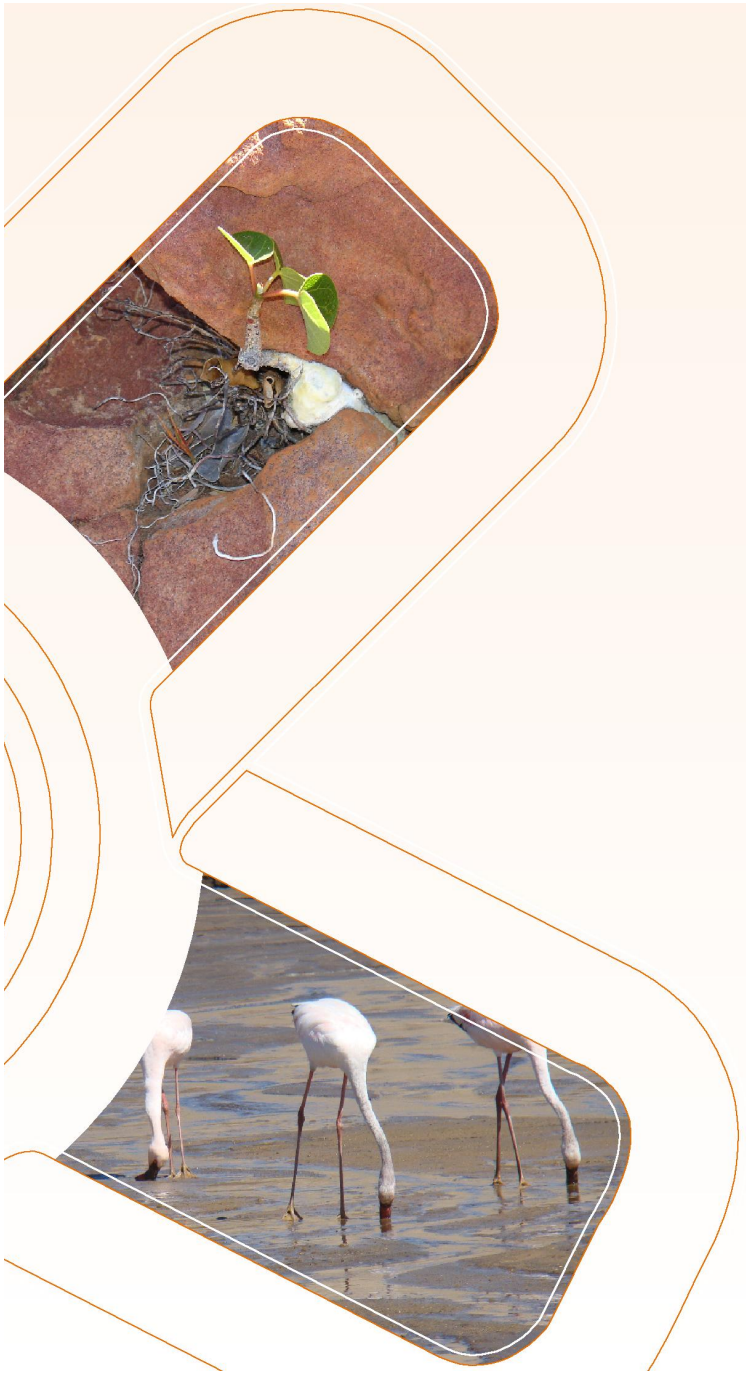

EIA REPORT FOR±250km 400kV-POWER LINE FROM BORUTHO S/S IN MOKOPANE TO BOKMAKIERIE S/S IN NZHELELE AND ASSOCIATED SUBSTATION WORKS TO ACCOMODATE THE POWERLINE IN LIMPOPO

DEA Ref:14/12/16/3/3/2/2/287
NEAS Ref: DEA/EIA/0001049/2012

Final Report

5 July 2013

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NZUMBULULO

Final Report

FINAL ENVIRONMENTAL IMPACT REPORT FOR THE PROPOSED CONSTRUCTION OF ±250km 400kV-POWER LINE FROM BORUTHO S/S IN MOKOPANE TO BOKMAKIERIE S/S IN NZHELELE AND ASSOCIATED SUBSTATION WORKS TO ACCOMODATE THE POWERLINE IN LIMPOPO PROVINCE

5 July 2013

Prepared by: Hellen Mlotshwa

External Review:

For and on behalf of
Nzumbululo sustainability, Energy and Environment (SEE)
Approved by: Hellen Mlotshwa

Signed:

Position: Partner/ Director

T*Date:* 5July 2013
h

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EXECUTIVE SUMMARY

Introduction

In order to address the existing network constraints in the Polokwane North network, Eskom Holdings Limited proposes **to construct a ±250km 400kV transmission power line from the new Borutho Substation near Mokopane to new Nzhelele (Bokmakierie) Substation near Musina in Limpopo Province**. » **Associated infrastructure** to integrate the new transmission power line into the Transmission grid (such as access roads, relocation of existing lines, etc) and accommodate the new line into the substations (such as the construction of new feeder bays).
The proposed power line would be associated with construction works of the Borutho and Bokmakierie Substations, which have already received environmental authorizations (Authorisation Reference Number DEA 12/12/20/1187and 12/12/20/2084).

1.2 Motivation for Development

Eskom Holdings Ltd is responsible for the provision of reliable and affordable power to its consumers in South Africa. Electricity cannot be stored and therefore must be used as it is generated. Electricity is generated in accordance with supply-demand requirements. In South Africa, thousands of kilometers of high voltage transmission lines (i.e. 765kV or 400kV transmission lines) transmit this power, which is mainly generated at the power stations located within Mpumalanga and Limpopo Provinces, to Eskom's major substations. At these major substations, the voltage is reduced, and distributed to smaller substations all over the country through distribution lines (i.e. 132kV, 88kV or 66kV distribution power lines). Here the voltage is reduced and distributed to local substations, which distribute the power via numerous small lines (i.e. 22kV and 11kV distribution power lines) to local users. The power generated by Eskom can only be utilised from those points of supply, which transform the power into a usable voltage.
If Eskom Transmission is to meet its mandate and commitment to supply the ever-increasing needs of end-users, it has to plan, establish and expand its infrastructure of transmission power lines on an on-going basis, in support of the generation processes. It is therefore vital that transmission capacity keeps up with both electricity generation capacity and electricity demand.
The Northern region is experiencing exponential increasing in energy demand from various socio-economic development and land use activities such as mining, agriculture and local users in the region. The proposed powerline is therefore necessary to:

Avoiding current and future possible voltage collapse;contributing towards a more flexible electrical network;Improvement in the overall reliability of the electrical systems, which would benefit electricity users in the region andto sustain economic growth in the region.

1.3 Alternative Transmission Line Corridors

Technically feasible alternative transmission line corridors have been identified for investigation within the EIA process. These alternatives were selected on the basis of the local topography, as well on technical criteria. Through the EIA process, a preferred transmission power line corridor will be nominated for consideration in the decision-making process by the National Department of Environmental Affairs (DEA), as competent authority for this project. Should the proposed project be authorised by the DEA, Eskom will enter into a negotiation process with each affected landowner. The negotiation process is independent of the EIA process, and will be undertaken directly by Eskom Transmission.
Three alternative power line routes have been identified for this project, each planning and environmental studies covers 3000m in width. The final servitude would be a route required to accommodate 55m constructions of the 400kV power line transmission towers. The receiving environment for the proposed transmission power line consists of rural village settlements; traditional authority lands, game reserves, towns and commercial farmlands distributed between Borutho and Nzhelele (Bokmakierie) Substations. The power line would traverse across two districts, Capricorn and Vhembe in Western and Eastern regions of the Limpopo province respectively. (Refer to map-attached appendix 2)

1.4 Legislative requirements

The construction of the 400kV transmission powerline, including associated infrastructures, is an activity identified in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), in respect of the Environmental Impact Assessment (EIA) Regulations No. R543 of 2010, which stipulates that such developments, may not commence without Environmental Authorisation (EA) from the National Department of Environmental Affairs (DEA).
The National Department of Environmental Affairs (DEA) is the competent authority for this project. An application for authorisation has been acknowledged by DEA (under Application Reference number 14/12/16/3/3/2/287.Through the decision-making process, DEA will be supported by the Limpopo Department of Economic Development, Environment and Tourism (LEDET).

1.5 The EIA process

The EIA study and the EIR outcome are planning and decision-making processes and tools respectively undertaken in terms of Section 24 (5) of the National Environmental

Management Act (NEMA), Act No. 107 of 1998. The EIA has parallel and integrated processes namely: a technical assessment process and public participation process (PPP). The technical process investigates "hard" information: facts based on scientific and technical study, statistics or technical data. It identifies the potential negative and positive consequences of a proposed project or development at an early stage, and recommends ways to enhance positive impacts and to avoid or reduce or mitigate negative impacts. The PPP exercise engages the public and I&AP's on the issues relating to the proposed development including identifying community concerns and gather inputs from other relevant parties. Figure 2 below illustrates the EIA process. The findings of an EIA also guide the technical and financial investigations relating to the viability of the proposed development. The EIA regulations also require that an EMP be developed to guide the planning, development and subsequent operation of the development. The provisions of the EMP will be legally binding on Eskom Holdings SOC and on its contractors to ensure a sustainable development subject to DEA issuing the Environmental Authorisation that clears the proposed development to proceed. Figure 1 below provides the EIA process in its entirety.

The Scoping/EIA Process Flow Diagram

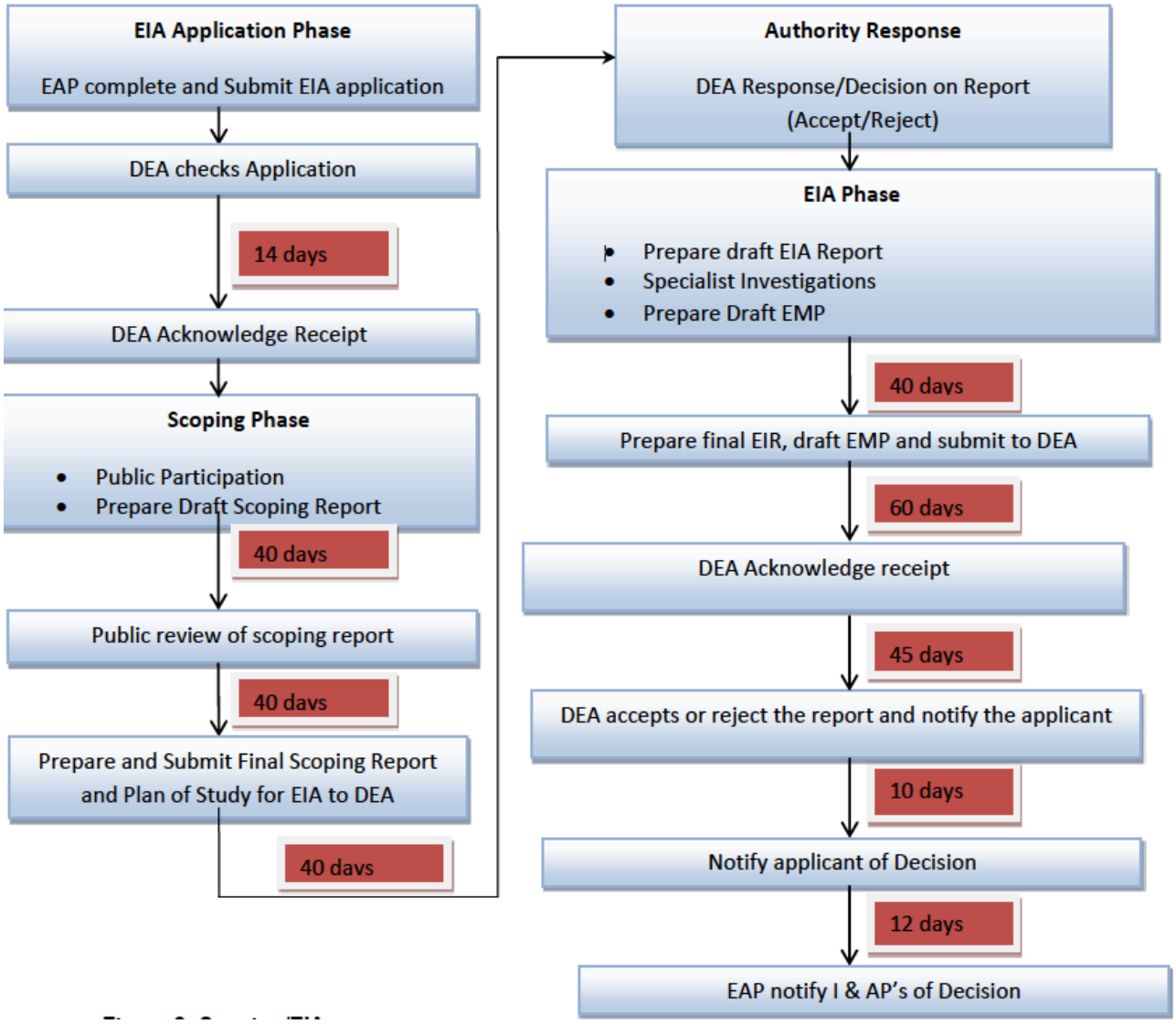

Figure 1: Standardised Process flow diagram of the EIA process.

ASSUMPTIONS AND LIMITATIONS

During the undertaking of the EIA process, the Environmental Assessment Practitioner (EAP) utilised information that was available at the time of the study including specialist inputs, field survey data, PPP inputs and other primary and secondary material review. This report is based on the assessment of the potential environmental impacts associated with and limited to the receptor project area of the proposed development. All specialists who undertook the specialist studies for this EIA were qualified and independent to undertake the necessary investigations required. It is not always possible to involve every Interested and / or Affected Parties (I&AP's) individually. However, every effort has been made to involve as many interested parties as possible. It is also assumed that individuals representing various associations or parties convey the necessary information to these association/ parties. Nonetheless, the project has been advertised and made phone calls to arrange meetings with relevant people, such councilors, farmers, headmans and chiefs.

Approach to EIA Phase

This section provides brief description of the EIA process. This Environmental Impact report aims at highlighting issues that have been identified during Scoping phase in order to assess the likely significance of the various impacts on the receiving environment and to propose mitigation measures (where Possible) to lower the significance of these impacts. As part of the EIR, a comparative assessment of the alternative routes put forward during the Scoping phase has been undertaken in order to highlight the route alignment with least significant impact on the receiving environment.

Assumptions and Limitations

The following assumptions and limitations apply to this report

- it is assumed that all information provided by the applicant and the technical team which informed the environmental consultants as well as which is contained within this report is reliable, accurate and up-to-date.
- All specialists who undertook specialist studies for the Environmental Impact Assessment were qualified and had the necessary experience to undertake the necessary investigations required
- It is assumed that all information and reports obtained from the specialist have taken into consideration all relevant information pertaining to their specialisation
- The final pylon positions are not yet known. A selection of pylon positions (when known) which are deemed to be more environmentally sensitive locations will be investigated by the ecologist and the archaeologist to ensure

that no sensitive features are impacted upon and the management plan amended accordingly to become site specific.

CONCLUDING REMARK

The EIA Report expands on the key issues and concerns identified during the Scoping phase and incorporate the authorities' comments on the Scoping Report. Specialist investigations were conducted and included in the EIA Report. The specialist studies assisted with the assessment of anticipated impacts as identified in the Scoping Phase and highlighted the key areas of concern as well as necessary mitigation measures. Mitigation measures were provided for each impact.

ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED CONSTRUCTION OF THE 250km 400kV POWERLINE FROM BORUTHO S/S IN MOKOPANE TO BOKMAKIERIE S/S IN NZHELELE AND ASSOCIATED SUBSTATION WORKS TO ACCOMODATE THE POWERLINE LIMPOPO PROVINCE.

2 INTRODUCTION

Nzumbululo Heritage Solutions South Africa was appointed by Eskom SOC Limited (Transmission) to conduct an Environmental Impact Assessment (EIA) study for the proposed construction of a 250-km-long 400kV transmission powerline and associated substation infrastructure. The powerline will traverse from the west of the Capricorn District to Vhembe District in Limpopo Province. The proposed line will start at Borutho substation in Mokopane to Bokmakierie substation in Nzhelele Limpopo Province.

The proposed powerline and associated substation works are listed activities as defined by GNR 545 (Listing Notice 1) Of 18 June 2010 of the National Environmental:

Activity 8 (l): *"The construction of facilities or infrastructure, for the transmission and distribution of electricity with a capacity of 275 kolovolts or more, outside an urban area or industrial complex."*

The folowing are also the activities triggered by the construction of the powerline

Table:List of activities triggered by the powerline

544, 18 June 2010	Activity 38: of listing notice 2 of 2010	The Bokmakirrie and Borutho will be extended in order to accommodate the new line
544, 18 June 2010	Activity 24: of listing notice 1 of 2010.	Construction camps and site offices will be temporaly established in study
544,18 June 2010	Activity 26:of Listing notice 1 of 2010	Bush will be required for clearing for the positioning of the towers.
546, 18 June 2010	Activity 4 (a): of listing notice 3 of 2010	The proposed development would require the construction of a road that would be used both in construction and operations of the proposed power line.
546,18 June 2010	Activity 12 : of listing notice 3 of 2010	The construction phase will require construction camps and site offices, thus the need to clear vegetation for establishment of these facilities.
546, 18 June 2010	Activity 19(a): of listing notice 3 of 2010	Where extistng road cannot be used, access roads for construction and maintainance may be required

The above-mentioned activity requires a full Environmental Impact Assessment (EIA) study, in line with the 2010 Regulations in order to acquire the environmental authorisation. The application for environmental authorisation was made on 2nd February 2012. The lead environmental authority for this application is the Department of Environmental Affairs (DEA). As such an EIA application was lodged

with DEA (Application Reference 14/12/16/3/3/2/287) and NEAS: DEA/EA/0001049/2012.

This application is for the construction of a 400kv powerline, it is not for the substation therefore the future plans and infrastructure after decommission in 20 – 30 years and possibility of upgrading do not apply to powerline, nevertheless the transmission powerlines are designed for a 50 year life span, after that items used may be refurbished and sold for reuse. During the life span of the transmission line, ongoing maintenance is performed, including, line inspections are undertaken on an average of 1-2 times per year, depending on the area. During maintenance period, the line is accessed via the access routes established during the construction phase. Maintenance is required to be undertaken in accordance with specifications of the EMP

EXPERTISE OF THE ENVIRONMENTAL ASSESSEMENT PRACTITIONERS

2.1 Introduction

The Environmental regulation specifically requires practitioners involved in the EIA process to list their qualifications and expertise in the report. An Environmental Assessment Practitioner (EAP) appointed in terms of regulation 17 (1) is required to:

- Be independent
- Have expertise in conducting environmental impact assessments including knowledge of the Act, these regulations and any guidelines that have relevance to the proposed activity
- Perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- Comply with the Act, these regulations and all other applicable legislation
- Take into account, to the extent possible, the matters listed in regulation 13 when preparing the application and
- Disclose to the applicant and the competent authority all material information in the possession of the EAP that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority in terms of these regulations or the objectivity of any report, plan or document to be prepared by the EAP in terms of these regulations for submission to the competent authority.

Nzumbululo Heritage Solution, the independent consultants and the designated project EAP have met the above directives. The table below lists the EAP study team involved in this project. These will work with other independent scientists and specialists until the DEA, makes a decision.

2.1.1Details of the EAP

Table 1a: Details of EAP (H. Mlotshwa)

Name	Hellen S. Mlotshwa
Company	Nzumbululo Heritage Solutions
Physical Address	4 Berger Road, Vorna Valley Midrand
Postal Address	P. O. BOX 4106; HALFWAY HOUSE 1685
Telephone Number	011 021 4937
Fax Number	086 544 2177
E-mail	mlotshwah@nzumbululo.com
Role in Project	Environmental Consultant/Practitioner

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Table 2: Details of Assistant EAP (K. Mogajane).

Name	Kelebogile Mogajane
Company	Nzumbululo Heritage Solutions for South Africa
Physical Address	4 Berger Road Vorna Valley Midrand
Postal Address	P. O. BOX 4106; HALFWAY HOUSE, 1685
Telephone Number	011 021 4937
Fax Number	086 544 2177

E-mail	mogajaneK@nzumbululo.com
Role in Project	Environmental Consultant/Practitioner

2.1.2 Detail of Applicant

Table 3: Details of the Proponent.

Name	Henry Nawa (Representative of Proponent)
Company	ESKOM HoldingsLimited
Postal Address	P.O. Box 1091,Megawatt Park Maxwell Drive Sunninghill Johannesburg 2000
Telephone number	011 800 8111
Fax number	011 800 2122
Email	nawah@eskom.co.za
Role in Project	Project Manager

3 DESCRIPTION OF THE PROPOSED PROJECT

3.1 Introduction

The proposed project will include the construction of approximately +-250km-long 400kv powerline from Borutho Substation to proposed Nzhelele Substation in the Limpopo Province.

3.2 Project Location

The affected project area is located in the Capricorn and Vhembe Districts in Limpopo Province. The powerline preferred and alternative routes will traverse through the following farms. The list of affected farms is attached as Appendix 3 The farms are within the Limpopo Province and the receiving environment for the proposed transmission powerline consists of rural village settlements, traditional authority lands, game reserves, towns and commercial farm lands

3.3 Layout and design

The proposed project includes the following activities:

-
- Establish Borutho-Nzhelele 250km 400kV transmission power line,

3.4 Project Motivation

The project was initiated as part and parcel of power transmission network grid improvement and stabilisation within and across the Limpopo Province. Polokwane Customer Load Network (CLN), including the Tabor and Spencer power corridor, remains susceptible to voltage instability and is the weakest part of the Northern Grid network due to being operated beyond its reliability power transfer limit. In addition to this, the Polokwane CLN, i.e., Tabor and Spencer 275kV and132kV network, is susceptible to low voltages regardless of the approved and commissioned network strengthening in year 2010:

- Tabor-Spencer 275kV line, and
- 2nd 250MVA 275/132kV transformer.

Listed below is another approved 400kV network re-enforcement in the Polokwane CLN which is expected for commissioning by the end of year 2012:

- Witkop-Tabor 400kV line, and
- Tabor 500MVA 400/132kV transformer.

The combined transformation capacity at Tabor and Spencer MTS of 846MW exceeds the installed and the approved transformation capacity of 712MW. In addition to this, the low voltages and thermal constraints in the 132kV Distribution network for both existing and planned network remains far below operational par.

The Tabor and Spencer 275/132kV transformation recorded peak in the year 2010 was 280MW and 210MW, respectively. The exceeded Tabor 275/132kV transformation firm capacity will be restored to optimal operational and transmission capacity once the Witkop-Tabor 400kV line and the 1st of the 500MVA 400/132kV transformer have been commissioned. The Spencer 275/132kV transformation firm capacity of 234MW will be exceeded by 40MW in year 2015, as shown in load forecast, therefore, compromising the network reliability by violating the set Grid Code N-1 transformation criteria.

Furthermore, the lengthy Tabor and Spencer 132kV Distribution networks stretching 200km from Polokwane to 50km away from the Mussina border-post result in low voltages and thermal constraints during N-1 transformation and line contingencies in year 2011 and beyond. The expected Tabor and Spencer 132kV load growth is located 100km north of Tabor and 70km from Spencer, therefore, the Transmission outreach constraint will cap the load growth. Following the findings after an assessment of the Tabor and Spencer 400kV, 275kV and 132kV network constraints for the 20 year horizon, Eskom SOC Limited Grid Planning proposes the following:

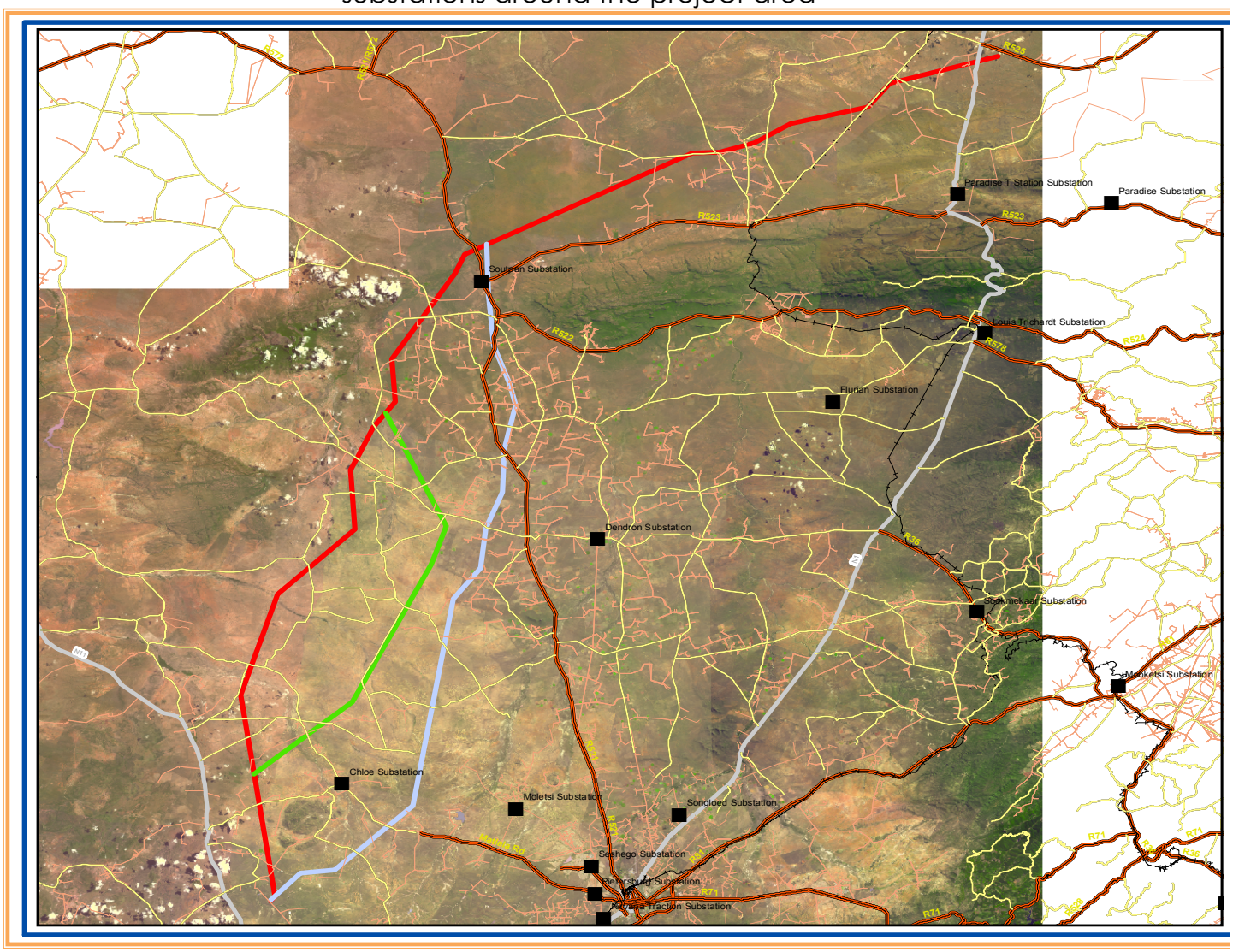
- Establish 3x 250MVA 400/132kV Nzhelele Main Transmission Station (MTS),
- Construct Tabor–Nzhelele 130km 400kV line,
- Construct Borutho–Nzhelele 250km 400kV line, and
- Commision all the associated infranstructure by year 2017.

However, the proposed servitudes for the Tabor-Nzhelele-Borutho 400kV power line is likely to be more challenging to acquire due to the Soutpansberg mountain range section of which the lines will have to traverse through to feed into the Nzhelele MTS. However, the planned commissioning date of 2017 has taken into account the EIA approval processes and possible project planning challenges.

The above proposed network solution meets the 10-year Distribution load requirements in the Tabor and Spencer network areas and it is also informed by the 20 year Transmission and Distribution load forecast in meeting the Transmission 20 year plan.

It is in this context that this project is proposed and motivated to be considered for approval by compliance authorities in light of its highlighted significance and critical role in the future socio-economic and national development interests.

Figure 1: Locality map in 1: 50 000 showing the 3 Powerline routes and main roads and substations around the project area



3.5 Technical Details of the Proposed Powerline

The proposed powerline will be approximately 250km long. Various structures are being considered for use during the construction in different sections of the line subject to landscape features.

3.5.1 400kv Tower types

Towers for the proposed powerline will be between 29m and 40m in height. Their total footprint area for each tower would be around 41, 6m x 70,6m. The distance between each tower would be approximately 430m. The actual number of towers, the type of towers and other support structures associated with the proposed powerline would be confirmed and detailed following approval of final corridor for the proposed development. In general, the type of towers to be used would consider weight, the area (e.g. topography characteristic), height, costs and erection time. In addition, from an engineering perspective, transmission powerline routes are planned with as few bends as possible.
Examples of some of the towers that Eskom would select from for the proposed 400kV transmission powerline and which have been widely used in similar developments. The cross-rope and self-supporting suspension towers are typical of most single structures, having been developed to support 400kV lines. The tower type generally carries triple Bersfort and twin Dinosaur conductors, a relatively light configuration.

3.6 Proposed Activities and Project Timeline

The activities for the construction and operation will be finalised during EIA phase. Design details of the powerline will also be finalised during EIA phase. However, the powerline is expected to be operational in 2017.

3.6.1 Preconstruction

The project is currently on the pre-construction phase where the EIA study is conducted. This study includes describing the project, determining the project alternatives, environmental management plan for the proposed project to be reported in the EIA Report. Permits from landowners (through EIA study) should be acquired. When the project is approved , the project will need to be advertised and await objections from IAPs for 30 days. Should all parties be satisfied and the Environmental Authorisation only then can the construction phase commence

3.6.2 Construction

As illustrated above, construction will commence once pre-construction studies are completed. Construction is estimated to take about 12 months or more. It is currently envisage construction to begin in 2014. The construction activities for the proposed development will include the following activities.

3.6.2.1 Access roads

Creation of access roads and construction camps form part of the proposed project. Access road will enable transportation of the material and construction teams to the site and facilitate post construction maintenance. The access road will be gravel and constructed for vehicles. These access roads will be along the entire length of proposed powerline. They will be used for construction phase and operation, mainly for maintenance. The information about the access point and exact route for the access roads will be negotiated and finalised with the landowners after the authorisation has be awarded.

3.6.2.2 Construction Camp

The construction camps will be located at the nearest appropriate areas within the approved servitude route of the proposed location of power lines. The exact locations will be negotiated and finalised with relevant landowners, where applicable, after completion and approval of the EIA study.

3.6.2.3 Construction of transmission powerlines

The following activities will be conducted as part of constructing the transmission powerlines:

- Survey of the route for the powerline
- Site walk down to determine sensitive features.
- Selection of best-suited structures and foundations
- Final design of powerline and placement of towers
- Issuing of tenders and award of contract to construction companies
- Vegetation clearance and construction of access roads (where required)
- Pegging of structures
- Construction of foundations
- Assembly and erection of structures
- Stringing of conductors
- Rehabilitation of disturbed area and protection of erosion sensitive areas

- Testing and commissioning.

3.6.2.4 Stringing of Conductors

Eskom Holdings Limited has strict international best-practice methods of building powerline such as the proposed Borutho-Nzhelele Transmission Power line. For example, the construction teams would guide wires, to string the conductors between towers. This can be undertaken mechanically or by hand. The line will generally be strung in sections. There will be cable drums placed at 2 km intervals during this stringing process. In order to minimise any potential negative impacts on the surrounding areas, these cable drums would be placed within the approved servitude. The following will be followed

- Handling and transporting of the conductor and accessories shall be done in a manner as to minimize the possibility of damages from abrasion through rough handling or dirt and grit and getting into the reel of the conductor by touching or rubbing against ground or objects, causing injury to the conductor. Particular care shall be taken at all tines to ensure that the conductor do not become kinked twisted or abraded. If the conductor is damaged, the section affected shall be replaced or repaired by putting joint or using repair sleeves or polishing with emery cloth, so as to give satisfactory performance.

- At all stages of construction proper care shall be taken so that the conductor surface is smooth enough to give satisfactory corona and radio interference performance. All equipment used in handling or transporting the conductor such as grips, pulleys slings, cable care, shall be so designed and maintained that the surface which may contact the conductor, are kept free of foreign objects.

- Care shall be taken while running out the conductors such that the conductors do not touch or rub against the ground or objects, which could scratch or damage the strands. The conductor shall not be over strained during erection. The conductor shall be run out of the drums from the top in order to avoid damage due to chaffing. Drum battens shall not be removed until conductor drums are properly mounted at the drum station on the line, and battens shall be immediately refitted on the drum if any surplus conductor is left thereon. Drums will be transported and positioned on station with the least possible amount of rolling, immediately after running out, the conductor shall be raised at the supports to the level of the clamps and placed into the running blocks. The grooves of the running blocks shall be of a design that the seat is semi-circular and larger that the diameter of conductor/earth wire and it does not slip over or rubs against the sides. The grooves shall be lined with hard rubber or neoprene to avoid damage to conductor and shall be lined with hard rubber or neoprene to

avoid damage to conductor and shall be mounted on well oiled bearings. At all stages of construction proper care shall be taken so that the conductor surface is smooth enough to give satisfactory corona and radio interference performance.

- The running blocks shall be suspended in a manner to suit design of the cross-arm. All running blocks specially those at the tensioning end, will be fitted on the cross arms with jute cloth wrapped over the steel works and under the sling to avoid damage to the slings as well as the protective surface finish of the steel work. In case, section towers are used even for temporary terminations, if this be unavoidable, they shall be well guyed and steps shall be taken to avoid damage. The drums shall be provided with a suitable breaking device to avoid damage, loose running out and kinking of the conductor. The conductor shall be continuously observed for loose or broken strands or any other damage. When approaching end of a drum length at least three coils shall be left when the stringing operations are stopped. These coils shall be removed carefully and if another is required to be run out a joint shall be made as per the recommendations of the conductor manufacturers. Normally, the joints shall be so made that these are not required to pass through running out of blocks, the joints will be protected with suitable joint protector sleeves.

- The conductors, joint and clamps shall be erected in such a manner that no bird-caging over-tensioning of individual wires or layers or other deformation or damage to the conductors shall occur. Clamps or hauling devices shall, under erection conditions, allow no relative movement of strands or layers of the conductors.

- Repairs to conductors, in the event of damage being caused to isolated strands of a conductor during the course of erection, if necessary, shall be carried out during the running out operations with repair sleeves. Repairing of conductor surface shall be done only in case of minor damage, keeping in view both electrical and mechanical safety requirements. The final conductor surface shall be clean, smooth and shall be without any projections, sharp points, cuts, and abrasions.

- Repair sleeves may be used when the damage is limited to the outermost layers of the conductor and is equivalent to the severance of not more than one third of the strands of the outermost layer. No repair sleeves shall be fitted within 30 m of tension or suspension clamp or fittings, nor shall more than one repair sleeve per conductor be normally used in any single span.

i. Conductor splices shall be so made that they do not crack or get damaged in the stringing operation. Only such equipment/methods during

conductor stringing which ensure complete compliance in this regard shall be used.

ii. Derricks shall be used where roads, rivers, channels, telecommunication or overhead power lines, railways, fences or walls have to be crossed during stringing operation. It shall be seen that normal services are not interrupted or damage caused to property. Shut down shall be obtained when working at crossing of overhead power lines.

- The proposed transmission lines may run parallel for certain distance with the existing telecommunication line, 132 KV, 22kv lines which will remain energised during the stringing period. As a result, there is a possibility of dangerous voltage build up due to electromagnetic and electrostatic coupling in the pulling cables, conductors and earthwires which though comparatively small during normal operations can be severe during switching and ground fault conditions on the energised lines.

- The sequence of running out shall be from to down-wards After running out the top conductor the conductor at the opposite side at the bottom level should be run out. After wards the remaining phase conductor shall be run out. Imbalance of loads or tower shall be avoidable as far as possible.

- Adequate steps to prevent clashing of sub conductors after paying out of conductor before spacers/spacer dampers are installed. Care shall be taken that all the two sub conductors of the bundle are taken from same conductor supplier and preferable from the same batch so that creep behaviour of these remains identical during sagging, care shall be taken to eliminate differential sag as far as possible.

Plate 1: Shows the stringing of conductors for the power lines.

3.6.2.5 Operation and maintenance

The operation and maintenance of the transmission powerline will be an on-going process for the planned life span for Borutho to Nzhelele powerline. The Powerline will be monitored and managed according to Environmental Management Plan that will be provided in EIA phase and post-construction Operational EMPs. In addition, Eskom has established and approved international practices guides for operating and managing such transmission lines.

4 STATUTORY REQUIREMENTS

Introduction

The proposed development is guided and governed by Legislative Acts and Ministerial Guidelines (also see Table 5). In addition, EIA studies for electricity generation, transmission and distribution projects are also guided by additional internal Eskom Guidelines and Policies (also see www.eskom.co.za).

4.1 Legislations Related to the project

4.1.1 Constitution of South Africa (Act 108 of 1996)

The Constitution (Act No. 108 of 1996) provides the legal basis for allocating powers to different spheres of Government and contains a number of rights, primary to this study are those right specifically relevant to the national energy policy. The Constitution states that Government must establish a national energy policy to ensure that national energy resources are adequately tapped and delivered to cater for the needs of the nation. Energy should be made available and affordable to all citizens, irrespective of geographic location. The production and distribution of energy should be sustainable and lead to an improvement in the standard of living of citizens (DME, 2003b:6). Section 24 of the Bill of Rights provides that:

> *"Everyone has the right:*
>
> **a) to an environment that is not harmful to their well being and**
>
> *b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that:*
>
> prevent pollution and ecological degradation;
>
> promote conservation; and
>
> secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development**.".**

4.1.2 Energy Policy

The White Paper on Energy Policy (DME, 1998) sets out Government Policy with regard to the supply and consumption of energy for the next decade. The policy strengthens existing energy systems in certain areas, calls for the development of underdeveloped systems and demonstrates a resolve to change in a number of areas. The policy addresses most elements of the energy sector.

Furthermore, the White Paper on Energy Policy identified the need to undertake an Integrated Energy Planning (IEP) process in order to achieve a balance between the energy demand and resource availability, whilst taking into account the health, safety and environmental parameters. In addition, the policy identified the need for the adoption of a National Integrated Resource Planning (NIRP)

approach to provide a long-term cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies.

4.1.3 Electricity Regulation Act of 2006

The proposed development is aligned to the following objectives (DME, 2006b:6):

- Achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa;
- Ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency, effectiveness and long-term sustainability of the electricity supply industry within the broader context of economic energy regulation in South Africa;
- Facilitate investment in the electricity supply industry;
- Promote the use of diverse energy sources and energy efficiency; and
  Facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public. In addition, the Electricity Regulation Act (Act No 4 of 2006)in terms of section 46 (2c) projects involving new generation capacity that is needed to ensure the continued uninterrupted electricity supply would require authorisations or exemptions in terms of NEMA (No 107 of 1998) or as may be required by any other law for the purpose of authorisation for proposed Eskom developments (DME, 2006).

4.1.4 Integrated Energy Plan (IEP) – 2003

The Department of Minerals and Energy (DME) commissioned the IEP to provide a framework in which specific energy policies, development decisions and energy supply trade-offs could be made on a project-by-project basis. The framework was intended to create a balance in providing low cost electricity for social and economic development, ensuring a security of supply and minimizing the associated environmental impacts. The IEP projected that as the years accumulate the additional demand in electricity would necessitate an increase in electricity generation capacity in South Africa. Therefore, contemporary concerns relate to electricity capacity to accommodate growth in demand (DME, 2003a).

4.1.5 Integrated Resource Plan (IRP) – 2010-2030

The Department of Energy, under the New Generation Capacity regulations has authorised the System Operations and Planning Division in Eskom to produce the IRP for electricity in consultation with the Department and the National Energy

Regulator of South Africa (NERSA) (DOE, 2011). The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next 25 years. In summary, the IRP is intended to:

- Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development
- Ascertain South Africa's capacity investment needs for the medium term business planning environment;
- Consider environmental and other externality impacts and the effect of renewable energy technologies.
- Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies) as envisaged in the New Generation Capacity regulations.

4.1.6 The National Heritage Resources Act (No. 25 of 1999)

The proposed development comprises certain activities (e.g. changing the nature of a site exceeding 5 000m^2 and linear development exceeding 300m or river crossing for more than 50m in length) that require authorisation in terms of Section 38 (1) of the NHRA, Act 25 of 1999. Section 38 (8) of the Act states that if heritage considerations are taken into account as part of an application process undertaken in terms of the ECA, there is no need to undertake a separate application in terms of the National Heritage Resources Act (NHRA). The requirements of the National Heritage Resources Act can thus be addressed as an element of the EIA process, specifically by the inclusion of a Heritage Impact Assessment (South African Heritage Resource Agency, 1999). In addition, for instance, NEMA section 24 (4) (b) (iii) appears to reinforce the provisions of NHRA by requiring that procedures for assessing impacts including heritage impacts for most of NHRA sections 38 (1) activities be addressed in an application for Environmental Authorisation.

4.1.7 Minerals and Petroleum Resources Development Act (No. 28 of 2002)

In terms of the Act, the sourcing of material for road construction purposes (i.e. the use of borrow pits) is regarded as mining and accordingly is subject to the requirements of the Act. In terms of the proposed project, Section 106 (3) provides exemption from the Act. "Only where the organ of state has obtained formal exemption from the Minister, the organ of state has to:

- make formal application for exemption;
- notice of the exemption has to be gazetted by the Minister; and
- the organ of state has to compile an EMP per borrow pit and submit these

to DMR for approval" (DME, 2002).

4.1.8 Development Facilitation Act (No. 67 of 1995)

The Development Facilitation Act (DFA) is the flagship statute, which sets the overall framework and administrative structures for planning throughout the country. It is a framework Act with broadly worded provisions to allow individual provinces to enact more detailed planning laws and regulations to meet their own specific needs and circumstances. The DFA and its provincial equivalent may be relevant should Eskom require a rezoning of the land from agricultural to industrial zoning (South Africa, 1995).

4.1.9 Expropriation Act (No. 63 of 1975)

The Expropriation Act is used to acquire land from unwilling sellers (South Africa, 1975). If necessary, Eskom transmission would need to acquire additional land for this development. This would have to take place during the pre-construction phase of the development.

4.1.10 National Environmental Management: Biodiversity Act (No. 10 of 2004)

Provisions of this Act, which are relevant to this study, are the guiding principles relating to threatened and protected ecosystems and species, species and organisms posing a threat to biodiversity, permits relating to listed threatened and protected species, alien species or invasive species. Cognisance is also taken of the list of critically endangered, vulnerable and protected species as listed in the Government Notice No. R151 of 23 February 2007.

4.1.11 National Environmental Management: Waste Act (Act No. 59 of 2008)

In terms of section 16 (1) of the Act, duty of care is applicable to (DEAT, 2008b):

- Avoid the generation of waste and where such generation cannot be avoided, to minimize the toxicity and amounts of waste that are generated;
- Reduce, re-use, recycle and recover waste;

- Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;
- Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;
- Prevent any employee or any person under the proponent's supervision from contravening this Act; and
- Prevent the waste from being used for an unauthorised purpose.

4.1.12 Conservation of Agricultural Resources Act (Act 43 of 1983)

In Terms of GN 1048 of 1984 and GN 2485 of 1999, the Act provides management principles relating to weeds and invaders and also categories of weeds and invaders (DOA, 1983).

4.1.13 National Water Act (No 36 of 1998)

The National Water Act states that duty of care to remedy the effects of pollution to water resources needs to be taken into consideration in all circumstances (section 19). The Act also stipulates procedures to be followed in the event of an emergency incident that may impact on a water resource (Section 20) as well as governing water use licences (Section 21) if required for construction purposes (DWAF, 1998).

4.1.14 Promotion of Administrative Justice Act (PAJA) (Act no 3 of 2000)

The Promotion of Administrative Justice Act aims to give effect to the right to administrative action that is lawful, reasonable and procedurally fair, and to the right to written reasons for administrative action as contemplated in Section 33 of the constitution of the Republic of South Africa 1996 and provides for matters incidental thereto (PAJA, 2000). In particular, the proposed development was considered in accordance with this Act in terms of the following (PAJA, 2000:4):
An administrator undertaking procedurally fair administrative action must give adequate notice of the nature and purpose of the proposed administrative action:

- a reasonable opportunity to make representations;

- a clear statement of the administrative action;
- adequate notice of any right of review or internal appeal, where applicable; and
- adequate notice of the right to request reasons if they were not provided

  In cases where an administrative action affects the rights of the public, an administrator, must decide whether to hold a public inquiry and therefore conduct the public inquiry or appoint a suitably qualified person to do so and determine the procedure for the public inquiry, which must:
- include a public hearing and comply with the procedures to be followed in connection with public inquiries;
- conduct the inquiry in accordance with that procedure; and
- compile a written report on the inquiry and give reasons for any administrative action taken or recommended If an administrator decides to follow a notice and comment procedure, the administrator must:
- take appropriate steps to communicate the administrative action to those likely to be materially and adversely affected by it and call for comments from them;
- consider any comments received; and
- comply with the procedures to be followed in connection with notice; and
- comment procedures

Any person whose rights have been materially and adversely affected by administrative action and who has not been given reasons for the action may, within 90 days after the date on which that person became aware of the action, request that the administrator concerned furnish written reasons for the action. The administrator to whom the request is made must, within 90 days after receiving the request, give that person adequate reason in writing for the administrative action.

4.1.15 National Environmental Management: Protected Areas Act (Act 57 of 2003). (NEMPAA)

NEMPAA provides for protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The Act also supports the establishment of a national register of all national; provincial and local protected areas, for the management of those

areas in accordance with national norms and standards, for intergovernmental cooperation and public consultation in matters concerning protected areas, for continued existence, governance and functions of South African National Parks and for matters in relation to protected areas.

The proposed development would traverse environmental sensitive areas (to be identified by biodiversity specialists during field work). Nonetheless, mitigation measures will be adhered to with regards to avoid and / or minimise detrimental impacts on the environmental sensitive areas

EIA Regulations 2010 promulgated in terms of NEMA under Government Notice (GN) No. 543 outline the activities for which Basic Assessments or EIAs should apply.

Bearing in mind the above Regulations and listed activities, and as been discussed in proceeding sections of this report, the proposed development requires ENVIRONMENTAL IMPACT ASSESSMENT and a full EIA process. Following the submission and acknowledgement of the EIA application by DEA (Reference No DEA: 14/12/16/3/3/2/287 and NEAS: DEA/EIA/0001049/2012, ENVIRONMENTAL IMPACT ASSESSMENT study for the project was formulated in line with the applicable regulation to achieve the following:

a) Conduct at least the public participation process set out in Regulation 54-57
b) Give notice in writing of the proposed application to any organ of state which has jurisdiction in respect of any aspect of the activity
c) Open and maintain a register of all interested and affected parties in respect of the application in accordance with Regulation 57
d) Consider all objections and representations received from interested and affected parties following the public participation process
e) Subject the application to ENVIRONMENTAL IMPACT ASSESSMENT by identifying
    i. Issues that will be relevant for consideration of the application
    ii. The potential environmental impacts of the proposed; and
    iii. Alternatives to the proposed activity that are feasible and reasonable
f) Prepare a ENVIRONMENTAL IMPACT ASSESSMENT report in accordance with Regulation 28; and give all registered interested and affected parties an

opportunity to comment on the ENVIRONMENTAL IMPACT ASSESSMENT report in accordance with Regulation 57.

4.1.16 Limpopo Environmental Management Act (LEMA) 2003 (Act No 7 of 2003)

The MEC may in appropriate circumstances allow any interested person to present oral representation or objections to the MEC or to persons designated by the MEC.

If a site is of Ecological Importance or a protected Natural Environment is declared on private land, the owner of the land is responsible for the management, control and maintenance of that land such management shall be guided by integrated environmental management practices which may include

A management plans for biodiversity management and conservation in the protected Natural environment.

An undertaking by the owner concerned, to improve on the standards stipulated by the law for the protection of environment, which are applicable to the declaration of an area as a protected Natural environment.

4.1.17 National Forests Act (NFA), 1998 (Act No 84 of 1998)

Any person or organ of state or organisation may apply to the minister to protect a forest, tree or group of trees in terms of section 18 of the act, an application bought under sub regulation must, identify the forests or trees to be protected, identify the land or area where the forest or to be protected occur.

Eskom guidelines

The following Eskom guidelines are also relevant to the proposed development:

- Air Quality Management Policy (ESKPBAAA3)
- The Control Of Dust Exposure Within Eskom (ESKADAAD6)
- Environmental Impact Assessment (ESKPVAAL7)
- Passive Fire Protection For Oil Filled Equipment In High Voltage Yards (FSGASAAQ8)

- Standard For Bush Clearance And The Maintenance Of Overhead Powerlines (ESKASABG3)
- Guidelines For Weed Eradication At Eskom Substations Using Herbicides (TRR/S.92/034)
- Oil Spill Clean-Up And Rehabilitation (ESKAGAAD7)

5 DESCRIPTION OF STUDY AREA

Introduction

This section discusses the key characteristics of the biophysical and human environmental aspects of the potentially affected area. For this project, the study area is defined as the development footprint and its immediate surroundings as well as to a larger scale; the local municipal areas, the broader district and region. The information pertaining to the receiving environment has been complemented with information from desktop studies and physical studies. During the EIA stage, the biophysical and human environmental aspects supplemented with results from the various specialist impact assessments comprising: Vegetation, Avifauna; Wetland; Agriculture; Visual; Heritage; and Socio-economic impact assessments as well as tourism have been attached to this report.

5.1 Biodiversity

5.1.1 Fauna

The proposed powerline would pass through sections that are degraded, others slightly changed and others with limited sections of primary vegetation cover. Based on observations and preliminary reconnaissance survey, the primary vegetation cover is most likely limited to the grassland biome. The grassland can be subdivided into numerous vegetation units depending on the presence of different soil types that ranges from sandy to clay, as well as a moisture gradient. The chemical composition of the soil also plays a major role in determining the vegetation unit. In the grassland, the absence of a dominant tree or shrub layer is characteristic. The grassland is dominated by grasses such as Finger grass (Digitaria*eriantha),* Red grass (Themeda*tiandra),*various love grasses *(Eragrostischloromelas, E. lehmanniana, E. superba),* Horse grass (Triraphis*andropogonoides),* Carrotseed grass *Tragus koeleroides,* Three-awned grass species (Aristida*congesta, A. adscensionis)* (Beater, 2006).

There is a possibility that protected fauna and flora species may be found in the proximity of the study area from Borutho to Nzhelele.

The majority of this study area is in a state of transformation, with a number of settlements and small towns dotted throughout the immediate surrounds intermingled with agricultural areas, rural settlements and business developments.

As a result, a great deal of the vegetation within the study area is being transformed (Beater, 2007).

The fauna and vegetation studies conducted helped in identifying the species and methods of handling them. The powerline will also run through agriculture fields as shown Plate 2 below.

Plate 2: Agriculture circle based on the central pivot point of irrigation such disturbed land sections dominate the proposed powerline servitude.

The project area is currently degraded predominantly by agricultural land use activities. The field survey did not record any major wild faunal species colonies along the powerline routes. There are a number cattle ranches within the project area.

5.2 Birds

Eskom has a commitment to conservation and has established an Environmental Division to investigate problems related to the possible interactions between wildlife and electrical equipment (Ledger, 1988). Therefore, one of Eskom's responsibilities is to cause as little destruction to bird life as possible, whether by electrocution, collision or any other cause. A particular concern is the mortality of endangered and vulnerable birds that may be the result of interactions with transmission lines. The death of such birds due to collisions with an Eskom Line is a serious loss to these small populations. A number of bird species are to be found

along the banks of the river course and the wooded ravines on either side of the river. Black Storks will undoubtedly use the banks of the river or wetlands as foraging areas (Beater, 2007). An assessment of avifauna was conducted during the EIA phase to identify potential impacts and mitigation measures on any identified species that occur in the study area.

5.3 Existing Environmental Conditions

5.3.1 Climate

The Limpopo region has a wide climatic variation. The Polokwane to Musina region is reflective of the province and offers pleasant climate for most of the year. Blessed with year round sunshine, (http://www.myforecast.com/bin/climate.m? city=77209&metric=false) it can get hot in the summer period (October- March), averaging 27 Degrees Celsius. Winter is a sunny season of chilly mornings, warm middays, dry afternoons and cool to cold nights.

5.4 Land use

The project area is predominantly a commercial farming area with a mixture of game, cattle and crop cultivation both dry land and rural residential areas forms part of the land use, (see Plate 3). Other parts of the large tracts of land within the study area are still in a natural state (largely undisturbed by human development) particularly close to Nzhelele substation near the end of the powerline, and also some sections have been disturbed by past impacts (e.g. access roads, construction substations, boundary fence lines, distribution powerlines, etc.) especially the areas where there are human settlements such as Jupiter, Venus, Sefahlane, Luxemburg and many others

Plate 3: View of residential areas in Moetagare, in Mokopane area where the powerline will traverse.

Plate 4: View of selected sections of farming areas, the powerline will pass through farming areas. Note that 70% of the powerline servitude traverses through farming areas.

5.5 Geology and Soils

Soil itself is created by the physical and chemical weathering of bedrock, deposition of other sediments and soils and the breakdown of organic matter. Soil formations affected by a series of factors including the organisms that live on and in it, the climate of the region, the topography (aspect, slope, etc), bedrock below and time (Pidwirny 2008). The study of soils is known as Pedology and the evolution of soils is often referred to as Pedogenesis**.** The geology of the lower portion of the Limpopo River consists largely of consolidated and unconsolidated

sedimentary rocks (Ashton *et al.* 2001), including argillites, fluvial sandstones and mudstones (Chinodae*t al.* 2009). These sediments form a region of shallow sloping plains interrupted occasionally by exposed granitic intrusions (SARDC 2002). The sediments of this region are largely alluvial in origin, including Ferrigenous arid sands (Chinoda 2009). The coastal zone is lined with interior dunes, including some consolidated dunes, and coastal dunes (Chinodae*t al.* 2009).

5.6 Existing infrastructure

The study area is within rural communal and commercial agricultural areas, hence there is some existing infrastructure. There are access roads (see Plate 4 and 5) and the distribution powerlines and telecommunications, main roads running through the study area. There is also an existing railway line.

Plate 5: View of existing powerlines in the project area.

Plate 6: View of proposed powerline route running next to the existing railway line.

5.7 Noise

The main source of high noise level associated with the proposed project area derives from traffic from the local communities, and also from agricultural machinery and activities.

5.8 Water features

The area consists of a number of water bodies such as pans, rivers, streams and drainage lines. The proposed development is anticipated to cross a number of small streams. A wetland assessment study was conducted and it therefore addressed mitigation measures for potential impacts on any watercourses during the EIA phase of the project (See plate 7).

Plate 7: View of a water body located in the vicinity of the proposed powerline route near alternative 1.

5.9 Air quality

The existing powerlines are not currently a source of any potential air pollution. The nature of the proposed development entails that it is unlikely that there will be any activities during the operational phase of the development, which would generate any emissions. As such, apart from temporary construction vehicular pollution, the operation of the proposed powerline is highly unlikely to cause air pollution in the surrounding area.

The only potential source of air pollution for sensitive receptors in the project area (such as surrounding farmlands and Eskom employee temporary dwellings) from the proposed development would be dust that may be generated during the construction phase. Dust levels depend on the type and level of construction activity being undertaken as well as the prevailing meteorological conditions.

Dust emissions are typical caused by land clearing, drilling, blasting and cut and fill operations. The excavation for new development is likely to generate dust, which may travel into surrounding farmlands areas and households.

However, mitigation measures, which will be put in place during the construction phase, are likely to prevent dust from affecting areas beyond the boundaries of the site. The Environmental Management Plan Report specifies measures such as the damping down of exposed surfaces to prevent dust travel.

5.10 Human environment

The individual local municipalities (affected by the proposed project) have demographic features that resemble the districts in which they are located. The following socio-economic characteristics have been gathered from the Capricorn and Vhembe Districts Integrated Development Plans (IDPs).

The affected areas have high levels of poverty, unemployment and illiteracy. The rural areas in the project area also have a high level of female-headed households. The main economic activities are commercial agriculture, wholesale and retail. The levels of income in the municipalities are also low based on the fact that unemployment is high. Access to water, lighting and refuse removal in the area are other challenges. Furthermore, the construction and maintenance of the transmission powerlines and substations upgrades could lead to a change in the number and composition of people within any given community, which in turn could lead to economic, land use, and socio-cultural change processes. The table below shows the clusters faced by the district.

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Table 5: Clusters faced by districts

Infrastructure cluster	Social cluster	Economic cluster	Institutional cluster
1. Water supply and sanitation	1. Provision of Health and welfare facilities and services	1.Increase the level of employment	1. Capacity to render basic services
2. Energy (electricity grid and no grid)	2. Inadequate Education facilities and improve culture learning	2.Improve access and use of resource	2. Increase financial capacity and Management
3.Roads and infrastructure	3. Maintain safety and security	3.Increase economic growth	3.Strategic leadership and management
4. Provision of housing	4.Disaster management plan	4.Improve communication and Information systems	4. Service delivery and performance management
5. Telecommunication network	5.Waste management	5.Economic Infrastructure	5.Transfer of power and functions ,alignment and transformation.
6.solid waste infrastructure	6.Gender Imbalances	6.Cooperative Governance	
	7.Provision of fire and rescue Services		
	8.Promotion of youth development, Sports, arts and recreation.		
	9. Promotion of the Aged and People with Disability issues		
	10.Public transport and community infrastructure		

A question that is regularly raised by interested and affected parties is whether the installation of powerlines will have a detrimental medical effect on these living in close proximity of the powerlines. In 2006, Eskom commissioned an independent study conducted by Empetus Close Corporation to assess the effect of electric and magnetic fields (EMF) on the surrounding environment. The report, and several others from international researchers and experts, highlights that all household appliances and other electrical equipment generate electrical and magnetic fields (EMF). Therefore people are generally exposed to varying levels of EMF in their daily lives at work and at home. EMF is always created, in varying levels, with the generation of electricity and the frequency of the electrical power system. Overhead powerlines generate electric and magnetic fields but not any different from what people are already exposed to from other sources in their daily lives.

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Table 6: Summary of typical electric field levels measured in the vicinity of the Eskom Powerlines (Empetus Close Corporation).

VOLTAGE (kV)	MAX ELECTRIC Field (V/m)	ELECTRIC FIELD AT SERVITUDE (V/m)	SERVITUDE WIDTH (m)
132	1,300	500	15,5
275	3, 000	500	23,5
400	4,700	1,500	23,5
765	7,00	2,500	40,0

Table 7: Summary of magnetic field in the vicinity of the Eskom Powerlines (Empetus Close Corporation).

Voltage (kV)	Current	Max Magnetic field	Magnetic field at Servitude Boundary	Servitude Width
132	150	4,0	1,0	15,5
275	350	6,0	1,0	23,5
400	650	10,5	2,5	23,5
765	560	6,0	1,5	40,0

The above tables (Table 6 and Table 7) illustrate that the electric and magnetic fields fall to lower levels with an increase in distance from the line. The main concern that is raised with regard to powerlines is that they are thought to increase chances of cancer. No evidence of a causal relationship between magnetic field exposure and childhood leukaemia or breast cancer has been found and no dose-response relationship has been shown to exist between EMF exposure and biological effects (Ibid).

The Empetus Report concluded that according to findings of studies on the effects of electric and magnetic fields on plants with levels typical of a powerline environment, complying with the requirements for proper servitude management

as prescribed by the electric utility, are unlikely to affect plants in terms of growth, germination and crop production.

The guidelines for electric and magnetic field exposure set by the International Commission for Non- ionising Radiation Protection (ICNIRP 2000) receives world wide support and are endorsed by the Department of Health in South Africa (2006). Calculations of electric and magnetic field levels created by overhead powerlines have shown that areas where members of the public may be exposed at the servitude boundary and further away from the line are well within the ICNIRP guidelines. Where field levels exceed the ICNIRP guidelines within the servitude, Eskom is experienced and has advanced techniques that exist to reduce the field levels.

The proposed development may traverses through section where it is near residential areas on the Mokopane side, however it is not anticipated to result in prohibitive and high significant or unmitigatable impacts

Nonetheless, one class of impact that has been identified relates to heritage resources, such as graveyards or single graves associated within the proposed servitudes especially on the residential side. These are usually fixed in space and Eskom will have to consider applicable mitigation or apply avoidance measure where applicable should the line be cleared to proceed as planned.

5.11 Roads

The proposed powerlines has a potential of crossing regional roads R521, R522 & R53 as well as the National Road, N1. Unnamed district roads will also be transversed by the proposed power lines. Eskom will engage with the relevant road authorities to indicate the exact crossing once the final route is prepared and acquire the necessary approvals to cross or run parallel to the roads

5.12 Heritage

The project may impact on a range of heritage resources as defined in Section 3 of the National Heritage Resources Act (No. 25 of 1999) including places and buildings of cultural and historical significance, archaeological sites, graves and burial grounds. Stone Age sites are marked by stone artefacts found scattered on the surface of the earth or that form part of the deposits in caves and rock shelters. The Stone Age is divided into the Early Stone Age (ESA) (from 2.5 million years ago to 250 000 years ago), the Middle Stone Age (MSA) (from 250 000 years ago to 22 000 years ago) and the Late Stone Age (LSA) (from 22 000 years ago to about 2 000 years ago).

The same category of Iron Age archaeological sites are also anticipated to be available in the project area.

5.13 Construction camp

The proposed powerline will require the erection of a temporary construction camp. Due to the time limits nature of this project the construction camp will also be small and will be located within the existing servitude boundaries. The EMP includes strict mitigation measures, which will manage the construction camp during construction. Eskom and the independent contractors both appoint Environmental Control Officer (ECO), who will be responsible for the implementation of these measures. Due to these mitigation measures, the presence of a construction camp is not expected to impact negatively on the Socio economic environment of the site.

5.14 Visual landscape

The visual impact of powerlines depends on the complex relationship between the visual environment (landscape), the development (object), and the observer (e.g. local residents or farmers). To further elaborate; the visual environment (landscape) is a combination of landform and land cover. It determines whether the object will be visible to observers and whether the landscape provides any significant visual absorption capacity. It also determines the extent of visual compatibility of the object with its immediate surroundings and the background to the object (Eyethu Engineers, 2000).

6 DISCUSSION OF THE PROJECT ALTERNATIVES

Introduction

The identification of alternatives is a key aspect of the success of the EIA process and was initiated at the start of this project in the scoping phase. All feasible alternatives must be fully addressed and their advantages and disadvantages compared in order to determine the best alternatives. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of such a long powerline. Such constraints include financial, social and environmentally related issues that will be discussed in the evaluation of the alternatives. This section includes strategic, technical, site, route and no go option alternatives.

6.1 Strategic alternatives

As part of the planning exercise, the division of Eskom SOC Limited responsible for Transmission investigated different alternatives to the preferred powerline. They identified the preferred technical and cost effective options for the proposed development. The power line will be approximately 250 km long traversing through terrain of almost uniform environmental sensitivity. Hence, preference is given to developing a power line running directly from and to the proposed substations at Borutho and Nzhelele Sites. The shortest possible route will also ensure minimum impact on the receiving environment.

6.2 Technical and Process Alternatives

6.2.1 Overhead Powerlines

From engineering, planning and financial perspectives, overhead lines are less costly to construct than underground lines. They are also less destructive on the ground compared to underground cabling. Therefore, the preference with overhead lines is mainly on the grounds of costs and intrusive nature.

Overhead lines allow high voltage operations and the surrounding air provides the necessary electrical insulation to earth. Further, the surrounding air-cools the conductors that produce heat due to lost energy (Swingler*et al,* 2006). The overall weather conditions in the Limpopo Province are less likely to cause damage and faults on the proposed overhead transmission powerline. Nonetheless, if a fault occurs, it can be found either quickly by visual means using a manual line patrol or, in urgent cases, by helicopter patrol.

Repair to overhead lines is relatively simple in most cases and the line can usually be put back into service within a few days.

In terms of impacts caused by the proposed development, factors such as visual intrusion and threats to sensitive habitat are not generally the same along the whole route. Should the alignment be proposed in sensitive areas such as river crossings, the tower dressing method may be used. This would involve lowering the conductors into position using an aerial method of construction such as a helicopter, which would require little or no clearing on the ground.

6.2.2 Underground lines

Underground cables have generally been used where it is impossible to use overhead lines. This is often because of space constraints, for example, in densely populated urban areas or for sea crossings. Underground cables are oil cooled and are also at risk of groundwater contamination. Maintenance is also very difficult on underground lines compared to overhead lines. When a fault occurs in an underground cable circuit, it is almost exclusively a permanent fault due to poor visibility. Underground lines are also more expensive to construct than overhead lines. Factors that may increase the cost of an underground system include (Swingler*et al,* 2006):

- Rock Excavation;
- Installation in Pavement (Streets or Sidewalks);
- Requirements to Bore Underneath Street Crossings;
- Right of Way Acquisition Costs;
- Reactive Compensation Requirements at Substations. Underground cable is capacitive in nature and the longer the length of circuit, the more likely the need for compensation; and
- Radial Configuration of the Line. Absence of another transmission source to maintain service during an outage of the line may require installation of additional underground cable redundancy.

6.3 Design Alternatives

6.3.1 Tower design

There are various types of tower design that has different implication in terms of cost for implementation. The need for selection of a tower type will be determined by Eskom engineering team that will consider the tower type that is more feasible and can still be less risk in terms of collision with birds. Self supporting suspension tower is the one that will be suitable in most places of the Borutho to Nzhelele 250 km powerline and also depending on the terrain and also suggestions from different specialists.

6.3.1.1 Self supporting suspension

Self supporting suspension is a typical of most single circuit structures in use at the time, having been developed to support Eskoms introduction of 400kv lines to the national grid. It typically carries twin Dinosaur conductor a relatively light configuration. The use of a V-string assembly allows for compaction of phase spacing which in turn results in both structural and electrical efficiency. In terms of the economical feasibility of this tower, it was found that self-supporting suspension towers are more costly compared to others towers. The impetus to opt this tower design it is expensive but does not require more land as compared to other ones.

Plate 8: Example of self-supporting structure

6.3.1.2 Cross rope suspension tower

This tower is more suitable for long distance powerline whereby most part goes straight and doesn't have lost of bends and turning. This is a more preferred design that is suitable for birds in relation to powerline impact on Birds. It requires a lot of land as compared to other towers.

6.3.1.3 Compact cross rope suspension tower.

The cross rope tower concept was modified in a unique design, which introduces an inverted delta configuration, in which all phases are approximately equally spaced. This configuration results in greater electrically efficiency over long distances links, and also enables the reduction of related substation equipment costs.

6.3.1.4 Guyed Vee Suspension Tower Voltage

Eskom developed this structure for optimal use with the quad Zebra configuration. The guyed vee towers has one large foundation and four guys therefore four smaller foundation. Guyed vee towers provide the best protection from lightning impulses due to the ground wire and cross arm configuration. Tower cross bar helps with the live line maintenance. Problems with guyed vee towers are that they limited to relatively flat terrain.

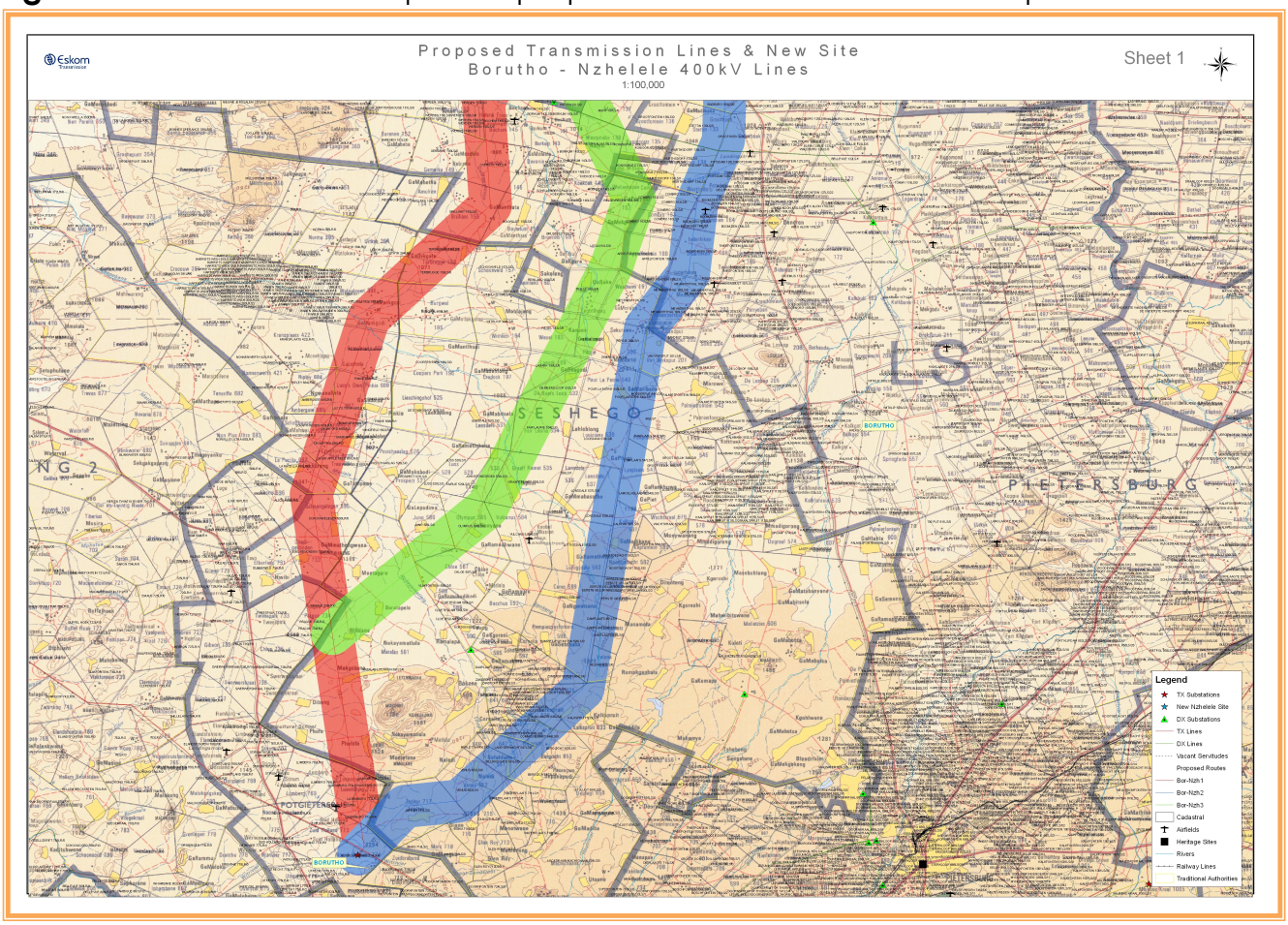
6.4 Route Alternatives

For this study, three alternative routes are being considered each estimated to be 250km long with a 3000m wide corridor being considered. However, the final approved servitude corridor would be reduced to the appropriate width according to the final engineering designs and approvals by the DEA.

6.4.1 Alternative Power Line (Option 1)

This alternative powerline route starts from Borutho substation located near Mokopane. The route runs in a slightly straight alignment for about 60km.Passing areas like Luxemburg, Brilliant, Overdyk, Bochem, Schroelen, It continues with a few bends in and out of rural village settlement. Along the route, it traverses through subsistence farming areas passing a number of graveyards, schools, communities and farms. The route also traverses across streams and possible wetlands. The line will also cuts through flat topography dominated by commercial faming with a mixture of game, cattle and crop cultivation in its midsection. The coordinates of the route are attached on Appendix 2 with maps

Figure 2: The locational Maps and proposed alternative route of the powerline.



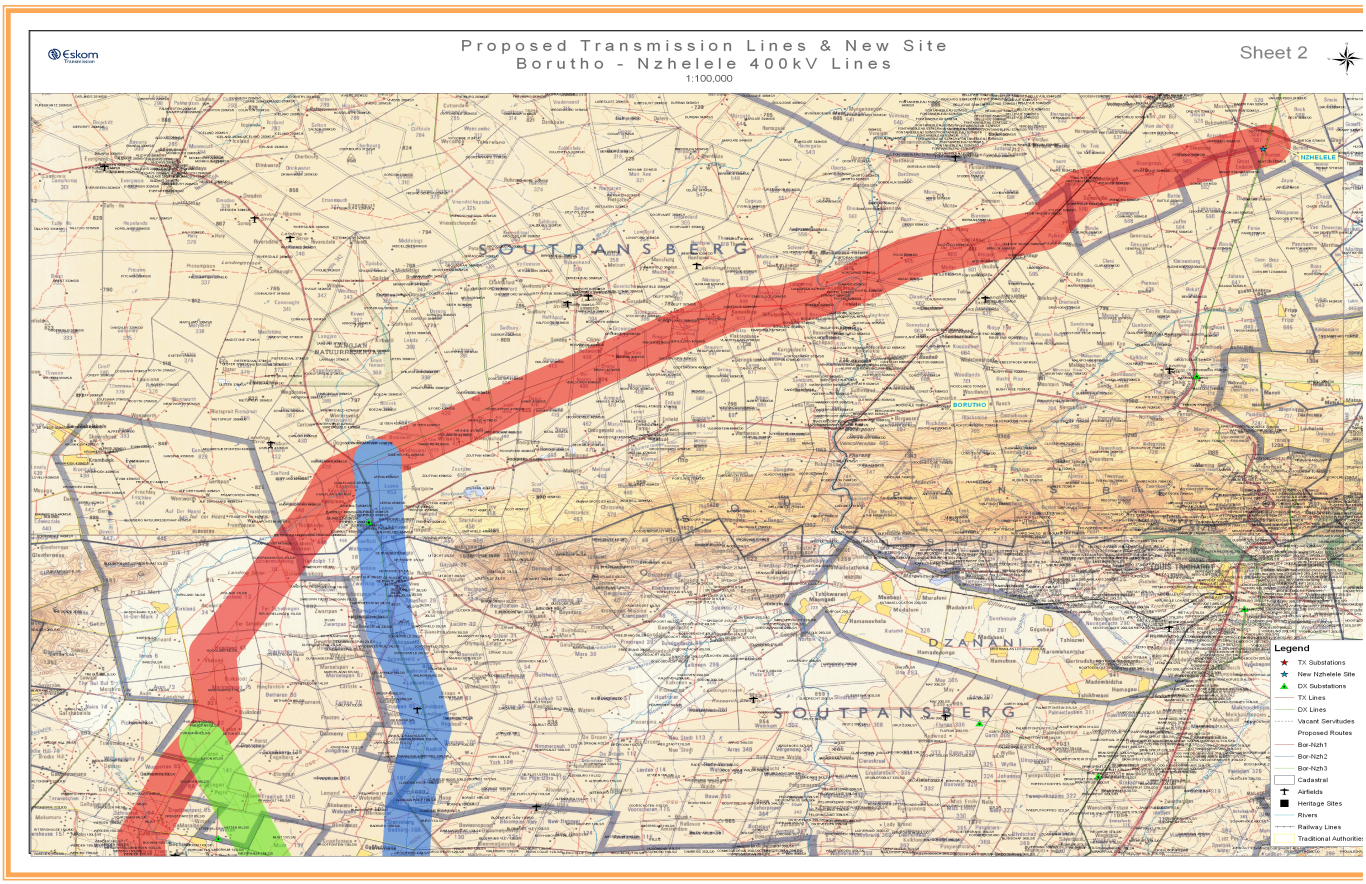


Figure 3: **Continuation of 3 routes traversing through already developed project area.**

6.4.2 Alternative Powerline Option 2

This Alternative Option 2 (Blue) starts from Borutho substation and slightly bends on the right as shown on the map. It traverses into similar environment crossed by Option 1. It passes Venus village, Sefahle village, Lepotlaka village, Road 567, Maribara village and a few cemeteries as compared to Route Opton 1. Most deviations are due to avoiding environmental features and dwellings where possible. However findings of the specialist surveys have confirmed what environmental sensitive features are to be avoided within the study area during the EIA Phase..The coordinates of this option are attached on Appendix 2 with maps.

6.4.3 Alternative Powerline Options 3

Alternative Corridor 3, (which is green in colour as shown by the attached map Figure 3 starts from the alternative 1 corridor or the western corridor at Ntolane Village. It run slightly straight, bending towards and avoiding some villages. The route Option 3 is estimated to be 80km and passes through farmhouses and crossing two rivers within the corridor. There is a tarred district road, so the powerline would cross R567 Road close to an existing cemetery. It bends to avoid an existing communication tower going towards Maponto village, and then it re-joins the route on Option1.The coordinates for the corridor are attached on appendix 2 with maps

6.5 Demand alternatives

Demand can generally be defined as the activities performed by the electricity supply utility, which are designed to produce the desired changes in the load shape through influencing customer usage of electricity and to reduce overall demand by more efficient use. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity.
By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. Some of the basic tools are the price signals (such as time of use tariffs) given by the utility and direct load management. This option is practised to a certain extent. No other alternative energy sources have been identified at this stage.

6.6 No-go option

The "do nothing" Alternative is the option of not undertaking the proposed

development, which implies that the 400kV powerline line would not be constructed. Retention of the status quo would mean that it would not be possible to meet the growing electricity demands in the area and other surrounding towns.

This option is not economically feasible because electricity users such as farmers and domestic users would be unable to avoid interruptions. Consequently, without the proposed new power line there is an increasing possibility that outages could occur, resulting in economic losses that could run into millions of rands, particularly for the various industries, farmers in the area.

Based on the identified need for the proposed development to proceed and the fact that although there could be negative impacts associated with the proposed development, there will be mitigating measures to minimise or eliminate negative impacts, where possible, associated with the construction and operational /maintenance phases for power line developments. It is reasonable to indicate that the "No Go" alternative is not an option to be considered for this activity.

With reference to the above discussion, it should be noted that it is important to identify potential impacts in the early development process in order for timely influence on power alignment, the position of power line, technical designs criteria and budget allocations for effective implementation of mitigation measures.

The most prominent envisaged of the proposed activity would be the provision of electricity. Electricity supply developments are generally intended to promote economic development and improve the social welfare of communities, industries and mines. A steady growth in electricity demand is expected to continue in South Africa for some time because required electrification of housing projects and developments such roads, schools and railway lines.

7 POTENTIAL ENVIRONMENTAL IMPACTS

Introduction

The environmental impacts of a project are those consequential changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. It must be acknowledged that the intended overview of issues does not highlight a wide range of details such as: the differences in impacts between the different phases (for example, construction, operation and closure); spatial extent and predicted lifetime of the impact. Detailed significant impacts and mitigation analyses would be presented alongside impact assessment findings and from issues raised by I&APs during the EIA phase.

7.1 Biodiversity

Biodiversity is an important environmental component. It is essential for the regulation of natural processes that support human life such as soil formation. Vegetation will be cleared for the construction camp as well as for the servitude; this will result in loss of species that depend on the grassland. There will be habitat loss and degradation as a result of the vegetation clearance and natural environmental processes such as soil erosion will be affected. As shown in the plates above (description of affected environment chapter) never the less vegetation clearance will be minimal.

As a result of the noise during construction activities, animal species may migrate in search of other habitat; this may disturb the ecosystem in the area. In addition, birds may be electrocuted by power line in three possible ways. The possible ways are: simultaneously touching two live wires and simultaneously an energised wire and any other piece of equipment on a pole or tower that is bonded to the earth through a ground wire.

7.2 Land use

Current or future land uses may be affected due to the proposed construction of the power line. Powerlines usually run across various property boundaries and livestock camps. Boundary fences may be damaged during construction or gates may be left open resulting in the unplanned integration of livestock. The land earmarked for the proposed development is currently residential, mine land and other areas are game lands, farmlands and are used for subsistence farming thus the construction of the power line will result in changes of the land use.

7.3 Visual impact

All construction activities would involve the use of a variety of construction equipment, stockpiling of soils, materials and other visual signs. While evidence of such will be visual to the farm owners and others in the nearby vicinity, such visual disruptions will be short term and limited to the construction phase only.

7.4 Archaeological/heritage resources

Cultural heritage resources can be broadly defined as physical features, both natural and man-made, which are associated with human activity. Heritage resources would include both tangible and intangible resources such as archaeological resources, paleontological remains, meteorites, historical sites and beliefs systems, religious practices, ideas and oral traditions respectively. The National heritage Resources Act (Act No.25 of 1999) regards the following as heritage resources:

- Places, building structures and equipment,
- Places to which oral traditions are attached
- Places which are associated with living heritage
- Historical settlements and townscapes
- Landscapes and natural features
- Geological sites of scientific or cultural importance
- Graves and burial grounds.

Any development that alters the status quo has the potential to impact upon any of the listed heritage resources particularly during the construction phase.

Plate 9: View of cemeteries at the Sefahlane area

7.5 Water resources

Construction grading and utility excavations for the pylon installations would increase the sediment load in storm water during rainfall events. Sediment sources created during construction include soil stockpiles and soil tracked across

construction areas, debris resulting from the installation of electric towers foundation. These sediment loads could be deposited into the water bodies close to the site. Due to the vast spatial extent of power line developments, it is often impossible for the power line corridor not to cross over water bodies such as rivers and wetlands. Construction activities within the vicinity of these water bodies create problems if not taken care of to prevent them. These range from erosion into rivers, which creates water pollution to draining of wetlands in order to give way for the construction equipment. Some of the construction equipment could be located within floodplains and/or within 1:50 000 year flood lines. The combination of all these presents threat to water resources.

7.6 Soil

Soil has an important role in the environment as it supports biodiversity and provides for a physical base for plants, buildings and other infrastructure. Soil structure will be disrupted during the digging of foundations for the new, pylons for the power line.

Continuous movement of heavy machinery to and from the construction site will result in soil compaction thereby reducing its capacity to hold water which will in turn result in increased runoff during the rainy season. Fuel leakages and accidental oil spills from construction vehicles and machinery have the capability of contaminating soil once they infiltrate into the soil, this indirectly also affects plant growth in the near future.

Mixing of cement on unpaved surfaces during construction will result in change of soil chemistry, such as changes in the alkalinity/ acidity of the soil, which will reduce soil fertility hence indirectly affecting flora. Such an effect will be limited to the construction phase and it will be of short duration. The significance of the impact can be avoided if mitigation measures are implemented.

7.7 Noise

Noise levels are expected to increase as a result of various construction activities. The noise will be limited to the construction phase

7.8 Air quality

The quality of the air will be impacted on and the sources are likely to emanate from: excessive emission of exhaust gases from construction vehicles, dust during excavation works, digging of foundations, stock piled soils and gravel surface access roads.

7.9 Health and safety

If construction workers are exposed to excessive and continuous levels of construction-related dust and noise their health could be affected. Such exposure to dust may aggravate conditions such as asthma. Exposure to excessive levels of noise may result in temporary deafness, shock and discomfort.

7.10 Infrastructure and services

Powerlines often intersect or are aligned in close proximity to existing infrastructure and services such as roads, telecommunication lines, boundary lines and existing powerlines. There could be temporary disruption of services during the construction of the power line.

7.11 Socio economic

Employment opportunities may arise during the construction phase especially for activities that do not require the use of machinery. This will have a positive impact on the local community especially if provision of appropriate training and skills development is implemented. Other potential social impacts associated with the proposed development will emanate from safety and security concerns of the affected communities from the uncontrolled influx of migrant workers during the construction phase of the project. This is especially so given the fact that the project area is sparsely populated and contractors may have to bring in labour from outside the immediate project area.

Due to the specialised and technical complexity of the proposed development, it is unlikely that local service providers qualify to undertake the job, which will be found within the project area. As such, contractors may have to retain workers from other areas either nationally or even internationally.

7.12 Topography

The topography of the area will determine the level of visual exposure of the power line. The power line will be visible from a distance if it is located on an elevated landscape. There are other linear developments already in the vicinity of the project area and as such, the proposed development will conform to some of these developments.

7.13 Avifauna

The construction of the Borutho to Nzhelele 400kv Powerline in the Limpopo could potentially have a very negative effect on Bird in the area, especially the Endangered Cape Vulture. The birds are likely to utilise the powerline for perching and roosting, which will place them at risk of collision with the earth wires. Eskom has got different bird nesting guidelines, which will be used on the construction of the powerline as well with the Management plan, which will be used. The purpose of the bird nesting guideline to use on ways of dealing with phenomenon in a manner that will reflect Eskom's stance on the environment as well as to prevent distribution of power to customers and the guidelines explain that a bird incident happens when a bird physically strikes either the overhead conductor or overhead ground wire of a powerline. In case of transmission lines, the overhead ground wire of a powerline. In case of transmission, the overhead ground wire is usually involved. It is generally accepted that birds usually avoid the highly visible bundled conductors but often fail to see the thin ground wire. (refer to in Appendix 4).

8. ENVIRONMENTAL IMPACTS ASSESSMENT AND MITIGATION MEASURES

This section represents methodology used and adopted in assessing the identified or anticipated impacts on the proposed powerline's receiving environment. The section then later continues to the actual assessment on anticipated impact and the mitigation measures.

8.1 Measuring Environmental Impacts Assessment Methodology

There are guidelines and formulas developed for assessing or measuring identified or anticipated impacts on a given development's receiving environment. There are at least seven generic rating scales that are used in this EIA study. These are:

- Duration
- Extent
- Intensity
- Status of impact
- Probability and
- Degree of confidence
- Significance

8.1.1 Duration

Table 0.1: Period of Impact Rating.

RATING	DESCRIPTION
Short term	0-2 years
Medium term	2-15 years
Long term	Where the impact will cease after the operational life of the activity
Permanent	The impact will occur even after the operational and decommissioning of the project has occurred.

8.1.2 Extent

Extent defines the physical or spatial scale of particular impact on the receiving environment.

Table 0.2: Extent of Impact Rating

RATING	DESCRIPTION
Local	Limited to the site and its immediate surroundings
Regional	Impact extends beyond site boundary.
National	Impact is widespread, it can be Countrywide

8.1.3 Intensity

Evaluation of intensity is used to measure or establish whether the impact would be destructive or the level of destruction particular impacts will have on a given environment.

Table 0.3: Impact Intensity Rating.

RATING	DESCRIPTION
Low	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
Medium	Where the affected environment is altered but natural, cultural and social functions and processes continue, although in a modified way.
High	Where natural, cultural and social functions or processes are altered to the extent that they will temporarily or permanently cease.

8.1.4 Status of Impact

The status of an impact is used to describe whether the impact would have a negative, positive or no effect on the receiving environment.

8.1.5 Probability

Probability describes the likelihood of the impact occurring during the proposed development, after the development or during the operational phase of the development.

Table 0.4: Impact Probability Rating.

RATING	DESCRIPTION
Improbable	The possibility of the impact occurring is very low or unlikely
Probable	There is a possibility that the impact will occur.
Definite	The impact will definitely occur

8.1.6 Degree of confidence

Degree of confidence measures the level of reliability of the impact predictions subject the availability of relevant information.

Table 0.5: Degree of Confidence.

RATING	DESCRIPTION
Low	Less than 35% sure of impact prediction.
Medium	Between 35% and 70% sure of impact prediction.
High	Greater than 70% sure of impact prediction.

8.1.7 Significance

Significance scale refers to threshold of the importance of a particular impact on the receiving environment.

Table 0.6: Level of significance

RATING	DESCRIPTION
Low	Impacts could both be of low intensity at a regional level and endure in the medium term or of low intensity at a national level in the short term.
Medium	Impacts could be either of high intensity at a local level and endure in the medium term or of medium intensity at a regional level in the medium term.
High	These impacts could of high intensity at a regional level and last for a medium term or they could be of high intensity at a national level and go on for a short duration.
Very high	Impacts could either of high intensity at a regional or national level and last for a long time

8.1.8 Degree to which the impact can be reversed

Table 0.7: Degree of Reversibility.

RATING	DESCRIPTION
Low	Less than 35% sure of impact prediction.
Medium	Between 35% and 70% sure of impact prediction.
High	Greater than 70% sure of impact prediction.

8.1.9 Degree to which the impact may cause irreplaceable loss of resources

Table 0.8: Degree the impact may cause irreplaceable loss of resources

RATING	DESCRIPTION
Low	Less than 35% sure of impact prediction.
Medium	Between 35% and 70% sure of impact prediction.
High	Greater than 70% sure of impact prediction.

8.20 Degree to which the impact can be mitigated.

Table 0.9: Degree to which the impact can be mitigated

RATING	DESCRIPTION
Low	Less than 35% sure of impact prediction.
Medium	Between 35% and 70% sure of impact prediction.
High	Greater than 70% sure of impact prediction.

8.20 Cumulative Impact Assessment

The proposed development of powerline and substation works will have minimal significant cumulative impacts, considering the current status of environment at the proposed areas and the other activities within the area (such as agriculture). The identified impact for the proposed powerline and substation works are direct as opposed to be indirect. Impacts will be observed as development occurs. No climatic change effects are expected from the development, and in time lag. If impacts such as fragmentations of environment and others occur, they have likelihood to occur because of other activities in the area such as mining in and around the substation in Bokmakierie and the following farms Bierman 599 MS, Cohen 591 Ms, Honeymoon 610Ms, Faure 562 Ms, Du Toit 562 Ms, Vriendin 589Ms fall under Coal Of Africa which have prospecting rights where they will be doing open cast mining.

8.21 Impact Assessment

This impact assessment section assesses the potential impacts towards the receiving environment of the proposed development. The section is separated according to the phases that will happen for the project which are construction, operation and decommission. Construction and decommission is handled together as they would have similar impacts in most cases and where they would be different, the sections are separated.

8.21.1 Air Quality

The quality of the air will be impacted on during construction and decommissioning phases only. The sources which are likely to emanate from: excessive emission of exhaust gases from construction vehicles, dust during excavation works, digging of foundations, stock piled soils and gravel access roads. The dust may affect animals, vegetation and people on site and the surroundings. Please refer to impact for vegetation and flora for details of dust generation.

Table 0.10:Rating matrix for air quality impacts in the construction phase

Criteria	Rating
Extent	Local
Duration	Short term
Intensity	Low
Probability of occurrence	Definite
Degree of confidence	Medium
Status	Negative
Significance	Medium- Low
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	High
Mitigation measures:	Mitigation measures will include the following but not limited to: • No open fires will be permitted on site. • Burning of materials, grass and refuse will not be permitted on site. • Construction machinery and vehicles will be maintained and serviced regularly. • Speed limits of about 40km/hr will be enforced and maintained on the construction site.

	• **Dust control.** Damping down of un-surfaced access roads, road shoulders and un vegetated areas during dusty period is required Digging and other clearing activities shall only be done during agreed working times to avoid drifting of sand and dust into neighboring areas. **Emission control** Regular servicing of vehicles and machinery in order to limit gaseous emissions (to be done off-site). Fire Prevention The Contractor shall have operational fire-fighting equipment available on site at all times. The level of fire fighting equipment shall be assessed and evaluated through a typical risk assessment process. It may be required to increase the level of protection especially during the winter months No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires No fires shall be allowed at active construction areas and stop and go stations

8.21.2 Soil

Soil structure will be disrupted during the digging of foundation for the towers and during excavation works associated with the development. Continuous movement of heavy machinery such as cranes used to erect the towers to and from the construction site will result in soil compaction thereby reducing its capacity to hold water. This will result in increased runoff during the rainy season. Fuel leakages and accidental oil spills from construction vehicles and machinery have the potential of contaminating soil. This indirectly affects plant life and other organism that resides in the soil in the immediate and long-term future. Mixing of cement for the foundations on unpaved surfaces during construction will result in change of soil chemistry particularly changes in the alkalinity or acidity of the soil. This will result in reduced soil fertility thereby indirectly affecting flora and consequently the fauna that depend on both the soil and the flora. Such an effect will be limited to the construction phase and it will be of short duration limited to the construction site. The significance of the impact can be avoided if mitigation measures are implemented. Please refer to the Environmental

Management Programme (EMPR) for mitigation measures Attached as Appendix 1.

Table 0.11:Rating matrix for soil impacts in the construction and operational phase

Criteria	**Rating**
Extent	Local
Duration	Long term
Intensity	Low
Probability of occurrence	Probable
Degree of confidence	Medium
Status	Negative
Significance	Low
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Medium
Degree to which the impact can be mitigated	Medium
Mitigation measures	Mitigation measures will include the following but not limited: • Topsoil shall be removed from all areas where physical disturbance of the surface will occur and shall be stored and adequately protected • The areas to be cleared of topsoil shall include the storage areas. • All topsoil stockpiles and windrows shall be maintained throughout the contract period the contract period in a weed-free condition. Weeds appearing on the stockpiled or windrowed topsoil should be removed by hand. • The topsoil stockpiles shall be stored, shaped and sited in a way that they do not interfere with the flow of water to cause damming or erosion, or itself be eroded by the action of water • Stockpiles of topsoil shall not exceed a height of 2m. • The contractor shall ensure that no topsoil is lost due to erosion –either by wind or water • The subsoil is the layer of soil

	immediately beneath the topsoil. It shall be removed to a depth instructed by the engineer and stored separately from the topsoil if not used for road building • Topsoil shall be reused where possible to rehabilitate disturbed areas • Care shall be taken not to mix topsoil and subsoil during stripping. • Polluted topsoil shall be disposed of at a licensed landfill site. Soil Stripping • No soil stripping shall take place on areas within the site that the contractor does not require for works, or on areas of retained vegetation • Subsoil and overburden should be stockpiled separately to be returned for backfilling in the correct soil horizon order Stockpiles • Stockpiles should not be situated such that they obstruct natural water pathways and drainage channels • If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth, stockpiles may further be protected by the construction of berms or low brick walls around their bases • Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding. • Measures should be taken to avoid/minimise soil contamination on site. • Where soil is contaminated, it should be treated with absorbents and

	disposed at hazardous landfill site • Topsoil and subsoil to be protected from contamination. • Fuel and material storage shall be away from stockpiles. **Erosion Control** • Wind screening and storm water control should be undertaken to prevent soil loss from the site by the installation of diversion berms, sandbags and silt traps • All erosion control mechanisms need to be regularly maintained. • Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time • Re-vegetation of disturbed surfaces should occur immediately after construction activities are done. • No impediment to the natural water flow other than approved erosion works is permitted

8.21.3 Vegetation

The vegetation of all the three alternatives was investigated by George Bredenkamp, the major vegetation types identified, namely Musina Mopane Bushveld, Makhado Bushveld and Polokwane plateu Bushvesh. However the studies showed that at Alternative 1, at Nzhelele substation and northern part of the line typical musina Mopane Bushveld occurs. This vegetation type is not rare and occurs quite widespread. Several game farms occur in this area. The most serious problem that the line must avoid destruction of the protected trees such as Adnsoniadigita(Baobab) there are also some individuals of the protected trees like Bosciaalbitruca (sheppard's tree) it the powerline route, but these are fairly limited at alternative 2 at the Borutho substation and the southern part of alternative 1 and 3 the Makhado sweet Bushveld occurs. However, the northern parts of this Bushveld is typical Makhado sweetbushveld, while the Southern parts

are highly transformed by agriculture and villages and is classified as short degraded Acacia veld.it is noted that from an ecological point of view all three alternatives run through short degraded Acacia veld which has low sensitivity.

Destruction of vegetation in the footprint of tower structures

This may only be an issue if the tower is situated within a sensitive habitat or within a species population of special concern. The potential magnitude of this impact is minor due to the size of the pylons relative to the overall extent of the natural vegetation. It will have an impact at the scale of the proposed infrastructure, which is local. The duration of the impact will be long term and the probability of occurrence is definite.

Disturbance of natural vegetation through trampling, compaction by motor vehicles

Destruction of vegetation may occur around construction sites.

Impacts on the movement and migration of animal species

This will occur if the infrastructure imposes an insurmountable barrier to movement. Consequences of this may include:

- Impaired gene flow within fragmented populations;
- Breakdown of ecological relationships, e.g. pollinator-plant; and
- Breakdown of migration routes.

Soil erosion, increase in silt loads and sedimentation

This will occur during soil disturbance and increased run-off from compacted areas during construction phase and decommission. Where there are erodable soils, it is possible that construction of infrastructure will result in local exposure of the soil surface or increase in runoff of impermeable surfaces.

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Increased noise pollution during construction

This may affect animals in the vicinity causing stress in individuals of various animal species, which may result in them moving away or cause changes in behavior or causing some territorial animals to be displaced.

Increased risk of veld fires

There is a higher risk of veld fires around construction sites due to the use of fires for cooking and warmth by construction workers.

Table 0.12: Rating matrix for vegetation impacts in the construction phase and operation

Criteria	Rating
Extent	Local
Duration	Long
Intensity	High
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Medium High
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Medium-High
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation measures will include the following but not limited to: • During the construction phase workers must be limited to areas under construction and access to the undeveloped areas, especially the surrounding open grassland and valley bottom wetland areas must be strictly regulated ("no-go" areas during construction activities). • Close site supervision must be maintained during construction of the powerline. • Minimal disturbance to vegetation where such vegetation does not interfere with construction and operation of the line. • No unnecessary destruction to surrounding vegetation • Protection of or endangered plant species • Where herbicides are used to clear vegetation, specimen-specific chemicals should be applied to individual plants only • General spraying should be prohibited. • No dumping of any materials in undeveloped open areas and neighboring properties

8.21.4 Avifauna

During construction there is possibility to destruct habitats of birds with the construction of access roads, the clearing of servitudes. Birds also pose threat of causing electrical faulting during operation.

Table 0.13: Rating matrix for avifauna impacts in the construction phase

Criteria	Rating
Extent	Local
Duration	Long
Intensity	High
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Medium
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	Low
Mitigation measures	• Mitigation measures will include the following but not limited to:To mitigate against collision impacts, it is recommended that the identified sections of line be marked with anti collision devices on the earth wire to increase the visibility of the line and reduce likelihood of collisions. • Strict control should be maintained over all activities during construction. • Confine impacts only to the development area.

The avifauna will be impacted by the proposed powerline and substation works during operation, as the birds will pose threats to be electrocuted on towers and at the substation station, and colliding with the actual powerlines, which are earth wires and conductors.

Table 0.14: Rating matrix for avifauna impacts in the operational phase

Criteria	Rating
Extent	Local
Duration	Long
Intensity	High
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Medium High
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Medium
Degree to which the impact can be mitigated	Medium
Mitigation measures	Mitigation measures will include the following but not limited to: it is recommended that the identified sections of line be marked with anti collision devices on the earth wire to increase the visibility of the line and reduce likelihood of collisions. Marking devices should be spaced 10m apart. The sections of line that pose a concern and require marking should be finalised in a site "walkthrough" by the avifauna specialist once final route is decided and towers/pylons pegged. A "Bird Friendly" steel lattice structure should be used for the tower structures. Strict control should be maintained over all activities during construction. The line should be fitted with the standard Eskom "bird Perch" on the top of all poles in order to provide a safe perching space.

8.21.5 Wetland and Riparian areas

Construction grading and utility excavations for the pylons would increase the sediment load in storm water during rainfall events. Sediment sources created during construction include soil stockpiles and soil tracked across construction areas, debris resulting from the installation of pylons foundation. These sediment

loads could be deposited into the water bodies close to the site. Due to the vast spatial extent of power line developments, it is often impossible for the power line corridor not to cross over water bodies such as rivers and wetlands. Construction activities within the vicinity of these water bodies create problems if not taken care of to prevent them. These range from erosion into rivers, which creates water pollution.. Some of the construction equipment could be located within floodplains and/or within 1:50 year flood lines. The combination of all these presents threat to water resources.

Table 0.15: Rating matrix for water resources impacts in the construction and operational phase

Criteria	Rating
Extent	Local
Duration	Short
Intensity	High
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Medium-High
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Medium
Degree to which the impact can be mitigated	Medium
Mitigation measures	Mitigation measures will include the following but not limited to: • Construction to take place during dry season • Construction should avoid sedimentation • Access road to be sealed with dust suppressant • Develop wetland and vegetation habitat biomonitoring programme

8.21.6 Land Use

The project area is predominantly a commercial farming area with a mixture of game, cattle and crop cultivation both dry and rural residential areas form part of the land us. Current or future land uses will be affected due to the proposed construction of the powerline. Relatively some land portions within the project area can be classified as degraded, and also some sections have been disturbed by past impacts, (e.g. access road, construction of substations, boundary fences

line, distribution powerlines, etc) especially the areas where there are human settlements such as Jupiter, Venus, sefahlane, Luxnburg and many other areas..

Table 0.16:Rating matrix for land use impacts in the construction phase

Criteria	Rating
Extent	Local
Duration	Long term
Intensity	High
Probability of occurrence	Definite
Degree of confidence	Medium
Status	Negative
Significance	High
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation measures will include the following but not limited to: • Confine impacts only to the development area.

8.21.7 Visual Impact

Landscape impacts are alterations to the fabric character, visually 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 as it traverses. The activities expected to cause landscape impacts are that associated with the construction phase, are the establishment of the construction camp, construction of roads and clearance of the servitude. These activities will create surface disturbance, which will result in the removal of vegetation and the exposure of the underlying soil, Surface disturbance created during construction may remain for an extended period during operational phase. These are seen as residual effects carried forward from the construction phase and can be completely or substantially be mitigated if treated appropriately during the construction phase. An additional impact will be caused as a result the presence of the completed transmission line.

The excavated soil will have to be stockpiled. While evidence of such will be visual to the farm owners and others in the nearby vicinity, such visual disruptions will be short term and limited to the construction phase only. The transmission suspension towers are considered for 400kv especially the Self Supporting; this

structure is typical of most single circuit structures and typical carries twin Dinosaur conductor, a relatively light configuration.

Table 0.17:Rating matrix for visual impacts in the construction and operational phase

Criteria	Rating
Extent	Local
Duration	Short term
Intensity	Low
Probability of occurrence	Probable
Degree of confidence	Medium
Status	Negative
Significance	Low to Medium
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	Medium
Mitigation measures	Mitigation measures will include the following but not limited to: • Confine impacts only to the development area and maintainaing strict control of staff at all times so as to minimize disturbance of natural environment.
Cumulative impacts	Not significant, because the area is impacted by several other developments.

The potential to mitigate visual impacts namely the appearance and dimension of the transmission powerline is very problematic to mitigate. The transmission lines towers should be in spatial constrained sections and the development corridors especially in built up areas like Sefahlane and many others, the monopole structure is less visually intrusive than the convectional powerlines, and at the same time taking into consideration the space and technical considerations and the terrain of the land

8.21.7 Archaeological / Heritage Resources

The proposed powerline will go through disturbed areas due to previous land uses such as existing powerline, railway line activities and residential use. Under such disturbed conditions the chances of archaeological material preserved in situ are unlimited as stated by the Heritage Specialist report attached.
Impact will include:

- Impact on fossils
- Impact on late stone age and possible iron age sites

Table 0.18:Rating matrix for archaeological impacts in the operational phase

Criteria	Rating

Extent	Local
Duration	Short term
Intensity	High
Probability of occurrence	Definite
Degree of confidence	Medium
Status	Negative
Significance	Medium-Low
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	High
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation measures will include the following but not limited to: • If during construction, the Contractor unearths archaeological resources or unmarked graves, all work will stop immediately and Eskom Holdings SOC Limited will be notified who will in turn inform an Archaeologist for further action on what should be done.

It is recommended that an Archaeologist should do a thorough heritage assessment from Borutho to Nzhelele substation where the transmission line will start and end. Once the surveyors have mapped the pylons the investigation should include assessment of each pylon in the landscape this is to mitigate the disturbance of potential heritage resources sites such as unmarked graves. The HIA should be supplemented with a brief induction of Eskom staff on heritage and grave management.

- An archaeologist should be involved in the final walk down phase of the line design to ensure that tower bases are not located on archaeological sites.

8.21.8 Agriculture or farmlands

The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles, establishment of lay-down areas for towers and cables and preparation of foundations for the towers has the potential damage and result in the loss of farmland for future farming activities. This is an issue that has been raised as a concern by the farmers during the public participation process held.

The impact on farmland associated with the construction phase can be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase. Recommended mitigation measures are outlined below.

The presence of construction workers on the site increases the potential risk of

livestock and produce theft. The farming activities that are exposed to this impact are livestock farming and intensive agricultural farming, specifically vineyards, orchards and vegetables. Plastic littering also poses a threat to livestock.

The movement of construction workers on and off the site also poses a potential threat to farm safety and farm infrastructure, such as fences and gates, which may be damaged. Irrespective of the project, farmers frequently raise the issue of livestock losses, resulting from gates being left open and/or fences being damaged, as key concern. Impacts are generally more severe in remote locations where they may only be discovered some time after occurrence. A number of farmers also indicated that incidents involving Eskom and or Eskom's maintenance contractors are frequently disputed. Construction related activities, such as the establishment of access roads and tower foundations, also pose a threat to irrigation systems, specifically in the case of vineyards and orchards. Stock and produce losses and damage to irrigation systems pose a threat to the productivity of the operations and the livelihoods of the affected farmers.

Table 0.19:Rating matrix for agriculture impacts in the construction phase

Criteria	Rating
Extent	Local
Duration	long term
Intensity	Low
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Low
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation measures will include, but not limited to: • An Environmental Control Officer (ECO) should be appointed by Eskom to monitor the construction phase, including the establishment component. • The footprint associated with construction related activities (access roads, turning circles, lay-down areas, construction platforms, workshop should be minimised. Eskom and the appointed contractor as well as the ECO must consult with affected landowners to identify suitable sites for the establishment of these areas. • Eskom and the appointed contractors must consult with the affected landowners to identify the location of key infrastructure, such as irrigation systems, and ensure that damage to infrastructure is avoided and or minimised. • Eskom and the appointed contractors must consult with the affected landowners with regard to timing of construction related activities. The aim of this should be to avoid critical periods in the farming process, such as planting and harvesting. • Every effort should be made by Eskom and the appointed contractors to minimise time associated with construction activities, specifically in the intensive vegetable growing areas for example the potatoes. and tomatoes • The movement of construction vehicles on the site should be strictly controlled and confined to clearly defined access roads and areas. • All areas disturbed by construction related activities, such as access roads, lay-down areas, construction platforms, workshop area, should be rehabilitated at the end of the construction phase. • The implementation of a rehabilitation programme should be included in the terms of reference for the

	contractor/s appointed to construct the power lines. • Compensation should be paid to farmers that suffer a permanent loss of land due to the establishment of the transmission line. Compensation will be paid by Eskom based on accepted land values for the area. **Livestock or game management** • Eskom should establish a Monitoring Forum that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by Eskom and the contractors before the contractors move onto site. • Eskom should hold contractors liable for compensating farmers and communities in full for any livestock, animals and produce losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between Eskom, the contractors and affected landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities. • The EMP must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested. • Contractors appointed by Eskom must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms. • Contractors appointed by Eskom must ensure that construction workers who are found guilty of stealing livestock and farm produce and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation; • The housing of construction workers on the site should be limited to security person
Cumulative impacts	Overall loss of farmland could impact on the livelihoods of the affected farmers, their families and the workers on the farms and their families. However, disturbed areas can be rehabilitated.

8.21.8 Noise

Noise levels are expected to increase as a result of various construction activities and use of heavy machinery. The noise will be limited to the construction phase. .

Many people will be affected by construction activities as the proposed powerline routes are in residential and in farms.

Table 0.20:Rating matrix for noise impacts in the construction phase

Criteria	Rating
Extent	Local
Duration	Short term
Intensity	Low
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Low
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	High
Mitigation measure	Mitigation measures will include, but not limited to: • Working hours will be limited to 7:00am -17:00pm strictly from Monday-Friday. • Affected residents will be notified of excessive noisy activities (if any are going to take place). • Open liaison channels with affected community will be developed in order to facilitate their concerns and complaints about the construction activities.

8.21.9 Health and Safety

The construction workers will be exposed to excessive and continuous levels of construction-related dust and noise, without protective measure, which may affect their health. Mitigation measure such as Personnel Protective Equipment (PPE) will assist in reducing health impacts. Exposure to dust may aggravate conditions such as asthma, while exposure to excessive levels of noise may result in temporary deafness, shock and discomfort.
Other impact will include:

- Impact of electromagnetic fields on human beings
- Fire hazards pose a threat to human health and safety

Table 0.21: Rating matrix for health and safety impacts in the construction and operational phase

Criteria	Rating
Extent	Local
Duration	Short term

Intensity	Low
Probability of occurrence	Definite
Degree of confidence	High
Status	Negative
Significance	Medium
Degree to which the impact can be reversed	Low
Degree the impact may cause irreplaceable loss of resources	Medium
Degree to which the impact can be mitigated	High
Mitigation measures	Mitigation measures will include, but not limited to: • All workers will be fully informed about the Health and Safety Policy by the contractor • All workers will wear PPE at all times. • No worker shall act in any way that may pose risk to other workers.

8.21.10 Socio Economic

Employment opportunities will rise during the construction phase. Local unskilled people may be hired for unskilled labour. However in most instances, the contractor brings their own workforce. This may bring positive impact on the local community especially if provision of appropriate training and skills development is implemented.

Other potential social impacts associated with the proposed development will emanate from safety and security concerns of the affected communities from the uncontrolled influx of migrant workers during the construction phase of the project. This is a highlight because the project area is sparsely populated and contractors may have to bring in labour from outside the immediate project area. Impacts would include:

- Employment of local labour (South African citizens and people local to the area) and preference given to a local contractor.
- Further more, in terms of property values both on the residential and agricultural has a potential negatively impact taking into consideration that it is a 400kv powerline, the impact on property value is mostly linked to visual impacts associated with transmission lines, the values of property can be also be affected by the servitudes and impacts that they have on farming activities and future developments since Eskom will take ownership of the servitude through negotiations and compensations where possible, in terms of compensation, only those directly affected by the proposed 400kv Powerline will be compensated. The compensation is linked to the loss of land associated with the establishment of the servitude and forms part of the Servitude negotiations.

The majority of negative social impacts associated with the construction phase can be effectively mitigated and, as such, they do not have a significant bearing

on the identification of the corridor alignment that is likely to have the least impact on the social environment.

However, having said this, the majority of the construction phase impacts are linked to the impact on land uses, specifically agricultural related land uses. As such the potential severity of the impact will differ depending on the type of land use that is affected. For example, the construction phase related impacts on land that is used for intensive vegetable farming will differ to those associated with land that is used for livestock grazing. This difference does have a potential bearing on the assessment of alignment alternatives.

The key social issues associated with the construction phase include:

Potential positive impacts

Creation of employment and business opportunities.

Potential negative impacts

- Impacts associated with the presence of construction workers employed on the project.
- Increased risk of livestock and produce losses and damage to farm infrastructure associated with presence of construction workers on the site.
- Increased risk of veld fires associated with construction related activities.
- Loss of agricultural land associated with construction related activities.
- Impact of heavy vehicles, including dust, safety and damage to roads.

Creation of employment and business opportunities during the construction phase.

The duration of the construction phase will be determined by Eskom and the contractor. The contractor may employ skilled and unskilled staff. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the access roads and the erection of the towers and establishment of the power lines. It is expected that the majority of the construction workers will be accommodated. There should be adequate accommodation where needed in the vicinity of the servitude and should be no leisure accommodation along the servitude during construction. However, construction camps for the storage of construction related material will need to be established and security personnel will be required to remain on site overnight.

A portion of the construction phase employment opportunities will be for low skilled job categories. These will be linked to security related jobs. The remaining jobs will fall within the skilled category. The majority of the employment opportunities are likely to be associated with the qualified contactors appointed by Eskom to construct the transmission lines and the associated infrastructure

The proposed development will create an opportunity to provide on-site training and increase skills levels. However, these opportunities are likely to benefit the workers employed by the contractors and not locals from the area. The opportunities for skills development and training of locals are likely to be limited.

In terms of business opportunities for local companies, the expenditure during the construction phase will create business opportunities for the regional and local economy. The majority of these opportunities are likely to be linked to specialised engineering companies involved in the manufacture of the components associated with transmission lines, such as towers, conductors etc. The sector of the local economy that may benefit from the proposed development is the local service industry. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security. As indicated above, the majority of the construction workers will be accommodated in the local area. This will create opportunities for local hotels, B&Bs, guest farms and people who want to rent out their houses. In addition, a proportion of the total wage bill earned by construction workers over the construction phase will be spent in the regional and local economy. However, given the scale of Limpopo local economy this injection will make a significant contribution to the City's local economy.

These benefits are associated with accommodation and meals for professionals for example engineers, quantity surveyors, project managers, product representatives and other personnel involved on the project. Experience from other large construction projects indicates that the potential opportunities are not limited to onsite construction workers but also to consultants and product representatives associated with the project, however, a large number of the skilled personnel are likely to be locally based and as such will not require accommodation.

Table 0.22:Rating matrix for Socio economic impacts in the construction phase

Criteria	Rating
Extent	Local
Duration	Short
Intensity	High
Probability of occurrence	Probable
Degree of confidence	Low
Status	Positive
Significance	Low- Medium
Degree to which the impact can be reversed	Medium
Degree the impact may cause irreplaceable loss of resources	Low
Degree to which the impact can be mitigated	Does not require mitigation
Mitigation measures	• **Enhancement:** • In order to enhance local employment and business opportunities associated with the construction phase the following measures should be implemented: **Employment** • Where possible, Eskom should make it a requirement for contractors to implement a 'locals first' policy for

	construction jobs, specifically semi and low-skilled job categories. However, as indicated above, the contractors appointed to for the project are likely to employ their own staff. The opportunities for the creation of local employment are therefore likely to be low; Where feasible, training and skills development programmes should be initiated prior to the initiation phase or construction phase • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. **Business** • Eskom should develop a database of local companies, specifically Historically Disadvantaged (HD) companies, that qualify as potential service providers (e.g. engineering and construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;

Economic impacts will include:

- Employment of local labour (South African citizens and people local to the area) and preference given to a local contractor
- National and provincial importance of project in terms of promoting economic growth in the region and South Africa.

9 Summary of key findings of EIA

All identified impacts will be evaluated with regards to their significance as illustrated.

Table 7:Summary of Impacts

ISSUE	DETAILS	PHASE OF CONCERN	POTENTIAL SIGNIFICANCE OF IMPACT	
			Before mitigation	**After mitigati**
1. NATURAL ENVIRONMENT				
1.1 Erosion	Erosion on access roads may become a problem.	Construction & Operation	Medium low	Low
1.2 Importation of alien vegetation	Importation of alien vegetation through building materials	Construction	Medium High	Low
1.3 Impact on flora	General impacts on flora.	Construction & Operation	Medium	Medium Lo
1.4 Impact on fauna	Impacts on the natural fauna in the area	Construction & Operation	Medium	Low
1.5 Impacts on Avifauna (birds)	Impacts on birds. Vultures in the Blouberg area.	Operation	High	Low
1.6 Impact of construction camps	The construction camps may have an impact on the natural environment. Waste generation; land clearing	Construction	Potentially High	Moderate t low
1.7 Impact on ecology	Disturbance on ecological habitats	Construction and Operation	Medium High	Medium
2. AESTHETICS				
2.1 Visual impact	Visual impacts will be significant in the local area	Operation	Low to Medium	Low
2.2 Sense of Place	Negative impact on the aesthetic qualities associated with the landscape in the project area in the vicinity of the powerline	Operation	Low to Medium	Low to Medi
3. WELL BEING				
3.1 Dust & Noise (within plant area)	Dust & noise control during construction	Construction	Low	Negligible
3.2 Corona noise	The effect of the corona (low "buzzing" noise) may be noticeable in properties immediately adjacent to the servitude.	Operation	Low	Negligible
3.3 Electro-magnetic fields	Impact of electromagnetic fields (EMFs) on animals, people and vegetation	Operation	Low	Low
3.4 Fire hazard	The construction and operation of the powerline may alter the occurrence and management of fires in the area. The change in the nature of fire hazards and events can have safety, economic and ecological implications.	Operation & Construction	High	Medium– Lo
4. LAND ISSUES				
4.1 Property value reduction	Negative impact on property values	Operation	Medium (perceived)	Low (positi
5. SOCIAL				
5.1 Disruption of social networks and daily movement patterns	The social routine and social networks may be disrupted during the construction process.	Construction	Low	Low
5.2 Location of	The establishment of construction	Construction	Potentially	Potentially

construction camps	camps		High	(positive)
5.3 Gravesites	Protection of gravesites, disinterment of graves	Construction	Potentially high	Low
5.4 Traffic Safety	Road traffic safety, particularly relating to construction traffic.	Construction	Low	Low
6.FARMING RELATED ISSUES				
6.1 Access to properties	The creation of new or improved access to properties, for access to the power line, brings potential associated issues that need to be considered.	Construction & Operation	Medium to High	Low
6.2 Access roads	The physical creation and use of new roads, or increased use of existing roads will also have associated impacts	Construction & Operation	Potentially High	Medium to Low
6.3 Loss of agricultural potential	Restrictions on land use and activities will impact on the agricultural potential of the land.	Construction & Operation	Medium	Medium
6.4 Season for construction activities	Certain activities (construction and operation) may have greater impacts on the environment and agricultural activities at certain times of the year.	Construction	Medium to Low	Low
7. CULTURAL AND ARCHAEOLOGICAL SITES				
7.21Archaeology	Impact on late stone age and possible iron age sites.	Construction	Medium to Low	Low
8. CONSTRUCTION CAMP ISSUES				
8.1 Immigration of construction workers	Immigration of construction workers may lead to social disruption, increased crime.	Construction	Medium to high	Medium to low
9. ECONOMIC				
9.1 National and Provincial Impact	National and provincial importance of project in terms of promoting economic growth in the region and South Africa	Operation	High (positive)	High (positive
9.2 Local Benefits	Economic benefits that the power line will bring to the residents	Construction & operation	Low to Medium (positive)	Medium (positive)
9.3 Job Creation	Employment of local labour (South African citizens and people local to the area) and preference given to a local contractor	Construction & operation	Low to Medium (positive)	Medium (positive)
10. Wetlands and Riparian areas				
10.1 Disruption of hydrological integrity	The proposed development will impact on hydrological integrity of wetland areas on site	Construction & operation	Medium	Medium- Lov

10 AUTHORITY CONSULTATION AND PUBLIC PARTICIPATION

10.1 Introduction

The public is classified as a group whose interest may be affected positively or negatively by the proposal of an activity or project and who are concerned with the proposal or activity and its consequences. The public should be adequately engaged in processes that affect their biophysical, social, cultural and economic environment. The increasing degree of decentralization in decision making and the growing influence of NGO, community based organisations for example in Bookmarie where the substation is located the farm is owned by the community, who have their legal adviser and they invested back again to the community by building schools.

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

Public Participation Process (PPP) is a cornerstone of any EIA. It is an integral requirement of the National Environmental Management act (Act 107 of 1998). The nature and manner in which the public participation process (PPP) should take place is governed by Chapter 6 of the Environmental Impact Assessment Regulations (GN No. R.543 of 02 August 2010). This chapter outlines the PPP should be advertised on site and in the media, the requirement of maintaining a register of Interested and affected parties (IAPs) and the entitlement of Registered IAPs to comment on written submissions to the Decision- Making Authority. The process followed during the public participations has taken into account all aspects of public participation as stipulated in legislation.

10.2 Public Participation Process

The principles of the National Environmental Management Act (NEMA) govern many aspects of EIA"S, including public participation, including the provision of sufficient and transparent information on an ongoing basis to the interested and affected parties to allow to comment.

The PPPs primarily based on two factors, firstly the ongoing interaction with the environmental specialist and the technical teams in order to achieve integration of environmental assessment, technical assessment and public participation

throughout. Secondly, to obtain the bulk issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to interested and affected parties for verification that their issues have been captured and for further comment.

Providing Interested and Affected Parties (I&APs) with opportunity to express their concerns and/or views on issues relating to a proposed development is one of the aims of ENVIRONMENTAL IMPACT ASSESSMENT, as mandated by best practice and the regulations, as it means of focusing on the relevant issues to ensure that the concerns of the IAPs are addressed, as well as ensuring that the environmental report deals with those identified issues and is thus useful to the decision maker whose obligation is to review the report and either authorise or reject the application.

10.2.1Objectives of Public Participation

The public participation process is designed to provide and accessible information to interested and affected parties (IAPs) in an objective manner to assist them:

- During the Impact Assessment Phase:
    - Verify that their issues have been considered by the specialist and technical investigations
    - Comment on the findings of the EIA

10.2.2 Press Advertising

In accordance with the requirements pertaining to advertising as detailed in the Regulations, press advertisements, and communicating with councilors and union representatives making them aware of the meetings and availability of Draft EIR Report for them to comment on the reports.

10.3 Public review of Draft Environmental Impact Assessment Report

The Draft Environmental Impact Assessment Report was sent to different departments and posted on different public areas for review and commenting by the key stakeholders and the I&Aps. The reports were sent to:

- Limpopo Farmers Union.
- Aganang Municipality,
- Blouberg Municipality
- Makhado Municipality

- Mogalakwena Municipality
- Molemole Municipality.
- Heritage Resource Agency (Lihra)
- Department of Agriculture, Forestry and Fisheries
- Limpopo Department of Environment Agriculture and rural Development
- Department of Water Affairs

Public meetings

I&APs were invited through the local Councillors and community leaders and for Public meetings. The public meetings for the EIA phase started from the 3rd week of January 2013.

Issues and Response Report

Government Regulation 543, Section 56, dictate that comments received from IAPs should be kept and response thereof recorded, Issues and comments raised by I&APs over the duration of the EIA process have been synthesized into Comments and Response Reports (refer to Appendix 12 for the Comments and Response Reports compiled from both the Scoping and EIA Phases). A summary of the key issues raised to date includes:

- Social and socio-economic issues
- Visual issues
- Avifauna Issues
- Heritage issues
- EIA process comments/issues
- Technical comments/issues
- Issues related to the proposed route alternative corridors
- Servitude comments/concerns
- Compensation comments/concerns
- Existing infrastructure
- Proposed/planned infrastructure/developments
- Eskom distribution related issues
- Communication issues Where possible, comprehensive responses to issues raised have been included in the Comments and Response Report by the

EIA project team as well as Eskom Transmission. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided. Based on the findings of the Scoping Study, the following issues were identified as being of low significance, and therefore not requiring further investigation within the EIA:

Potential impacts on agriculture

Potential impacts on transmission infrastructure associated with farms

Specialists investigations included desk-top evaluations of existing information (including that provided by land owners during the public participation process), as well as detailed field surveys (including field survey by the ecologist specialist, heritage) of the identified corridors. In undertaking field assessment and public participation, effort was made to contact affected landowners.

11 Conclusions drawn from the EIA process

During the course of the EIA investigation, specialist input was obtained for all aspects of the proposed transmission power line along with the associated impacts on the receiving environment. Specialist assessment of route alternatives along with a comparative assessment of specialist findings helped elucidate the preferred route alternatives from a purely specialist perspective. The detailed public involvement process gave input on the potential impacts of the power line and must be used to inform the final route selection.

Possible impacts that have been identified are detailed below (according to the relevant specialist field) and significant impacts are detailed with possible mitigation measures proposed in order to reduce the cumulative impact of the development. It must be borne in mind that a transmission power line does not only provide benefits to a small number of individuals in a limited area but is part of the national electricity grid which benefits the nation as a whole.

11.1 Avifaunal perspective

Through perching and nesting on power line towers, many of the larger bird species can cause electrical faults through their faeces, and nest material. However, on the structures proposed for this power line, it is not possible for these birds to perch or nest directly above the live hardware, so this impact is not anticipated to be significant at all. Some species will however still nest within the "columns" of the towers.

The most significant anticipated impact of this power line on birds is that of collision with the earth wire. The alignment currently crosses about seven main rivers namely, Matlala, Natse, Brak, Sand, Seokeng, Mogwatsane and Tshipu rivers and arable lands at relatively good, narrow points. They represents important habitat for many bird species associated with water. River courses in general represent important flight paths for many bird species, therefore posing a collision risk. See attached specialist report appendix 4.

11.2 Social perspective

It is recommended that a Community Management and Monitoring Committee

(CMMC) be established. This committee would serve as a communication channel between the community and Eskom. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and Eskom. Such a committee will play an important role in executing the proposed mitigation measures. It is anticipated that most social impacts pertaining to the power line will be experienced in the pre-construction and construction phases, with minimal impacts in the operational and decommissioning phases. There is no specific preference of a route alternative and the social impacts will all be similar regardless of the final route alignment selected. Appendix 5.

11.3 Visual perspective

Alternative 1 is regarded as the most preferred alternative. Its alignment along the existing distribution line and distribution servitude is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the roads and servitudes..

Although, there are minor differences in the impact rating for the other alignments, they are all medium i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated.

It is highly probable that the proposed 400kv transmission power line will have at least a medium negative impact on the local visual environment in the short term during the construction phase. During the operational phase, the significance of impact is predicted to be medium in the long term i.e. the impact will only cease after the operational life span of the project

Mitigation measures are not feasible after the route has been chosen i.e. mitigation can only take place in the routing of the line to avoid conflict areas. Therefore mitigation of any significant kind is not achievable during the operational phase, see attached report appendix 6.

11.4 Ecological perspective

From an ecological perspective alternative route 2 is very preferable to

alternative route 1 and 3, due to the fact that it passes through an area already affected by existing infrastructure, i.e. gravel roads, railway line and a farm homestead complex.

Currently, either route 2 or 3 may be considered since the difference in ecological sensitivity is marginal. Route 2 has a small section of High sensitivity, but this is impacted by other infrastructure. Route 3 therefore less preferable from this aspect.

The entire substation site is covered with a disturbed plant community, dominated by *Dichrostachyscinerea*. The prominence of grasses such as *Heteropogoncontortus, Pogonarthriasquarrosa, Trichoneuragrandiglumis*and *Eragrostisrigidior,* and weedy forbsconfirms the relative disturbed condition of the vegetation. In the vicinity are a few individuals of the protected tree *Sclerocaryabirrea*(marula), though it seems that no protected trees are present within the footprint of the proposed substation, or along the loops. See attached report on Appendix 7

11.5 Heritage perspective

Once the final route is decided and tower positions known, selections of the latter, which are deemed to be in potentially more sensitive locales, should be inspected more closely. There are no grounds presently.

All sites are protected by law: a permit would be required if any site is to be destroyed or graves to be shifted. Mitigation measures, if necessary, would need to be formulated and acted upon. From a heritage perspective, the proposed transmission power line is not expected to have a high negative impact since the tower positions will be inspected by a qualified archaeologist prior to final sitting and construction taking place. See attached report on Appendix 8.

11.6 Surface water

All of the proposed Corridor Alternatives will likely need to cross one or more surface water resources with a strong possibility of the placement of electricity towers / pylons in surface water resources (mainly watercourses). Therefore, it is imperative that when selecting a final route, the presence of the delineated

surface water resources as identified in the report attached on Appendix 9, are incorporated into the alignment and location of the powerlines and routing around surface water resources must be undertaken as far as possible. Should it be required that watercourses will need to be spanned, the crossing point should be at the narrowest part of the linear watercourse to avoid the placement of electricity towers / pylons. Pan wetlands are not to be spanned. Given the relatively small size of these surface water resources, these can be circumvented by the final proposed power line. Accordingly, no electricity towers / pylons are to be placed in the delineated pan wetlands. As evaluated in the comparative alternatives assessment section of the report, either the Central or Eastern Corridor Alternatives were identified as favourable for the proposed development. However, given the linear nature of the watercourses and the potential ability of the surface water resources to be spanned at narrower sections, thereby reducing the possibility of the placement of electricity towers / pylons, **the Eastern Corridor Alternative (2) is recommended as the more favourable option for the final routing of the proposed power line**. Finally, since the delineation exercise took place primarily at a desktop level, a final surface water walk-down study will be required once the route has been finalised to inform the final placement of electricity towers / pylons near outside of any surface water resources where possible, identify suitable crossing points over watercourses, inform routing of the proposed power lines around pan wetlands, to identify high risk areas where the placement of electricity towers / pylons will be required and stipulate site specific mitigation measures for minimising impacts where this is required. See attached Appendix 9

11.7 Tourism perspective

From tourism perspective visual impacts and potential disruption from construction activities are the greatest possible issues.

Tourism is a sensitive industry based primarily on subjective perspectives of visitors to an area. In destinations where tourism is focused on outdoors or based on natural elements, such as wilderness, sky, rivers, veld and wildlife, the tourism value rests largely on the experience which can be provided. The study area has

potential for negative visual impacts on tourism from the erection of a transmission line, see attached report appendix 10. This can potentially be an issue during the day as well as during the night. During the day, the line can potentially obscure views, degrade scenery and decrease the scenic value of the area or part of the area. Additionally, any lighting that may potentially be used may extend the visual impact into the night in a part of the country renowned for its night skies and stargazing.

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

There are reports in the area of problems with the reliability and quality of the power supply. If developments such as transmission lines can lead to better services for local people and for tourism enterprises seeking to provide a high standard of service, then there is potential for a positive impact, or spin off, from the development. By better servicing areas with electricity, this can create an environment where tourism can emerge or improve see attached Report. Appendix 10

11.8 Agricultural perspective

The three-powerline corridors traverse fairly similar land capability class, which is the low to moderate class. There is a however localized pocket of moderate to high capability class within the corridors, which is found in more concentration under eastern corridor. Considering the extent of agriculture potential impact, the construction of a powerline along the western and central corridors will have a significantly less impact than that of the eastern corridor. The three-powerline routes experiences relatively similar geology to a large extent except some localized patches in the Southern and Northern portions. The three powerline

corridors traverse similar and dominant vegetation type, the Makhado, sweet Bushveld, in addition to this, the eastern corridor experience significant a patch of the Polokwane Plateau Bushveld to the South. The quality of the grass under the Makhado Sweet Bushveld in term of feeding is generally low whereas that of the Polokwane Plateau Bushveld is high. Avoiding the eastern corridor will result in minimal disturbance of the quality of grass compared to that of the western and central corridors. See attached report appendix 11.

12 Impact Statement

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that:

- Although some impacts of potential high significance are associated with the proposed transmission lines, there are no environmental fatal flaws that should prevent the proposed power lines from being constructed on the preferred alignment alternative 2, provided that the recommended mitigation measures are implemented.
- This route is acceptable from an environmental perspective.
- The significance levels of the majority of identified negative impacts can be mitigated and minimised by implementing the recommended mitigation measures and Eskom Management Guidelines for transmission line servitudes.

The Environmental Impact Assessment was undertaken for the proposed Borutho to Nzhelele substation. The proposed construction of the powerline has fulfilled the NEMA regulatory requirements, with great steps, having been taken to provide all interested and affected parities an opportunity to participate meaningfully in the identification of the project alternatives issues that require investigation.

During the Scoping phase numerous issues were raised and identified, the issues were shared with specialist and potential impacts were investigated and mitigation measure recommended. By nature, the construction and operations of 400kv Powerlines will have a negative impact on the environment. However, when appropriate mitigation measures are implemented, intensity of impacts is reduced. The preferred corridor alternative is alternative two (2) (Blue) which starts at Borutho and join red option. The impacts of the proposed powerline on alternative 1 and 3 have shown to be medium and medium high significance in certain areas. Alternative 1 and 3 have ecological, wetland areas and other key factors which were taken into consideration during comparative assessment of alternatives which include wet land, loss of use of productive agricultural lands mainly potatoes, game farms, protected trees, graves and forestry due to servitude requirements, the resulting consequences from loss of agricultural production job losses and the visibility of the powerlines.The probability of agriculture is a major concern on all the 3 alternatives; nevertheless, the intensity of the impact on alternative 2 will be a lower percentage of land use. For instance a number of I&AP raised concern about the loss of agriculture and game farm lands around the areas of waterport and Vivo see attached comments and issues report appendix 12

A number of stakeholders raised concern about loss of the use of productive agriculture land within commercial farming areas Nzumbululo Heritage Solutions, therefore recommends environmental authorisation of transmission line within alternative 2 as compared to alternative 1 in areas around Vivo and associated activities with the following conditions:

- Deal with vulnerable groups and individuals with great sensitivity
- Consult with the affected telecommunications sector in order to address the traversing of transmission along or over masts and similar structures
- The maintenance and continued running of new access roads should be addressed by Eskom Transmission and affected local municipalities. New access roads should also benefit the movement of local people as much as possible
- If possible, construction should take place outside the critical phases of agriculture, in particular, during the final stages of pre-harvesting and during harvesting
- Avoid agricultural land and preserve agricultural output by running the transmission line on low potential agricultural land and/or on boundaries of farms.
- Where possible, the servitude should be adjusted to avoid impacts on irrigation systems. If this is not possible, compensation must be paid for the disruption of loss of use of current and future irrigation systems, including costs incurred in the relocation or reestablishment of systems
- A clear and efficient communication channel must be established between Eskom and agriculture sector including farm owners.
- Encourage and allow local businesses to provide products and services such as sanitation, catering and goods and services to instigate the benefits of the construction of the powerline, especially in the communities
- Keep the construction area to a strict minimum.
- Clearing of the full servitude should be avoided. If stripping is required, then vegetation stripping should be undertaken in a manner where the edges are organic or curvilinear rather than straight or sharp edged.
- Mitigation measures during post-construction must focus on the rehabilitation of the construction areas and access roads.
- A clear and efficient communication channel must be established

between Eskom and planning authorities (Local and Regional spheres) in order to address potential incompatibilities with present and future land use.

- Avoid bird sensitive areas and, where the need is indicated, use bird flappers and bird guards on conductors and towers, respectively.
- Appoint an independent and suitable experienced Environment Control Officer to ensure compliance with the mitigation and or management actions.
- Appoint an independent and qualified ecologist and archeologist to ensure that all construction activities including access roads, working areas and tower assembly sites comply with the mitigation measures and or management actions.
- If feasible, all construction activities should take place during the drier periods of the year.
- Construction personnel must be inducted on wild animal awareness and safety, including issues such as poaching.
- Develop a Fire Safety and Response Plan to deal with accidental fires and to address training requirements and reporting procedures.
- Where possible, use existing access roads as much as possible.
- Fires must be restricted to designated areas and designed to limit the risk of spreading to the surrounding environment.
- Driving at high speeds should be prohibited.
- Construction activities must be restricted to daylight. No construction should take place at night.
- All bush clearing activities should be considered in terms of slope (steepness) and soil type
- All waste material must be collected at designated temporary waste disposal areas and transported to a licensed municipal site for disposal. Waste must not be stored on site. For not longer than the stipulated timeframe.
- Keep construction activity-related noise and lighting to a minimum.
- For cultural heritage resources, mitigation will vary from sampling, surveying,

mapping and excavations to determine the significance of the impact.

- Avoid or minimise visual impacts on tourism-related cultural heritage sites if found on site.
- No disturbance to cemeteries. In cases where human remains are found outside recognized cemetery site during construction, the heritage authority must be informed immediately, Lihra (Limpopo Heritage Resource Authority)
- All mitigation measures as recommended by specialists should be applied.

13 General conclusion

An in-depth Environmental Impact Assessment has been undertaken to provide the environmental authorities with sufficient information for the purpose of making an informed decision. The comparative assessment of the specialist findings showed that the route alternatives are all potentially feasible with adequate mitigation measures in place. The comparative assessment of specialist findings highlighted alternative 2 as preferred over 1 and 3,

Summary of findings regarding route alternatives in the farming section of the study area:

Study	Alternative Preferred	Comments
Avifauna	2	1t passes further from the larger Blouberg vulture colony than the other routes.
Vegetation	2	Alternative 1 is the most sensitive. Vegetation has largely been transformed, either by residential developments, or agriculture, both formal irrigation farming and subsistence farming and sensitivity is low on the eastern and central corridors 2 and 3
Heritage	2	It is the one with less potential impact in terms of heritage resources. It has less site density when compared to 1and 3
Wetland	2 (Eastern corridor)	The nature of the watercourses in the alternative corridor are such that the predominantly linear shape of the delineated features will mean that there is greater chance for spanning these features at narrower, as a result alternative 2 is the most preferred
Agriculture	1	The three-powerline corridors traverse an area, which would be classified as high potential due to the presence of centre pivot and linear irrigations system according to the national land potential classification system. However, on relative terms, the eastern corridors traverses more irrigated fields than the western and central corridors and there is also the presence of wetland

		across this corridor. Hence, to avoid significant disturbance, the eastern corridor should be avoided
Social Impact assessment	2	The proposed development is supported by the Social Impact study and within recommendation to use Route 2, which would have less minimal impact to the communities.
Visual Impact Assessment	1	The most preferred alternative. Its alignment along the existing transmission line and transmission servitude is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the roads and servitudes.

During the course of this study, numerous objections to this powerline were received to name a few and more are attached to this report which forms part and parcel of public participation process conducted, from Mr. LouisKotze (farm owner and chairperson of the Waterport Farmers Union), Mr. Wessel van Wyk (owner of Safari Game Lodge), Dr. J.C. Kriek (Kriek Helicopters), Mr. D.R. Fourie (farm owner) and Mr. J. Fourie (farm owner). Their objections were based primarily on loss of farm space-based on the fact that their farms are their source of income such as game farming and dangers imposed by this powerline to aerial game management practices. The highlighted dangers regarding the presence of the transmission powerline to aerial game management must be carefully considered by the environmental authorities during final route selection:

The majority of the specialist studies preferred alternative 2. This was based on the fact that alternative 2 and 3 passes through a sparsely populated area with little environmental sensitivity highlighted.

- During the public meeting held in Nzhelele (2 August 2012), farm owners provided more insight into the 3 alternatives in the area. According to Mr. W. Bezuidenhout, stressed the point that the powerline should follow the railway line rather than crossing into their farms, as this powerline would result in having them no farms since Eskom is continuing constructing lines

13 Recommendations

During the course of the EIA process, numerous specialists were commissioned in order to provide a professional opinion on potential issues resulting from the construction of the 400kV transmission power line between the Borutho and Nzhelele. Detailed public involvement was being conducted to help inform the process and get local opinion on the proposed project. Key interested and affected parties and also farmers were additionally consulted to comment and to enable to open discussion between all parties involved in order to ensure that the development results in the least significant impacts on the receiving environment.

Objections were received with regards to the proposed transmission power line, especially on the farmers side of Waterport and Vivo, Others do not object the powerline they would want to know the process more especially after the submission of the Finally report and the output from the Department of environmental affairs see attached appendix 12 issues and minutes report for the meeting held on 28 May 2013 however some famers did voice their concerns regarding the fact that the power line would not directly benefit them regarding route alternative 2, however it is recommended that Eskom Transmission work closely with the community of Jupiter, Venus, Sefahlane, Boratapelo, Olympus to attempt to implement some form of electricity provision (including solar panels, etc). This small contribution would be greatly appreciated by the local community.

Final route selection should be based on specialist findings as well as public input. None of the proposed alternatives contain fatal flaws, however the over-riding impact of certain alternatives appears to be financially based (for the proponent as well as affected parties).

Mitigation measures for the numerous impacts that have been identified are detailed in this report as well as the individual specialist reports and these mitigation measures must form part of the Environmental authorisation from DEA and the Limpopo Department of Environmental Affairs, to ensure that these impacts are minimised as far as practically possible. The following mitigation measures must be adhered to and apply to the transmission power line in it's entirety.

1. All construction and maintenance activities should conform to generally accepted environmental best practice guidelines at all times. In particular, construction camps should preferably be placed in the towns and not close to natural vegetation so as to minimize the impact of illegal activities such as hunting, snaring, firewood collection.
2. The ECO for the project should attempt to identify any breeding pairs of

raptors (or any other bird species) and report them to Eskom as early as possible in the construction phase so as to allow adequate recommendations to be made with respect to minimising the impact on these birds,

3. The raptor nests should not require any management and should be left alone as far as possible,
4. All sections of power line crossing drainage lines should be marked, only on the one relevant span.
5. Power lines crossing or adjacent to any dams or open water sources should be marked, including one span either side,
6. Since it would be impractical to mark the power line through all the natural vegetation areas to mitigate for collision of species, it is rather suggested that the power line be patrolled annually and areas where collisions have occurred can then be marked reactively,
7. Marking of the power line should be according to the technical specifications,
8. Due to the sensitivity of the wetland areas, the difficulty in distinguishing them from the surrounding habitat, and their apparent absence from the land cover and land use data sets - it will be necessary for the Specialist to conduct a final "walk through" assessment once the exact alignment has been surveyed and each tower position has been pegged. This will allow the identification of exact spans of line that will need to be marked with a suitable marking device.
9. Avoid sensitive habitats, as defined in the sensitivity assessment, when planning the power line route;
10. Avoid populations of species of special concern, when planning power line route
11. Use water sprayers to reduce dust emissions off road surfaces,
12. Ensure effective fire control at camp and construction sites of construction crew,
13. Raise awareness of necessity for fire control,
14. Institute management system to react to veld fires that do occur
15. Use existing access roads as service and construction roads, where possible,
16. Avoid medium to tall vegetation in planning the power line route,
17. Assess the planned pylon sites individually for sensitive ecological, wetland and heritage features;
18. If it is necessary to cross potentially sensitive areas, then attempt to do so in a manner that will cause the least amount of fragmentation,
19. Rehabilitate disturbed areas following construction and monitor erosion in areas previously disturbed until the vegetation has suitably re-established,
20. Don't translocate topsoil from one area to another or bring in topsoil from

other areas,

21. It is recommended that a Community Management and Monitoring Committee (CMMC) be established. This committee would serve as a communication channel between the community and Eskom. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and Eskom. Such a committee will play an important role in executing the proposed mitigation measures. It is anticipated that most social impacts pertaining to the power line will be experienced in the pre- construction and construction phases, with minimal impacts in the operational and decommissioning phases.
22. An Environmental Control Officer must be appointed to ensure contractors conduct themselves in an appropriate way and to make sure that the EMP and the conditions of the Environmental Authorisation implemented.
23. It would be recommended that an entire professional team be assembled to assess tower positions for any sensitivity in order to develop a specific tower EMPr.

Recommendations pertaining to the construction works are as follows:

24. Using existing access routes as much as possible during construction and maintenance of the substation.
25. Limit disturbance to vegetation and rehabilitate disturbed vegetation as quickly as possible.
26. The identification of the protected tree species should be confirmed before any management measures are proposed. If necessary, relevant permits must be obtained in order to relocate or destroy this individual specimen. All measures to relocate this specimen must be investigated as opposed to simply destroying it. This Environmental Impact Report presents the relevant information to the Department of Environmental Affairs and the Limpopo Department of Tourism, Environment for the purpose of decision-making. Authority on the approval and development of the proposed activity as well as the final route alignment selection lies solely in the hands of the delegated decision maker. Nzumbululo Heritage Solutions, as independent consultants, primary involvement in the EIA process is to provide the relevant authority with access to all relevant information in relation to the proposed activity

14 CONCLUDING REMARKS

Introduction

This section concludes the ENVIRONMENTAL IMPACT ASSESSMENT Report for the proposed construction of 400kV power line running for approximately +-250km from Borutho to Nzhelele Substations in Limpopo Province. The proposed location of the power line is in an area, which has already been disturbed especially in the first part of the project from Borutho to the residential areas of Bochum region. While the other part of the study area consists of commercial farming with a mixture of game, cattle and crop cultivation, the preliminary study data does not anticipate permanent barriers to the proposed development. Some sections of the study area contain subsistence farming. As such, several localities along the powerline route and project area are directly affected by the proposed development. Nonetheless, the proposed new power line will provide electricity to the local people and farmers and future developments in Limpopo Province. It is of critical importance that the proposed powerline be considered for approval as proposed subject to all applicable legislative and regulatory conditions being met.

Final Remarks

The power line route is located in an area of medium to high visual quality, and every effort should be made to minimize any further disturbances on the cultural landscape. Where they exist, heritage resources such as graves sites would be protected or avoided during the proposed development. However, given that there are other significant linear developments existing in the area (distribution power lines, railway line, telecommunication and dirt small access roads in some areas in the farming areas etc), and other substation sites, the proposed development will result in similar impacts to the existing infrastructure or landscape in the area.

Recommendation by EAP

Based on the nature and extent of the proposed 400kv powerline, the local level of disturbance predicted as a result of the proposed transmission powerlines, the finds of this EIA and the significance of environmental impacts, it is the opinion of the EAP that the application for the proposed construction of a 400 kv Powerline and associated substation works (NEAS Reference number: DEA/EIA/00010409/2012 and DEA Reference: 14/12/16/3/3/2/287), be authorised by DEA and include the following:

- Construction of 400kv transmission powerline from Borutho substation Mokopane to Nzhelele substation Bokmakierie in Limpopo.

Alterative corridor 2, Eskom must negotiate the route within this corridor with the affected landowners.

Associated works .to integrate the proposed new transmission power line into eskoms electricity transmission grid

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The following conditions of this recommendation must be included within the authorisation to be issued:

- All mitigation measures detailed within this report and the specialist report contained within Appendices must be implemented.
- The draft EMP as contained within Appendix of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed 400kv transmission power line, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for construction and operation of the proposed project is considered to be key in achieving the appropriate environmental management standards as detailed for this project.
- Applications for all other relevant and required permits required to be obtained by Eskom must be submitted to the relevant regulating authorities.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the impact should be kept to a minimum.
- The EMP for construction must be updated to include site-specific information and specifications resulting from the final walk-through surveys. The EMP must be submitted to DEA for approval prior to the commencement of construction on site.
- An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMP for the duration of the construction period.
- Mitigation of the vegetation and heritage impact should be adhered too (i.e. vegetation screening, landscaping or design) is highly recommended, especially in areas where heritage and archaeological resources like graves were identified. The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.
- Bush cutting within the servitude should be limited within the identified sensitive areas, as recommended in the Ecology specialist report forming part of this EIA.

- As far as possible, the transmission line towers should, in spatially constrained sections of the development corridors (i.e. in built-up areas), consist of monopole structures that are less bulky (albeit slightly taller) and less visually intrusive than conventional power line towers. Where space and technical considerations permit, the utilisation of cross rope suspension tower structures is recommended above the conventional self supporting strain towers that are more obtrusive.
- The process of communication and consultation with the community representatives must be maintained after the closure of this EIA process, and, in particular, during the construction phase associated with the proposed project.
- To ensure that social impacts are mitigated during construction and operation, it is recommended that the following be implemented and monitored by the Environmental Control Officer:

  A social management Plan during construction and operation

  A stakeholder Engagement Plan

  A grievance mechanism for the construction and operation phases

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