	1	20
Hondeklipbaai	1	30
Koekenaap	1	30
Lutzville	1	30
Vredendal	2	40[4]
TOTAL 23 towns	35 Site notices	660 BID's

[1] Site notices were put up in sets consisting of one English & one Afrikaans notice
[2] IP & BID packages were placed at Post Offices within each town.
[3] Packages in Springbok were divided into three batches of 30 placed at the NamaKhoi Municipality, Namaqua District Municipality and the Post Office.
[4] Packages were placed at the Kentucky Fried Chicken (KFC) outlet.

4.2.3 Direct Notification of Identified I&APs

Key stakeholders, who included the following sectors, were directly informed of the proposed development by e-mail, post and fax on 23-27January 2006.

- Authorities;
- Service providers;
- Residential Associations; and
- Non-governmental organizations.

4.2.4 Key Stakeholder Meetings

The main key stakeholders involved in the public consultation process include SANParks and CapeNature. The first round of key stakeholder meetings was held in Port Nolloth on 7 February 2006 and in Garies on 9 February 2006. The second round of key stakeholder workshops took place on 7 March 2006 in Kamieskroon in the afternoon and Vanrhynsdorp in the evening. The specific aim of these meetings was to inform the key stakeholders of Eskom's intention to construct the Transmission power-line and to obtain their input regarding the route that line is to follow.

Accordingly, construction of the line is planned for the year 2007 and the commissioning of the line is planned for 2008 (i.e. fifteen months after construction commences). Various factors need to be considered in the execution of the environmental investigation at present, namely:

- Firstly, the reliability of the existing power supply to the Western Cape is under increasing demand, which means that a new line will contribute to strengthening of this supply.
- Secondly, the prediction for the growth in demand for additional electricity in the Western Cape shows that the current system – where power is fed from the coal-fired stations in Mpumalanga – will not be able to cope with the predicted demands, especially when the proposed Coega development in the Eastern Cape commences in near future.
- Thirdly, Eskom Transmission aims to develop the national electricity grid in such a manner as to secure uninterrupted power supply to different parts of the country. This requires that the national grid should be based on a system whereby the supply to a specific area comes through more than one route.

The key stakeholders raised two main concerns regarding the erection of the Transmission power-line. Firstly, that no construction is to take place within the Knersvlakte due to the highly sensitive nature of this area, and secondly that the Transmission power-lines be erected along or

near sites that are already disturbed such as major tarred roads (e.g. the N7). In order of preference, the proposed alternatives are:

- Transmission power-lines should be erected along the coast and cross through the Namaqua National Park along the Rondeklip road and then directly south.
- Transmission power-lines should be erected through the Boesmanland area via Springbok and Vaalputs, along existing power-lines/ railway lines.
- Transmission power-lines should be erected along the N7.

Detail with regards to these different alternatives will be given in Section 5: Alternatives

4.2.5 Public Open Day Meetings

Public open day meetings were held to allow the surrounding communities to voice their opinions and concerns regarding the Kudu-Eskom project. Details of the project were presented to those who attended and the public were given an opportunity to respond. Main concerns raised within these meetings were the following:

- The sensitivity of the Knersvlakte ecosystem and the refusal to see this biome disturbed.
- That the local communities would not benefit from the Transmission power-lines erected. This was viewed as grossly unfair in that their landscape will be visually scared to provide another area (i.e. Cape Town) with more electricity.
- The effect Transmission power-lines would have on the tourism industry in the area, especially with regards to the coastal and N7 alternatives proposed by SANParks.

In essence the public understood the need for the Transmission power-line and agreed that developments such as these would take place in the future. However, they also argue the need for Eskom to benefit the communities living in the area of the proposed Transmission power-line; the following were put forward for consideration by Eskom: subsidised or free electricity for farmers and surrounding towns; employment of locally skilled and unskilled people during the construction phase as well as capacity building and empowerment of local communities.
I&APs were given 30 days to comment and or raise issues of concern regarding the proposed development. The period for comment expired on 22 February 2006.
Interested and affected parties registered by completing registration forms, sending comments by email, fax, post, telephonically and attending project meetings.
The minutes of the meetings are summarised in Appendix 3. Identified and registered I&APs were entered into an electronic database, summarised in Appendix 4. The Issues and Responses Report are included in Appendix 5. The site notices and background information document follow in Appendices 6 and 7 respectively.

4.3 DRAFT SCOPING REPORT FOR REVIEW

On 8 April 2006 the draft Scoping Report was made available for public review. It was placed at easily accessible venues in the project area, as well as on SEF's website. The Report was available for a 30-day period and all registered I&APs were directly informed of the availability of the draft Report.

4.4 ISSUES RAISED

Based on the comments and concerns received during the public participation process, it is evident that the main concerns are:

- Environmental effects of the proposed Transmission power-line, specifically on the Knersvlakte;
- Benefits to local communities in the affected area; and
- Visual effects with regards to tourism in the area.

These concerns have been carefully considered and appropriate mitigation measures are suggested to address them.

4.5 EIA REVIEW PERIOD

This draft Environmental Impact Report is being provided for public comment for a period of 30 calendar days from 20 November 2006 to 22 January 2007. During this time (January 2007), should numerous key stakeholders request it, meetings presenting the draft findings of the EIA investigation will be held. Comments collected at these meetings, as well as written comments submitted to SEF will be incorporated into the comments and response report (forming part of the EIR) and addressed in the EIR. The final EIR will then be submitted to the National Department of Environmental Affairs and Tourism; the Northern Cape Department of Tourism, Environment and Conservation and the Western Cape Department of Environmental Affairs and Development Planning for decision-making.

ISSUES AND RESPONSE REPORT

Issues / comment raised by:	*Date*	*Means of communication*	*Issue / comment*	*Response*
GUIDELINES TO BE FOLLOWED				
B. Conradie	24 Jan 2006	Registration form	Emphasised that the requirements of the National Water Act 1998 (Act 36 of 1998) must be adhered to.	All legal requirements will be adhered to.
C. de Villiers (Botanical Society of South Africa, Conservation Unit) V. Bowie (Scientific Services – Cape Nature)	27 Jan, 22 Feb, 12 April 2006	E-mail & Faxed letter	Ensure that the specialist report regarding biodiversity follow the terms of reference of environmental assessment and decision-making they forwarded. Attention should also be paid to the Fynbos Forum ecosystem guidelines for environmental assessment in the Western Cape. Cape Nature supports all comments made by the Botanical Society of SA, Conservation Unit (27 January2006)	The botanical specialist is well-informed of these guidelines. Several phone calls were made to ensure that these guideline are considered and to discuss the process followed for the EIA process
C. de Villiers (Botanical Society of South Africa, Conservation Unit)	27 Jan 2006	Faxed letter	Regarding the Succulent Karoo: Biodiversity Hotspot; A precautionary risk-averse approach must be followed with regard to the proposed Kudu Integration Project, as the proposed transmission lines as well as new access roads will be located in a global biodiversity hotspot, The Succulent Karoo Biome, which is the only arid “hotspot” in the world. He further stated that the National Spatial Biodiversity Assessment has identified the succulent Karoo Biome as one of nine broad priority areas for conservation action at a national scale.	The botanical specialist is well-informed of these guidelines. Several phone calls were made to ensure that these guideline are considered and to discuss the process followed for the EIA process
C. de Villiers (Botanical Society of South Africa, Conservation Unit)	27 Jan 2006	Faxed letter	Regarding the Succulent Karoo Ecosystem Plan (SKEP); The SKEP framework for action has identified specific areas where vegetation is highly vulnerable and new options exist for achieving conservation targets. Such areas with highly irreplaceable and vulnerable biodiversity occur among others between Port Nolloth and Lekkersing, Kleinsee and Springbok, and around Lutzville-Vredendal respectively. The Oranjemund-Gromis-Juno corridor negotiates a number of landscapes features that are important for the maintenance of ecological processes. The areas with the Quartz patches in particular are	The botanical specialist is well-informed of these guidelines. Several phone calls were made to ensure that these guideline are considered and to discuss the process followed for the EIA process

Issues / comment raised by:	Date	Means of communication	Issue / comment	Response
			Habitats that is almost uniquely associated with the Succulent Karoo Biome. The Quartz patches are centres of plan endemism and species diversification. These quartz patches are delicate ecosystems that are sensitive to transformation. Once these quartz patches are disturbed, they are virtually impossible to restore. The SKEP maps are a very useful planning tool.	
C. de Villiers (Botanical Society of South Africa, Conservation Unit)	27 Jan 2006	Faxed letter	Spatial recommendations and specialists' workshop; Planning should seek to: 1. Avoid any additional habitat loss in areas designated as highly irreplaceable for the achievement of biodiversity targets; 2. Promote functional connectivity; 3. Reduce the fragmentation of habitat by appropriate restorative actions. 4. It was strongly recommended that an inter-disciplinary, corridor workshop be held to draw on expert knowledge and experience of the area which can be used to identify major issues or "Show-stoppers" that can be dealt with through positive planning.	Major issues will be discussed and mitigation measures proposed during the EIA specialist integration meeting. The botanical specialist is well-informed of these guidelines. Several phone calls were made to ensure that these guideline are considered and to discuss the process followed for the EIA process
C. de Villiers (Botanical Society of South Africa, Conservation Unit)	27 Jan 2006	Faxed letter	National Environmental Management Principles; It was strongly recommended that all reports for the environmental process firmly demonstrate how the proponent intends complying with the following National Environmental Management Principles: 1. Avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity; 2. Avoid degradation of the environment; 3. Avoid jeopardising ecosystem integrity; 4. Pursue the best practicable environmental option by means of integrated environmental management; 5. Protect the environment as the peoples common heritage; 6. Control and minimise environmental damage; 7. Pay specific attention to management and	All principles of NEMA will be discussed in the EIR.

Issues / comment raised by:	Date	Means of communication	Issue / comment	Response
			planning and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.	
C. de Villiers (Botanical Society of South Africa, Conservation Unit)	27 Jan 2006	Faxed letter	Recommendation: Biodiversity ToR; The Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape (Helme, in De Villiers et al. 2005, pp 58-61) can be consulted to identify critical issues that should be addressed when undertaking biodiversity assessments in the Succulent Karoo. SEF was also referred to the DEADP guideline on the involvement of biodiversity specialists in EIA processes.	Several phone calls were made to ensure that these guideline are considered and to discuss the process followed for the EIA process
V. Bowie (Scientific Services – Cape Nature)	22 Feby 2006	Faxed letter	Support of the specialist assessments to take place – must ensure that the DEADP 2005 guideline series in EIA processes are used.	Concern has been noted and confirmed by phone call.
ENVIRONMENTAL IMPACTS				
V. Bowie P. Grobler E. Cloete	22 Feb, 2 March 2006	Faxed letter & Public Meeting - Vanrhynsdorp	Emphasised the extremely sensitive nature of the Knersvlakte and that extreme caution should be exercised as it can never be rehabilitated to the original state. The white quartz patches may not be disturbed under any circumstances.	This is a well known concern. This option will be regarded as the last alternative for construction
A. Le Roux	2 March 2006	Public meeting – Kamieskroon	The erection of Eskom's powerlines will not be allowed through the Knersvlakte	This option will be regarded as the last alternative for construction
A. Le Roux	2 March 2006	Public meeting - Kamieskroon	The Kamiesberg mountains have numerous endangered species, therefore Eskom will not be allowed through this area either.	This option will be regarded as the last alternative for construction (Part of the Knersvlakte route.
C. Paulsen	2 March	Public meeting – Vanrhynsdorp	It is suggested that the Hardeveld area of the Knersvlakte will not be an option for Eskom. The installation of water pipes in this area in the past proved extremely difficult.	This option will be regarded as the last alternative for construction
A. Le Roux	2 March	Public meeting-Kamieskroon	Highlighted the fact that the most environmental damage will be from the movements of construction vehicles and not necessarily the actual erection of the powerline.	Confirmed by botanical specialist. This will be investigated to ensure adequate mitigation measures
V. Bowie P. Grobler E. Cloete	22 Februar y - 2 March 2006	Faxed letter & Public Meeting - Vanrhynsdorp	Eskom must fly in pylons & cables (or walk in) in sensitive areas, vehicles are NOT to be used.	This option will be addressed. This way of construction may be used in some areas.

Issues / comment raised by:	*Date*	*Means of communication*	*Issue / comment*	*Response*
H. Kohrg	2 March 2006	Public meeting – Kamieskroon	Concerned that maintenance of the powerlines, will in future have a negative impact on the environment and that this needs to be considered.	Will be addressed in the Environmental Management Plan. The issue is noted and EIA team will consider it during the EIA
A. Le Roux P. Grobler	2 March 2006	Public meeting – Kamieskroon & Vanrhynsdorp	Sand will rehabilitate more easily than the Knersvlakte.	Noted the issue
G. Nel	2 March 2006	Public meeting – Vanrhynsdorp	Enquired of E. Cloete what the impact on the environment would be if, for example, the Juno substation expanded by one hectare.	Impact would be minimal on the Knersvlakte.
R. Smart	2 March 2006	Public meeting – Kamieskroon	The main reason for the corridor expansion of the Namaqua National Park is to ensure species survival through Global Warming	Issue noted
K. Kritzinger	2 March 2006	Public meeting – Vanrhynsdorp	A small patch of fynbos exists close to the coast inline with the proposed coastal alternative. This patch of fynbos needs to be bypassed and not disturbed in any way.	Comment noted
A. Le Roux	2 March 2006	Public meeting – Kamieskroon	It is suggested that an environmental control officer be present at all times during construction.	The need of an environmental control officer during construction will be included in the EIA report.
AVIAN IMPACTS				
V. Bowie P. Grobler E. Cloete	22 Feb, 2 March 2006	Faxed letter & Public Meeting - Vanrhynsdorp	Mitigation measures must be implemented to prevent raptors from nesting above the conductors – option of nest platforms should be investigated.	Plastic spikes are attached to the pylons, just above the conductors. This ensures that no bird will sit or nest on or above the conductors/
S. Davids	9 May 2006	E-mail	Pylons may have a negative effect on the birds frequenting the region	Noted. This has been addressed in the avian impact assessment.
P. Grobler	2 March 2006	Public meeting – Vanrynsdorp	Commented that powerlines along the coast will have a lesser impact on bird life than those erected more inland.	The person tasked with the Avifauna studies will be in contact with him to ensure that all impacts and mitigation measures are addressed..

VISUAL IMPACTS				
S. Davids	9 May 2006	E-mail	The pylons will have a severe negative visual impact on the area and this in turn will have a negative socio-economic impact on the region. Tourism in general and eco-tourism in particular, forms a cornerstone of the area's socio-economic development (Kamiesberg IDP 2005: 34,44,46,47, 73, 77, 83, 90, 97, 98, 100, 102, 113, 121). He further stated that the unsightly pylons will go against the grain of this marketing campaign that aims to benefit this poverty stricken area. He believes that pylons will not be neutral static structures, but will function negatively for years to rob the community of potential economic income it can derive from its major natural resource, namely an undisturbed landscape. The cumulative cost to the community may run into millions over a few years while the human cost of not empowering the disadvantaged through tourism, will be substantial.	Comment noted. Issue will be addressed in social and tourism report in the EIR.
C. Paulsen	2 March 2006	Public meeting – Vanrynsdorp	It is suggested that the visual impact of the powerlines will be less in the sand as compared to the Knersvlakte because plants are taller in the sand area.	K. Rau added that, if possible, Eskom should erect powerlines during the rainy season to ensure minimal impact and faster rehabilitation.
PROPOSED POWERLINE ROUTES & ISSUES ASSOCIATED WITH EACH				
J. Deventer G. de Kock K. Helmut R. Smart A. Le Roux	2 March 2006	Public meeting - Kamieskroon	It is suggested that the powerline routes along the coast, cut through the Namaqua National Park alongside the Hondeklip road and then south again allowing for at least 2.5-3km distance from the eastern edge of the new park boundary.	This issue was noted
K. Rau	2 March 2006	Public meeting – Vanrhynsdorp	It is suggested that construction along the Lutzville-Nuwerus or Hondeklip roads are best alternatives.	This issue was noted
J. Deventer G. de Kock H. Kohrg R. Smart A. Le Roux	2 March 2006	Public meeting - Kamieskroon	Preferred powerline route to go through the Boesmanland area, second alternative is down the coast and through the Namaqua National Park along the Hondeklip road and the least preferred alternative along the N7.	It was explained that the route through the Boesmanland will be very costly and that the people residing in the Boesmanland will have issues with the line as well.
H. Kohrg	2 March 2006	Public meeting – Kamieskroon	Preferred the powerlines to be erected through the Boesmanland area, past Vaalpits	It was explained that the route through the Boesmanland will be very costly and that the people residing in the Boesmanland will have issues with the line as well.
J. Deventer	2 March 2006	Public meeting – Kamieskroon	Preferred the powerlines to be erected alongside the N7	A. Le Roux again emphasized that the erection of powerlines will not be allowed

				in the Knersvlakte (Quarts area).
P. Grobler C. vd Merve E. Cloete T. Mehtoor K. Rau J. de V Kritzinger C. Paulsen A. Khan	2 March 2006	Public meeting – Vanrhynsdorp	It was decided that the first alternative suggested by SANParks (through the Boesmanland area) is not the best alternative, due to the negative impact on the Knersvlakte. The alternative that routs along the coast and cuts through the Namaqua National Park must be considered to be the most preferred alternative.	This issue was noted
C. Paulsen	2 March 2006	Public meeting – Vanrhynsdorp	It is suggested that the Boesmanland alternative be viewed as the second best alternative as the environmental impacts are relatively high.	J. Kritzinger suggested that the Springbok Mountains must not be an option for Eskom.
J. Kritzinger C. Paulsen P. Grobler C. vd Merve E. Cloete T. Mehtoor K. Rau A. Kahn	2 March 2006	Public meeting – Vanrhynsdorp	Preferred the coastal route for the erection of powerlines	SANParks agrees with this alternative.
K. Rau	2 March 2006	Public meeting – Vanrhynsdorp	It is noted that mining already exists along the coast, therefore the erection of the powerlines will impact the environment minimally.	Issue was noted
K. Rau	2 March 2006	Public meeting – Vanrynsdorp	Cautioned to the coastal mist.	Eskom would prefer not to erect their powerlines within 10km from the coast.
S. Davids	9 May 2006	E-mail	Unique plant material occurs in patches and the patches can easily be avoided by rerouting the power lines. An honest appraisal of the area by the specialists doing the vegetation assessment will reveal the well-known location of globally unique areas such as the Riethuis quartz patch. The power line must be routed around such sensitive areas. He referred the following biodiversity experts working in the area to assist in this regard. Dr. Phil Desmet. Cell: 082-352-2955 email: factoryrider@absamail.co.za Analise Roux. Cell 082-484-6993. email: rouxa@cncjnk.wcape.gov.za	The botanical specialist appointed to the project team has a substantial amount of experience in the Succulent Karoo, and has been working closely with Dr Phil Desmet. Annalise le Roux of Cape Nature and Charl de Villiers of the Botanical Society of South Africa have registered as I&APs with SEF.
K. Rau	2 March 2006	Public meeting – Vanrynsdorp	Mentioned that there are existing roads in the sand and that Eskom and SEF should consider these when finalising the powerline route.	Comment noted

CONSTRUCTION ACTIVITIES				
J. de Jager Maass Namakwa Boerdery BK	22 Feb 2006	Registration form	Construction workers do not stay within the construction site and that vehicles drive all over the veld and adjacent farms. Workers also trample bushes.	Issue was noted. This will be addressed in the EMP
J. de Jager Maass Namakwa Boerdery BK	22 Feb 2006	Registration form	Eskom closes and opens gates without permission as well as cutting farm fences. Important that this gets addressed as livestock constantly move around.	Issue was noted. This will be addressed in the EMP
Namakwa Boerdery BK	22 Feb 2006	Registration form	Emphasises that Eskom must keep their construction sites clean from waste and fuel.	Issue was noted. This will be addressed in the EMP
K. Kritzinger	2 March 2006	Public meeting – Vanrynsdorp	Emphasised that construction must remain alongside the roads and not in the dunes.	Issue was noted. This will be addressed in the EMP
BENEFITS OF THE POWERLINE				
H. Kohrg	2 March 2006	Public meeting - Kamieskroon	Enquired as to what benefits Namaqualand would receive from the project. If nothing, then why should the Namaqualand community comply?	No benefit to the people in Namaqualand. There is a major shortage of electricity in the Cape Metropolitan area. Allowing the powerline will only help to address this problem
J. Deventer G. de Kock H. Kohrg R. Smart A. Le Roux	2 March 2006	Public meeting - Kamieskroon	It is suggested that Eskom should subsidise Namaqua National Park's electricity	Issue noted. For Eskom to negotiate terms and conditions
B.J. Kennedy	15 Feb 2006	Letter	Interested in accessing electricity should the powerline be erected alongside the Groenrivier road or through his farm.	Issue noted and confirmed by phone call
COMMUNITY UPLIFTMENT / WORK OPPORTUNITIES				
W. B. Hendriks G. Cloete	8-23 Feb 2006	Registration form/Telephonically	Enquired with regards to contract or subcontract work.	
A. Kahn	2 March 2006	Public meeting – Vanrynsdorp	Enquired as to whether Eskom was looking at any possible opportunities for the local communities.	A database of all interested parties has been compiled and Eskom will consult this in order to meet employment stipulations with regards to local communities.
A. Kahn	2 March 2006	Public meeting – Vanrynsdorp	Stated that he owns the largest herbicide company in South Africa and that he has done work for Eskom before.	Advised to send details of companies to be registered and included in the database.

GENERAL ISSUES RAISED				
R. Smit	1 Feb 2006	Registration form faxed	Address the impact this project will have on existing electrical lines.	Issue was noted
H. K. J. Kohrs	22 Feb 2006	Registration form	Enquired as to whether the powerline was a new one to be erected or upgrading an existing line.	Responded that this will be a new powerline
M. Dreyer	9 Feb 2006	Registration form	Enquired as to whether the powerline will be erected in a zig-zag manner or straight line. All households along the route need to be notified of activities. Specifics of where the powerline will be erected between Garies & Bitterfontein.	Phone call: The plan is to have a line that is as straight as possible. Depending on sensitive areas.
C. Paulsen	2 March 2006	Public meeting – Vanrhynsdorp	Enquired as to why electricity had to go to the Juno substation when Eskom has a national grid.	The national grid cannot be sorted into incoming/outgoing electricity. Lines are erected for a specific reason and to serve specific areas.
C. Paulsen	2 March 2006	Public meeting – Vanrynsdorp	Enquired as to when Eskom would begin construction.	SEF is still in the Public Participation stage of the Scoping report. The Environmental Impact Assessment follows and once approved, which could take a few months, another thirty days is allowed for appeals from all I&APs after ROD.
J du Toit S.F. du Toit	22 Feb 2006	Registration form	Intends to build guest houses on his farm and does not want powerlines to cross his farm.	Issue noted. The EIA will determine the route of the powerline.
C. Paulsen	2 March 2006	Public meeting – Vanrynsdorp	It is suggested that Eskom would save funds if they construct their powerlines through sand rather than granite.	Issue was noted
H. Kohrg	2 March 2006	Public meeting – Kamieskroon	It is suggested that Eskom should consider incorporating the extra R600 million (for the longer route through the Boesmanland area) in user tariffs. This will amount to a minimal increase in tariffs that consumers should be willing to pay to protect the environment.	Issue was noted. These decisions are not for the EIA team to make. To be considered by Eskom
C. Du Toit Mostert J.C.J Rossouw	22 Feb 2006	Registration form	Would like to know whether the project will affect him in any way	The exact route of the powerline is not known. The route will be presented to all registered I&AP's prior to construction.
PEOPLE/ ORGANIZATIONS TO BE CONTACTED				
T.A. Anderson V. Bowie (Scientific Services – Cape Nature)	27 Jan 2006 22 Feb 2006	Registration form/Faxed letter	Local expert with knowledge and experience in the Succulent Karoo must be appointed. Dr P. Desmet has done botanical work on the Knersvlakte (as well as visual modelling) and should be consulted– if possible included in the project team.	This is noted. The Botanical Specialist will be in contact with this person.

V. Bowie P. Grobler E. Cloete	22 Feb - 2 March 2006	Faxed letter & Public Meeting - Vanrhynsdorp	Dr P. Desmet must be consulted with the exact sitting of pylons.	Issue was noted.
A. van der Westhuizen	9 Feb 2006	Registration form	Notify the Knersvlakte Biosphere Association – M. Langenhoven	Issue was noted.
G. de Kock C. Paulsen J. Kritzinger	2 March 2006	Public meeting – Kamieskroon & Vanrhynsdorp	Important tourist routes need to be considered before finalizing the route of the powerlines. Herbert Howe of the Matzikama Tourist Bureau should be contacted in this regard.	He will be contacted prior to decision of the position of the final line.
J. J. Cloete (Garies Development Movement)	9 Feb 2006	Registration form	Notify the Kamiesberg Municipal area & Garies Economies of all activities within their area.	Issue was noted.
M. Dreyer	9 Feb 2006	Registration form	All households along the route need to be notified of activities.	Issue was noted.
M. J. Runkel (SANRA)	31 Jan 06	Letter	Application needs to be made to SANRAL if there is need for a road crossing & installation within the road reserve	Issue was noted. Phone calls.
REQUEST FOR ADDITIONAL INFORMATION				
S. E. Cloete J. Maas A. van der Westhuizen	30 Jan 2006 17 Feb 2006	Letter/ Telephonically/ Registration form	These respondents saw the adverts / notices about the EIA or were informed about it by other means and requested additional information about the project. No questions or comments were raised.	Phonecalls were made to these persons. Issues of possible employment opportunities were raised.

SECTION 5: IMPACT ASSESSMENT

This section of the report provides an overview of the environmental impacts that will result from the construction, operation and maintenance of the proposed transmission line. The significant impacts that have been assessed have been selected based on the views of interested and affected parties and the opinions of specialist consultants that have been appointed to assist in the environmental impact assessment.

Each impact is considered individually, and the assessment of the significance of the impacts is based on the specialist reports that are contained in Appendix 7. Each impact is presented in the form of an impact table that assesses the impact according to a number of different criteria. An explanation of these criteria are provided in Appendix 7.

Following after each impact table is a short narrative description of the following:

- **Source of the impacts**: i.e. the cause of the impact. It is considered important to identify the source of the impact, since this enables pro-actively addressing the root cause of the impacts rather than applying mitigation after the impact has occurred.
- **Description of the impact:** this indicates the interaction between the environment and the activity causing the impact.
- **Significance rating:** This provides a motivation for the assignment of a particular significance rating to the impact.
- **Mitigation measures:** these are actions that must be taken to prevent the impact from occurring or lessening the significance of the impact.

When mitigation measures have been prescribed, the principle is to follow a hierarchy. The topmost mitigation measures are most preferable whilst the bottommost mitigation measures are least preferable:

- **Avoidance** (preferably by appropriate design of the project) such that the impact is substantially prevented or prevented in totality;
- **Reduction** of the impact (preferably by appropriate design of the project);
- **Rectification** of the impact by rehabilitation of the affected environment after the fact;
- **Compensation** for the impact by replacing or providing substitute resources elsewhere (e.g. providing “offsets”); and
- **No action** (only appropriate where it is truly impossible to mitigate).

5.1 IMPACTS ON VEGETATION

5.1.1 Impacts on sensitive vegetation types in northernmost section

Table 4 *Impacts on sensitive vegetation types in northernmost section: construction*

Nature	Loss of vegetation which may include rare or endemic species, especially in the sensitive areas identified in the maps		**Status**	**-**
Impact source(s)	Clearance of vegetation for construction of pylon footings and stays Construction of new access tracks for >70% of the route			
Affected stakeholders	• SANParks; • Conservation organisations; and • Conservation-minded people.			
Magnitude	*Extent*	**Local, but of national importance**		
	Intensity	**High**		
	Duration	**Permanent**		
	Reversibility	**None**		
	Probability	**Definite**		
Significance	*Without mitigation*	**High -ve**		**H**
	With mitigation	**Medium to High -ve**		**M-H**
Confidence	High			

Table 5 *Impacts on sensitive vegetation types in northernmost section: operation*

Nature	Loss of vegetation which may include rare or endemic species, especially in the sensitive areas identified in the maps, Development of gullies and washaways, with possible loss of vegetation		**Status**	**-**
Impact source(s)	Vehicular damage to plants within access tracks, Long-term erosion along tracks			
Affected stakeholders	• SANParks; • Conservation organisations; and • Conservation-minded people.			
Magnitude	*Extent*	**Local / Footprint**		
	Intensity	**Medium**		
	Duration	**Long term**		
	Reversibility	**None**		
	Probability	**Definite**		
Significance	*Without mitigation*	**Low to medium -ve**		**L-M**
	With mitigation	**Low -ve**		**L**
Confidence	High			

- *Source of the impact*:
  - Clearance of vegetation for construction of pylon footings and stays,
  - Construction of new access tracks for >70% of the route
  - Maintenance of the transmission line
- *Description of the impact*: The primary long term impacts associated with such a project are direct loss of natural vegetation under the pylon bases, where the stays are grounded, along the access tracks and in "laydown areas", and in construction camps. Tracks and laydown areas are technically not a permanent loss of vegetation, as without regular driving these tracks will rehabilitate in most areas, except in quartz patches. Both these impacts occur at construction stage. It has become evident from discussion with the geotechnical specialist that construction of the proposed line in areas of deep sand (such as in much of the section from Oranjemund to Gromis substations) will necessitate the excavation of large holes in order to bury huge quantities of concrete, which are required to stabilise the 45m tall powerlines. Each stay (or guyrope) requires a hole approximately 4m wide and 4m deep, but in reality these have much larger disturbance footprints, as the loose sand does not allow for vertical walls, and the excavated sand also has to be placed to one side. This loose sand then blows away and will impact on surrounding natural vegetation, perhaps smothering some of the plants. For every pylon there are four such holes, and heavy vehicles (offroad concrete mixers, steel carrying trucks, offroad cranes, etc.) have to drive between all the points, effectively creating a 1ha node of disturbance around every pylon. New lines will mean new access tracks, even if the existing one is used as the main access track in and out of the general area. The only real botanical impact at the operational stage is servicing of the lines, where vehicles drive on the existing access tracks, and impacts are thus minimal at this stage. This analysis thus covers both stages, but is concerned primarily with the construction stage, as this is when 80% of the impact occurs. Something seldom considered, but worth considering here, is the decomissioning of the line, which may have a significant negative impact, and may effectively double the overall impact, meaning that the overall impact will certainly be High negative.
- *Significance*: The impacts in this area will have medium to high or high negative significance.
- *Mitigation:*
  - Generic mitigation for the entire route is addressed in section 5.1.3 below.
  - It could be argued that the negative botanical impacts in this area could be sufficiently high for this to imply that the development should not be allowed. The botanical specialist believes that a 30yr lifespan for a powerline in this area does not justify the permanent and long term loss of a portion of a suite of unique, endemic plant species of global conservation significance (and their associated invertebrate fauna). It is unlikely that more than 20% of the known populations of any one species will be lost due to powerline construction, but the cumulative impact (along with mining and other infrastructure projects in the area) is high, as large areas have already been lost. Basic environmental best practice requires the avoidance of the impact as first choice, followed by minimisation. As the impacts cannot effectively be minimised or reduced in this case avoidance would be the preferred option. Should the project go ahead in this area *extreme care* must be taken to minimize impacts. Significant damage *will* be caused, whatever is done,

due to the nature of the terrain, very slow rates of rehabilitation, and density of rare and localised plant species.

- Offsets:
  There will be an unavoidable residual negative impact, which is most effectively mitigated by a biodiversity offset (Ten Kate et al 2004). An offset is considered mandatory mitigation in this case, due to the sensitive nature of the area. An appropriate offset would be to formally conserve a portion of similar habitat (adjacent if possible) that is conservation worthy and under threat. A possible option would be to increase the servitude width in the 12.5km south of Oranjemund substation, to at least 1000m. This area should then be rezoned Open Space 3 if possible, and registered as a Private Nature Reserve, in order to secure some conservation status for this very vulnerable area. Alternatively, a portion of the farm Grootderm 10, not less than 100ha in extent should be purchased immediately south of the Oranjemund substation. This area should then be rezoned Open Space 3 and registered as a Private Nature Reserve, and negotiations entered into with the Northern Cape environmental authorities about securing a higher, formal conservation status for this area (such as a Stewardship Contract). Eskom must be responsible for erecting signage indicating the boundaries of this conservation area. Alternatively, the land could be transferred to Northern Cape conservation, and registered in their name. A significant offset of at least 100ha as a conservation area would help secure an example of this important vegetation type, which would be a positive effect of the proposed development. However, this needs to be balanced against the loss of vegetation within the pylon footprint, and thus the overall impact could be reduced to a medium significance, after mitigation. An offset of this type would be the only way to reduce the impacts to an acceptable level.

5.1.2 Impacts on sensitive vegetation types for preferred routes: D, E and G

Table 6 *Impacts on sensitive vegetation types along routes D, E and G: construction*

Nature	Loss of vegetation which may include rare or endemic species, especially in the sensitive areas identified in the maps		**Status**	**-**
Impact source(s)	Clearance of vegetation for construction of pylon footings and stays Construction of new access tracks for >70% of the route			
Affected stakeholders	• SANParks; • Conservation organisations; and • Conservation-minded people.			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Permanent**		
	Reversibility	**None**		
	Probability	**Definite**		
Significance	*Without mitigation*	**Medium -ve**		**M**
	With mitigation	**Low to Medium -ve**		**L-M**
Confidence	High			

Table 7 *Impacts on sensitive vegetation types along routes D, E and G: operation*

Nature	Loss of vegetation which may include rare or endemic species, especially in the sensitive areas identified in the maps, Development of gullies and washaways, with possible loss of vegetation		**Status**	**-**
Impact source(s)	Vehicular damage to plants within access tracks, Long-term erosion along tracks			
Affected stakeholders	• SANParks; • Conservation organisations; and • Conservation-minded people.			
Magnitude	*Extent*	**Local - Site**		
	Intensity	**Medium - Low**		
	Duration	**Long term**		
	Reversibility	**None**		
	Probability	**Definite**		
Significance	*Without mitigation*	**Low to Medium -ve**		**M**
	With mitigation	**Low to Medium -ve**		**L-M**
Confidence	High			

- *Source of the impact*:
  - Construction of new access tracks for >70% of the route
  - Clearance of vegetation for construction of pylon footings and stays
  - Maintenance of the transmission line
- *Description of the impact*: Similar to 5.1.1 (Northernmost section). However, the significance of the impact is lower than for the northern section, due to the lower botanical sensitivity and soil conditions that allow for smaller excavation.
- *Significance*: The impacts in this area will be of medium to medium-low negative significance.
- *Mitigation:*
  - Avoidance: Serious consideration should be given to modifying Alternative E in its southernmost portion, to avoid impacting on the Jaagleegte quartz patches near the Namakwa Sands MSP. It is proposed that from southwest of Nuwerus the southern portion of E actually continues on the original route of Alternative A in this area, rather than deviating west as it does in Alternative E at this stage (see Figure 7 of the specialist report).

5.1.3 Generic mitigation for the entire route

  - Reduction: If possible all construction should be done during the dry season (Oct – April), as this will minimise damage to the many rare or localised bulbs and annuals which grow and/or are above ground only during the autumn – spring period. This refers particularly to the driving of vehicles over natural veld, and is especially important in this highly seasonal area. However, given the length of this route the

construction period is expected to extend over a long period, and thus the above recommendation should become mandatory for at least the High Sensitivity areas identified in the maps.

- Avoidance: Detailed pylon and access track placement must be undertaken in conjunction with the botanist at the walk-down stage for all High Sensitivity areas identified in this report. This will help ensure that impacts in the most sensitive areas are minimised. This walk down should ideally be undertaken during the period May – September in order to facilitate the identification of especially sensitive areas. Avoidance: The Eskom planners should ensure that all rocky outcrops, quartz patches, gravel patches, and wetlands (including pans) are avoided when doing preliminary pylon placements, as this will save a lot of time later on. If they are indicated on the maps as falling within such areas they will have to be moved during the walk-down process, and it would be best to pre-empt this time consuming task by doing the job responsibly at the desktop stage.
- No vehicles should be driven through seasonal or permanent wetlands.
- All rocky outcrops, gravel patches, and quartz patches must be regarded as Very High Sensitivity areas and must not be disturbed by vehicles, unless authorised by the botanical specialist during the walk-down study.
- There should be no construction or pylon placement in any sort of wetland area (seasonal or permanent).
- Existing access tracks should be used where possible in order to minimise the creation of new tracks.
- At the walkdown stage the botanist should look at all sensitive areas and identify and locate the footprints with the least impact. This walkdown should be conducted in the period May – September.
- Cables should be laid out on existing tracks or disturbed areas.
- Mixing of concrete should be undertaken in the contractors camps or laydown areas (or other low sensitivity areas), and may not be undertaken in areas of natural vegetation that will not be disturbed. In other words, if concrete is mixed on site, it should be done only in footing areas that will be disturbed anyway later on, and not in adjacent natural areas. No concrete residue should be left in any areas of natural vegetation.
- Contractors and Eskom personnel may not make any open fires in the Namaqualand Sand Fynbos areas northeast of Koingnaas, or in the dunes east of Hondeklipbaai, or elsewhere in Sand Fynbos areas. These areas contain sufficient fuel to burn, and will recover only very slowly, as they are not a fire driven ecosystem.
- An ECO must be present throughout the construction process in all sensitive areas, and it is Eskom's responsibility to ensure that this ECO is fully briefed by the botanist beforehand.
- Construction work here must be undertaken in summer (Oct – April), when most plants are dormant, and least likely to be damaged.
- Vehicular activity must be minimised in the sensitive areas.
- All laydown and storage areas, and contractors camps, must be located outside sensitive areas.
- Search and Rescue of all possible translocatable species must be conducted by the ECO on all footprints in sensitive areas, prior to disturbance.

5.2 IMPACTS ON SOILS AND AGRICULTURAL POTENTIAL

5.2.1 Impacts on soils through wind erosion

Table 8 *Impacts on soils through wind erosion*

Nature	Loss of exposed topsoil due to wind erosion		**Status**	**-**
Impact source(s)	Exposure to soils due to movement of vehicles through veld			
Affected stakeholders	• Commercial farmers; • Landowners; • Those concerned with conservation			
Magnitude	*Extent*	**Local (only alternative E)**		
	Intensity	**Low to medium**		
	Duration	**Short term**		
	Reversibility	**Reversible**		
	Probability	**Probable**		
Significance	*Without mitigation*	**Low to Medium**		**L-M**
	With mitigation	**Low**		**L**
Confidence	High			

- *Source of the impact*: The loss of vegetation due to the movement of construction vehicles in undisturbed veld will result in the exposure of soil. This exposed soil will then become susceptible to erosion through wind.
- *Description of the impact:* If no disturbance takes place, sufficient vegetation cover will exist to protect the valuable topsoil from wind erosion. If, however, this vegetation cover is lost, the underlying soil may be eroded through wind action. Accelerated wind erosion may result in the formation of young, unstable dunes and limit the development of vegetation due to the lack of suitable topsoil.
- *Significance:* The impact of wind erosion is expected to be of no significance along the proposed alternative C, due to the limited amount of wind and soils susceptible to wind-erosion. The impact along alternative C is expected to be of low to medium significance, as the area is comprised of few erosion-susceptible soils, experiences less wind and is under relatively dense vegetation. Furthermore, there is – relative to the rest of the region – more rainfall, which should be sufficient to wet the soils to limit aeolian erosive losses.
- *Mitigation:*
  - The amount of vegetation subjected to vehicle traffic must be kept to the absolute minimum to prevent loss of valuable vegetative cover.
  - Sections of construction roads that experience accelerated wind erosion should be protected by windbreaks.

- Should areas cleared not revegetate after good rains and continue to erode, windbreaks should be erected or the soil should be covered with synthetic or organic mulch.

5.2.2 Impacts on soils through water erosion

Table 9 *Impacts on soils through water erosion (alternative E)*

Nature	Loss of exposed topsoil due to water erosion		**Status**	**-**
Impact source(s)	Exposure to soils due to movement of vehicles through veld			
Affected stakeholders	• Commercial farmers; • Landowners; • Those concerned with conservation			
Magnitude	*Extent*	**Local (100 km is moderately to severely affected along the route)**		
	Intensity	**Medium**		
	Duration	**Medium**		
	Reversibility	**Reversible**		
	Probability	**Highly probable**		
Significance	*Without mitigation*	**Low to Medium**		**L-M**
	With mitigation	**Low**		**L**
Confidence	**High**			

Table 10 *Impacts on soils through water (Alternative C)*

Nature	Loss of exposed topsoil due to water erosion		**Status**	**-**
Impact source(s)	Exposure to soils due to movement of vehicles through veld			
Affected stakeholders	• Commercial farmers; • Landowners; • Conservation organisations; and • Conservation-minded people.			
Magnitude	*Extent*	**Local (270 km is moderately and severely affected along route)**		
	Intensity	**Medium to high**		
	Duration	**Medium to long term**		
	Reversibility	**Reversible**		
	Probability	**Highly probable**		
Significance	*Without mitigation*	**Medium**		**M**
	With mitigation	**Low**		**L**
Confidence	**High**			

Table 11 *Impacts on soils through water (Alternative F)*

Nature	Loss of exposed topsoil due to water erosion		**Status**	**-**
Impact source(s)	Exposure to soils due to movement of vehicles through veld, clearance of land for roads for construction vehicles, pylon sites and service roads			
Affected stakeholders	• Commercial farmers; • Landowners; • Conservation organisations; and • Conservation-minded people.			
Magnitude	*Extent*	**Local (163.4 km is moderately and severely affected along route)**		
	Intensity	**Medium to high**		
	Duration	**Medium to long term**		
	Reversibility	**Reversible**		
	Probability	**Highly probable**		
Significance	*Without mitigation*	**Medium**		**M**
	With mitigation	**Low**		**L**
Confidence	**High**			

Table 12 *Impacts on soils through water (Alternative G)*

Nature	Loss of exposed topsoil due to water erosion		**Status**	**-**
Impact source(s)	Exposure to soils due to movement of vehicles through veld, clearance of land for roads for construction vehicles, pylon sites and service roads			
Affected stakeholders	• Commercial farmers; • Landowners; • Conservation organisations; and • Conservation-minded people.			
Magnitude	*Extent*	**Local (163.8 km is moderately and severely affected along route)**		
	Intensity	**Medium to high**		
	Duration	**Medium to long term**		
	Reversibility	**Reversible**		
	Probability	**Highly probable**		
Significance	*Without mitigation*	**Medium**		**M**
	With mitigation	**Low**		**L**
Confidence	**High**			

- *Source of the impact*: The loss of vegetation due to the movement of construction vehicles in undisturbed veld will result in the exposure of soil. Furthermore, vehicle traffic will compact the soil to form linear depressions.

- *Description of the impact:* Land types with a moderate to sever erosion hazard will experience accelerated water erosion during rain events along roads, especially when the precipitation rate is high. At pylon construction sites this hazard should be low because of the localized disturbance. Soil will be eroded along the cleared and compacted roads and will be deposited on lower, down-slope positions with a slope gradient small enough that the flow rate is slowed down to a level where the transported soil material will deposit and accumulate. The above-mentioned eroded areas will lose fertile topsoil and even relatively infertile subsoil. Under severe erosion all the soil will be removed and the underlying weathering base rock will be exposed. Together with the fertile topsoil the natural seedbed will also be lost throughout the eroded areas. The vertical and linear extent of the erosion will depend on the rainfall intensity, the number of rainfall events, slope gradient and slope length. On long, steep slopes the potential water erosion will be significantly greater, especially along the lower section of the slope, than on short, less steep slopes. Under less severe conditions only part of the topsoil will be removed. The extent of the erosion will be such that the erosion scar can be covered by shallow plough or disc cultivation laterally across the eroded area. Under severe conditions the water will remove the topsoil and cut into the underlying subsoil to form gullies with vertical edges. Depending on the amount of rain, rate and volume of runoff water as well as the nature of the soil, two narrow gullies will form along the compacted wheel track alignments or, under extreme conditions, virtually all the soil along the road can be removed to form fairly wide, deep gullies. Deep, wide gullies are difficult to rehabilitate. The down-slope accumulated soil material must mechanically be brought back to refill the gully. Another factor that influences the water erodibility of the soils, especially the subsoil, is the relative concentration of extractable ions. In soils with a low erosion hazard, extractable calcium usually dominates the exchange complex with low concentrations of magnesium and sodium. Most soils in the study area that developed from in situ weathered undifferentiated granites and gneisses of the Namaqualand Metamorphic Complex, however, contain more extractable magnesium plus sodium than calcium in the subsoil. Sodium - magnesium rich soil material is physically unstable. This chemical condition will accelerate the mechanical removal of soil material by flowing water through clay dispersion.

- *Significance:* Along alternative C from Schaaprivier east of Springbok to as far south as Nuwerus, and along the central section of alternative E the terrain and chemical composition of the subsoil are of such a nature that water erosion will have a moderate to severe impact. Depending on the slope gradient and length over which runoff is canalised along cleared construction and service roads the extent of the impact may range from site to off-site. The significance of water erosion as an impact should generally be medium without mitigation and low with mitigation. Under exceptional conditions (e.g. more than one event with a high rainfall intensity within a few days) the impact without mitigation could, however, be high. Once a deep gully has scarred the landscape it will be difficult to ameliorate and even with mitigation will have a medium to high impact. Along the

construction roads the intensity will vary from low to medium depending on the duration of use and whether the roads are used during summer or the rainy season. With a low intensity the duration of the impact will be short term and the impact will be reversible because of the relatively high rainfall along alternatives C and E, provided that the road is in natural veld that will act as a natural seed bank. Along the service road that will be used on a regular basis, the impact intensity of water erosion will at least be medium because of the regular compaction and disturbance of new plant growth. The impact will be long term and will be irreversible. In natural veld with a low runoff intensity the impact will be lower than in cleared fields with high runoff intensities on steep and long slopes. The impact assessment criteria will have a higher or more severe rating for water erosion during both the construction and operational phases for those sections of the route that crosses cleared lands compared to natural veld. Along the southern sections of alternatives C and E fairly extensive areas have been cleared for small-grain production and will therefore be more impacted by water erosion than the northern sections, and water erosion impacts on these lands will be more difficult to rehabilitate.

- *Mitigation:* Mitigation measures that can minimize the effect of water erosion in disurbed areas or even prevent water erosion to take place include the following:
  - The amount of vegetation subjected to vehicle traffic must be kept to the absolute minimum to prevent loss of valuable vegetative cover.
  - Clearance of vegetation for construction roads along very steep areas that are sensitive to water erosion should be avoided. Less steep areas (land types with a higher percentage level land and relatively small local relief) with a lower water erosion hazard should be selected wherever possible. If possible the transmission power-line route should be shifted away from water erosion sensitive land types to adjacent less sensitive land types.
  - Construction on water erosion sensitive land types should preferably be done during the dry season.
  - The width of the strip cleared for construction roads should be kept as narrow as possible.
  - During construction of the transmission power-line, runoff along sections of construction roads that are steep over long distances and therefore sensitive to water erosion, should be minimized by constructing ridges in the road to divert runoff water into the adjacent natural veld.
  - After construction, the compacted soil material along construction routes and at pylon sites should be loosened with a tine implement to improve water infiltration. Revegetation will also be faster on the loosened soil compared to compacted soil material.
  - Water eroded areas that do not recover and become revegetated after good rains and continue to be affected by water erosion should be kept covered with an organic mulch. Reseeding of affected areas combined with mulching should be considered.
  - Mitigation of water erosion along long and steep sections of the service road is difficult because of the continuous disturbance of the soil surface and destruction of new plant growth. Water diversion ridges must be constructed at regular intervals on steep sections of the service road to shorten the runoff distance and lower the water erosion hazard.

- At the first signs of water erosion (rill or gully formation) along the service road, the eroded sections must be refilled with soil material and additional diversion ridges constructed.
- To improve the rate of water infiltration on soils that tends to form a surface crust, surface application of gypsum combined with mulching should be considered.

5.2.3 Impacts on grazing and dry-land production

Table 13 *Impacts on grazing and dry-land production*

Nature	Loss of grazing capacity and potential arable land		**Status**	**-**
Impact source(s)	Clearance of land for roads for construction vehicles, pylon sites and service road			
Affected stakeholders	Small livestock farmers and small-grain producers			
Magnitude	*Extent*	**Local**		
	Intensity	**Low**		
	Duration	**Short to medium**		
	Reversibility	**Reversible**		
	Probability	**Probable**		
Significance	*Without mitigation*	**Low to medium**		**L-M**
	With mitigation	**No significance**		**N**
Confidence	**High**			

- *Source of the impact*: Clearing of natural vegetation along construction roads, at pylon sites and the service road, combined with soil compaction by the construction vehicles and along the service road.
- *Description of the impact*: Clearing and destruction of the natural vegetation will lower the grazing potential until that time that the cleared areas have become revegetated, while soil compaction in cleared lands used for small-grain production will lower the yield potential of the land.
- *Significance*: During the construction phase the cleared construction roads and pylon sites will have a small impact over a short time span on total area available for grazing. After rehabilitation of the veld along the construction roads and at the pylons, only the service road will continue to have a low grazing potential. The total area occupied by the service road, however, will be very small compared to the total area grazed and will have a negligible impact on the grazing potential.

  South of Namaqua National Park along alternative E and along alternative C from Kamieskroon to Nuwerus there are fairly extensive areas cleared for small-grain production. During the construction phase construction roads and the pylon construction sites will have a negative impact on crop production practices if it coincides with the period from land preparation for sowing to harvest. During non-growing periods, on fallow lands and during the operational phase after rehabilitation it will have no impact on small-grain production. During the operational phase the service road will have a small negative or positive impact on small-grain production. The positive impact is when the farmer uses the

service road as an additional access road to camps or ploughed fields. The impact is negative when the service road has no advantage as an access road and cannot be used for planting of small-grain. The area occupied by the service road, however, is small compared the total area of cultivated lands. Because of the low small-grain yield potential in the study area as a result of the low and unreliable rainfall during the growing season, the net production loss associated with the service road is therefore low and the impact low.

- *Mitigation:* The same measures required for mitigation of the negative impacts of wind and water erosion and to ensure that cleared areas are revegetated can be implemented to improve the grazing capacity following clearing and disturbance.
  Compaction by wheels of heavy construction vehicles that lowers the yield potential of small-grain can be mitigated through deep tillage with a tine implement. This is an action that should be undertaken when the soils are dry to ensure proper loosening of the compacted soil. This action should never be done when the soils are moist or wet.

5.2.4 Impacts on the Olifants River Irrigation Farming Region

Table 14 *Impacts on Olifants River Irrigation Farming Region*

Nature	Loss of arable land		**Status**	**-**
Impact source(s)	The construction of pylons and access roads through a highly productive agricultural region			
Affected stakeholders	▪ Landowners; ▪ Supporting industries			
Magnitude	*Extent*	**Southern extent of alternative E**		
	Intensity	**High**		
	Duration	**Long term to permanent**		
	Reversibility	**Irreversible**		
	Probability	**Probable**		
Significance	*Without mitigation*	**High**		**H**
	With mitigation	**No significance**		**N**
Confidence	**High**			

- *Source of the impact:* Construction of the transmission line, specifically the placement of pylons and access roads in highly productive arable land.
- *Description of the impact*: The placement of pylons and access roads in the highly productive arable land will result in the loss of a certain amount of land which would otherwise have been well-utilised as agricultural land. Certain amounts of the land within the servitude will no longer be suitable for agricultural activities, and will be lost to agriculture.
- *Significance:* The initial irrigated land development was below the irrigation canal; especially on the low-lying, nearly flat alluvial plain. During the last few decades more new irrigated lands were developed above the canal on the higher lying old erosion terraces. This is mainly due to soil types that react better to physical amelioration

measures (e.g. deep subsoil tillage) than the alluvial soils, and have more favourable chemical (e.g. low salinity) and physical (e.g. porosity) properties for deep-rooted crops such as wine grapes. The climate is also more favourable for the production of quality wines than on the low-lying alluvial soils. During the Western Cape Olifants / Doring River Irrigation Study it was determined that vast areas of soils suitable for irrigated wine grape development occur above the irrigation canal from Koekenaap south to as far as Klawer. With additional irrigation water through raising of the Clanwilliam Dam wall and/or collecting and storing water from the Doring River, at least another 5 000 ha might become available for irrigated crop production in the Olifants River Irrigation Farming Region. It is highly probable that this additional irrigation water will be used for development above the existing canal. This will imply that new irrigation developments will expand laterally. As such, any development of this land will have a highly significant impact upon the agriculture of the Olifants River agricultural region.

- *Mitigation:* In order to preclude any limitation to future lateral expansion of irrigated crop production from Koekenaap to Juno, the proposed transmission line should be placed as far away as possible from the existing irrigation canal.

5.3 VISUAL AND LANDSCAPE IMPACTS

The significance of impacts is a comparative function relating to the severity of the identified impacts on the respective receptors. The significance of an impact is considered *high* should a *highly* sensitive receptor be exposed to a *highly* severe impact (Table 15).

Table 15 *Significance of visual impacts*

RECEPTOR SENSITIVITY	IMPACT SEVERITY		
	LOW	MEDIUM	HIGH
LOW	No significance	Low	Low
MEDIUM	Low	Medium	Medium
HIGH	Low	Medium	High

5.3.1 Significance Of Landscape Impact

5.3.1.1 Landscape Character Sensitivity

The sensitivity of the landscape character is an indication of "…the degree to which a particular landscape can accommodate change from a particular development, without detrimental effects on its character" (GLVIA, 2002). A landscape with a *high* sensitivity would be one that is greatly valued for its aesthetic attractiveness and/or have ecological, cultural or social importance through which it contributes to the inherent character of the visual resource.

The assessment of the sensitivity of the different landscape types is substantiated through professional judgement and informed reasoning which is based on the landscape character assessment in the VIA. A landscape sensitivity rating was adapted from GOSW (2006) and applied in the classification of the study area into different sensitivity zones.

Table 16 *Landscape character sensitivity rating (Adapted from GOSW, 2006)*

	DESCRIPTION
Low sensitivity	These landscapes are likely to: ◦ Have distinct and well-defined landforms; ◦ Have a strong sense of enclosure; ◦ Provide a high degree of screening; ◦ Have been affected by extensive development or man-made features; ◦ Have reduced tranquillity; ◦ Are likely to have little inter-visibility with adjacent landscapes; and ◦ Exhibit no or a low density of sensitive landscape features that bare visual value.
Moderate sensitivity	These landscapes are likely to: ◦ Have a moderately elevated topography with reasonably distinct landforms that provides some sense of enclosure; ◦ Have been affected by several man-made features; ◦ Have limited inter-visibility with adjacent landscapes; and ◦ Exhibit a moderate density of sensitive landscape features that bare visual value.
High sensitivity	These landscapes are likely to: ◦ Consist mainly of undulating plains and poorly defined landforms; ◦ Be open or exposed with a remote character and an absence of man-made features; ◦ Are often highly visible from adjacent landscapes; and ◦ Exhibit a high density of sensitive landscape features that bare visual value.

The majority of the study area is considered to have a *high* landscape character sensitivity due to the relative undeveloped and pristine condition of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. Low terrain variability mainly occurs in the western part of the study area where a low to moderate VAC can be expected. Generally the vegetation cover is limited to low shrubs and ground covers which will provide no visual screening for the proposed transmission line.

The landscape character of the different landscape types are considered highly susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is not resilient and recovers very slowly from surface disturbances. This often results in long periods of exposed soil and a reduction in visual quality.

Previous human induced activities and interventions have adversely impacted on the original landscape character of the different landscape types. In this case, mining activity along the coast, the fallow agricultural fields on the Lowland Succulent Karoo plains and between the hills of the Kamiesberg Mountain range and existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the pristine condition of the affected landscape type and detrimentally affect the quality of the visual resource.

The reduced sensitivities of the different landscape characters are localised and do not account for the entire landscape type. The impact of existing development on the different landscape types are discussed below.

Table 17 *Landscape character sensitivity*

LANDSCAPE TYPE (LT)	PREVAILING LANDSCAPE CHARACTER SENSITIVITY	AREA OF DISTURBANCE IN LT	LOCALISED REDUCTION OF SENSITIVITY
Orange River Valley	High	• At the point where the existing Oranjemond substation is located	Moderate
Strandveld Coast Line	High	No major disturbances are recognised	-
Disturbed Standveld Coast Line	Low	• The entire coastline is disturbed • The R382 route	Low
Lowland Succulent Karoo plains	High	• The corridor along the existing Oranjemond-Gromis-Nama 220kV line between the Oranjemond and Gromis substations; • The R382 and R355 route; • The areas of cultivated or fallow cropland south of the NNP	Moderate
Kamiesberg Succulent Karoo	High	• The N7 route; • The areas of cultivated or fallow cropland south of the NNP and adjacent the N7.	Moderate
Olifants River Valley	Moderate	• The development and cultivated cropland on the Olifants River banks; • Roads crossing the river.	Low
Vredendal Agricultural	Moderate	• The existing Juno substation; • The network of roads in the area; • The highly cultivated region of Vredendal.	Low

5.3.1.2 Severity Of Potential Landscape Impacts

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses. The magnitude/severity of this intrusion is measured against the scale of the project, the permanence of the intrusion and the loss in visual quality, -value and/or VAC.

Table 18 *Landscape impact – Altering the landscape character*

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative A	Negative – Impacting on the visual quality of the landscape due the presence of foreign elements and a loss of vegetation cover.	Localised impacts over an extensive area	Permanent if not mitigated	High	Definite	High	Low	High
Alternative B				High	Definite	High	Low	High
Alternative C				Moderate	Highly probable	Moderate	Low	High
Alternative D				Moderate	Probable	Moderate	Low	Low
Alternative E				High	Definite	High	Low	High
Alternative F				High	Definite	High	Low	High
Alternative G				High	Definite	High	Low	High
Operational phase								
Alternative A	Negative – Impacting on the visual quality of the landscape due the presence of a transmission line.	Regional	Permanent	High	Definite	High	High	High
Alternative B				High	Definite	High	High	High
Alternative C				Moderate	Highly probable	Moderate	Low	High
Alternative D				Moderate	Probable	Moderate	Moderate	Low
Alternative E				High	Definite	High	High	High
Alternative F				High	Definite	High	High	High
Alternative G				High	Definite	High	High	High

Construction phase

The activities that are expected to cause landscape impacts and that are associated with the construction phase, are the establishment of the construction camp, construction of access roads and the clearance of the servitude. These activities will create surface disturbances which will result in the removal of vegetation and the exposure of the underlying soil.

The extent of the disturbances will generally affect a relative small footprint area. Access roads to the towers are expected to be a two-track dirt road which will create the minimum disturbance. During construction, the area around the individual towers will be disturbed. Vegetation will be trampled and may take many years to recover.

The construction camps and lay-down yards are anticipated to disturb a much larger area. The size and location of the construction camps will play a major role in the severity of the landscape impact. Due to a lack of technical information two options are considered; the location of construction camps in remote, virgin land, or in/adjacent existing settlements. The initial presence of a construction camp in a pristine landscape will cause a temporary and localised alteration to the landscape character. A construction camp located in or adjacent an existing town or settlement will be easily associated with the town and therefore the presence of the town, mitigates the impact. The mitigating result is most effective, the bigger the town or settlement is.

Servitudes will generally be kept undisturbed and vegetation clearance may only occur in isolated scenarios where higher growing and dense vegetation stands provide enough biomass to cause a fire hazards if ignited. The taller and denser vegetation stands mostly occur in drainage lines or on the hills of the Kamiesberg Succulent Karoo landscape type in isolated patches. The complete removal of the vegetation will result in disturbed areas of exposed soil.

Figure 8 Example of existing disturbance in the study area

The exposed soil will contrast severely with the intact vegetation around the disturbance footprint. In many parts of the study area the soil is light coloured and areas of disturbance are exceedingly obvious, impacting on the visual quality of the study area (See Figure 8 above).

Considering the low VAC throughout most of the study area, the pristine condition of great parts of the landscape and the slow recovery rate of the endemic vegetation, the *severity of landscape impact* during the construction stage is expected to be *high* for Alternatives A, B, E, F and G. The impact will extend over the entire length of the different alignments and may vary in degrees of severity along the linear length as it transects landscape types of varying VAC and surface disturbances are minimised through, for example utilising existing roads.

Alternative C aligns the existing R355 route and the N7 between the Gromis and Juno substations. The presence of the roads has caused a localised reduction in the visual quality of the landscape types. Large areas along these routes are occupied by active or fallow cropland which further reduces the quality of the landscape. The VAC between Springbok and Bitterfontein is also considered high due to the varied topography of the Kamiesberg Mountain range. These factors limited the *severity of landscape impact* to a *moderate* degree.

The *severity of the landscape impact* can be mitigated to a low severity. Sensitive placement of the construction camp, limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

Operational phase

Surface disturbances created during construction may remain for an extended period during the operational phase. These are seen as residual affects carried forward from the construction phase and can be completely or substantially mitigated if treated appropriately in the construction phase.

An additional impact will be created as a result of the presence of the completed transmission line, i.e. that of the evenly spaced towers. The industrial character and the near monumental vertical scale of the towers, will severely contrast with the simple and mundane landscape character that prevails through most of the study area. Generally, VAC is considered low to moderate throughout most landscape types with the exception of the Kamiesberg Succulent Karoo. The mountainous terrain provides some form of screening, and inter-visibility between landscape units[5] is limited.

The remoteness and the associated openness of the western part of the study area is considered as a landscape amenity (refer to VIA) that provides the study area with a unique and valued sense of place. This quality of the landscape will be adversely affected with the presence of a transmission line of this scale and extent. Proclaimed conservation areas such as the NNP and the proposed expansion of its jurisdiction, will experience major loss in visual quality which will impact on the landscape character.

Alternatives A, B, E and G traverse over the jurisdiction area of the NNP and also extend over the southern areas of the study area which are also considered as highly valued tourist areas. Alternative F crosses over a small section of the NNP planning domain and continues south on the same alignment as proposed for Alternative B.

Alternative C is aligned along existing linear infrastructure such as the R355 and the N7 highway. The co-existence of transport routes and transmission lines is a common sight in South Africa. These two man-made features are often associated with each other and are considered compatible linear features. The location of a transmission line parallel to the N7 is the most preferred alternative even though it traverses through a generally highly sensitive landscape, the Kamiesberg

[5] A landscape unit can be interpreted as an “outdoor room” which are enclosed by clearly defined landforms or vegetation. Views within a landscape unit are contained and face inward.

Succulent Karoo and Lowland Succulent Karoo plains. Table 18 substantiates the preference for Alternative C. A localised reduction of landscape character sensitivity occurs along the R 355 and N7 routes which will result in a *moderate* significance of landscape impact.

5.3.2 Significance of visual impacts

5.3.2.1 Viewer Sensitivity

Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project. The visual receptors are grouped according to their similarities. The visual receptors included in this study are:

- Residents;
- Tourists; and
- Motorists.

To determine visual receptor sensitivity a commonly used rating system is utilised. This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

a) Residents

Residents of the affected environment are classified as visual receptors of *high* sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

b) Tourists

Tourists are regarded as visual receptors of exceptional *high* sensitivity. Their attention is focused towards the landscape and essentially utilise it for enjoyment purposes and appreciation of the quality of the landscape.

c) Motorists

Motorists are generally classified as visual receptors of *low* sensitivity due to their momentary view and experience of the proposed development. As a motorist's speed increases, the sharpness of lateral vision declines and the motorist tends to focus on the line of travel (USDOT, 1981). This adds weight to the assumption that under normal conditions motorists will show *low* levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief.

Motorists on the scenic routes in the study area will present a higher sensitivity. Their reason for being in the landscape is similar to that of the tourists and will therefore be categories under the tourist viewer group.

5.3.2.2 Severity Of Potential Visual Impacts

Severity of visual impact refers to the magnitude of change to specific visual receptor's views and/or experience of the landscape. Severity of visual impact is influenced by the following factors:

- The **viewer's exposure** to the project:
  - Distance of observers from the proposed project;
  - The visibility of the proposed project (ZVI);
  - Number of affected viewers; and
  - Duration of views to development experienced by affected viewers.
- Degree of **visual intrusion** created by the project.

Empirical research indicates that the visibility of a transmission tower and hence the severity of visual impact, decreases as the distance between the observer and the tower increases. The landscape type, through which the transmission line crosses, can mitigate the severity of visual impact through topographical or vegetative screening. Bishop *et al* (1988) noticed that in some cases the tower may dominate the view for example, silhouetted against the skyline, or in some cases be absorbed in the landscape. A complex landscape setting with a diverse land cover and topographical variation have the ability to decrease the severity of visual impact more so than a mundane landscape (Bishop *et al*, 1985).

The Zone of Visual Influence (ZVI) can be calculated through the use of a Geographical Information System (GIS). The result reflects a shaded pattern which identifies the areas that are expected to experience views of the proposed alignments. The ZVI is limited to 10 km from the proposed alignments.

A visibility analysis has been completed for each of the seven alternative alignments (refer to VIA, Appendix -). According to Bishop *et al* (1988), visual receptors within 1 km from the alignment are most likely to experience the highest degree of visual intrusion, hence contributing to the severity of the visual impact. This is considered as the zone of highest visibility after which the degree of visual intrusion decreases rapidly at distances further away.

The visibility analysis considers the worst-case scenario, using line-of-sight based on topography alone. This assists the process of identifying possible affected viewers and the extent of the affected environment.

Table 19 *Potential visual impacts on residents*

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative A	Negative – Construction camp and lay-down yards may cause unsightly views.	Local	Temporary	Low	Probable	Low	Low	Low
Alternative B				Low	Probable	Low	Low	Low
Alternative C				Moderate	Probable	Moderate	Low	Low
Alternative D				Low	Probable	Low	Low	Low
Alternative E				Low	Probable	Low	Low	Low
Alternative F				Low	Probable	Low	Low	Low
Alternative G				Low	Probable	Low	Low	Low
Operational phase								
Alternative A	Negative – The presence of a transmission line intrudes on existing views and spoils the open panoramic views of the landscape.	Regional	Permanent	Moderate	Highly Probable	Moderate	Moderate	High
Alternative B				Moderate	Highly Probable	Moderate	Moderate	High
Alternative C				High	Highly Probable	High	High	High
Alternative D				Moderate	Probable	Moderate	Moderate	Low
Alternative E				Moderate	Highly Probable	Moderate	Moderate	High
Alternative F				Moderate	Highly Probable	Moderate	Moderate	High
Alternative G				Moderate	Highly Probable	Moderate	Moderate	High

Generally, the study area is sparsely populated with the exception of a few small towns and farming communities. These communities are normally situated along main transportation routes, near mining areas or adjacent rivers or water resources. The towns of note that have been identified in the visibility analyses as places that will experience intrusive views to either of the proposed alternatives, are:

- Okiep;
- Springbok;
- Kamieskroon;
- Garies;
- Bitterfontein;
- Vredendal; and
- Soebatsfontein.

Numerous other small villages and farm residents will experience an intrusion on their views due to the presence of the proposed transmission line. It is unpractical to discuss all, but they are recognised as the general population of the study area and are identified as affected visual receptors.

Considering the sparse and relative even distribution of residents across the study area, it can be concluded that the entire study area have a low density of residents with the exception of higher concentrations of residents in the towns mentioned previously. Many of these towns occur along the main transport routes such as the N7. These towns are also larger and contain a much higher number of residents than those towns further west.

Construction phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yards. The uncertainty pertaining to the number, location and size of the construction camps, relates to a low level of confidence in the assessment of the visual impact. The duration of the potential

visual impact will be temporary which will result in an anticipated *low* significance of visual impact for all but Alternative C.

Alternative C is located in close proximity to six recognised towns. The number of visual receptors that may be affected is considered relatively high and their visual exposure will be dependant on the placement of the construction camps and lay-down yards. At worst, the construction camps will be located in or adjacent the exiting towns. This may cause a high visual intrusion for residents located adjacent the construction camps. A *moderate* significance of visual impact is anticipated and is based on the worst-case potential for visual impact.

Operational phase

The resident of the towns along the N7 may experience a high degree of visual intrusion due to their proximity to Alternative C & F. These residents are within 5 km and in some instances within 1 km from the proposed alignment. This is considered the zone of highest visibility (Section 0) in which the highest degree of visual intrusion can be expected. Alternative C will affect the largest number of residents compared to the other alternatives. Visual exposure is considered high due to the proximity of the alignment to the towns and the high level of visibility that can be experienced.

The other alternatives mostly traverse through areas that are vacant and only intrude on views of remote settlements or farm residents. The number of affected viewers is relatively low. A 5 km corridor along the individual alignments delineates the zone that will experience the highest visual intrusion. Any farm residents or small settlements in this zone may experience a high visibility of the proposed transmission line and hence, experience a *highly* severe visual impact.

The VAC of the different landscape types does play a major role in the visibility of the proposed transmission line. As discussed in Section 0, a diverse land cover and topographically varied terrain does have the ability to decrease the severity of visual impact (Bishop *et al,* 1985) by creating a backdrop. The steel frame of the towers (especially the cross-rope suspension type) presents a high degree of visual permeability, and hence a low degree of visual obstruction. This characteristic of the towers allows it to readily blend with the background colours and patterns of the landscape. The mountainous terrain of the Kamiesberg Succulent Karoo and parts of the Lowland Succulent Karoo plains do provide sufficient topographic variability and diversity in surface cover to greatly reduce the severity of visual impact by absorbing the towers in the landscape setting. This results in a reduced ZVI because the visibility of the individual towers is limited to a smaller distance.

Inversely, a mundane landscape with a low degree of elevated topography often fails to create an effective backdrop. The degree of visibility of a series of transmission towers in a relative flat landscape is mostly determined by distance since the silhouette effect against the sky tend to increase visibility and hence, increase the severity of visual impact over a much larger ZVI. This would be the case for alternatives that cross through the Strandveld Coastline, Lowland

Succulent Karoo plains, Vredendal Agricultural and Olifants River Valley landscape types.

The presence of a transmission line in the visual field of the residents in this part of the study area will spoil the uncluttered panoramic views they experience. The silhouette of a transmission line on the horizon will be visible from a great distance and thus increase the ZVI considerably, potentially impacting on more residents.

Table 20 *Potential visual impacts on tourists*

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative A	Negative – Construction camp and lay-down yards may cause unsightly views and spoil the undisturbed views over the landscape.	At a number of point locations	Temporary	Moderate	Probable	Moderate	Low	Low
Alternative B				Moderate	Probable	Moderate	Low	Low
Alternative C				Low	Highly probable	Low	Low	Low
Alternative D				Moderate	Probable	Moderate	Low	Low
Alternative E				Moderate	Probable	Moderate	Low	Low
Alternative F				Moderate	Probable	Moderate	Low	Low
Alternative G				Moderate	Probable	Moderate	Low	Low
Operational phase								
Alternative A	Negative – The presence of a transmission line intrudes on existing views and spoils the open panoramic views of the landscape	Regional	Permanent	High	Definite	High	High	High
Alternative B				High	Definite	High	High	High
Alternative C				Moderate	Definite	Moderate	Moderate	High
Alternative D				Moderate	Highly probable	Moderate	Moderate	Low
Alternative E				High	Definite	High	High	High
Alternative F				High	Definite	High	High	High
Alternative G				High	Definite	High	High	High

The study area is renowned for its exceptional biodiversity and pristine desert-like landscapes. These characteristics provide the basis for the tourism industry which plays a major role in the economy of the Western and Northern Cape. The entire study area is considered to have a high tourism potential with the emphasis on the NNP which is a proclaimed protected area and also the numerous other centres of floral endemism that occur in the study area. Tourists flock to Namaqualand during the early spring period when the spectacular floral displays are at its peak. During these periods, tourists infiltrate every small gravel road and town, in search of secluded locations where they can experience the true remoteness and undisturbed beauty of the landscape.

The type of tourist that visits the Namaqualand is expected to travel considerably through the study area by vehicle. This implies that they will experience a large part of the study area in a relative short time span.

Construction phase

The temporary duration of the construction phase is not expected to cause major visual impacts. The location, number and size of the construction camps and lay-down yards will be crucial in regulating the impact. Detail information is not available and it is anticipated that visual impact will occur localised and that a small number of tourists will be adversely affected by these project components during construction.

The construction camps may however cause a higher visual intrusion on tourists visiting the mostly vacant, western areas of the study area where the possibility of integrating it with existing settlements/towns and so, mitigate the visual intrusion, is least. This could potentially be the case during the construction of alternative A, B, E, F & G. It is highly probable that a number of construction camps will have to be established in pristine landscapes, which may temporarily interfere with the undisturbed views that will experienced by tourists at that time. Their exposure to possible unsightly views of the construction camps and the associated activity, will be minimal and localised.

The potential visual impact on tourists during the construction phase of the proposed project can be mitigated with relative ease. The greatest factor to consider is the location of the construction camp out of potential views that may be experienced from scenic routes or tourist hotspots.

Operational phase

Considering the extent of the proposed alternatives, a great number of tourists will be affected during their visit to the Namaqualand. Although it is difficult to pinpoint particular locations in the study area that are of specific tourist value, since the entire study area bares value, the most obvious concentration of tourists can be expected in the NNP. For these tourists, alternatives A, B, E, F & G will create major alterations to their views. The landscape is very photogenic and is the majority of many tourists' photographic memorabilia. The presence of a transmission line in this pristine landscape will severely spoil the often picturesque views that are experienced over the undulating hills.

The same argument accounts for the rest of the study area that is classified as vacant and is anticipated to bare similar qualities as the NNP. Although not part of a conservation area, the tourist potential is considered extremely high. Access to the more remote areas of the study area is often difficult, but may hold a reward for the more dedicated tourist.

It can be concluded that alternatives A, B, E, F & G will cause major visual intrusion for tourists travelling through the study area. The western part of the study area generally has a low VAC which will cause a greater ZVI. The severity of the visual impact will be *highly* severe, causing a *highly* significant visual impact.

Alternative C will be constructed along the N7. Considering the high VAC of the Kamiesberg Succulent Karoo landscape type and the common association with infrastructure along major transport routes, the severity of potential visual impact will be *moderate* (Reference are made to the discussion in Section 0). The backdrop created by the mountains has a further mitigating effect which will firstly limit the visibility of the individual towers and secondly reduce the ZVI. The significance of visual impact will be *moderate*.

Table 21 *Potential visual impacts on motorists*

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative A	Negative – Intruding on existing views of the landscape.	At a number of point locations	Short period	Low	Highly Probable	Low	Low	Moderate
Alternative B				Low	Highly Probable	Low	Low	Moderate
Alternative C				Low	Highly probable	Low	Low	Moderate
Alternative D				Low	Probable	Low	Low	Low
Alternative E				Low	Highly Probable	Low	Low	Moderate
Alternative F				Low	Highly Probable	Low	Low	Moderate
Alternative G				Low	Highly Probable	Low	Low	Moderate
Operational phase								
Alternative A	Negative – Intruding on existing views of the landscape.	Local	Short period	Low	Definite	Low	Low	High
Alternative B			Short period	Low	Definite	Low	Low	High
Alternative C			Intermittent	Low	Definite	Low	Low	High
Alternative D			Short period	Low	Highly Probable	Low	Low	Low
Alternative E			Short period	Low	Definite	Low	Low	High
Alternative F			Short period	Low	Definite	Low	Low	High
Alternative G			Short period	Low	Definite	Low	Low	High

The major routes in the study area is the N7 connecting the towns of Bitterfontein and Springbok, the R355 between Springbok and Kleinzee and the R382 connecting Steinkopf, Port Nolloth and Alexanderbay. Secondary and tertiary routes form a loose network of gravel roads in the remote areas, linking smaller settlements. This assessment will be limited to motorists utilising the main routes, as the countless smaller roads are considered as scenic routes, mostly utilised by tourists (refer to VIA, Appendix).

Construction phase

The potential visual impact that may be experienced by motorists during the construction phase is considered to be minimal. Limited information is available and the number, location and size of the construction camps and lay-down yards are essential for accurately assessing the visual impact. It is anticipated that views of the construction camps and lay-down yards of Alternative C may be visible from the N7. The other alternatives cross the R355 one location. The likeliness of a construction camp at this location is high and can be motivated from an accessibility point of view, due to the proximity to a major route.

The presence of the construction camp and lay-down yards may create unsightly views. Motorists' visual exposure to the impact will be brief and the severity of visual impact will be *low*. The VAC of the Lowland Succulent Karoo plains and the Kamiesberg Succulent Karoo landscape types are considered sufficient to screen or absorb these project components relatively effectively if siteing of the construction camp is done with consideration to the views experienced by motorists. The significance of potential visual impact is expected to be *low*.

Operational phase

Of these routes, the N7 are the most prominent which carries the highest capacity of motorists. The N7 traverses through the mountainous terrain of the Kamiesberg Succulent Karoo which has a high VAC. The elevated terrain will visually screen

much of the transmission line proposed by Alternative C & F. The partial screening effect will considerably reduce visual exposure to the transmission line and intermittent views may be experienced. The speed at which motorists travel also has a moderating affect on the severity of the visual impact and further reduces visual exposure.

The R355 & R382 cross through landscape types which have a moderate to low VAC. The motorists' visual exposure to the proposed transmission lines will be prolonged due to the minimal visual screening created by the landscape. These routes are less travelled than the N7 which implies a limited number of affected motorists.

Alternatives A, B, E, F & G cross the R355 at one location. The severity of visual impact at this point of crossing will be increased, but the high degree of visual exposure is limited to a very short period.

The severity of visual impact for all the proposed alternatives on motorists will be *low*. The speed at which they travel reduces their sensitivity and also contributes to short periods of visual exposure which result in a *low* significance of visual impact.

5.3.3 Mitigation measures

The aim of mitigation is to reduce or alleviate the intrusive contrast between the proposed project components and activities, and the receiving landscape to a point where it is acceptable to visual and landscape receptors.

5.3.3.1 General

- Proceed with construction of the transmission line during the off peak tourism season;
- Where areas are going to be disturbed through the destruction of vegetation, for example the establishment of the construction camp, the vegetation occurring in the area to be disturbed must be salvaged and kept in a controlled environment such as a nursery, for future re-planting in the disturbed areas as a measure of rehabilitation;

5.3.3.2 Transmission Towers

- Avoid crossing over or through ridges, rivers, pans or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation are not resilient and takes extended periods to recover;
- The preferred type of tower is the compact cross-rope or the cross-rope suspension tower. These two tower types are the most visually permeable and creates an extremely low degree of visual obstruction;
- Avoid changing the alignment's direction too often in order to minimise the use of the self-supporting strain tower. This tower type is the most visually

intrusive and the steel lattice structure are more dense than the other two tower types, hence creating more visual obstruction;

- Where practically possible, provide a minimum of 1 km buffer area between the transmission line and sensitive visual receptors; and
- Rehabilitate disturbed areas around pylons as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil.

5.3.3.3 Access Routes

- Make use of existing access roads where possible;
- Where new access roads are required, the disturbance area should be kept as small as possible. A two-track dirt road will be the most preferable option;
- Locate access routes so as to limit modification to the topography and to avoid the removal of established vegetation;
- Avoid crossing over or through ridges, rivers, pans or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation are not resilient and takes extended periods to recover;
- Maintain no or minimum cleared road verges;
- Access routes should be located on the perimeter of disturbed areas such as cultivated/fallow lands as not to fragment intact vegetated areas; and
- If it is necessary to clear vegetation for a road, avoid doing so in a continuous straight line. Alternatively, curve the road in order to reduce the visible extent of the cleared corridor;

5.3.3.4 Cleared Servitudes

- Locate the alignment and the associated cleared servitude so as to avoid the removal of established vegetation; and
- Avoid a continuous linear path of cleared vegetation that would strongly contrast with the surrounding landscape character. Feather the edges of the cleared corridor to avoid a clearly defined line through the landscape;

5.3.3.5 Construction Camps And Lay Down Yards

- Locate construction camps in areas that are already disturbed or where it isn't necessary to remove established vegetation like for example, natural bare areas;
- Utilise existing screening features such as dense vegetation stands or topographical features to place the construction camps and lay-down yards out of the view of sensitivity visual receptors;

- Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; and
- Screen the construction camp and lay-down yards by enclosing the entire area with a dark green or black shade cloth of no less than 2 m height.

5.4 IMPACTS ON HERITAGE RESOURCES

The impacts on heritage resources are dealt with geographically, section by section of the proposed transmission line, as follows:

- Oranjemond Substation to Holgat River;
- Holgat River to Gromis Substation;
- Gromis substation to Escarpment;
- Escarpment to Garies
- Garies to Juno Substation.

5.4.1 Oranjemond substation to Holgat River

This portion of the route follows the existing Eskom transmission line.

Figure 9 Aerial view of existing erosion of the access road near the Holgat River

Table 22 *Impacts on heritage resources between Oranjemond Substation and the Holgat River*

Nature	Loss of heritage resources		**Status**	**-**
Impact source(s)	▪ Construction ▪ Use of the existing access road for construction and maintenance purposes			
Affected stakeholders	Those concerned with heritage conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**Medium**		
	Duration	**Permanent**		
	Reversibility	**Irreversible**		
	Probability	**Highly probable**		
Significance	*Without mitigation*	Very low to medium		**L-M**
	With mitigation	Low		**L**
Confidence	High			

- *Source of the impact*: The impacts are caused by the presence of the existing access road, which will be continued to be used during construction of the new transmission line.
- *Description of the impact*: The unpaved surface of the road results in the removal of artefacts through the agents of erosion (gravity, wind and water). The current erosion is particularly evident at the crossing of the Holgat River (see). Further use of the existing road during construction of the new transmission line will result in increased erosion due to the passage of heavy vehicles that will transport the materials for the pylons. The impacts will be less during the operational phase, since the same road will be used for maintenance of the existing and proposed transmission lines.
- *Significance*: The significance of the impacts vary depending on the nature of the resources that are affected.
    - Late stone age: Very low
    - Early and Middle Stone age: Medium
    - Historical and built environment: Very low
    - Intangible heritage and landscape: Low
- Mitigation:
    - An archaeologist must be appointed to do a walk-through of the route prior to construction to inspect each pylon position for heritage features.
    - Vehicles must stay strictly on the existing track and may not create new tracks in the veld during construction of the new transmission line.
    - The existing crossing of the Holgat River must be stabilised by suitable means so that further erosion is prevented. No method for stabilisation is prescribed, but whatever method is used must be based on an inspection of the area for the nature of the erosion and must ensure that no further unnatural erosion takes place as a result of vehicle movement.

5.4.2 Holgat River to Gromis Substation

This portion of the route follows the existing Eskom transmission line between the Holgat River and Gromis Substation close to Grootmis.

Table 23 Impacts on heritage resources between the Holgat River and Gromis Substation

Nature	Loss of heritage resources		Status	-
Impact source(s)	▪ Construction ▪ Use of the existing access road for maintenance purposes			
Affected stakeholders	Those concerned with heritage conservation			
Magnitude	*Extent*	**Site**		
	Intensity	**Medium**		
	Duration	**Permanent**		
	Reversibility	**Irreversible**		
	Probability	**High probability for Early and Middle Stone Age resources, but very low to low probability for all other heritage resources**		
Significance	*Without mitigation*	Very low to medium		L-M
	With mitigation	Low		L
Confidence	Moderate			

- *Source of the impact*: The impacts are caused by:
    - Construction of the new transmission line pylons; and
    - the presence of the existing access road, which will be continued to be used during construction and operation of the new transmission line.
- *Description of the impact*: A range of low hills and outcrops is present along the eastern edge of the corridor. Early and Middle Stone Age material is likely to occur, especially on outcrops of silcrete, or in pans and blow-outs where the dorbank is exposed. Occasional Late Stone Age sites are to be expected associated with springs, pans and rocky outcrops and especially blowouts (which were favoured by prehistoric people throughout the western side of the country). Sites have been recorded in and close to the Buffelsrivier. The built environment is restricted to scattered farmhouses and stock posts. These are unlikely to suffer any direct impact. The greatest threat to heritage sites, especially ESA and MSA, and to a lesser extend LSA material is the erosion caused by the service road which is used by Eskom staff to service the transmission lines. The unpaved surface of the road results in the removal of artefacts through the agents of erosion (gravity, wind and water).
- *Significance*: The significance of the impacts vary depending on the nature of the resources that are affected.
    - Late stone age: Very low

- Early and Middle Stone age: Medium
- Historical and built environment: Very low
- Intangible heritage and landscape: Low

- Mitigation:
  - As above for the section from Oranjemond Substation to the Holgat River.
  - The route should be kept as far west as possible to avoid the range of hills and outcrops to the east as it is here that the chances of archaeological material is higher due to the likelihood of sheltered areas and springs.

5.4.3 Gromis Substation to the Escarpment

Table 24 Impacts on heritage resources between the Gromis Substation and the Escarpment

Nature	Loss of heritage resources		**Status**	**-**
Impact source(s)	▪ Construction ▪ Creation and use of new access road for construction and maintenance purposes			
Affected stakeholders	Those concerned with heritage conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**Medium**		
	Duration	**Permanent**		
	Reversibility	**Irreversible**		
	Probability	**Medium probability for intangible heritage and landscape; low probability for all other heritage resources.**		
Significance	*Without mitigation*	Very low to medium		**L-M**
	With mitigation	Low		**L**
Confidence	Confidence is moderate to low due to the fact that only a conceptual route was available at the time of the assessment. Accurate assessment of impacts on heritage resources will only be possible once the route of the access road and the position of the pylons have been determined.			

- *Source of the impact*: The impacts are caused by:
  - Construction of the new transmission line pylons with associated trampling of the area; and
  - the creation of a new access track and the continued use of the track during the operational phase for maintenance purposes.

- *Description of the impact*: The route crosses red aeolian sands and stable vegetated dune systems until it reaches the escarpment where granite outcrops are more prevalent. The area is characterised by vegetated dunes, occasional blow-outs and complexes of blow-outs in ancient dune seas. At the point of reaching the escarpment there is a large riverbed of a significant tributary of the Buffels River. Much of this entire area is very sandy which means that earlier archaeological material (ESA –MSA) is likely to be quite deeply buried unless on exposed terraces close to river beds. Late Stone Age archaeological sites are likely to be encountered in the many blowouts and dune seas that were so favoured by San hunter-gatherers. Colonial period sites are sparse. Erosion caused by the service road remains a significant threat to heritage resources. The unpaved surface of the road results in the removal of artefacts through the agents of erosion (gravity, wind and water).

- *Significance*: The significance of the impacts vary depending on the nature of the resources that are affected.
  - Late stone age: Very low
  - Early and Middle Stone age: Low
  - Historical and built environment: Very low
  - Intangible heritage and landscape: Low

- Mitigation:
  - An archaeologist must be appointed to do a walk-through of the route prior to construction to inspect the route of the proposed access road and each pylon position for heritage features.
  - Vehicles must stay strictly on the existing track and may not create new tracks in the veld during construction of the new transmission line.

5.4.4 Escarpment to Garies

Table 25 Impacts on heritage resources between the Escarpment and Garies

Nature	Loss of heritage resources		**Status**	**-**
Impact source(s)	▪ Construction ▪ Creation and use of new access road for construction and maintenance purposes			
Affected stakeholders	Those concerned with heritage conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**Medium**		
	Duration	**Permanent**		
	Reversibility	**Irreversible**		

	Probability	**High probability for Early and Middle Stone Age resources, but very low to low probability for all other heritage resources**	
Significance	*Without mitigation*	Very low to medium	**L-M**
	With mitigation	Low	**L**
Confidence	Confidence is moderate to low due to the fact that only a conceptual route was available at the time of the assessment. Accurate assessment of impacts on heritage resources will only be possible once the route of the access road and the position of the pylons have been determined.		

- *Source of the impact*: The impacts are caused by:
  - Construction of the new transmission line pylons with associated trampling of the area; and
  - the creation of a new access track and the continued use of the track during the operational phase for maintenance purposes;
  - Visual impacts due to the presence of the transmission lines.

- *Description of the impact*: Very little is known about the archaeology of this area. Late Stone Age archaeological sites are associated with features on the landscape such as large boulders with hollows or shelters underneath, granite outcrops which contained “waterbakke”. Water sources would have been particularly important after 2000 years ago when Khoekhoen came into Namaqualand with herds of domestic animals. Colonial period sites are scarce, being limited to small towns, occasional farms and stock posts. There is an early transport and railway system that linked the copper mines with Hondeklip Bay. An anticipated heritage issue is the possible proximity of the transmission lines to the western side of the N7 which is considered to be a scenic drive. The possibility of impacts to traditional lifestyles of the Nama people of the Kamiesbergs must also be established.

- *Significance*: The significance of the impacts vary depending on the nature of the resources that are affected.
  - Late stone age: Low
  - Early and Middle Stone age: Low
  - Historical and built environment: Low
  - Intangible heritage and landscape: Medium

- Mitigation:

- It is recommended that the transmission line route stay as far west as possible, to avoid impacts on the scenically important N7 route.
- An archaeologist must be appointed to do a walk-through of the route prior to construction to inspect the route of the proposed access road and each pylon position for heritage features.
- Vehicles must stay strictly on the existing track and may not create new tracks in the veld during construction of the new transmission line.

5.4.5 Garies to Juno Substation

Table 26 Impacts on heritage resources between Garies and Juno Substation

Nature	Loss of heritage resources		**Status**	**-**
Impact source(s)	▪ Construction ▪ Creation and use of new access road for construction and maintenance purposes			
Affected stakeholders	Those concerned with heritage conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**Medium**		
	Duration	**Permanent**		
	Reversibility	**Irreversible**		
	Probability	**Early Stone Age, Late Stone Age and Intangible Heritage and Landscape: Medium** **Late Stone Age and Historical & built environment: Low**		
Significance	*Without mitigation*	Low to medium		**L-M**
	With mitigation	Low		**L**
Confidence	Confidence is moderate to low due to the fact that only a conceptual route was available at the time of the assessment. Accurate assessment of impacts on heritage resources will only be possible once the route of the access road and the position of the pylons have been determined.			

- *Source of the impact*: The impacts are caused by:
  - Construction of the new transmission line pylons with associated trampling of the area; and
  - the creation of a new access track and the continued use of the track during the operational phase for maintenance purposes;
  - Visual impacts due to the presence of the transmission lines.
- *Description of the impact*: This portion of the route passes over broken granite hills, granite domes and eventually into flat landscape (red aeolian sand) closer

towards the Olifants River Valley. The granite foothills of the Nuwerus area are likely to be archaeologically sensitive in certain localities. Any form of rock shelter or sheltered boulder is likely to contain an archaeological site. Granite rock domes where water collection hollows have formed are likely to have dense scatters of archaeological material nearby. Extensive scatters of Early Stone Age and Middle Stone Age archaeological material have been recorded on the Knersvlakte. Archaeological assessments in the Vredendal area have revealed that scattered ESA and MSA material are almost ubiquitous in the area, but tend to be seen where the aeolian sands have eroded, exposing the underlying dorbank layers. Most of this early material is seen in or on the surface of the dorbank. Built environment and colonial period sites are extremely sparse, being limited to occasional farm houses and stock posts.

- *Significance*: The significance of the impacts vary depending on the nature of the resources that are affected.
    - Late stone age: Low
    - Early and Middle Stone age: Medium
    - Historical and built environment: Low
    - Intangible heritage and landscape: Medium

- *Mitigation:*
    - It is recommended that the transmission line route stay as far west of the N7 as possible.
    - An archaeologist must be appointed to do a walk-through of the route prior to construction to inspect the route of the proposed access road and each pylon position for heritage features.
    - Vehicles must stay strictly on the existing track and may not create new tracks in the veld during construction of the new transmission line.

5.4.6 Route as a whole

The impacts in terms of disturbance to the material remains of past human presence to heritage that could be caused by the proposed corridor tend to have a low probability. These impacts will take place at:

- The points on the landscape where the towers are to built (every 400 m or so depending on terrain).
- The establishment of the service road along the transmission line servitude which is used for transporting materials for construction, thereafter periodic maintenance. Ongoing impacts will occur if the service road exacerbates erosion.
- The points on the landscape where construction camps may be established will result in local disturbance to the ground surface.

In terms of intangible heritage, the greatest impact of all will be the loss of "sense of remoteness" which accompanies human intervention in one of South Africa's last remaining wide open spaces outside of a National Park. Unfortunately, this is impossible to mitigate.

It is concluded that the overall impact of the proposed project in terms of heritage is considered to be low. This is because heritage sites are sparsely distributed in the inland areas of the region, and secondly, construction of transmission lines, by virtue of their relatively small impact and on the landscape has a lower chance of impacting compared with other kinds of development activity. **In terms of route selection, the potential impacts to heritage will be low enough to allow other environmental factors to take precedent first.**

5.5 IMPACTS ON THE SOCIAL ENVIRONMENT

Social impacts are a complex issue, since what is regarded as positive or negative in terms of community values may change over time. Whether an impact is short term or long term, is also a complex issue, as time scales are to a considerable extent culturally and socially defined. The predicted impacts have been divided into four categories:

- Social impacts originating prior to the erection of the power line. Many of these processes pertain to the concerns and objections raised by key stakeholders during the public participation process;
- Impacts during the construction phase;
- Impacts during the operational phase; and
- Impacts during the decommissioning phase, if that should occur.

Social impacts do not occur in a vacuum. Many social impacts are dependent on one another or on physical or environmental impacts. Mitigation of social impacts can therefore also not be made in a vacuum. Where the social impact is a direct consequence of the development and the developer can mitigate it, it would be recommended in that way. However, sometimes the social impact results from a cumulative effect and can only be mitigated by formal societal structures like the government. It is indicated which form of mitigation will be necessary.

5.5.1 Impacts on health and social well-being

5.5.1.1 Impact on aspirations for the future

The entire area has great tourism potential. Planning to unleash this tourism potential has been included in regional and local governmental planning. Marketing of the area relies heavily on the sense of place - the isolation, wild and unspoilt nature of the area, wild flowers and stars are all attractions which will be spoilt by infrastructure like a power line. Thus, the transmission line could frustrate efforts to establish tourism products in the area.

Table 27 *Change in sense of place*

Nature	Change in sense of place		**Status**	**-**
Impact source(s)	Visual presence of the transmission line			
Affected stakeholders	Local residents, particularly those that live in isolated areas			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Long-term**		
	Reversibility	**Irreversible**		
	Probability	**High**		
Significance	*Without mitigation*	High		**H**
	With mitigation	Moderate		**M**

Confidence	High

- *Source of the impact*: The impacts will result from the visual presence of the transmission line in a landscape that currently has few signs of human influence. This will change the perceptions of the local inhabitants about their environment and what they value about it.
- *Description of the impact*: Change in sense of place
- *Significance*: The significance will be high, because this will be a long-term impact of high probability that is essentially irreversible, since it is unlikely that the transmission line will be decommissioned for at least a generation. Thus, it will have a permanent impact on tourism initiatives.
- Mitigation:
    - Avoid conservation areas like the Namaqua National Park.
    - Implement the mitigation measures recommended by the Visual Impact Assessment.

5.5.1.2 Feelings in relation to the project

Feelings in relation to the project might result in the formation of interest groups. Projects often generate uncertainty or fear and sometimes the impacts perceived in anticipation of the planned intervention can be greater than the impacts ultimately resulting from the intervention. These impacts include uncertainty, annoyance (a feeling/experience such as that due to disruption of life, but which is not necessarily directed at the intervention itself), dissatisfaction due to a failure of the project due to deliver promised benefits, and an experience of moral outrage (such as when a project leads to violation of deeply held moral or religious beliefs). A number of stakeholders voiced their concerns regarding the proposed project. These concerns varied, and will be discussed under relevant sections of the report. A number of concerns have been voiced about the fact that strangers will have to gain access to the farms, the impact on safety from this perspective and the impact of carelessness like an open gate on farming. Farmers also expressed dissatisfaction about the impact of a power line crossing their properties and not having access to electricity themselves. This was echoed by community members who have inadequate or weak electricity supply. All community members are not negative about the proposed project, however, only the negative impacts will be discussed.

Table 28 *Public dissatisfaction with the proposed route of the transmission line*

Nature	Public dissatisfaction with the proposed route of the transmission line		**Status**	**-**
Impact source(s)	Visual presence of the transmission line			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		

	Duration	**Medium-term**	
	Reversibility	**Reversible**	
	Probability	**Moderate**	
Significance	*Without mitigation*	Moderate	**M**
	With mitigation	Low	**L**
Confidence	High		

- *Source of the impact*: The impact will result from the routing of the transmission line.
- *Description of the impact*: The impact results from decisions taken by Eskom Transmission regarding the proposed routing of the transmission line, which the members of the affected communities may not regard as suitable for a transmission line.
- *Significance*: The significance is moderate, because not all people interviewed indicated dissatisfaction with the routing of the transmission line.
- *Mitigation*: Public should be made aware of their rights and the channels they can utilise to object to the process. An formal committee must be established to act as a liaison channel between the community and Eskom Transmission, who will work in conjunction with the Environmental Control Officer.

Table 29 *Dissatisfaction with not getting benefits from electricity transmission*

Nature	**Dissatisfaction with not getting benefits from electricity transmission**		Status	**-**
Impact source(s)	**Presence of the transmission line**			
Affected stakeholders	**Local residents**			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Medium-term**		
	Reversibility	**Reversible**		
	Probability	**High**		
Significance	*Without mitigation*	High		**H**
	With mitigation	Moderate		**M**
Confidence	Definite			

- *Source of the impact*: The impact will result from the routing of the transmission line past individuals and communities that do not have access to electricity.
- *Description of the impact*: The impact results from the fact that many, if not most, of the communities and individuals who will be affected by the transmission line

do not have access to electricity themselves. This creates a sense that they are not important and that it is only people in the large urban centres who are catered for by Eskom.

- *Significance*: The significance is high, since there is a strong feeling of unhappiness in the community with the fact that they will not get any benefit from the transmission line.
- *Mitigation:*
    - Eskom must inform the community about alternatives e.g. self-build schemes.
    - An Environmental Monitoring Committee must be established and must approach local municipalities to engage in discussions with Eskom Distribution about possible solutions to provide electricity to affected communities.

5.5.2 Quality of the living environment

5.5.2.1 Quality of the physical environment

The impacts in this section refer to, from a social point of view, how fit the neighbourhood is to inhabit from a social point of view. Some of the impacts relate directly to the biophysical environment. This concept has both a perceived and an actual dimension.

Social impacts experienced in the physical environment relate to exposure to dust, noise, risk, odour, vibration, artificial light etc. During the construction phase, there will be a decrease in the quality of the physical environment. Noise levels and traffic will increase as result of the construction activities. Concerns were expressed about the way in which contractors conduct themselves when on site. This relates directly to the physical environment. In an arid area such as the Northern Cape, environmental scars take a long time to heal. If a contractor drives off-road, he might destroy a shrub that takes twenty years to mature and the evidence of his tracks can take years to disappear.

Table 30 *Quality of the physical environment*

Nature	Increase in noise and traffic		**Status**	**-**
Impact source(s)	Construction vehicles and the construction process			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Short-term**		
	Reversibility	**Irreversible**		
	Probability	**High**		
Significance	*Without mitigation*	Moderate		**M**
	With mitigation	Low		**L**
Confidence	High			

- *Source of the impact*: The impact will result from the constant and repeated passage of vehicles along the construction tracks in close proximity to residences, as well as the process of actually constructing the pylons.
- *Description of the impact*: The impact will occur due to the noise generated by construction traffic.
- *Significance*: The impact is moderate, since it is a localised impact or short-term duration that can be easily managed by monitoring of the construction process.
- *Mitigation:*
    - The proposed EMC must address traffic concerns with Eskom Transmission and agree with residents on appropriate times for construction activities, as well as routes to be used by vehicles to avoid impacts on residences.
    - The EMC and ECO must consult the community to determine when they experience peak traffic (e.g. during harvest times and transportation of livestock), so as to avoid conflicts with local traffic.

Table 31 *Quality of the physical environment*

Nature	Damage to natural resources		**Status**	**-**
Impact source(s)	Construction vehicles driving off-road			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Short-term**		

	Reversibility	**Reversible**	
	Probability	**High**	
Significance	*Without mitigation*	Moderate	**M**
	With mitigation	Low	**L**
Confidence	High		

- *Source of the impact*: The impact will result from drivers of construction vehicles not following established routes.
- *Description of the impact*: The impact will occur due to construction vehicles driving through virgin veld, resulting in the destruction of plants and other natural resources that may be regarded as important by local people.
- *Significance*: The impact is moderate, since it is a localised impact that can be easily mitigated by ensuring responsible supervision during the construction process.
- *Mitigation*:
    - An independent Environmental Control Officer (ECO) must be appointed to supervise construction and ensure that they abide by the requirements of the Environmental Management Plan (EMP).
    - A fining system must be implemented in terms of the EMP, so that drivers are discouraged from veering off established tracks. Fines must be large enough to act as a real deterrent and to pay for rehabilitation of the affected areas.

5.5.2.2 Aesthetic quality

Community members are concerned about the aesthetic impact of the development on the area. A Visual Impact Assessment has been conducted and will make recommendations in this regard.

Table 32 *Aesthetic quality*

Nature	Decrease in aesthetic quality	**Status**	**-**
Impact source(s)	▪ Creation of access roads ▪ Visual presence of the transmission line		
Affected stakeholders	Local residents		
Magnitude	*Extent*	**Local**	
	Intensity	**High**	
	Duration	**Long-term**	
	Reversibility	**Reversible**	
	Probability	**High**	

Significance	*Without mitigation*	High	**H**
	With mitigation	Moderate	**M**
Confidence	High		

- *Source of the impact*: The impact will result from the creation of access roads and the visual presence of the transmission line.
- *Description of the impact*: The impact will occur due to access roads, which will contrast with the surrounding natural veld, as well as the presence of large steel pylons which have an industrial appearance in an otherwise predominantly natural area.
- *Significance*: The impact is high, since the contrast of the transmission line pylons with the surrounding natural landscape is extreme.
- *Mitigation*:
    - The access roads must be limited to tracks. No roads may be scraped.
    - Disturbed sites must be rehabilitated as soon as possible once construction has ceased so that exposed soil is covered by natural vegetation.

5.5.2.3 Adequacy of physical infrastructure

Table 33 *Adequacy of physical infrastructure*

Nature	Deterioration of physical infrastructure during construction		**Status**	**-**
Impact source(s)	Use of existing roads during construction			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Long-term**		
	Reversibility	**Reversible**		
	Probability	**Moderate**		
Significance	*Without mitigation*	High		**H**
	With mitigation	Moderate		**M**
Confidence	High			

- *Source of the impact*: The use of existing roads by construction vehicles

- *Description of the impact*: Heavy vehicles may trample existing roads, resulting in their rapid deterioration. There is a concern amongst community members that the road infrastructure is not adequate if any other route than one that follows existing roads would be chosen.
- *Significance*: The impact is high, due to the limited infrastructure that is available in the area and the high level of dependence of people on these resources.
- *Mitigation*:
    - The EMC must become involved in liaison with ESKOM about the planning and timeframes of proposed infrastructure.
    - Route adjacent to existing road to be given favourable consideration.
    - Contractors and Eskom Transmission maintenance personnel must be strictly required to keep gates closed, especially in areas used for livestock farming areas.

5.5.2.4 Personal safety and risk exposure

Table 34 *Personal safety and risk exposure*

Nature	Perceived increase in risk and decrease in safety		**Status**	**-**
Impact source(s)	Influx of strangers to the area			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Long-term**		
	Reversibility	**Reversible**		
	Probability	**Moderate**		
Significance	*Without mitigation*	Moderate		**M**
	With mitigation	Low		**L**
Confidence	High			

- *Source of the impact*: Influx of strangers to the area
- *Description of the impact*: A number of concerns have been voiced about personal safety and risk exposure. Amongst these are the concern that undesirable people will be attracted to the area, strangers on farms servicing the power lines and fires as a result of possible theft of conductors of transmission lines. The communities are close-knit and because it is such a small community one of the factors making it safe was the fact that everybody knows each other. The long term effect of maintenance work to the transmission lines should also be considered.

- *Significance*: The impact is high, due to the limited infrastructure that is available in the area and the high level of dependence of people on these resources.
- *Mitigation*:
    - The EMC must work with ESKOM to develop a protocol for obtaining access to farms for maintenance purposes e.g. informing landowners at least two days in advance of intention to use the access road, carrying of appropriate identification, etc.
    - Technical investigations about actual risk of fires – results should be made available to farmers.

5.5.2.5 Crime and violence

Table 35 *Crime and violence*

Nature	Increase in crime levels in communities and on farms		**Status**	**-**
Impact source(s)	Influx of construction teams to the area			
Affected stakeholders	**Local residents**			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Medium-term**		
	Reversibility	**Reversible**		
	Probability	**Moderate**		
Significance	*Without mitigation*	Moderate		**M**
	With mitigation	Low		**L**
Confidence	High			

- *Source of the impact*: Influx of construction teams to the area
- *Description of the impact*: The idea of construction teams working on their farms and maintenance teams fixing the power lines is not welcomed by many farmers, as the perception exist that it can lead to an increase in crime.
- *Significance*: The impact is moderate, since it will be limited to a relatively short duration during the construction period. It can also be effectively mitigated by proper surveillance of the area and liaison between community policing forums and the proposed EMC..
- *Mitigation*:
    - ESKOM must liaise with the farmer's unions and a protocol for gaining access to farms should be established and distributed to all parties involved.

- Construction teams should be clearly identified by wearing uniforms of identification cards that should be exhibited in a visible place on their body.
- The EMC must liaise with the Community Policing Forums to ensure that police are aware of crime incidents and potential.

5.5.3 Economic impacts and material well-being

5.5.3.1 Property values

Table 36 *Change in property values*

Nature	Change in property values		**Status**	**-**
Impact source(s)	▪ Registration of transmission line servitudes on private properties, preventing certain uses in the servitude ▪ Physical footprint of pylons on land, making it unavailable for other uses			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Long-term**		
	Reversibility	**Irreversible**		
	Probability	**High**		
Significance	*Without mitigation*	High		**H**
	With mitigation	Moderate		**M**
Confidence	High			

- *Source of the impact*: Registration of transmission line servitudes and physical footprint of the pylons.
- *Description of the impact*: The development will have an impact on the utility of the properties and thus, on their values and resale potential.
- *Significance*: The significance is considered to be high due to the permanent, irreversible nature of the transmission line servitudes that will affect properties, and because it affects the livelihoods of affected landowners.
- *Mitigation:*
    - Farmers must receive fair compensation for the servitude registration through a formal negotiation process. This process must be informed by valuation of the properties by an independent property valuer.

5.5.3.2 Employment

Table 37 *Creation of employment opportunities*

Nature	Creation of employment opportunities		**Status**	**+**
Impact source(s)	Short-term casual employment and fencing contracts during the construction phase			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Short-term**		
	Reversibility	**Reversible**		
	Probability	**Low**		
Significance	*Without mitigation*	Low		**L**
	With mitigation	N.A.		
Confidence	High			

- *Source of the impact*: Some short term employment of local people may be required during construction.
- *Description of the impact*: Short term employment of locals will be required to do fencing (e.g. for construction camps) and to install gates in existing fences for the construction and maintenance access roads. Very little if any employment opportunities will be associated with the construction of the pylons, since this is a specialised task that will be put out to tender to established contractors that have experience in this kind of construction project. There are high levels of unemployment amongst residents of the area. The demand for especially unskilled labour outnumbers the opportunities by far. It is preferable that whatever jobs are created during construction must be sourced from local communities, as they might oppose the presence of people from outside, whilst there are skilled individuals inside the community that could fill these positions. An added benefit would be that using local labour would obviate the need for temporary housing for construction workers. Apart from direct opportunities that will be created, a number of indirect jobs will also be created in the construction phase (e.g. catering to the construction crew). In the operational phase, no additional jobs will be created.
- *Significance*: The significance of this positive impact is considered to be low, due to the temporary nature of the impacts and the very small number of people that will benefit.
- *Optimisation*:
    - Labour and resources for construction must be sourced from local sources as far as possible.

- Contractors should be required to obtain accommodation from local sources rather than establishing independent construction camps, so that the contractor's employees are encouraged to spend their money in local communities.

5.5.3.3 Replacement cost of environmental functions

Table 38 *Loss of environmental goods and services*

Nature	Loss of environmental goods and services		**Status**	**-**
Impact source(s)	▪ Construction activities causing disturbance of vegetation and exposure of the soil ▪ Visual presence of the transmission line			
Affected stakeholders	**Local residents**			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Long-term**		
	Reversibility	**Irreversible**		
	Probability	**High**		
Significance	*Without mitigation*	High		**H**
	With mitigation	Moderate		**M**
Confidence	High			

- *Source of the impact*: The impacts will be caused by construction activities and by the visual presence of the line during the operational phase.
- *Description of the impact*: Construction activities will result on localised disturbance of vegetation along the access road and at the pylon positions, resulting in a visual impacts and loss of some of the scenic quality provided by an unspoilt natural environment. The loss of this scenic quality will affect the ability of the affected people to use the land for income generating activities such as tourism. The transmission line will have very little effect on the physical use of the land under the lines during operation, apart from a restriction of the construction of buildings.
- *Significance*: The significance of this impact is considered to be high due to the impacts it has on people's livelihoods.
- *Mitigation*:
    - As far as possible, the routing of the line through areas of high tourism potential must be avoided.

5.5.4 Cultural impacts

Cultural impacts include impacts such as the loss of language, loss of cultural heritage or change in the integrity of a culture.

5.5.4.1 Loss of natural and cultural heritage

Table 39 *Loss of natural and cultural heritage*

Nature	Loss of sense of place		**Status**	**-**
Impact source(s)	▪ Construction activities ▪ Visual presence of the transmission lines			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Long-term**		
	Reversibility	**Irreversible**		
	Probability	**High**		
Significance	*Without mitigation*	High		**H**
	With mitigation	Moderate		**M**
Confidence	High			

- *Source of the impact*: Construction activities and the visual presence of the transmission line in an otherwise largely natural landscape.
- *Description of the impact*: The proposed transmission lines will add to the process of changing the sense of place. The current sense of place is of a rural to natural environment with broad, sweeping vistas and very little human interference (besides the diamond mines along the coast). It is anticipated that some natural areas will be impacted on by the lines, and it will be investigated in the Environmental Assessment process. The culture of the local communities is also seen as unique and conservation-worthy.
- *Significance*: The impact is considered to be of high significance due to the significant change that the transmission line with bring about from a largely natural landscape to one with large, industrial-looking infrastructure.
- *Mitigation*:
    - Follow the mitigation measures as indicated in the Visual Impact Assessment.

5.5.5 Family and community impacts

These impacts relate to the family, social networks and the community in general.

5.5.5.1 Impact on social networks

Table 40 *Impact on social networks*

Nature	Increase in prostitution, unwanted pregnancies and HIV		**Status**	**-**
Impact source(s)	Influx of construction workers			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Long-term**		
	Reversibility	**Irreversible**		
	Probability	**High**		
Significance	*Without mitigation*	High		**H**
	With mitigation	Moderate		**M**
Confidence	High			

- *Source of the impact*: Influx of construction workers to the area.
- *Description of the impact:* This impact relates to the social interaction of household members with other people in the community. A huge portion of the community is very poor and there is a high unemployment rate. An influx of people with disposable income might lead to an increase in prostitution, which can impact on the HIV infection and unwanted pregnancies in the area. There can be a number of spin-offs like alcohol abuse and disintegration of families.
- *Significance*: The impact is considered to be of high significance due to the irreversible nature of pregnancies and the impacts of sicknesses such as HIV / AIDS.
- *Mitigation:* The EMC must work with communities to create awareness about these issues and how they can be prevented.

5.5.5.2 Impact on community connections

Table 41 *Impact on community connections*

Nature	**Improved community connection**		Status	**+**
Impact source(s)	**Proposed establishment of Environmental Monitoring Committee**			
Affected stakeholders	**Local residents**			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Long-term**		
	Reversibility	**Reversible**		
	Probability	**High**		
Significance	*Without mitigation*	Low		**H**
	With mitigation	Moderate		**M**
Confidence	High			

- *Source of the impact*: Involvement of community members in the proposed Environmental Monitoring Committee
- *Description of the impact:* It is perceived that there is a lot of social capital in the community. Social capital can be defined as a public good comprised of trust among a diverse group of citizens within the same community that facilitates cooperative networks among those citizens. Social capital comprises the abilities, traditions and attitudes that help ensure that a group of people will support each other, respond to challenges in a constructive manner, and innovate. Social capital is traditionally found amongst the communities, because these communities are isolated and members of the communities need to rely on each other in times of need. In poorer communities, survival depends on interdependence. Individuals in lower income groups often do not have the resources to operate as an individual – they need to look out for each other by sharing food, responsibilities and other social assets. The proposed EMC is likely to make community members more aware of the importance of standing together by its mere existence.
- *Significance*: Significance for this positive impact is considered to be low, since the community already experiences a high level of cohesion, which will only be slightly improved by the project.
- *Optimisation*: Ensure maximum community participation in the EMC.

5.5.6 Institutional, legal, political and equity impacts

These impacts refer to the ability of the authorities and other institutions to cope with the workload generated by the proposed interventions.

5.5.6.1 Impact on equity

Table 42 *Impact on equity*

Nature	Unfair distribution of costs and benefits		**Status**	**-**
Impact source(s)	Construction of the transmission line through an area that has very poor access to electricity supply			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Short-term to medium-term**		
	Reversibility	**Reversible**		
	Probability	**High**		
Significance	*Without mitigation*	Moderate		**M**
	With mitigation	Low		**L**
Confidence	High			

- *Source of the impact*: Construction of the transmission line through an area that has very poor access to electricity supply.
- *Description of the impact*: Impact equity is related to the fairness of the distribution of impacts across the community. It must be ensured that the people who will benefit from the development must also share in carrying the costs. Of great concern is the fact that the transmission line will cross over a number of farms that do not have access to electricity, and bypass communities that struggle to obtain adequate electrical supplies, but not provide a solution to these local problems. The project will lead to gain on a national level, but the local people who will be impacted on will not benefit from the project. Thus, there is an unfair distribution of costs and benefits across society.
- *Significance*: Moderate
- *Mitigation*: Benefits must be ploughed back into the community. The EMC must assist in identifying worthy recipients and ensuring impact equity. Eskom Transmission must convey the message to Eskom Distribution and aid in empowering the community on all levels, starting with providing information on the correct procedures to follow to obtain the required results.

5.5.7 Gender relations

This refers to relations between the sexes. Gender gaps are widespread in access to and control over resources, in economic opportunities, in power and in political voice. Women tend to bear the largest and most direct social impacts, and therefore it is a core social impact issue.

5.5.7.1 Gendered division of labour

Table 43 *Gendered division of labour*

Nature	Exclusion of women from economic opportunities		**Status**	**-**
Impact source(s)	Employment opportunities arising from construction			
Affected stakeholders	Local residents			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Long-term**		
	Reversibility	**Reversible**		
	Probability	**Moderate**		
Significance	*Without mitigation*	Moderate		**M**
	With mitigation	Low		**L**
Confidence	High			

- *Source of the impact*: Employment opportunities arising from construction
- *Description of the impact*: The construction industry does not lend itself to employment of woman. In the construction phase, woman will have less opportunity than men to become employed for construction-related work.
- *Significance*: Significance is regarded as high, since women are seen as a vulnerable group.
- *Mitigation:* It must be a contractual requirement with contractors that women have equal opportunity for employment. Salaries of women must be equal to that of men doing the same job.

5.5.8 Overall social impact

Community consultation throughout the project is imperative and the community and Eskom Transmission should work together to obtain the best solution. Across the board farmers and community members expressed dissatisfaction with the fact that the power line will cross their community while they do not have access to electricity. It is imperative that

this must be addressed by Eskom Transmission in order to avoid the formation of social pressure groups in the society.

Tourism development has been identified as an important element of strategic planning for the area. Impacts on possible tourist areas must be avoided at all costs, since the development of tourism in the area links strongly to the potential livelihoods of the communities.

5.6 IMPACTS ON BIRDLIFE

Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two most common problems in southern Africa are *electrocution* of birds and birds *colliding* with power lines. Habitat transformation and destruction and disturbance of breeding birds are also important risks associated with power lines.

5.6.1 Electrocution of birds

Table 44 *Electrocution of birds*

Nature	Electrocution of birds		**Status**	**-**
Impact source(s)	Birds perching in close proximity to conductors			
Affected stakeholders	Those concerned with conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Long-term**		
	Reversibility	**Irreversible**		
	Probability	**Low**		
Significance	*Without mitigation*	Low		**L**
	With mitigation	Low		**L**
Confidence	High			

- *Source of the impact*: The impact is caused by birds perching on or in close proximity to conductors.
- *Description of the impact*: Large birds of prey are the most commonly electrocuted on power lines. The large transmission lines from 220 kV to 765 kV structures are usually not a threat to large raptors, because the pylons are designed in such a manner that the birds do not perch in close proximity to the potentially lethal conductors. In fact, these power lines have proven to be beneficial to birds such as Martial Eagles, Tawny Eagles, African White-backed Vultures, and even occasionally Black Eagles by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce. Cape Vultures have also taken to roosting on power lines in certain areas in large numbers, while Lappet-faced Vultures are increasingly using power lines as roosts, especially in the Northern Cape. Electrocutions on these structures are virtually unknown. The proposed structure for this line is the “compact cross-rope suspension tower” (See Figure 10 below), which does not provide a suitable nesting substrate for most large raptors. It also does not provide suitable

perching substrate directly above the conductors, thereby making bird streamer faults or bird mortalities highly unlikely. The compact cross-rope design has no inherent electrocution risk for large birds because the clearances between live parts and live and earthed components greatly exceed the wingspan of any bird. Electrocution through the streamer mechanism is also unlikely since there are no suitable perches directly above the conductors. This type of tower has never had suspected bird streamer faulting.

- *Significance*: Low
- *Mitigation*: No mitigation necessary. The design of the compact cross-rope suspension structure makes the risk of electrocutions very low.

Figure 10 Example of a compact cross-rope suspension pylon

5.6.2 Bird collisions with power lines

Table 45 *Bird collisions with power lines*

Nature	Bird collisions with power lines		**Status**	**-**
Impact source(s)	Power lines not visible to birds			
Affected stakeholders	Those concerned with conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**High**		
	Duration	**Long-term**		
	Reversibility	**Irreversible**		
	Probability	**Low**		
Significance	*Without mitigation*	Varies according to species – see Table below		**L-M**
	With mitigation	Varies according to species – see Table below		**L-M**
Confidence	Confidence varies according to the species of bird involved and their habitat.			

- *Source of the impact*: The earth wire is usually poorly visible compared to the conductors.
- *Description of the impact*: Birds in flight tend to see the bundled conductors, and then gain height to avoid them. In the process, the much thinner earth wire is not noticed and the birds may then collide with it (see Figure 11). Date collected over the past six years has indicated that collisions are a major cause of unnatural mortality for several threatened birds. Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which make it very difficult for them to take the necessary evasive action to avoid colliding with power lines. Recent studies in the Karoo found a correlation between voltage size and collision risk, with 400 kV lines posing the highest collision risk for large terrestrial birds.

  Of particular concern in the current study are the Ludwig's and to a lesser extent the Kori Bustard. Work elsewhere has shown these species to be extremely vulnerable to collision with overhead cables. The main threats for Ludwig's Bustard stems from "from high susceptibility to collisions with overhead transmission lines (power and telephone lines)……"(Hockey et al 2005).
- *Significance*: Varies according to species (see Table 46 below).

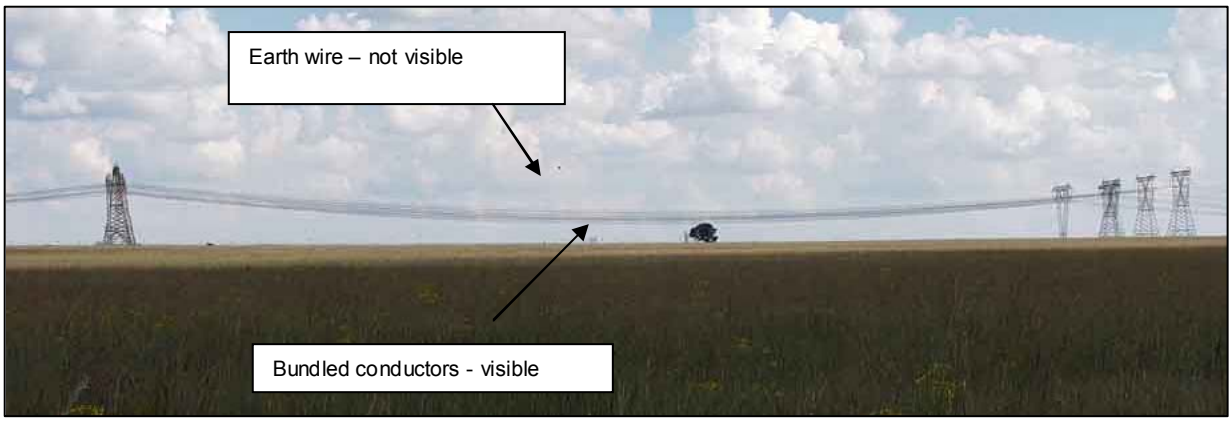

Figure 11 Visibility of earth wires vs. conductors

Table 46 Significance of bird collision with earth wires

Species	***Significance***
Ludwig's Bustard, Kori Bustard	Medium significance without mitigation, low with mitigation. Our confidence that this impact will occur is high, but confidence in where exactly on the line the impact will occur is only medium
White Pelican	Occurs particularly at the Orange River crossing. This is medium without mitigation but is relatively easily mitigated for so low significance with mitigation.
Greater and Lesser Flamingo	Occurs at the Orange River crossing and any dams/pans that may exist close to the final alignment. This is relatively easily mitigated for so has low significance with mitigation. Confidence in this prediction is only medium because the entire study area was not visited and so we cannot be sure whether there are dams/pans in some areas
Secretarybird	Occurs almost anywhere in the study area, in natural vegetation. This impact is difficult to mitigate for and so remains medium significance with mitigation. Confidence that the impact will occur is high, but confidence in the exact location of the impact is only medium.
White stork	Occurs in arable areas. This impact is relatively easily mitigated for as the exact location is known and confidence is high, thus significance is low.
Assorted water bird species, ibises and spoonbills	Occurs in close proximity to rivers, dams and drainage lines. This impact is relatively easily mitigated for so the significance with mitigation is low. Confidence in this impact occurring and its locality is high
Korhaans	Occurs almost anywhere in natural vegetation in the study area. Mitigation for this impact will result in it being of low significance. Our confidence in the impact occurring is high, but confidence in where it will occur is medium

- *Mitigation*:
    - Certain sections of line will need to be marked with a suitable marking device in order to mitigate for collision of certain Korhaans, Ludwig's Bustard and Kori Bustard. These areas will most likely be predominantly the flat areas. These areas will need to be identified by the EWT once the exact position of the line is determined and individual tower positions have

been surveyed and pegged. It is therefore strongly recommended that a final avifaunal "walk through" is conducted during the construction phase.

- Lines crossing the Orange River and all other rivers should be marked with a suitable marking device on the actual span crossing the river itself and one span either side.
- Lines crossing any obvious drainage lines should be marked with a suitable marking device on only the span crossing the drainage line itself. Line crossing or adjacent to arable lands should be marked with a suitable marking device. "Adjacent to" is defined as within one span of.
- Lines crossing or adjacent to either dams or pans should be marked with a suitable marking device. "Adjacent to" is defined as within one span of.

5.6.3 Disturbance during construction and maintenance

Table 47 *Disturbance during construction and maintenance*

Nature	Disturbance of birds in breeding, foraging and roosting		**Status**	**-**
Impact source(s)	Construction and maintenance of transmission line			
Affected stakeholders	Those concerned with conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**Moderate**		
	Duration	**Short-term**		
	Reversibility	**Reversible**		
	Probability	**High**		
Significance	*Without mitigation*	Varies according to species – see Table 48 below.		**L-M**
	With mitigation	Varies according to species – see Table 48 below.		**L-M**
Confidence	Confidence varies according to the species of bird and their habitat.			

- *Source of the impact*: Construction and maintenance of transmission line
- *Description of the impact*: Disturbance, particularly of breeding raptors, is anticipated to be a significant risk in this project. In the treeless, arid landscape power lines are relatively often used by many bird species as nesting substrate. In the northern section of the line, where it is to be built adjacent to the existing line, there is a distinct possibility that construction activities will disturb raptors breeding on the existing line. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude through short term disturbance caused by human activity.
- *Significance*: Significance varies according to the species involved (see Table 48 below)

Table 48 *Significance of disturbance during construction and operation*

Species	***Significance***
Ludwig's Bustard, Kori Bustard	This impact is particularly significant while breeding (approx July to Sep). Since mitigation is difficult, this impact is medium both with and without mitigation. Confidence in this impact occurring is high, although the exact locality of breeding of this species cannot be predicted and will hopefully be identified early in the construction phase.
Martial eagle (while breeding)	Since effective mitigation for this is difficult given the constraints that construction contractors have and the duration of construction activities, this impact is rated as medium significance both with and without mitigation. Confidence in this assessment is medium to high as the species is known to breed on the existing Oranjemond-Gromis 275kV power line.
Peregrine Falcon	Impact on this species is particularly significant while breeding (approximately Sep to Oct) in the vicinity of the Orange River crossing. Since probably only two pylons will be involved with this crossing, mitigation should be possible (detailed below), so significance without mitigation is medium and with mitigation is low. Confidence in this assessment is medium to high as the species has been recorded breeding at this site in recent years.
Karoo Lark	This species occurs in natural vegetation and coastal dunes. Mitigation is difficult hence significance with and without mitigation is rated as medium. Confidence in this impact occurring is high, although the exact location along the line is not known
Assorted raptors (e.g. Black Eagle)	These birds occur almost anywhere in the study area, and significance is medium, particularly whilst breeding. Mitigation of this impact is difficult and so significance remains medium even with mitigation. Confidence in this impact occurring is high, but confidence in the location is medium.

- *Mitigation*:
    - In order to minimise disturbance of any birds breeding during construction, any bird nests should be identified and reported to the EWT. In particular, the Environmental Control Officers for the project should be encouraged to identify such sites. Advice will then be given on how best to deal with the situation on a case by case basis.
    - All construction and maintenance activities should be undertaken according to generally accepted environmental best practice guidelines.

5.6.4 Habitat destruction

Table 49 *Habitat destruction*

Nature	Destruction of bird habitats		**Status**	**-**
Impact source(s)	Construction			
Affected stakeholders	Those concerned with conservation			
Magnitude	*Extent*	**Local**		
	Intensity	**Low**		
	Duration	**Medium-term**		
	Reversibility	**Reversible**		
	Probability	**Low**		
Significance	*Without mitigation*	**Low**		**L**
	With mitigation	**Low**		**L**
Confidence	High			

- *Source of the impact*: The impact will be caused by construction activities (erection of the pylons), the creation of access roads and the creation of construction camps.
- *Description of the impact*: During the construction phase and maintenance of power lines, some habitat destruction and alteration inevitably takes place. On the construction of power lines, this typically happens with the construction of access roads and the clearing of servitudes (the latter not relevant to this study). Habitat destruction is not anticipated to be a significant impact of the proposed power line as the habitat is relatively uniform throughout the study area, and the "footprint" of a power line such as this one is not likely to be very large.
- *Significance*: Since the entire study area and broader area is extremely uniform in terms of potential for birds, this is anticipated to be an impact of low significance.
- *Mitigation*:
    - Disturbance must be limited to the absolute minimum.
    - Construction camps must be rehabilitated with suitable locally indigenous species.

SECTION 6: SUITABILITY OF THE ENVIRONMENT FOR THE TRANSMISSION LINE

6.1 INTRODUCTION

Similar to the fashion in which the proposed development will impact upon the environment, the environmental parameters influence the placement of the transmission line by virtue of the impact exercised upon the transmission line infrastructure. There are two environmental parameters which will be considered in this section, namely geotechnical suitability and corrosion. This discussion will enable informed decision-making regarding line placement. Where the environment has a deleterious effect on the development to the point where the development fails to function properly within accepted maintenance practices, this will also constitute a fatal flaw, although for the opposite reason as for the Environmental Impact Assessment in Section 5 above.

6.2 GEOTECHNICAL SUITABILITY

6.2.1 Introduction

The proposed Kudu transmission line is intended to integrate power from the Kudu CCGT power station in Namibia, Oranjemund, with the Eskom network at Juno substation to supply power for the Western Grid. Three integration options were considered by Eskom to achieve this integration, of which the most suitable proved to be the Oranjemond – Gromis – Juno link. The scoping phase identified two alternative routes, and the impact assessment two more routes as being the most suitable for the integration of the power supply. The geological conditions for the routes north of Gromis are identical and are parallel to an existing transmission power-line. The geological conditions of the routes south of Gromis substation are described below.

6.2.2 Route Geology

6.2.2.1 Alternative C

This alternative would follow the existing transmission line from Gromis to Nama substation, and then follow the N7 to link with Juno. This route crosses the granitic and gneissic rocks of the various formations: Rietsberg Granite, Concordia Granite, Nababeep Granite and Buffels River Granite representing granitic plutons intruded into the older Bushmanland complex. The rocks are prominent and contribute to the very rugged topography in this area. Soil cover over these rocks is very limited and good outcrop is evident both along the N7 and form the air.

6.2.2.2 Alternative E

This alternative edges gradually towards Hondeklipbaai on the coast. This area is dominated by rolling dunes and the associated diamond mining activity. South of Hondeklipbaai the route passes through Wallekraal until it runs parallel with the Spoegrivier where outcrops associated with leucocratic gneiss of the Concordia Granite and biotite granite of the Nababeep Granite become evident. It then follows the Spoegrivier until it turns east. At this point the route follows the straight bearing between Gromis and Juno. This section crosses over dune sands interspersed with outcrop of the Kamieskroon and Kliphoek granite becoming more common to the south. The section of the Namaqua National Park reserve corridor crosses similar geology characterised by rolling dunes interspersed with leucocratic gneiss of the Kamieskroon gneiss.

6.2.2.3 Alternative F

The geology from Gromis to Spetakelpas is common to both Routes C and F, and described under Route C above.
From Spektakelpas to the Groenrivier Route F is underlain by similar geological conditions that are described under that of Route C, i.e. granites of the Buffels River Granite, gneisses, quartzites and schists of the Bitterfontein Formation (Bushmanland Complex), gneisses of the Kamieskroon Gneiss, granites and gneisses of the Bieisiesfontein Granite, schists and gneisses of the Stalhoek Complex, gneiss of the Nababeep Gneiss and quartzites of the Flaminkberg Formation, Vanrhynsdorp Group.
From Groenrivier the line crosses over dune sands interspersed with outcrop of the Kamieskroon and Kliphoek granite becoming more common to the south.
The section of the line following the NNP reserve corridor from about Kotzesrus is underlain by similar geology characterised by rolling dunes interspersed with the leucocratic gneiss of the Kamieskroon gneiss near the Brakrivier, granitic rocks of the Kliphoek Granite near the Soutrivier, and the quartzites, schists and gneisses of the Bitterfontein Formation of the Bushmanland Complex as the line approaches Juno Substation near Vredendal.

6.2.2.4 Alternative G

From Gromis, Route G crosses through an area underlain Aeolian deposited dune sands until the point where Route G deviates into the northern part of the Namaqualand National Park. From here the line is generally underlain by scattered outcrops of leucocratic gneisses of the Kamieskroon Gneiss. Where Route G joins again with ESKOM:Route A at the southern boundary of the Park, the line is more consistently underlain by the leucocrtatic gneisses with occasional interspersed dune deposits to Landplaas, with occasional outcrops of leucogranites and hornblende granites of the Biesiesfontein Granite occur in the vicinity of Rietpoort.
The section of the line following the Cape Nature : Route B between Landplaas and Juno crosses similar geology characterised by rolling dunes interspersed with the gneisses, quartzites, and schists of the Bitterfontein Formation, Bushmanland Complex.

6.2.3 Geotechnical and civil engineering factors

Factors affecting the costs of construction of the power line, from geotechnical and civil engineering perspectives are the following:

- *Topography,*
- *Susceptibility of erosion;*
- *Proximity of the steel towers to the corrosive environment of the coastline;*
- *Location and design of service roads in relation to the transmission line with access roads off provincial and national routes;*
- *Straightness of route i.e. degree of minimisation of bends, or changes in direction, in the route;*
- *Bends and crossovers costly and add to the cost of the line; and*
- *Impact of geotechnical issues on costs of construction with respect to :*
    - Earthworks associated with tower construction;
    - Materials usage for foundations and road construction;
    - Tower foundations; and
    - Tensioned ground anchors.

6.2.3.1 Proposed Tower Design

The proposed tower design is known as the compact cross-rope type. The design incorporates two diagonal tower arms joined by a horizontal straining cable which supports the transmission line. The entire arrangement is stabilised on either side by vertical tension cables anchored to the ground. The design is preferable to the traditional cross beam tower arrangement from a faunal impact aspect. However, other aspects such as foundations and the use of the lateral stabilising cables secured by ground anchors requires more competent geological conditions. The average distance between towers is 450 metres. Generally the tower foundation design is facilitated by construction in areas underlain by shallow soil cover overlying bedrock. In these areas foundations will comprise simple pad footings taken into bedrock while the anchors will be simple steel dowels drilled and grouted into the weathered bedrock. In areas underlain by deep soil cover the use of relatively large foundation bases, and possibly piled foundations in selected areas, along with soil anchors requiring deep installation will increase construction costs significantly.
Construction in sandy areas, such as those found along large sections of the route for all alternatives in the north would require deadweight anchors. Deadweight anchors for a strain tower measure approximately 4x1.5x1m.

6.2.3.2 Straightness of Proposed Line on Construction Costs

The straightness of the various proposed transmission lines is a critical factor affecting costs of construction of the line. The need to construct bends as a result of deviations in the chosen route will add up to R1.5 million to the cost of an affected tower. Furthermore, similar cost penalties will occur in cases where the new line may be required to cross over the existing one. Final design considerations would govern the number of bends and deviations in the routes. It is expected that the number of bends for the routes will be approximately as follows:
Route C : 470
Route E : 52
Route F : 61
Route G : 65
.

6.2.3.3 Topography

Topography may also have a profound effect on the cost of line construction. Generally, where the line traverses steep areas of rugged topography the following could become necessary:

- *Shortening/lengthening of span;*
- *Deviations to avoid extremely rugged areas;*
- *Additional stabilisation measures to support towers at steep cliff areas;*
- *Adhoc alterations to tower design to accommodate specific conditions;*
- *Difficulty of construction associated with difficult terrain, relating to access to tower locations;*
- *Difficulty in constructing service roads and access to main routes; and*
- *Need to construct tower building platforms in steep terrain.*

6.2.3.4 Corrosion[6]

Corrosion of the steel components of towers will be affected by their proximity to the ocean. The corrosive effect of the fog from the Atlantic Ocean is most pronounced within 10 km from the coastline. For this reason transmission lines are best located beyond about 20 km from the ocean to minimise corrosion. Costs associated with the corrosion of the towers are related to the following:

- *Increased maintenance of towers, cables and resistors; and*
- *Mitigating measures to limit corrosion, such as galvanic treatment to steel components and use of alternative materials for mast components which may be relatively expensive.*

[6] A detailed analysis of corrosion limitations is available in Section 6.3

6.2.3.5 Use of Existing ESKOM Servitude

Where the route is located within an existing ESKOM servitude the costs of establishing the line are greatly minimised for the following reasons:

- *Founding conditions are generally known from the existing towers;*
- *Earthworks are minimised; and*
- *Service roads and boundary fencing already exist.*

6.2.4 Qualitative comparison of construction costs for the Routes

In order to carry out a comparative assessment of Routes C, E, F and G in terms of suitability for development from geotechnical and civil engineering perspectives, a system of rating various aspects discussed in this report has been adopted. In that all routes will follow the existing ESKOM servitude from Oranjemond to Gromis, it is therefore only necessary to compare the routes from Gromis to Juno for the Routes. The various attributes of the two routes are rated numerically from 1 to 5, with 1 representing the least favourable and 5 representing the most favourable site for each of the geotechnical/ civil engineering attributes considered.
The comparison of the sites on the basis of the attributes described above is given in Table 50 below.

Table 50 *Rating of Attributes of Transmission line Routes C, E, F and G*

Geotechnical and Civil Engineering Attribute	Alternative Route:-			
	C	E	F	G
A. Topography	3	8	4	7
B. Corrosive Environment	8	3	7	8
C: Access Road to Construction	8	5	6	4
D: Straightness of Route	5.5	10	8.52	8
E: Length of Finished Route	7.23	9.74	8.44	10
F: Geotechnical/ Geological				
F1: Earthworks	3	7	4	7
F2: Materials for Road Construction	5	5	5	5
F3: Foundations/ Ground Anchors	7	4	6	5
TOTAL ATTRIBUTE SCORE	**46.73**	**51.74**	**48.96**	**54.0**

Based on the preliminary geotechnical assessment given in this report, the comparison of Routes C, E, F and G given in Section 8 above indicates that Route G is geotechnically the most suitable for the proposed new Oranjemond-Juno power line. This does obviously not take into account other planning and design issues, which must also be considered in selecting a site. Route E, which is very similar in terms of attribute scoring, may also be considered.

Finally, the discussions in this report are based on the information obtained from a desktop study and driveover and flyover of the sites only. Geological conditions and the effect on development are inferred from the information available, and could thus vary significantly from that anticipated, particularly in view of the highly variable characteristics of the prevailing regional geological conditions. It is thus extremely important that a detailed geotechnical investigation be carried out along the preferred or chosen route so that construction costs can be fixed or reliably estimated.

Indeed, the final design of either of the routes, and therefore construction cost, would depend heavily on such detailed geotechnical findings.

6.3 SUITABILITY IN TERMS OF CORROSION

6.3.1 Introduction

Air pollution is a major criteria for the design of transmission line insulators. Pollution has a negative effect on the insulation system of power lines and substations, which could in the shutdown of the power line. At present, there is no data available regarding the pollution level in the various regions.

6.3.2 The effect of air quality on transmission lines

Pollution falling on the insulators produces a conductive film on the surface which causes the surface leakage current to increase, eventually resulting in flashover / local arcing on insulators. Flashovers occur mainly on transmission lines when, in combination with condensation, light rain or fog, ash or dust build-up cause arcing across insulators and dips and spikes in power supplies. This weakens the insulators, and repeated arcing can cause the shutdown of the power line. Fires can also impact the insulators of power lines due to the generated ash particles. When these particles are combined with high humidity under foggy conditions, they form a “conductive fog” that can cause transmission network trips. This “conductive fog” is instantaneous and not predictable. Some of the glass insulators used in substations and power lines are not able to withstand this phenomenon, thus causing widespread flashovers, which initiate tripping of lines and plant. The sea-breeze circulations that can generate a “conductive fog” or heavy pollution on power lines have a typical extension of 20 km. Similar effects are observed with wind systems near heated mountains and in large-scale convection systems. To avoid these problems, it is necessary to perform pollution measurements to assess whether pollution deposits are within or beyond limits. Generally, the practice being adopted is to try and locate power line routes in low or medium pollution areas, and avoid the power line traversing an area near the coastal or industrial belts. There are several remedial measures that can be implemented in order to overcome problems due to pollution. These may be a combination of:

- *Manual cleaning of insulators;*
- *Corn blasting (dry cleaning);*
- *Use of bird guards;*
- *Application of silicon grease;*
- *Use of RTV silicon rubber coating;*
- *Use of semi-conducting glazed insulators; and*
- *Providing creepage extenders.*

The selection of the insulators used, particularly for areas with high potential for air pollution contamination is critical to minimise shutdowns. The best method for obtaining data in order to establish a successful cleaning and maintenance programme for insulators is via on-site tests along the route(s). Several test methods for insulator performance have shown that different types of insulators have different resistance to air pollution conditions. Therefore, the types of

insulators selected for areas with increased pollution levels can reduce the potential for shutdowns.

The types of pollution for consideration are presented in the following table.

Table 51 *Types and Sources of Air Pollution*

Type of Pollution	Source of Pollution
Salt	Coastal areas Salt industries/farms
Cement	Cement plant Construction sites Rock quarries
Dust	
Earth	Ploughed fields Earth moving on construction projects
Fertilizer	Fertiliser plants Frequent use of fertilizers in cultivated fields
Metal	Mining handling processes Mineral handling processes
Coal	Coal mining Coal handling plants/thermal plants Coal burning/brick kiln areas
Feedlot	Earth dust stirred by animals in large feedlots
Bird Defecation	Roosts of birds areas
Chemical	Wide variety of chemical / process industries, oil refineries etc
Smog	Automobile emissions at highway crossings Diesel engine emissions at railway crossings / yards Cooling tower effluents Thermal power plants Other cooling towers
Smoke	Wild fires Industrial or agriculture burning

6.3.3 Alternative route comparison

The two alternative routes differ vastly in terms of the average ambient air quality generally encountered throughout the year. The two routes are compared below in terms of the relative advantages and disadvantages on grounds of the environmental conditions.

Table 52 *Power line Route Comparisons*

Alternatives	Advantages	Disadvantages	Recommendations
Alternative C	• No fog • No mining activities • No industrial activities	• Large-scale convection system formed by presence of Kamiesberge	Recommended, since it avoids coastal areas, as well as areas with mine and quarry activities and industrial zones. Maintenance of power lines could be an issue.
Alternative E	• No industrial activities	• Close proximity to coastline • Heavy fog • Numerous mining activities (diamond, sand)	Not recommended, since it approaches the shoreline as close as 3 km at Koingnaas and Hondeklipbaai. The route at Koingnaas and Hondeklipbaai also passes within less than 1 km distance from dust pollution areas such as mines and quarries.

Therefore, alternative route C is recommended from an air quality perspective, as there will be fewer environmental factors acting negatively upon the transmission power-line than is the case for alternative E. The placement of the line along alternative route C will result in the line functioning better and requiring less maintenance over the long term, ultimately resulting in a more secure supply of power to Eskom's Western Grid.

The results for route C will be similar for routes F and G, as they are in a similar geographical area. As such, routes F and G will also be suitable for line construction from a geotechnical perspective.

SECTION 7: ALTERNATIVES

7.1 INTRODUCTION

The IEM procedure stipulates that an environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, DEAT requires that a number of possible proposals or alternatives for accomplishing the same objectives be considered. Alternatives can be categorised into the following: Strategic, Scheduling and Location (divided into integration and route alternatives) alternatives.

In order for the integration to be successful, the Transmission system must to meet the following criteria:

- Meet expected future increases in load demand;
- Satisfy the firm supply requirements of the future industrial development projects in the region;
- Maintain existing levels of reliability and quality of supply;
- Minimise cost; and
- Minimise any adverse environmental impacts.

These alternatives – and the No-Go option – are discussed briefly below.

7.2 STRATEGIC ALTERNATIVES TO THE PROPOSED TRANSMISSION POWER-LINE

The alternatives, listed below, for satisfying the need for more reliable and / or increased power supply to the Greater Cape Region were investigated by Eskom. These alternatives are to be examined in conjunction with the national grid system map (see Figure 12).

7.2.1 Demand-side Management

Demand Side Management (DSM) can generally be defined as the activities performed by the electricity supply utility, which are designed to encourage the reduction of the amount of electricity used during peak time 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. One of the basic tools is the price differentiation (such as time of use tariffs) between peak demand time and low demand time. This option is practiced to a certain extent, but is currently not considered feasible for expansion in this particular region. However, the large concentration of industrial users in the end-user group makes this a very difficult option to pursue. Eskom has taken measures to optimise the existing Transmission system so that

the construction of the new 400 kV line will occur only when needed. These measures include re-calculation of the thermal loading capability of the Transmission power-lines into to Greater Cape Region south of Bloemfontein based on the measured ambient temperatures in the area. The lines can now be loaded more heavily during cold days when the lines cool down and they do not sag as much.

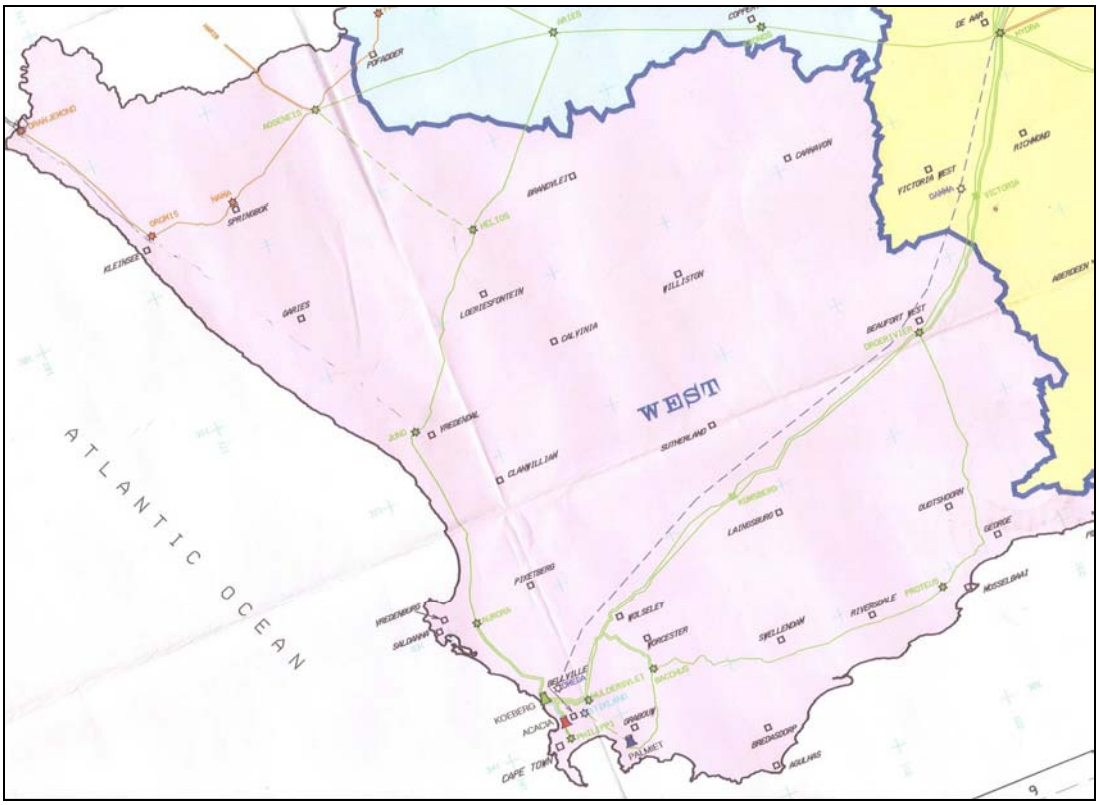

Figure 12 Eskom western grid

7.2.2 New generation systems

A new coal-fired or nuclear generation plant could be commissioned close to the load centres. This option is not considered feasible since Eskom has surplus generating capacity and is therefore reluctant to commit to new capacity while existing power stations are "mothballed" and not yielding a return on investment, while others (remote from the load centre) are being recommissioned. Even if the new plant enhanced generating capacity, the increase would have to be large enough (<200 MW) to make it economically feasible for Eskom to invest in such a plant. Additional Transmission power-lines would have to be built to connect the power station to the electricity grid and to transmit the electricity onwards. As the Kudu CCGT station will provide power in order to satisfy the demand in the Western Cape, it is not feasible to construct power stations when power is already available.

Another alternative is to establish a number of nuclear pebble-bed modular reactors close to the load centres. These units are small enough to be able to supply the required local load demand without the need to transmit excess electricity to other geographic locations.

This technology, however, is still in the early stages of development. A project is currently underway to establish a demonstration plant in the Western Cape Province, close to Koeberg Power Station. It is expected that it will take a number of years before this technology can be made commercially available at a competitive cost. The option of a nuclear pebble-bed reactor can therefore unfortunately not meet the short to medium term load requirements in the Greater Cape Region.

7.2.3 Upgrade existing transmission lines by using bigger conductors

The physical load on the existing towers would increase substantially and the towers would be inadequate. The extra cost incurred to physically strengthen the towers is not considered to be a viable option. This option would not optimise the existing infrastructure.

7.3 SCHEDULING ALTERNATIVES

There is a definite need to overcome the current and future problems on the existing Transmission power-lines. The forecasted growth in demand over the next few years urgently requires Eskom to plan and execute goals well in advance, bearing in mind the severe problems regarding electricity supply experienced in the Western Cape and especially in Cape Town in the last number of months. The expected step-load in 2009 – when the Coega aluminium and steel smelters become operational, which will draw more power from the Mpumalanga coal-fired power stations – is a further and no less serious consideration. It is therefore necessary to ensure extra supply capacity into the Western Cape in the medium to long-term.

It is planned that the proposed Transmission power-line will be brought into operation simultaneously when the Kudu power station becomes operational and when the load growth and demand require it. It is however necessary to secure the necessary servitudes before hand, to ensure that the region's long-term needs can be met.

7.4 INTEGRATION ALTERNATIVES

A detailed location alternative analysis was undertaken for the development by Eskom, entitled the Pre-engineering Steady State Analysis. There were obvious limitations by virtue of the relative locations of the Kudu CCGT power station and the load centre. The proponent considered three possible means of integrating the power from the Kudu power station into the South African grid.

The three alternatives were proposed by Eskom prior to embarking on the EIA process in terms of how the power generated from the NamPower Kudu station would be integrated with the Eskom grid are as follows:

7.4.1 Kudu-Aggeneis

This option will link into the Eskom grid via a direct Transmission power-line from the Namibian border to the Aggeneis substation near Kenhardt in the Northern Cape. The existing Aggeneis-Aries 400kV line ensures connection into the Cape network. Power could be distributed from Aries into the network, either towards Kronos or towards Helios, depending on the generation pattern and load profile. The line length to Juno substation would be approximately 250km within the RSA border. This option is the cheapest for integration, as the line is the shortest, yet will not yield the most secure network.

7.4.2 Oranjemond-Gromis-Juno

This option will link into the Eskom grid at the Juno substation near Vredendal. It will involve constructing a Transmission power-line from the Namibian border to Oranjemond substation and follow an existing 220kV line to Gromis substation. The Transmission power-line would then be extended to link with the Cape network at Juno substation. The line length would be approximately 390km within the RSA border. This option requires the greatest length of transmission line to be constructed, yet provides for a reliable network.

7.4.3 Oranjemond-Gromis-Aggeneis

This option will also link into the Eskom grid at Aggeneis from the Namibian border, but will follow the existing Oranjemond-Gromis-Nama 220kV line. The existing Aggeneis-Aries 400kV line ensures connection into the Cape network. Power could be distributed from Aries into the network, either towards Kronos or towards Helios, depending on the generation pattern and load profile. The line length to Juno substation would be approximately 300km within the RSA border. The cost and network reliability for this option falls between Options 1 and 2.

Results for all options, as determined by the Pre-Engineering Transmission Integration study steady-state analysis conducted by Eskom, indicates that with system healthy all the generated power can be absorbed into the Transmission network. No continuous thermal limits of lines or series capacitors are exceeded. All substation voltages remain within acceptable limits.

Results for all options further indicate that with an n-1 condition all the generated power can be absorbed into the Transmission network. No continuous thermal limits of lines or series capacitors are exceeded. All substation voltages remain within acceptable limits.

Preferred options shaded in blue. Red indicates a significant impact.

Table 53 Comparison of impacts of different integration options

Factor	Impact	Affected party	Option1	Option2	Option3
Line length	Cost	Eskom	250 km	390km	300km
Stability of integration	Operational security, cost	Eskom, users	Less than 2	Best	Less than 2
Electrical distance	Operational security, cost	Eskom, users	Medium distance	Closest to Cape network.	Medium distance
Line overload	Operational security	Eskom, users	Links directly at Aries substation	Avoids heavily loaded and isolated Aggeneis substation -	Links at Aries substation via Gromis
Servitudes	Acquisition of new land	Landowners, environment	Requires new servitude.	Parallel to existing servitude up to Gromis. New servitudes to be acquired to south.	Runs parallel to existing servitude
Sensitivity of area	Specific floral/faunal communities	Environment, tourists	Richtersveld and Boesmanland: Not studied	Studies indicate area is sensitive to disturbance.	Boesmanland: Not studied

Of the three alternatives, option 2 is favoured by the proponent, for the following reasons:

- *The impact (increased power flow on existing network) of option 2 is less on the existing network compared to option 1 and 3.*
- *Aries substation is fairly remote and, as such, maintenance can be problematic. All connection to NamPower runs through Aries for option 1 and 3. This is a risk for option 1 and 3.*
- *Provision of a second route increases the operational security of the network, which is a major advantage for option 2.The network stability will also increase due to a firmer interconnection, as the power station will be electrically closer to the load centre in Cape Town and at Aurora substation.*
- *Option 2 is the preferred option in terms of savings in losses.*
- *Option 2 would be most reliable, providing best operational security.*
- *Option 2 would provide better network stability during loss of equipment on the Kudu side, due to Namibian integration into more than just Aries at 400kV.*

Therefore, based on the load flows studied by Eskom during the Pre-Engineering Transmission Integration study steady-state analysis, option 2 is preferred.

7.5 ROUTE ALIGNMENT

Within the preferred Integration Alternative option 2, seven Route Alternatives were proposed, designated Alternative routes A - G. Of these alternatives, given on the locality map, alternatives E and C were recommended during the scoping phase. During the EIA phase, however, following discussions with SANParks and the completion of the specialist studies, it became necessary to consider two further alternatives, designated F and G.

The preferred route alignment will be determined based on:

- Consultation with stakeholders;
- the opinion of the public, ascertained through the public consultation process;
- specialists' recommendations;
- environmental characteristics; and
- techno-economic cost-benefit analyses.

7.5.1 A: Direct

This option will involve a by-and-large straight line with the minimum number of turns from Gromis to Juno substations, crossing the Namaqua National Park.

7.5.2 B: West

The line will deviate to the west of the existing borders of the Namaqua NP, but will traverse through the proposed westward expansion of the park at the narrowest point, following the road leading to Hondeklipbaai. South of the park, the Transmission power-line will be constructed on the sandy soil and follow the Nuwerus-Lutzville road to Juno.

7.5.3 C: N7

The line will follow the existing 220kV servitude between Gromis and Nama substations. At the southernmost point of this servitude, it will deviate to the east and follow the National Route 7 (N7) around the Namaqua National Park, all the way to Juno.

7.5.4 D: Boesmanland

The line will follow the existing 220kV servitude between Gromis and Nama substations, and cross over the mountains east of Springbok. From there the line will run through Boesmanland, turning west to cross the Hardeveld to Juno.

7.5.5 E: Combined B & A

As proposed during the authority meeting of 5 May 2006, the route alternative B has been amended to follow a section of route alternative A. From Gromis the line will run to the west of the Namaqua National Park. From the Spoeg River, the line will deviate to the east and follow the first alternative. In the vicinity of the Groot Goerap River, the line will deviate to the west of alternative A and follow the same route as alternative B to Juno.

7.5.3 F: East of N7

A meeting was held with Dr Michael Knight of SANParks (Head: Park Planning and Development) during September 2006. The possibility of traversing the Namaqua National Park was discussed. SANParks, as key stakeholders, would not support any transmission line route traversing their existing boundaries or planned expansions and insisted that another route be used. The future eastern expansion of the Namaqua National Park extends up to the N7. As such, this alternative route would follow the Gromis-Nama line, and deviate to the south of it at a certain point. The line would then cross the N7 and run east of the N7 until south of Kamieskroon, at which point the line would turn to the west and cross the N7 again between Garies and Kamieskroon. The line would then follow the direct line between Gromis and Juno in order to avoid the Knersvlakte.

7.5.4 G: Soebatsfontein

During the specialist integration meeting of 3 October 2006, it was agreed by the EIA team (including the specialists) and the applicant that a further alternative must be considered in an attempt to lessen construction costs, which would be substantial for alternative F from a geotechnical perspective. This route follows alternative A, crossing through the Namaqua National Park to the east of Soebatsfontein, but stays as close to the escarpment as possible, thereby limiting the visual impact by providing a backdrop.
Another very important motivation for the alternative is that, although Alternative F avoids the NNP, the impacts of Alternative F on biodiversity in the Kamieskroon area would be more severe than the biodiversity impacts within the NNP.
In spite of alternative G's impact on the NNP, it was agreed during the integration meeting that biodiversity issues in the study area are of very high importance relative to other environmental factors and that, in spite of this alternative transecting the NNP, it may be preferable to alternative F in terms of its impacts on biodiversity.

7.6 STRATEGIC COMPARISON OF ALTERNATIVES

During the scoping phase as well as the impact assessment phase, several route alternatives were proposed. In order to facilitate the environmental impact assessment process, the specialists conducted detailed assessments of the impacts on the different alternative routes. Two new routes were proposed during the EIA phase, which required further specialist investigation.

Specialist studies were conducted where impacts of each of the seven proposed routes were compared at a strategic level. These impacts are discussed in 46. Please note that these impacts only apply for where alternatives have been proposed, i.e. between Gromis and Juno. No alternatives have been proposed for the Oranjemund-Juno section.

Table 54 *Comparison of impacts of different integration options*

The impacts below are ranked in terms of the impacts expected. Where impacts are so high that the specialists have recommended that the area be avoided, the blocks are marked in red. Where the specialists recommended construction within a specific area, the block is marked in green. Where the impact is not sufficiently significant to sway the decision either way, the block is not coloured.

	Alternative A	Alternative B	Alternative C (N7)	Alternative D	Alternative E	Alternative F	Alternative G
Route description	Direct from Gromis to Juno.	West of Namaqua NP, runs parallel the Hondeklip and Nuwerus-Lutzville road to Juno	From Gromis to Springbok parallel to an existing Eskom servitude, to Juno along the N7	From Gromis to Springbok parallel to an existing Eskom servitude across Kamiesberge, to Juno through Boesmanland	As for Alternative B, but follows route A from the Spoeg River to the Groot Goerap River, where after it rejoins route B.	As for alternative C, but crosses the N7 and runs through the mountainous section east of the N7. Follows straight-line route after Kamieskroon.	Follows straight-line route, skirting the escarpment close to Soebatsfontein, through NNP. Thereafter straight to Juno.
SUITABILITY OF THE DEVELOPMENT IN TERMS OF ENVIRONMENTAL IMPACT							
Heritage			Low-moderate impact: granite hills		Low impact: avoids sands and granite outcrops		
Vegetation	No-go through the Riethuis-Oubees Quartz Vygieveld. Preferred route for final 40km	Medium negative. Avoid Kotzesrus Namaqua Sand Fynbos and Jaagleegte Knersvlakte Quartz Vygieveld	No-go: crosses core area of proposed Knersvlakte Biosphere Reserve on Knersvlakte Quartz Vygieveld	Low to medium negative, except Nama quartzite escarpment west of Steinkopf.	Low to medium negative. However, the Koekenaap Quartz Vygieveld must be avoided	No-go: crosses Kamiesberg highlands Centre of Plant Diversity	Low to medium negative. Crosses no unique botanical features

	Alternative A	Alternative B	Alternative C (N7)	Alternative D	Alternative E	Alternative F	Alternative G
Soils and agriculture	Rejected	Not recommended: high agricultural suitability	Not recommended: high risk of erosion	Lower suitability than F	Next most recommended route, after G	Lower suitability than E	Recommended: lowest risk of water erosion, lowest impact on agriculture
Visual			Recommended due to high visual absorption capacity.		Not recommended: High impact in crossing Namaqua National Park	Recommended due to high visual absorption capacity.	Not recommended: High impact in crossing Namaqua National Park
Avian	Higher impact than D or E but less than B	Least recommended highest impact on avifauna	Recommended: Lowest impact on avifauna	Higher impact than F or A	Higher impact than F or A	Second lowest impact on avifauna of the alternatives	Not recommended: High impact in crossing Namaqua National Park
Social and Tourism	Not recommended: crosses through proposed expansion of NNP, which has a negative influence on generating livelihoods through tourism.	Not recommended: crosses through proposed expansion of NNP, which has a negative influence on generating livelihoods through tourism.	Recommended: Less impact on communities due to higher resilience of communities to negative effects of infrastructure development	No-go: no consultation has taken place with the inhabitants of this area.	Not recommended: crosses through proposed expansion of NNP, which has a negative influence on generating livelihoods through tourism.	Recommended: Less impact on communities due to higher resilience of communities to negative effects of infrastructure development	Not recommended: crosses through proposed expansion of NNP, which has a negative influence on generating livelihoods through tourism.
SUITABILITY OF ENVIRONMENT FOR DEVELOPMENT							
Air quality	Suitable: large distance from ocean and	Not recommended: close proximity	Suitable: large distance from ocean and	Suitable: large distance from ocean and	Not recommended: close proximity	Suitable: large distance from ocean and	Suitable: large distance from ocean and

	Alternative A	Alternative B	Alternative C (N7)	Alternative D	Alternative E	Alternative F	Alternative G
	mining activities	to ocean and mining activities	mining activities	mining activities	to ocean and mining activities	mining activities	mining activities
Geotechnical	Suitable. Large excavations required for founding	Suitable. Large excavations required for founding	Not recommended: Steep rocky slopes	Suitable	Suitable. Large excavations required for founding	Not recommended: Steep rocky slopes	Suitable. Large excavations required for founding

7.7 SYNOPSIS OF SPECIALIST FINDINGS

7.6.1 Heritage

The expected heritage impacts of the proposed line construction are very low, due to the sparse nature of human settlement away from the coast. It is recommended that the route be ground-proofed (and mitigation applied through minor adjustment or recording and sampling) once other environmental and economic considerations allow for design of a proposed route. While no specific preferences are given in terms of the corridor, it is suggested that rocky outcrops, low hills and ridges be avoided as this is where the predominant heritage of the area (archaeological sites) are likely to occur. As such, this would imply that alternative routes C and F are not recommended due to the hilly nature of the terrain in that area. Therefore, alternative E or G are recommended. However, it is also stated in the heritage report that **there are few confirmed heritage features that would be affected and therefore, other factors could take precedence over heritage impacts in deciding on a preferred route**.

7.6.2 Birdlife

Ludwig's Bustard was used as an indicator species in evaluating the alternatives in terms of their sensitivity for large terrestrial bird collisions. Ludwig's Bustard is almost certainly the species of most concern for this study due to its vulnerability to collision with overhead wires. In addition, this bird has arguably the most consistently high report rates across the study area of all the species likely to be impacted through collision. Using report rates as a measure of abundance for the Ludwig's Bustard for each quarter degree square (1:50 000 map unit) that was crossed by the alternatives, the sensitivity of the route in terms of its impact on avifauna was calculated. The alternative route which is expected to have the lowest impact on avifauna, and as such the most suited for construction of the line is alternative route C. Alternative F is situated adjacent to existing infrastructure (including an existing power line) for part of its route, and passes through higher, more hilly ground in the northern half – this is advantageous in terms of impacts on Ludwig's Bustard, as discussed elsewhere in this report.

Alternative E passes generally through the low lying flat areas and in the southern half, E is situated adjacent to existing secondary roads for much of its length. It is therefore concluded that, due to Alternative C being excluded by the proponent in terms of cost, the **most preferred alignment from an avifaunal perspective would be Alternative F, followed by Alternative E**.

7.6.3 Visual impacts

The seven alternative alignments have been evaluated against international accepted criteria to determine the impact it will have on the landscape character and the viewers that have been identified in the study area.

The alternatives are rated according to preference by using a three-point rating system in Table 55, three (3) being the most preferred, to one (1) which is least preferred. The preference rating is informed by the impact assessment discussions in Section 5.3 and the overall performance of each alternative with regards to the impact on the landscape character and the identified viewers.

Table 55 *Evaluation of alternative alignments*

ALTERNATIVES	PREFERENCE RATING
Alternative A	1
Alternative B	1
Alternative C	3
Alternative D	2
Alternative E	1
Alternative F	1
Alternative G	1

Alternative C is regarded as the most preferred alternative. Its alignment along the R355 & N7 is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the roads. A large section of the alignment traverses the Kamiesberg Succulent Karoo mountain range which has the highest VAC. The backdrop that will be created by the mountains and the mottled texture of the vegetation will absorb the transmission pylons in the landscape.
The impact of Alternative C on visual receptors varies between residents, tourists and motorists. Alternative C's great advantage lies in the less significant visual impact on tourists as compared to the other alternatives. The high VAC of the Kamiesberg Succulent Karoo mountain range through which a large section of the alignment pass, will cause a major reduction in the visibility of the transmission line. Alternative C stays clear of major tourist attractions such as the NNP. The public association with transmission lines and major public roads is a common perception which makes the co-existence of these two features more acceptable.

7.6.4 Soil and agricultural potential

The weighted average dry land arable agricultural and grazing suitability of the corridor was used as an indicator of impact on agricultural production or potential. Note that the variables included in this estimation include soil type, depth, clay content, local relief and percentage level land. Rainfall is not included in the estimation. Based on these factors, alternative route C has the lowest dry land arable agricultural potential and are, therefore, the most suitable alternatives for the construction of the transmission line. This alternative route may have a higher grazing potential, however, due to the higher rainfall. Alternative route E has the highest impact on agricultural potential and is as such not recommended.

Alternative F is comparable alternative C, but is slightly shorter (322 km). Although wind erosion has no impact, alternative F cuts across a great number (and longest distance) of land types with a moderate to severe water erosion hazard. Soils in water erosion sensitive land types are predominantly shallow and the terrain is hilly to mountainous with a low percentage level land and high local relief. To mitigate the negative impact, especially along the service road, will be difficult due to the steep slopes and high runoff rates especially in certain land types. The impact of the pylon footprints on loss of arable land and production of small-grain will, however, be small. It is only the service road that will have a slight impact on the total small-grain yield.
Compared to the other alternatives, Alternative G is the shortest alternative (261 km). In the north the land is used mainly for grazing while lands cleared for small-grain production is common in the south. Wind erosion will have no impact. Land types that are sensitive to water erosion are common along this alternative. The soils that are sensitive to water erosion are predominantly shallow and the terrain is hilly with a low percentage level land and high local relief. Although this is the shortest route with the least disturbance due to a shorter footprint, less pylons and shorter construction time, crossing the Namaqua National Park will have a negative impact.
Based on the nature of the land types, route length, wind and water erosion hazard, as well as the potential impact on grazing potential and rehabilitation of disturbed vegetation, the alternatives can be arranged according to the potential agricultural impact, and as such suitability for construction of a transmission line in the following order: G, E, F and C.

7.6.5 Geotechnical suitability

The preliminary geotechnical investigation compared the different alternative routes in terms of:

- Topography,
- Proximity of the steel towers to the corrosive environment of the coastline,
- Location and design of service roads in relation to the transmission line with access roads off provincial and national routes,
- Straightness of route i.e. minimisation of bends, or changes in direction, in the route which are relatively uneconomical, and
- Impact of geotechnical issues on costs of construction with respect to :
    - *Earthworks associated with tower construction*
    - *Materials usage for road construction*
    - *Tower foundations, and*
    - *Tensioned ground anchors.*

Based on this comparison the routes most suited for construction of the transmission line is alternative E. Alternative routes C and F, due to the high cost expected to be incurred from construction in the rugged terrain, is not recommended.

7.6.6 Vegetation

Alternative A (Eskom proposal): The primary "No Go" area traversed by this route is the Riethuis – Oubees Quartz Vygieveld within the Namaqua National Park (northeast of Koingnaas). Numerous rare plants are endemic to this area, and due to the nature of the substrate both the plants and the habitat will be irreparably damaged by a powerline and associated tracks, and the habitat cannot be adequately rehabilitated. For this reason this route must be considered as a No Go alternative, in its current form. The remainder of the route passes over low rolling (mostly granite) hills of low to moderate sensitivity and small patches of high sensitivity (such as quartz ridges). In the extreme south (last 40km) this route is in fact the preferred route from a botanical perspective.

Alternative B: This is one of the preferred routes, with relatively few areas of botanical concern. However, in the area around Kotzesrus there are extensive patches of Namaqua Sand Fynbos, which is a biogeographically important vegetation type with a relatively restricted occurrence, and some of these may be negatively impacted by the powerline and associated new service track. The primary area of concern for this route is likely to be the Knersvlakte Quartz Vygieveld in the vicinity of the Jaagleegte river, around the Namaqua Sands MSP some 5km north of Koekenaap, although this is a fairly saline example of quartz patch vegetation, and these are known to be of lower conservation value than the less saline examples (P. Desmet – *pers. comm*.). This route is longer than Alternative E, and will therefore be more expensive, and will have a greater ecological footprint (longer sections of new access road, and more pylon positions).

Alternative C: This alternative runs inland along the N7 from Springbok to the Ratelkop area in the Knersvlakte. The first section would follow an existing, but very mountainous and botanically sensitive servitude to Springbok from Kleinzee. This alternative runs straight through the Knersvlakte Quartz Vygieveld for well over 100km, and in fact crosses the core area of the proposed Knersvlakte Biosphere Reserve. The line would have a significant negative impact on the very sensitive vegetation in the Knersvlakte. This vegetation supports numerous rare and endemic plant species, and once the habitat is damaged by vehicles does not rehabilitate effectively. The Knersvlakte is regarded as perhaps the global hotspot for dwarf succulent plant species, and the entire area is a major national and global conservation priority. For these reasons this Alternative is considered a No Go option.

Alternative D: This proposal runs from Springbok into Bushmanland, and then crosses the width of the southern Knersvlakte and joins the Alternative C. This route is very long. Botanically it traverses a sensitive, unavoidable, granite and Nama quartzite escarpment west of Steinkopf, sensitive (but easily avoided) granite hills southeast of Springbok, passes east of the main areas of sensitivity in the Kamiesberg, through western Bushmanland (few sensitive areas except pans and rocky outcrops), and then crosses the eastern Knersvlakte, following an existing powerline, fairly close to the Sishen – Saldanha railway line. The route is likely to have a Medium negative impact, as due to its length it has a greater ecological footprint, and it traverses some sensitive areas, but it could be considered. The section through the Knersvlakte is not an issue, as the route does not include significant quartz fields or key botanical areas (P. Desmet – *pers. comm*.).

Alternative E: This alternative was decided upon fairly recently and is a combination of Alternatives A and B, and is one of the preferred alternatives. The main difference from

Alternative B is that from Wallekraal to north of Koekenaap it runs further inland, cutting across the rolling granite hills of the Hardeveld, which support Namaqualand Heuweltjieveld. This area is potentially less sensitive than the Sandveld in the Kotzesrus area, traversed by alternative B, and was proposed for this reason. In addition, it is shorter, and therefore has a smaller direct footprint. The route may need to be slightly modified in its southern extent, to avoid the Quartz Vygieveld north of Koekenaap, and thus the best route may be to continue south on alignment A all the way to Juno.

Alternative F (Kamiesberg route): This alternative was proposed by SANParks, and runs inland from Gromis, up the Buffels river valley, up the escarpment northwest of Kamieskroon (sensitive granite hill area), and then through the rugged Kamiesberg highlands, which has been identified as a Centre of Plant Diversity (Van Wyk and Smith 2001), and has recently been the subject of a detailed study which has shown that it supports at least 55 true endemic plant species, and a further 55 near endemics (Helme and Desmet 2006), making it a regional hotspot for plant endemism. Many species are rare, and restricted to Renosterveld valleys, which is also exactly where a powerline would be likely to be routed. This proposal should thus be rejected as a No Go option on botanical grounds.

Alternative G (Soebatsfontein route): This route is essentially a variation of Alternative A, designed to avoid the most sensitive botanical areas in the Namaqua National Park, which occur in the Riethuis quartz fields. The route runs via Oubees se Sand, to inland of Soebatsfontein, at the western base of the escarpment, and actually avoids all areas of High botanical sensitivity, and will not have more than a Medium negative impact on any one system, and will not cross any unique botanical features.

7.6.7 Social and tourism impact

An important factor to consider is who will pay the price of the development and who will benefit from it. From a social and tourism perspective, it can be said that not only the local people will be impacted on by the line, but the impact may also be felt on regional and national scale. The reason for this statement is that the area in which the line is proposed is one of the nations prime tourist attractions, based on its natural beauty and ecological uniqueness, and is visited by local and foreign tourists for this reason. The sustainability of a power line should be weighed against the long term and permanent impact on the natural environment, which have the potential to generate a sustainable income to communities in the area. Some of these communities have already been working towards eco-tourism initiatives. It is a well-known fact that social development is not a short-term process, and that economic development does not necessarily lead to social development. Economic opportunities in the area are also limited, making the emphasis placed on tourism even more important. A realistic assessment of whether the proposed line will have a timely impact on Cape Town's energy crisis needs to be considered.

Social impacts are not necessarily site-specific, and therefore impacts might occur in communities near the proposed alignment. The main focus of this brief discussion is on the potential impact that the project might have on tourism. The location of the construction camps will have definite social impacts on all the alternatives. Another important factor to consider is that many farmers do not have access to electricity, and therefore the impact of having a line traversing the farm without having access to electricity yourself need to be considered.

The preliminary social and tourism impact discussion does not recommend alternative route E, due to the impact on the major tourism centre of the NNP. Alternative route C is recommended, as the larger and more heterogeneous communities along this route are more resilient to possible social impacts resulting from infrastructure development due to the exposure of these communities to existing infrastructure. Based on the potential impact the line may have on tourism and the photographic safaris and workshops presented by an internationally-renowned photographer attended by people from across the globe, alternative F is not seen as a viable alternative. From a social and tourism perspective, Alternative G is not seen as acceptable, as tourists visit the park especially during the flower season to view unspoilt vistas of flower carpets and night skies. Areas in and around the park are earmarked for eco-tourism development. Although there are national parks in the country which do have power lines traversing them, the landscape in which those parks are situated lends itself to visually hide the structures. Neither Alternative F nor Alternative G is seen as a viable and sustainable option. The recommendation remains with Alternative C, but this was not seen as a viable option during the specialist integration workshop. Taking this in account, it is therefore recommended that the no-go option must be considered.

7.6.8 Conclusion

It is clear that there is no single alternative that is preferable in terms of all categories of impact.

Alternative G is preferable in terms of the botanical impacts and impacts on soils and agriculture. Alternative G is considered particularity preferable from a botanical point of view due to the fact that is does not cross any unique botanical features. In terms of agricultural impact, Alternative E is the next most preferable route and in terms in botanical impact, alternatives Alternatives D and E are next most preferable.

From a social point of view, alternatives C (parallel to the N7) and alternative F (Kamieskroon) are preferred. From a visual point of view, Alternatives C and F are recommended as most suitable, due to the higher ability of the mountainous landscape along these routes to absorb the visual impact. In terms of birdlife, Alternatives C and F are rated the most preferable, with C being slightly more preferred than F. However, Alternative F is considered an absolute no-go alternative from a botanical point of view owning to its impacts on the Kamiesberg Highlands Centre of Endemism. Thus, taking social, visual and birdlife considerations into account, Alternative C is the only viable alternative that it not disqualified by other factors.

Therefore, in considering the alternatives, botanical and agricultural factors (in favour of Alternative G) are in conflict with social impacts, visual impacts and impacts on birds (in favour of Alternative C). As far as impacts on birds are concerned, although the different alignments are expected to result in different levels of impact due to concentrations of conservation-important species, mitigation (making the power line more visible to birds) can be effectively applied to any of the alternatives. Mitigation will entail installing sufficient marking devices on the line in particular habitats (e.g. close to wetlands, rivers and agricultural lands). From a botanical point of view, Alternative C is also considered unacceptable, since it traverses the important Knersvlakte Quartz Vygieveld and the proposed Knersvlakte Biosphere Reserve. This effectively also eliminates C as a viable alternative.

The two factors of lowest importance in making a decision on the preferred route are heritage impacts and the geotechnical suitability for the power line. The conclusion of the heritage study was that other factors could take precedence over heritage impacts in deciding on a preferred route, since there are no confirmed heritage features that would be affected. Geotechnical considerations are also considered relatively unimportant, since although geotechnical factors present constraints for construction, they can be overcome by more expensive construction, whilst it is impossible to overcome some biophysical and social impacts.

Thus, it is concluded that Alternative G is the preferred alternative. Unfortunately, this alternative will result in significant visual and social impacts, especially with respect to the Namaqua National Park, which will affect people's ability to make their livelihood from the

scenic quality of the landscape. In spite of the extensive search for other viable alternatives (viz. alternatives C and F) around the Namaqua National Park to avoid these impacts, neither of these alternatives were found to be suitable due to their very high impact on endemic species. In spite of the impact on the Namaqua National Park, the low significance of ecological impacts associated with Alternative G compared to the alternatives outside the Park is considered important enough to justify Alternative G.

7.8 THE NO-GO ALTERNATIVE

The Department of Environmental Affairs and Tourism stresses that the no-go option should be considered in cases where the proposed development will have a significant negative impact that cannot be effectively or satisfactorily mitigated.

Following the completion of specialist studies, consultation with key stakeholders and specialist integration meetings, it has become clear that the no-go alternative needs to be considered. Factors that tend to motivate the no-go alternative are discussed below.

Factors motivating consideration of the no-go alternative

Social impacts

The social impact assessment specialist has recommended that the no-go alternative must be strongly considered for this project. Building a power line will have a permanent impact on the environment and is considered by the social impact assessment specialist to have an irreversible impact on the sense of place[7]. Impacts in sparsely populated and undeveloped areas will be felt more acutely than the same impacts in areas more exposed to similar developments. The life of the power supply and power line must be weighed against the permanent impact the lines will have on tourism development and the possible livelihoods of communities who have been residing in the area for a number of years, especially because the line will not bring any direct benefits to those communities.

Long time frames for natural rehabilitation

The results of the study conducted by the botanical specialist have indicated that the vegetation, due to the combined factors of low rainfall, small physical size, slow growth rates and strong dependence upon the structural integrity of upper soil layer (the pedoderm), will not rehabilitate within any timeframe shorter than two to three centuries following the impact of construction activities. The highest impact will be due to the movement of heavy construction vehicles, which cannot be mitigated to any meaningful degree. However, in spite of this impact, the botanical specialist has indicated that these impacts can be mitigated by conservation offsets.

Large footprint area of pylons

The footprint area of the pylons is construction in sandy areas, such as those found along large sections of the route for all alternatives in the north would require deadweight anchors. Deadweight anchors for a strain tower measure approximately 4x1.5x1m, of

[7] The impact can, however, be reserved when the power line is removed during decommissioning.

which four will be required. Therefore, at least 24m^3 of sand will have to be excavated and stockpiled for each tower and the same amount of stone and cement trucked in for anchor construction. The vegetation will not only be damaged due to the movement of vehicles, but will be destroyed where sand and stone is stockpiled during construction.

High degree of endemism
Further compounding this impact is that no route alternatives have been proposed for the section from Oranjemund to Gromis, where it is estimated that in the area 15km south of Oranjemund substation, as much as 30% of the vegetation is locally endemic. In Namaqualand, over 70% of the plant species in the study area are endemic.

Lifespan of the power line compared to the environmental impacts
The Kudu gas fields, according to NamPower, have reserves to power the Kudu CCGT for a period of around twenty years. This fact, together with the extensive time required for rehabilitation, means that the benefits of the project will be relatively short-lived compared to the some negative impacts that will continue for many generations.

Factors motivating authorisation of the project

Need for power in the Western Cape
The purpose of the proposed 400 kV line is to supply reliable bulk power to the Western Cape, which has experienced a power deficit for upwards of two years. The line will enable Eskom to meet demands of the existing growth as well as the expected “step load” when the planned aluminium and steel smelters in the Coega IDZ reach operational status in 2009. If the proposed 400 kV line is not constructed, other sources could potentially be investigated, as explored in section 4.

Other power supply options already explored
There are other power generation alternatives that are currently being explored, e.g.: the Open Cycle Gas Turbine (OCGT) power stations to be constructed at Mossel Bay and Atlantis. Due to the current power crisis in the Western Cape, demand alternatives (i.e.: reducing electricity demand amongst customers) is also currently being implemented. OCGT power stations are, however, peaking stations and are not designed to supply bulk power in the same way that coal-fired or CCGT power stations would do. As such, OCGT stations such those planned for construction at Atlantis or Mossel Bay are not long-term sustainable solutions to solving the power deficit. Unfortunately, pebble-bed modular reactors, producing safe nuclear power, are not expected to become operational within the next five years at least.
Expected growth in electricity demand
Even with other power supply alternatives, the expected growth in electricity demand in the Western Cape is expected to continue to outstrip supply in the next five to ten years, and the supply of additional power to the Western Cape is therefore a necessity. Given the fact that NamPower has offered Eskom the surplus power to be generated by the Kudu power station, it would be foolish of Eskom to decline this offer in the light of the current power deficit in the Western Cape.

Kudu is a relatively clean source of energy

What makes the option of obtaining electricity from the Kudu power station especially attractive if seen on a larger scale, is the fact that this power is generated with far fewer environmental impacts than the coal-fired power stations, which account for the vast majority of Eskom's generation capacity. The relatively low environmental impacts of gas-fired power (no NO_x and SO_x emissions, no ash disposal and no land degradation due to coal mining) are important factors to consider when evaluating the alternatives with respect to where the necessary additional power must be obtained.

No other viable bulk power alternatives exist, therefore, should the proposed 400 kV line not be built, it could result in the Western Cape experiencing more frequent power outages, which would worsen as demand grows.

Conclusion

There is no easy compromise between the impacts and the benefits of the power line. The fact is that Eskom Transmission urgently needs to transport electricity between a supply point and a demand area, and that there are some very sensitive features in between these points that cannot be avoided, no matter what alternative is chosen. Some alternatives result in less significant impacts on the social environment, and others result in less significant impacts on the biophysical environment, but there is not a single alternative that results in lowered environmental impacts on all environmental variables.

Any alternative route will therefore have to be a compromise between different types of impacts. It was agreed in the integration meeting with the specialist consultants that botanical factors weigh very heavily compared to all other factors, due to the presence of globally important centres of botanical endemism in the area. In spite of the potential impacts of the power line on these biological communities, the botanical specialist has indicated that alternative G is acceptable, provided that strict mitigation measures (especially conservation offsets) are applied.

It is, therefore, concluded that the construction of the proposed 400 kV line must be considered, if the demand for electricity in the Western Cape is to be met. Although the project will result in significant impacts on both the social environment and biophysical environment in the study area, with thorough planning and judicious and careful construction the biophysical impacts particularly can be mitigated.

SECTION 8: CONCLUSIONS AND RECOMMENDATIONS

8.1 SIGNIFICANT IMPACTS

The probable impacts of sufficiently high significance to warrant mitigation measures and management during the construction of the Transmission power-line are as follows:

- Visual intrusion as a result of the building and operation of the Transmission power-line, especially within the Namaqua National Park;
- Floral destruction through vegetation clearing and earthworks during the construction phase, and maintenance activities during the operational phase;
- Loss of tourism potential as a direct result of the visual intrusion and floral destruction listed above;
- Loss of sources of livelihood as a result of the loss of tourism potential;
- Loss of small portions of arable land as a result of the demarcating the servitude along current farm lands;
- Destruction and displacement of birds as a result of the construction activities; and
- Impacts related to the social environment e.g. farmers.

8.2 RECOMMENDATIONS

It is recommended that the application for this power line be authorised subject to the following strict conditions:

- It is recommended that Alternative G should be authorised, on condition that the southern portion of the route in the Olifants River valley avoids all high potential agricultural land.
- The creation of offset conservation areas as defined in the ecological specialist report must be implemented to mitigate the loss of ecologically sensitive areas in the northern part of the route between the Oranjemond Substation and Gromis substation. A possible option would be to increase the servitude width in the 12.5km south of Oranjemund substation, to at least 1000m. This area should then be rezoned Open Space 3 if possible, and registered as a Private Nature Reserve, in order to secure some conservation status for this very vulnerable area. Alternatively, a portion of the farm Grootderm 10, not less than 100ha in extent should be purchased immediately south of the Oranjemund substation. Eskom Transmission must identify a suitable area in consultation with the provincial and national nature conservation authorities.
- Construction must be done during the dry season (Oct – April) in all areas of high sensitivity identified by the botanical specialist, in order to minimise damage to rare or localised bulbs and annuals which grow and/or are above ground only during the autumn to spring period. This refers particularly to the driving of vehicles over natural veld, and is especially important in this highly seasonal area.

- It is recommended that Eskom Transmission must, in consultation with SA National Parks, purchase a suitable area for the expansion of the Namaqua National Park to compensate for the impacts on the park. This must be a suitable area with potentially high tourism potential where local people can make their livelihoods through tourism.

- Existing erosion of the access road along the current servitude in the vicinity of the Holgat River (and any other portion of the proposed route) must be mitigated during the construction of the new power line.

- Immediately following authorisation and well prior to construction, Eskom Transmission and/or other relevant Eskom divisions must enter into negotiations with local authorities and communities regarding the provision of electricity to communities close to the power line. Eskom Transmission must provide proof of having reached agreements in this regard to DEAT before the commencement of construction.

- A walk through site inspection of the proposed route must be undertaken by an archaeologist, a bird specialist and a botanical specialist in order to optimise the route from an environmental perspective so as to ensure that there are no sensitive environmental features that will be affected by either the positions of the pylons or the access roads and associates areas like material storage and laydown areas. The advice of these specialists must be followed in the placing of the pylons, access roads and associated infrastructure. The end product of this inspection must be the development of a Construction Environmental Management Plan (CEMP) which contains detailed site-specific requirements for mitigating impacts during the construction phase. DEAT must approve this CEMP prior to construction.

- At least one independent Environmental Control Officer (ECO) must be appointed for the duration of construction. Due to the long length of the power line, more than one ECO may have to be appointed should construction take place concurrently in more than one area. The ECO(s) must be responsible for checking the contractors' adherence to the CEMP and reporting on compliance to the provincial and national environmental and conservation authorities.

- Due to the large footprint caused by construction of the deadweight concrete anchors in the areas of loose sand along the route, the pylons in these sections must be positions as far apart as possible so that as few pylons as possible are necessary in these areas. A plan in this respect must be submitted as part of the CEMP.

- All pylons and the entire power line must be removed as soon as possible once the Kudu power station has reached the end of its life in order to avoid permanent visual impacts in the study area.

- It is recommended that the Record of Decision authorise the power line on the

basis of a 3km wide corridor within which the power line position can be moved, to cater for environmental constraints identified during the walkthrough inspection and to cater for the results of negotiations with landowners.

8.3 STAGE OF THE PROJECT

Figure 13 below indicates which stage of the EIA process the current draft Environmental Impact Report (EIR) represents. A Plan of Study for EIA was submitted to the environmental authorities and accepted by the authorities. The EIA study was undertaken and the EIR report has been written in terms of the requirements of this Plan of Study.

Upon receiving all interested and affected party comments on the EIR, these comments will be addressed in the EIR and the final EIR will be submitted to the environmental authorities for decision-making. At the same time, the final EIR will be provided to I&APs for information. The environmental authorities will review the EIR and issue a Record of Decision (RoD) that either authorises the transmission line or declines authorisation. Once the Record of Decision has been issued, all registered I&APs will be informed about the content of the RoD. Following the issue of the RoD, a 30-day period is available to the applicant and I&APS to appeal against any condition of the RoD.

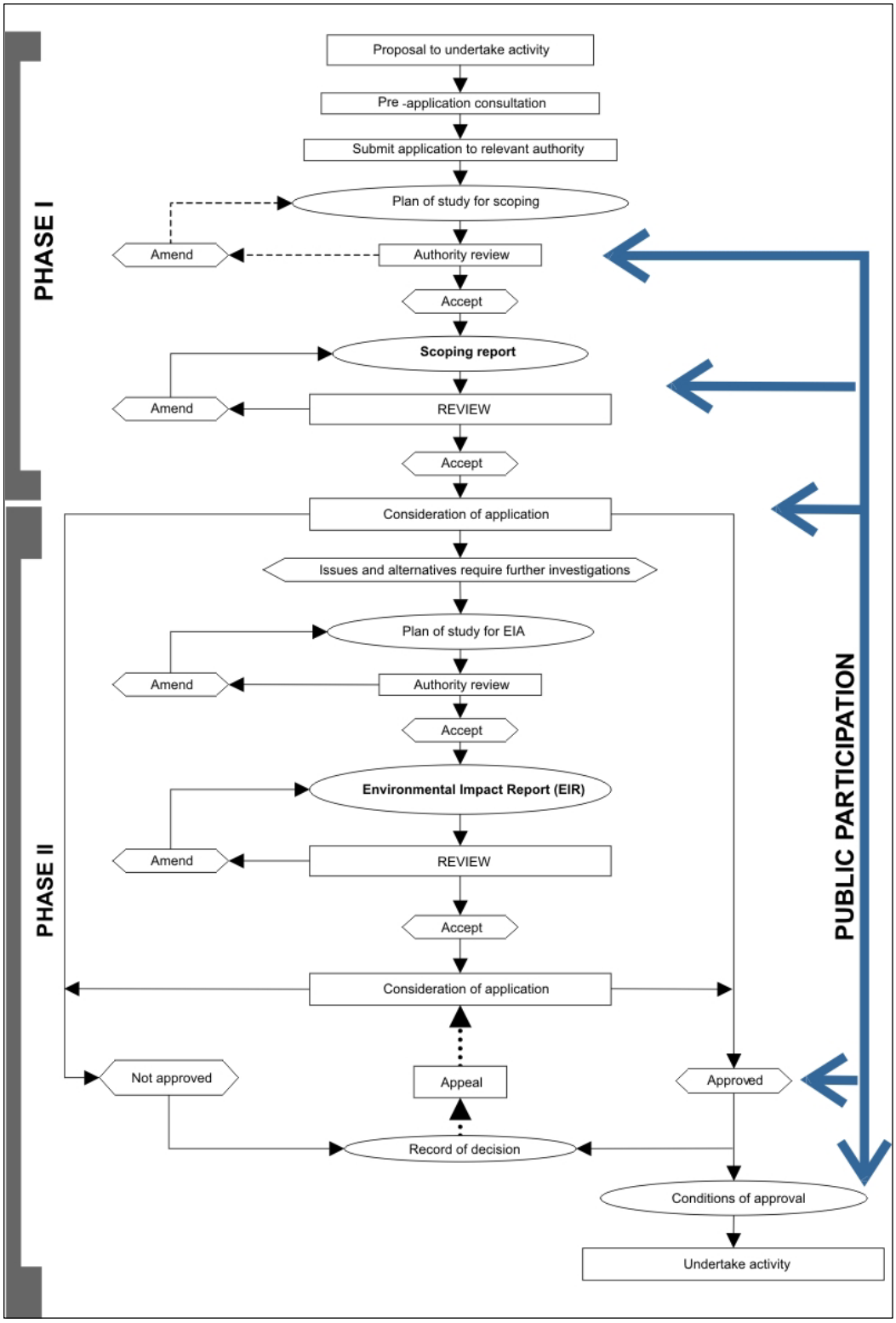

Figure 13 *Current position in the EIA process*

REFERENCES:

- The Gouritz Initiative. Accessed 2006. Electronic source: www.gouritz.com
- COWLING, R & PIERCE, S. 2000. Namaqualand: Plant life in an extraordinary desert. Electronic source: www.plant-talk.org. Plant Talk No 22/23 (July 2000)
- LOUBSER GJJ, MOUTON FN & NEL JAJ. 2001. Information supply on lesser-known but abundant animals: The ecotourism potential of herpetofauna in South Africa. Seminar on Planning, Development and Management of Ecotourism in Africa. Regional Preparatory Meeting for the International Year of Ecotourism, 2002. Presented at Maputo, Mozambique, 5-6 March 2001.
- LOW, A.B. & REBELO, T.G. 1996. Vegetation of South Africa, Lesotho and Swaziland Dept. of Environmental Affairs and Tourism, Pretoria, Pretoria, South Africa.

APPENDIX 1: CORRESPONDENCE WITH AUTHORITIES

APPENDIX 2: MINUTES OF THE PUBLIC PARTICIPATION MEETINGS

APPENDIX 3: DATABASE OF INTERESTED AND AFFECTED PARTIES

APPENDIX 4: COMMENT AND RESPONSE REPORT

APPENDIX 5: SITE NOTICES AND FLYER

APPENDIX 6: BACKGROUND INFORMATION DOCUMENT

APPENDIX 7: SPECIALIST REPORTS

APPENDIX 7.1: GEOTECHNICAL REPORT

APPENDIX 7.2: BOTANICAL IMPACT ASSESSMENT

APPENDIX 7.3: VISUAL IMPACT ASSESSMENT

APPENDIX 7.4: SOCIAL IMPACT ASSESSMENT

APPENDIX 7.5: SOIL AND AGRICULTURAL POTENTIAL IMPACT ASSESSMENT

APPENDIX 7.6: BIRDLIFE IMPACT ASSESSMENT

APPENDIX 7.7: HERITAGE IMPACT ASSESSMENT

APPENDIX 7.8: AIR QUALITY ASSESSMENT