DRAFT ENVIRONMENTAL IMPACT REPORT

FOR THE

PROPOSED CONSTRUCTION OF THE ARNOT-GUMENI DOUBLE CIRCUIT 400kV TRANSMISSION LINE AND THE INSTALLATION OF A 2ND 500MVA 400/ 132kV TRANSFORMER AT GUMENI SUBSTATION, MPUMALANGA PROVINCE.

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Prepared for:
ESKOM HOLDINGS SOC LIMITED
P O BOX 1091
Johannesburg
2000
RSA

Compiled by:
BAAGI ENVIRONMENTAL CONSULTANCY
PO Box 72847
Lynwood Ridge
0040
RSA

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Consultant details: **BAAGI ENVIRONMENTAL CONSULTANCY** PO Box 72847 Lynwood Ridge 0040 RSA Tel: 012 365 2546 Fax: 012 365 3217 x7 Email: baagi@ee-sa.com info@baagi.co.za	**Client details:** **ESKOM HOLDINGS SOC LIMITED** P O BOX 1091 Johannesburg 2000 RSA Tel: 011 800 4057 Fax: 086 602 9207 Email: mosimaa@eskom.co.za
Compiled by	Mr. Lordwick Makhura and Mr. Ryan Nel
Peer reviewed by	Mr. Lordwick Makhura
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Approved by	
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Please submit your comments to

Ms Marita Oosthuizen

Arnot-Gumeni Project Public Participation Team

Baagi Environmental Consultancy cc

P O Box 72847, Lynwood Ridge, Pretoria, 0040

Tel: 011 782 7487

Fax: 012 365 3217

Email: arnotgumeni@baagi.co.za

The due date for comments on Draft EIR is 10 January 2013

The Draft EIA Report will now be made available for public scrutiny and comment from 14 November 2012 to 10 January 2013 at the following locations:

Place	Address	Contact Details	Contact Person
Wonderfontein Co-op	1 School Street, Wonderfontein	082 773 8776	Mr. Ferdie Brits
Afgri Carolina	C/o Voortrekker & Du Toit Streets, Carolina	017 843 1040	Eileen / Gerhard
Afgri Belfast	5 Duggan Street, Belfast	013 253 1168	Ms. Sandra Ferreira
BKB Co-op	19 Voortrekker Street, Machadodorp	013 256 0064	Ms. Marinda Mare
Steve Tshwete Municipality	Walter Sisulu Street & Wanderers Ave, Middelburg	013 249 7241	Mr. Mandla Mnguni

Two Public Meetings will also be held to discuss the Draft Scoping Report. These meetings will be held as follows:

DAY & DATE	TIME	PLACE
Monday 03 December 2012	10:00 – 12:00	**Machadodorp Farmers' Union Hall**
Tuesday 04 December 2012	19:00 – 21:00	**Wonderfontein Farmers Union**

EXECUTIVE SUMMARY

INTRODUCTION

Eskom generates approximately 95% of the electricity used in South Africa and approximately 45% of the electricity generated in Africa. Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural and residential customers and redistributors. The majority of sales are in South Africa, and therefore, additional power stations and power lines need to be constructed in order to meet the growing electricity demand. Eskom is responsible for providing reliable and affordable power to South Africa.

The growing demand for electricity places increasing pressure on Eskom's existing power generation and transmission capacity. Eskom is committed to implementing a sustainable energy strategy that complements the policies and strategies of National Government. Thus, Eskom wants to expand and upgrade the infrastructure in order to improve the reliability of electricity supply to the country, and in particular to provide for the growth in electricity demand in the Mpumalanga Province.

The study area covers the jurisdiction of two district municipalities, namely the Nkangala District Municipality and the Gert Sibande District Municipality, and based on this the towns of Arnot and Belfast will be affected by the proposed project.

PROJECT NEED AND DESCRIPTION

The power load around the Nelspruit and Emthonjeni areas are mainly supplied by the Praire and Marathon Substations. Part of the transmission network in the Lowveld consumer load network (Prairie, Acornhoek, Marathon, Simplon, Merensky, Infulene, Matola and Komatipoort Main Transmission Substation) is voltage and thermally constrained. In addition, Eskom's Grid Planning Division has received a feasibility application from Assmang Ferrochrome and Nkomati mine with a total demand exceeding 200MW. Theses mining load applications will be supplied directly from the new Gumeni Main Transmission Substation (currently under construction). The Proposed Arnot-Gumeni transmission project, which will assist in resolving the issue of the voltage and thermally constrained Lowveld consumer load network, entails the following:

- Construction of the proposed 400kVdouble circuit transmission line from Arnot to Gumeni substation;
- Installation of a 2nd 500MVA 400/132kV transformer at Gumeni substation.

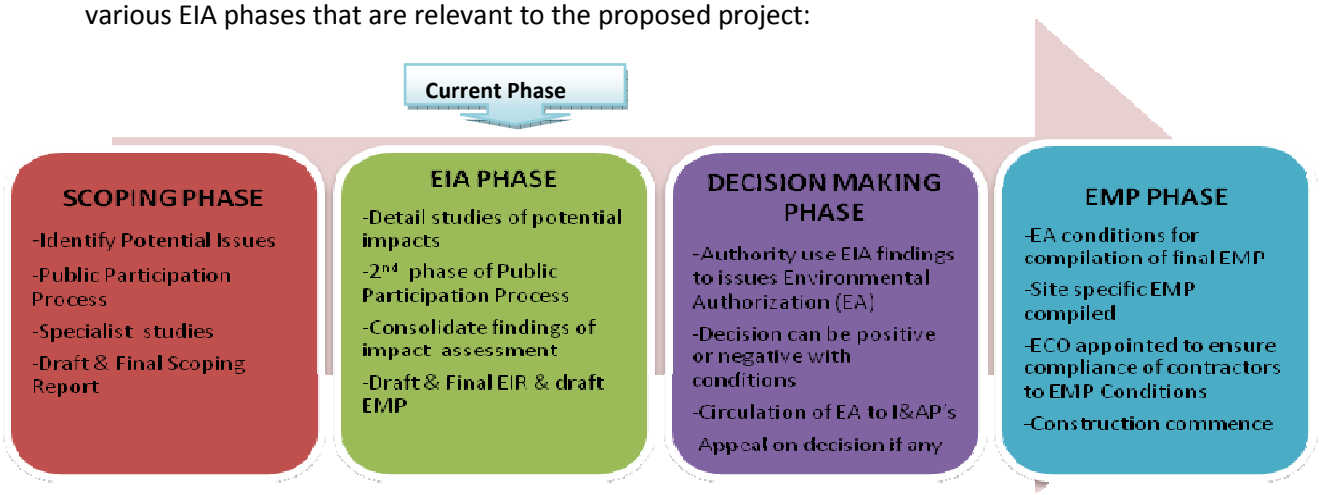
LEGAL FRAMEWORK APPLICABLE TO THE PROPOSED PROJECT

The proposed Arnot - Gumeni double circuit 400kV transmission line and the Installation of a 2nd 500MVA 400/132kV transformer at Gumeni substation falls within an array of required legislation (National, Provincial and Local Government spheres) to which the Eskom must adhere. Key legislation that is applicable to the project include Section 2 of Chapter 1 of the National Environmental Management Act, which provides details of the environmental management principles that should be adhere to all phases of the development. The National

Water Act (NWA) is the main legislative piece that controls both private and public water use within South Africa, as is relevant in terms of any water uses stipulated in Section 21 undertaken by the project. The Heritage Resources Act is concerned with the protection of the archaeological or paleontological sites or meteorites, and requires a permit of the destruction or disturbance thereof. The Biodiversity Act provides for the management and conservation of South Africa's biodiversity within the framework of NEMA and the protection of species and ecosystems that warrant national protection. Finally, the National Environmental Management: Waste Act is the main legislative piece that aims to consolidate waste management within South Africa, and is applicable to any waste related aspect of the project.

ENVIRONMENTAL IMPACT ASSSEMENT PROCESS

The Environmental Impact Assessment (EIA) process consists of various phases, the current phase is the Environmental Impact Phase. The proposed above-mentioned infrastructure development is a listed activity, in terms of the 2010 Environmental Impact Assessment Regulations, of the National Environmental Management Act, 1998 (Act No. 107 of 1998). Listed activities are regarded as activities that have the potential to cause substantial or significant impacts on the environment. An activity listed in the above-mentioned regulations requires environmental authorisation from the competent authority. The following figure details the various EIA phases that are relevant to the proposed project:



PUBLIC PARTICIPATION PROCESS

A Public Participation Process (PPP) is required in an EIA process as per Chapter 6 Section 54 of R543 of the National Environmental Management Act, 1998 (Act No. 107 of 1998). On the basis of the EIA regulation, Interested and Affected Parties (I&AP's) must be given the opportunity to comment on the proposed project and verify that all issues raised during the commenting period of the Scoping Phase, have been recorded.

The following were undertaken during the scoping phase of the public participation process:

- Announcement of the project
- Registration of I&APs
- Public & Stakeholders' Meetings
- Compilation of Issues and Responses Report (IRR).
- Announcement of the EIA phase

ALTERNATIVES

It is best practice in environmental management to consider various alternatives a feasible alternative is chosen. During the identification and assessment of alternatives to be considered for proposed project, the project team consisting of the proponent, Environmental Assessment Practitioner (EAP), specialists and members of the public, played a key role in considering and selecting viable alternatives. The following were considered to be the project alternatives:

- Alignment Alternatives:
  - Alternative 1 (Orange corridor)
  - Alternative 3(Purple corridor)
  - Alternative 5 (green corridor)
- No-Go Alternative

SPECIALIST FINDINGS AND RECOMMENDATIONS

From the initial scoping process and the distillation of issues and associated potential impacts, the need for the numerous specialist studies was identified. The results of the specialist studies are summarised below:

Flora Assessment

The results of the flora assessment found the Green corridor (Alternative 5) as the most suitable and less sensitive while Orange corridor (Alternative 1) was found to be less suitable and most sensitive. The Purple corridor was found to be in the middle between the two corridors in terms of the preference of corridors.

Fauna Assessment

The fauna assessment determined that Alternative 1 corresponds to more habitat types of high perceived ecological value when compared to Alternative 3 and 5. However, Alternative 3 is the least sensitive in terms of the fauna habitats and therefore the preferred route alignment.

Avi–Fauna Assessment

The results of the avi-fauna assessment show that Alternative 1 and Alternative 5 provide important nesting and foraging habitat for crane species, in particular the Wattled Crane when compared to Alternative 3. Alternative 5 (followed by Alternative 1) intersects a greater number of priority crane breeding habitat and also more wetland types when compared to the other corridors. Therefore, the intersection of the different wetland types by Alternative 5 and Alternative 1 could have a greater impact on cranes and waterfowl than Alternative 3.

Wetlands Assessment

In terms of the wetland assessment, the most favourable route is a close match between the Orange Corridor (Alternative 1) and Purple Corridor (Alternative 3). In overall, the Purple Corridor (Alternative 3) is regarded as the most favourable route from a watercourse consideration, while the Orange Corridor (Alternative 1) remained the close second option.

Visual Impact Assessment

According to the visual impact assessment, the recommended route from view perspective is Alternative 5 (Green corridor), however there is no significant difference with other alternatives based on visual sensitivity.

Heritage Impact Assessment

Iron Age stone walled sites are mainly concentrated around the Alternatives 1 and 5 with only a few close to Alternative 3. Alternative 3 would therefore, be the preferred alternative.

Social Impact Assessment

The results of the social impact assessment showed that Alternative 1 and Alternative 5 could be followed from a social perspective. However, based on the preference by the mining industry for Alternative 1 and the fact that there is approved 400kV line and two 275kV lines are already present in close proximity to Alternative 5, as well as the possibility that the Eerstelingsfontein mine would go ahead and that will make alternative 5 to be rather complex if not problematic, Alternative 1 could be more preferred than Alternative 5.

Soil and Agricultural Potential Assessment

Alternative 1, is thus the preferred option when considering the impacts on the region (un-impacted), lands in the areas. It is wise to note that the use of already altered lands (existing works, lay-down areas, etc.), should be prioritised (and thus ranked higher), over the un-impacted lands assessed in this report. This recommendation is made due to the high costs (time and money) associated with rehabilitation and recovery of viable arable lands (yield and natural recoverability).

Town and Regional Planning Assessment

According to a town and regional planning assessment, Alternative 1 and Alternative 5 posses the same land use character, which is agriculture and sporadic mining and there are no major developments or potential developments earmarked within and along the proposed routes. Alternative 3 affects Maputo corridor as well as key areas earmarked for future tourism establishment within the Maputo corridor and it is therefore not recommended.

Geological Overview

The geological overview undertake, shows that in terms of engineering geological constrains, Alternative 5 is the best option, whilst Alternative 3 is regarded as having the highest engineering geological constraints.

The results of specialist studies were used by the EIA team when undertaking the integrated assessment of the proposed development. The outcomes of the integration and assessment are documented in this Draft Environmental Impact Report (this report), which has been released to public domain for comment.

DRAFT ENVIRONMENTAL MANAGEMENT PLAN

The EMP will outline all activities that have to be undertaken, where they will take place, the responsible persons, all possible environmental or social impacts, mitigation measures, rehabilitation plans, monitoring methods, the frequency of monitoring and performance indicators. The EMP will be a legally binding stand-alone document, which will be used to ensure that Eskom adheres to all conditions of the Environmental Authorization (EA) and Environmental Impact Report (EIR).

ENVIRONMENTAL IMPACT STATEMENT

The study area is rich in biodiversity in terms of a flora, fauna, and Avi-fauna perspective. Numerous Red Data species were identified across the taxa. The most notable threatened species of high conservation value within the study area are crane species. Most habitats associated with crane species were delineated or marked as highly sensitive areas and all efforts were made so that the preferred corridor avoids these sensitive areas. Other sensitive areas that were taken into consideration were based on issues regarding potential agriculture (avoidance of centre pivot points), social (avoid resettlement, school) and other infrastructure impacts. Mining activities deemed to be one of the most areas that are likely to be impacted due to the area land use being predominantly mining activities.

It is perceived that the construction and operation of a transmission line will have negative effects on the environment. However, when appropriate mitigations are implemented, the intensity of the impacts is reduced. After careful consideration of the key aspects of environment (i.e. biophysical, social and economic aspects), the preferred corridor is Alternative 1 (Orange corridor). There was minimal distinction in terms of socio-economic and environment between all three alignment alternatives, however, the technical viability of the area to establish the proposed powerlines was considered as an aspect to arrive at the decision for selecting the preferred corridor.

ISIFINYEZO ESIFINGQA KONKE NGAMAFUPHI

ISETHULO

I-Eskom iphehla cishe ugesi olinganiselwa ku-95% wawo wonke ugesi osetshenziswa lapha eNingizimu Afrika kanti ugesi olinganiselwa cishe ku-45% ogaywa e-Afrika. I-Eskom iphehla, ithwale ibuye futhi yabe ugesi ezindaweni zokusebenzela, ezimayini, ezindaweni zokuthengisa, kwezolimo kanye nakumakhasimende angabantu abanemizi yabo kanye nalabo futhi ababuye bazithengisele wona ngesingabo. Indawo enkulu lapho ugesi uthengiswa khona kakhulu kulapha eNingizimu Afrika, kanti lokho-ke kusho ukuthi kufanele kwakhiwe ezinye izindawo ezengeziwe zokuphehla ugesi kanye nolayini bamandla ukuze sikwazi ukuhlangabezana nesibalo esikhulayo sabantu kanye nezindawo ezisebenzisa ugesi. I-Eskom inesibopho sokuhlinzeka ngogesi othembekile kanye nokhonakalayo kwiNingizimu Afrika.

Ukukhula ngamandla kwezindawo ezidinga ugesi kwenza ukuthi ukuphehlwa kwamandla kagesi okuqhubekayo njengamanje kanye nokwabiwa kogesi okwenziwa yi-Eskom kudinge ukuthi kukhushulwe kakhulu ukumelana nesimo esikhona. I-Eskom izimisele ukuveza uhlaka lokwabiwa kogesi oluhambisana nezinqubomgomo ezikhona kanye namacebo kaHulumeni Kazwelonke. Lokho kusho ukuthi i-Eskom ifisa ukukhula kanye nokwenza ngcono ingqalasizinda yayo ukuze ikwazi ukuqhubeka nokuphehla kanye nokuletha ugesi ngokwethembeka ezweni lethu, ikakhulukazi ikwazi ukuhlinzeka kanye nokubhekana nesimo sokukhula kokudingeka kogesi esifundazweni saseMpumalanga.

Izindawo ezicwaningwaywo njengamanje zifaka phakathi omasipala bendawo ababili, okuyiNkangala District Municipality kanye neGert Sibande District Municipality, kanti uma lolu hlelo luqhubeka, amadolobha i-Arnot kanye neBelfast nawo ayothinteka kulolu hlelo oluhlongozwayo.

ISIDINGO SALE PROJEKTHI KANYE NOKUCHAZWA KWAYO

Amandla kagesi ezindaweni ezifana neNelspruit kanye naseMthonjeni avela kwiziphehli zikagesi i-Praire kanye neMarathon Substations. Kanti ezinye izindawo ezithintekayo ekwabiweni kukagesi oya kubantu kwiLowveld yilezi (Prairie, Acornhoek, Marathon, Simplon, Merensky, Infulene, Matola kanye neKomatipoort Main Transmission Substation) kanti lezi zindawo zithathwa njengezithwele kakhulu futhi zinenkinga uma kuziwa ngasemandleni kagesi. Ukwengeza nje kulokhu uphiko lwakwa-Eskom, okuyi-Grid Planning Division lusanda kuthola isicelo esivela emayini i-Assmang Ferrochrome and Nkomati lapho khona ibisazisa ukuthi ugesi ezowudinga manje uzoba ngaphezulu kuka-200MW. Kanti la mandla kagesi amaningi kangaka azovela ngqo esiteshini esiphehla ugesi esisga okuyiGumeni Main Transmission Substation (nokumanje sisakhiwa). Kanti le projekthi ehlongozwaywo yokuphehla ugesi okuyi-Arnot-Gumeni transmission project, neyosiza kakhulu ekuxazululeni izinkinga zokushoda kwamandla kagesi, ifaka phakathi lokhu okulandelayo:

- Ukwakhiwa kolayini kagesi ohlongozwayo ozoba namandla angu-400kV usuka kwisiphehli sikagesi e-Arnot uya eGumeni substation;

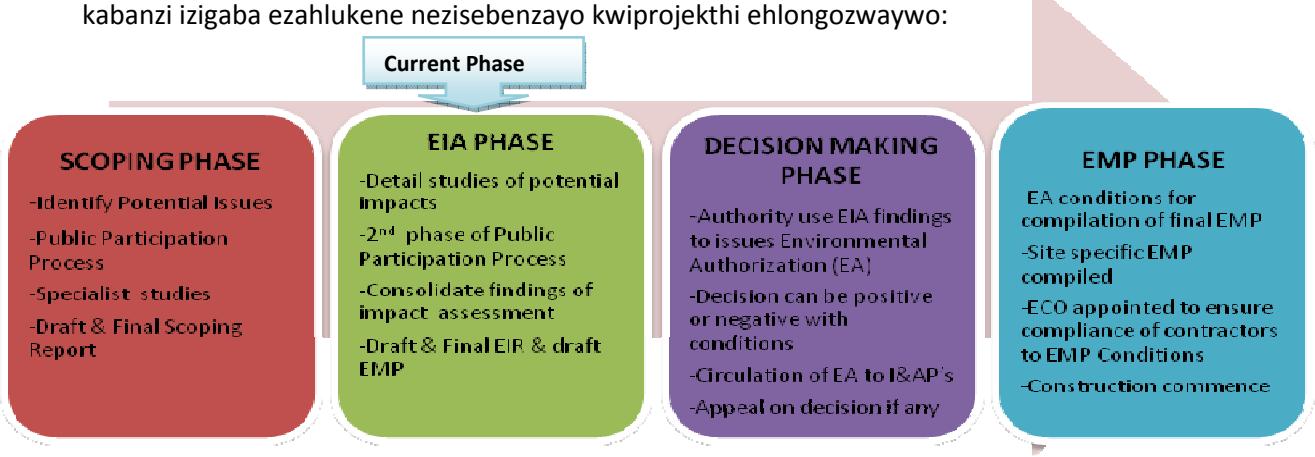
- Ukufakwa kwesiphehli sikagesi sesibili esiyi-500MVA 400/132kV eGumeni substation.

UHLAKA LOMTHETHO OSEBENZA KULE PROJEKTHI EHLONGOZWAYO

Lo layini ohlongozwayo okuyi-Arnot - Gumeni double circuit 400kV transmission line kanye nokufakwa kwesiphehli sikagesi sesibili okuyi-500MVA 400/132kV eGumeni substation kuyahambisana nemithetho edingekayo (ezinhlakeni zikaZwelonke, Zesifundazwe kanye noHulumeni Bendawo) nokuyimithetho nakanjani i-Eskom okufanele uyihloniphe. Kanti umthetho oqonde ngqo nokuyiwona osebenzayo kule projekthi ufaka phakathi Isigaba 2 seSahluko 1 soMthetho Kazwelonke Wokuphathwa Kwemvelo, nohlinzeka ngemininingwane ngemigomo yokuphathwa kwezemvelo nokufanele ukuthi ilandelwe kuzona zonke izigaba zentuthuko. UMthetho Kazwelonke Wamanzi (NWA) yiwona mthetho omkhulu kakhulu olawula ukusetshenziswa kwamanzi kwangasese kanye nokwasemphakathini lapha ngaphakathi eNingizimu Afrika, kanti uyasebenza kunoma yikuphi ukusetshenziswa kwamanzi okubalulwe kwiSigaba 21 esenziwe yiprojekthi. UMthetho Wezinsiza Zamagugu umayelana nokuvikelwa kwezindawo ezingamagugu noma ukuvikela izindawo ezithile, futhi kudingeka izimvume ezithile ukubulala noma ukuphazamisa izindawo ezifana nalezo. UMthetho Wezinto Eziphila Ndawonye uhlinzeka ngokuphathwa kanye nokongiwa kwezinto eziphila ndawonye eNingizimu Afrika ngokulandela umthetho i-NEMA kanye nokuvikelwa kwezilwane kanye nezitshalo okuphila ndawonye nokudingwa ukuvikelwa. Okokugcina, bese kuba uMthetho Kazwelonke Wokuphathwa Kwezemvelo: uMthetho Wemfucuza, yiwona mthetho omkhulu kakhulu ohlose ukuqinisa ukuphathwa kwemfucuza lapha ngaphakathi eNingizimu Afrika, kanti usebenza kunoma yimuphi umkhakha omayelana nemfucuza kwiprojekthi ehlongozwaywo.

UHLELO LWEGALELO LOKUHLOLWA KWEZEMVELO

Uhlelo Lokuhlolwa Komthelela Kwezemvelo (EIA) luyizigaba eziningi ezahlukene, kanti isigaba esikuso njengamanje Yisigaba Semithelela Kwezemvelo. Lokhu kuthuthukiswa kwengqalasizinda okuhlongozwaywo okungenhla kuwumsebenzi obaliwe, ngokwemibandela Yemitheshwana Yokuhlolwa Kwemithelela Kwezemvelo yangonyaka ka 2010, nokungeyoMthetho Kazwelonke Wokuphathwa Kwemvelo, 1998 (uMthetho onguNo. 107 ka 1998). Imisebenzi ebaliwe-ke yimisebenzi ethathwa ngokuthi kungenzeka ibangele imithelela ethile emikhulu kwimvelo okungabe kwakhiwa kuyo. Umsebenzi obalulwe kule mitheshwana ebalwe ngenhla udinga ukuthi kube nokugunyazwa kwawo ngokwezemvelo lokho kwenziwa yisikhungo esifanele ngaphambi kokuba kuze kube khona okwenziwayo ngawo. Lo mdwebo olandelayo ubalula kabanzi izigaba ezahlukene nezisebenzayo kwiprojekthi ehlongozwaywo:



UHLELO LOKUBANJWA KWEQHAZA NGUMPHAKATHI

Uhlelo Lokubanjwa Kweqhaza Ngumphakathi (PPP) luyadingeka ngesikhathi kuhlolwa imithelela kwezemvelo njengalokhu ludingeka ngoSahluko 6 Isigaba 54 sika R543 woMthetho Kazwelonke Wokulawulwa Kwezemvelo, 1998 (uMthetho onguNo. 107 ka 1998). Ngokwemibandela yokulawula Kokuhlolwa Kwemithelela Kwezemvelo (EIA), labo bantu Abanentshisekelo kanye Nabathintekayo kulokhu (I&AP's) kufanele banikezwe ithuba lokuphawula ngeprojekthi ehlongozwayo bese futhi beqinisekisa ukuthi zonke izinto okukhulunyiswene ngazo ngesikhathi kuxhunywana nabo ngesikhathi Sokuxhumana Nomphakathi, zirekhodiwe.

Lezi zinto ezilandelayo zaye zenziwa ngesikhathi kukhulunyiswana futhi kuboniswana nemiphakathi mayelana nale projekthi:

- Ukumenyezelwa kweprojekthi
- Ukubhaliswa Kwalabo Abanentshisekelo Nabathintekayo Kulokhu (I&APs)
- Imihlangano Nomphakathi & Nababambiliqhaza
- Ukuhlanganiswa Kombiko Wezinto Ezibalilekile kanye Nezimpendulo (IRR).
- Ukumenyezelwa kwesikhathi se-EIA

EMINYE IMIZILA ENGAZANYWA

Kuyindlela ekahle yokusebenza ekuphathweni kwemvelo ukuthi kuzanywe noma kubhekwe ezinye izindlela ezahluleke ukuze kubhekwe ukuthi ngabe zikhona yini ezifanele nezingasetshenziswa na. Ngesikhathi sokuhlonza kanye nokuhlola ezinye izindawo noma izindlela ezingasetshenziswa kule projekthi ehlongozwaywo, ithimba leprojekthi elalifaka phakathi umqali wendlela nokuyinkampani ehlongoza le projekthi, kwase kuba Umuntu Oqeqeshelwe Ukuhlola Imithelela Yezemvelo (EAP), ongoti abathile kanye namalungu omphakathi, bonke badlala indima ebonakalayo ekubhekweni kanye nasekucatshangweni ngezinye izindlela noma imizila eyangalandelwa kulokhu. Lezi zindlela ezilandelayo kwaba yiyona mizila okwavunyelwana ngayo ukuthi kungaba yiyona mizila eminye kwiprojekthi eyayingalandelwa:

- Imizila Okuhanjiswana Nayo:
    - Umzila 1 (Umgudu Osawolintshi)
    - Umzila 3(Umgudu Osabukhwebezane)
    - Umzila 5 (Umgudu Oluhlaza Okotshani)
- Umzila Ongu-Alubhadwa

LOKHO OKWATHOLWA OCHWEPHESHE KANYE NEZINCOMO

Kusukela ohlelweni lokuqala lokuhlungwa kuya ekuhlaziyweni kwezinto ezithintekayo kanye nemithelela ehambisana nalokho, isidingo socwaningo olubanzi olwenziwa ongoti noma ochwepheshe bemikhakha eyahlukene kwabonakala kufanele lwenziwe. Kanti imiphumela yezincwaningo ezahlukene ibekwe ngamafuphi lapha ngezansi:

Ukuhlolwa Kwezitshalo Nezimila

Imiphumela yokuhlolwa kwezitshalo nezimila ithele ukuthi Umgudu Oluhlaza Okotshani (Umzila 5) yiwona ofanele kakhulu ukuthi ungasetshenziswa futhi awuzweli kakhulu kwase kuthi Umgudu Osawolintshi wona (Umzila 1) watholwa ukuthi awufanele kahle hle ukuthi ungasetshenziswa futhi wakhombisa ukuzwela kakhulu. Kanti Umgudu Obukhwebezane wona watholwa ukuthi uphakathi nendawo kule migudu emibili uma kuyiwa ngasekukhetheni ukuthi yiwona muphi umgudu okhethwaywo nothandwaywo ukuthi ungasetshenziswa.

Ukuhlolwa Kwezilwanyana Ezincane Eziphila Endaweni

Ukuhlolwa kwezilwane eziphila endaweni kwaveza ukuthi Umzila 1 unezilwanyana ezincane eziningi kakhulu ezihlala kwindawo edinga ukongiwa. Lokhu kwatholakala uma Umzila 1 uqhathaniswa Nomzila 3 kanye Nomzila 5. Yize-ke kunjalo, kepha Umzila 3 kwatholakala ukuthi yiwona ongazweli kakhulu uma kubhekwa ngasohlangothini lwezilwanyana eziphila kuleya ndawo kwase-ke kuphethwa ngokuthi yiwona mzila lona okwakufanele ukuthi usetshenziswe.

Ukuhlolwa Kohlobo Oluthile Lwezinyoni Eziphila Kuleya Ndawo

Imiphumela yokuhlola uhlobo oluthile lwezinyoni eziphila kuleya ndawo ibonisa ukuthi Umzila 1 kanye Nomzila 5 ihlinzeka ngezindawo ezibaluleke kakhulu ekuzaleleni kwalezi zinyoni laphayana kanye nokuhlala nje kwezinyoni ezinemilomo emide kanye nemicondo emide ikakhulukazi oBhamukwe uma le mizila iqhathaniswa Nomzila 3. Umzila 5 (ulandelwe Umzila 1) usebenza njengayona ndawo enkulu ekuzaleleni kwalezi zinyoni ezindekazi ngoba phela futhi ziyizinyoni ezithandayo nokugcaluza emaxhaphozini, kanti yomibili le mizila esishiwo ngenhla inazo lezo zindawo ezihlala zinamanzi. Ngakho-ke, ukuba khona kwezindawo ezihlala zimanzi Kumzila 5 kanye Nomzila 1 kungenzeka kube nomthelela omkhulu kakhulu kulezi zinyoni ezingomdeyide kanye nezinye nje izinyoni zamanzi. Lokhu kungaba ngaphezu kokuba kwenzeka Kumzila 3.

Ukuhlolwa Kwezindawo Ezihlala Zinamanzi

Ngokokuhlolwa kwezindawo ezihlala zinamanzi, umzila okuyiwona othande ukudla ubhedu kube yimizila emibili ebambane eduzane phakathi Komgudu Osawolintshi (Umzila 1) kanye Nomgudu Obukhwebezane (Umzila 3). Lilonke-ke nje, Umgudu Obukhwebezane (Umzila 3) uthathwa njengawona mzila onconywaywo uma kubhekwa ukuhamba kwamanzi endaweni kanti njalo Nomgudu Osawolintshi (Umzila 1) nawo awukude kakhulu ngokuthandwa, usezithendeni futhi ulale isibili emigudwini okungakhethwa kuyona.

Ukuhlolwa Komthelela Wokubonakala Kwendawo

Ngokokuhlolwa komthelela wokubonakala kwendawo, umzila onconywaywo uma kuziwa ngasekukwazini ukuthi kubonakale izindawo eziningi nguMzila 5 (Umgudu Oluhlaza Okotshani), yize-ke kunjalo, kodwa akukho mehluko otheni phakathi neminye imizila uma kuziwa ngasekubonakaleni kwezindawo ezithile.

Ukuhlolwa Komthelela Kumagugu Namasiko

Izindawo zakudala ezibiyelwe ngezindonga zangesikhathi Sokuqala Kokusetshenziswa Kwensimbi ziqaqelene Nemizila 1 kanye no-5 bese kuba khona nezinye izindawana ezimbalwa

ezisondelene Nomzila 3. Kanti lokhu kusho ukuthi-ke Umzila 3 kungaba yiwona mzila okhethwayo lapha.

Ukuhlolwa Komthelela Kwezenhlalakahle

Imiphumela yomthelela kwezenhlalakahle iye yabonisa ukuthi Umzila 1 kanye Nomzila 5 yiyona mizila engalandelelwa uma kuziwa ngasohlangothini lwezenhlalakahle. Kodwa-ke, uma kubhekwa umzila okhethwe yilabo bemboni yezimayini kuleya ndawo, Nokuwumzila 1 kanye nokuthi vele kumanje kunolayini abakhona ababili asebephasisiwe abangu-400kV kanye no-275kV abaseduzane Nomzila 5, kuhlanganisa nanokuthi imayini i-Eerstelingsfontein isazoqhubeka kuleya ndawo, lokho kungenza ukuthi Umzila 5 ube nezinto eziningi okudingeka ukuthi kuqalwe kudlulwe kuzo futhi nje kungenzeka usinike nezinkinga, Umzila 1 yiwona okunganconywa ukuthi usetshenziswe ukunoMzila 5.

Ukuhlolwa Komhlabathi kanye Nezolimo Ezingahle Zibe Khona

Umzila 1, yiwona mzila okunconywa ukuthi ungasetshenziswa uma ubheka imithelela esifundeni umhlaba (ongenamithelela nongathinteki kulokhu), kanye neminye imihlaba nje kuleyo ndawo. Kuwubuhlakani-ke nokho ukuqaphela ukuthi ukusebenzisa imihlaba esivele isidatshuliwe (imisebenzi evele ikhona, izindawo eziphansi, njl.), kufanele kube yinto ebekwa phambili (futhi ibekwe phezulu eqhulwini), ngaphezu kwemihlaba enganamithelela neye yahlolwa kulo mbiko. Lesi sincomo-ke senziwe ngenxa yezindleko eziphezulu (isikhathi kanye nemali) ezihlobene nokulungisa kanye nokuthola eminye imihlaba efanele nabayokwazi ukulima kuyo labo bezolimo (ukuze ikwazi ukukhiqiza futhi ibe sesimweni sokusimama esifanele).

Ukuhlolwa Okuthinta Ukuhlelwa Kwedolobha kanye Nesifunda

Ngokombiko wokuhlolwa kwamadolobha kanye nesifunda, yombili imizila, okunguMzila 1 kanye Nomzila 5 inokusebenziseka okufanayo kwindawo yayo, nokungezolimo kanye nezimayini ezithe gqwagqwa kanti akukho ntuthuko enkulu engahle yenzeke nokucatshangelwa ukuthi ingahle ibe khona kule mizila noma eceleni kwale mizila ehlongozwayo. Kanti Umzila 3 wona uthanda ukuthikameza umgudu waseMaputo kanye nezinye izindawo ezinqala ezibekelwe ukuthi zithuthukiselwe ezokuvakasha ngomuso ngaphakathi kumgudu waseMaputo nokusho ukuthi-ke Umzila 3 akunconywa neze ukuthi ungasetshenziswa.

Isithombe Esibanzi Ngendawo Jikelele

Ukubheka isithombe esibanzi ngendawo jikelele, kubonisa ukuthi ngokwezingqinamba zokumbiwa kwezindawo ezithile, Umzila 5 yiwona mzila ongcono kakhulu nongasetshenziswa, kanti Umzila 3 wona uthathwa ngokuthi uyonikeza onjiniyela izinkinga eziningi kakhulu uma kusetshenziswa wona.

Imiphumela yezincwaningo ezenziwe ngochwepheshe iye yasetshenziswa yithimba le-EIA ngenkathi lihlaziya futhi lihlola le ntuthuko ehlongozwayo kuleya ndawo. Imiphumela yokubhekwa kanye nokuhlolwa kwendawo ibhaliwe kulolu Hlaka Lombiko Wemithelela Kwezemvelo (okuyilo mbiko), kanti iye yakhishelwa emphakathini ukuze umphakathi uphawule ngayo.

UHLAKA LOHLELO LOKUPHATHWA KWEZEMVELO

Uhlelo Lokuphathwa Kwezemvelo (EMP) luyohlaziya yonke imisebenzi okuyodingeka ukuthi yenziwe, nokuthi iyokwenzelwa kuphi, anatu okuyodingeka bayengamele, yonke imithelela yezenhlalakahle kanye neyezemvelo okungenzeka ibe khona, izindlela zokulungisa izimo ezidinga ukulungiswa, izinhlelo zokwenza ngcono izindawo ezithile, izindlela zokubheka ukuqhutshwa komsebenzi, izikhawu zokubheka umsebenzi kanye nezinkomba zokwenziwa komsebenzi. I-EMP kuyoba yidokhumenti esemthethweni neyobophezela wonke umuntu, neyosetshenziselwa ukuqinisekisa ukuthi i-Eskom iyayilandela yonke imigomo Yokugunyazwa Ngokwezemvelo (EA) kanye Nombiko Womthelela Kwezemvelo (EIR).

ISITATIMENDE SEGALELO NOMA SOKUTHINTEKA KWEZEMVELO

Le ndawo ecwaningwaywo icebe ngezemvelo ezahlukene nesingabala phakathi kwazo izihlahlana ezinhle ezincane noma izimbali nezimila, izilwanyana ezincane ezithile kuhlanganisa nohlobo oluthile lwezinyoni ezitholakala kuleya ndawo kuphela. Kanti nezihlahla ezithile ezivikelekile zaye zabonakala nazo kuleya ndawo ziwumhlambi. Izilwane okuyizona ezatholakala kakhulu kuleziya zindawo nokucatshengelwa ukuthi yizona ezisengcupheni enkulu yokushabalala kwaba yizinyoni ezinde ezisho ngemilomo yazo emide kanye nemicondo yazo. Kanti izindawo eziningi ezihlala lolu hlobo lwalezi zinyoni zamakwa njengezindawo ezinokuzwela okukhulu kanti kwenziwa yonke imizamo ukuthi imigudu ekhethwayo igweme lezo zindawo ezazingaphazamisa noma zishabalalise lezi zilwane. Ezinye izindawo ezizwelayo nezabhekwa kwakugxilwe kakhulu ezintweni ezifana nokuthi kungenzeka kube yizindawo ezisetshenziselwa ezolimo ngomuso (ukugwenywa kwezindawo ezibaluleke kakhulu kulokhu), izindawo zenhlalakahle (ukugwema ukuthuthwa kwabantu, izikole) noma-ke eminye imithelela yengqalasizinda eyayinokwenzeka. Imisebenzi yokumba noma ezezimayini ezinye zezindawo eziyoba nokuthinteka okukhulu kulolu hlelo ezindaweni eziningi ngenxa yokuthi vele umhlaba omningi kuleziya zindawo usetshenziselwa ukumba noma yona imisebenzi yezimayini.

Kucatshangelwa ukuthi ukwakhiwa kanye nokusebenza kolayini othwala amandla kagesi kuyoba nomthelela ongemuhle kahle kwimvelo. Yize-ke kunjalo, kodwa uma imigudu efanele ilandelwe, ubungako bomthelela bungancishiswa kakhulu. Ngemuva kokubheka ngokucophelela okukhulu izinto ezinqala zezemvelo (esingabala phakathi kwazo izinto eziphilayo, ezemvelo kanye nezemnotho), indlela okuyiyona okunconywa ukuthi ingasetshenziswa kungaba Indlela Ekhethiwe 1 (Orange corridor). Kuye kwaba nomehluko omncane phakathi kwesimo sezenhlalakahle kanye nezomnotho phakathi kwazo zonke izindlela ezintathu obekungakhethwa kuzo, kodwa-ke futhi kuye kwabhekwa nokuthi kungasebenzeka yini kule ndlela uma sekwakhiwa izintambo zikagesi nokuyikhona okuholele ekutheni ekugcineni kukhethwe le ndawo ekhethiwe.

UITVOERENDE OPSOMMING

INLEIDING

Eskom wek ongeveer 95% van die elektrisiteit op wat in Suid-Afrika verbruik word en ongeveer 45% van die elektrisiteit wat in Afrika opgewek word. Eskom wek op, gelei en versprei elektrisiteit aan nywerheid-, mynbou-, kommersiële, landbou- en residensiële verbruikers en herverspreiders. Die grootste deel van die verkope is in Suid-Afrika en gevolglik is dit nodig dat bykomende kragstasies en kragdrade opgerig word om te voldoen aan die groeiende elektrisiteitsaanvraag. Eskom is daarvoor verantwoordelik om betroubare en bekostigbare elektrisiteit aan Suid-Afrika te voorsien.

Die groeiende elektrisiteitsaanvraag plaas toenemende druk op Eskom se bestaande kragopwekking- en transmissiekapasiteit. Eskom is daartoe verbind om 'n volhoubare energiestrategie te implementeer wat die beleide en strategieë van die nasionale regering aanvul. Gevolglik wil Eskom die infrastruktuur uitbrei en opgradeer ten einde die betroubaarheid van elektrisiteitsvoorsiening aan die land te verbeter en om veral voorsiening te maak vir die stygende elektrisiteitsaanvraag in die Mpumalanga-provinsie.

Die studiegebied dek die jurisdiksie van twee distriksmunisipaliteite, naamlik die Nkangala Distriksmunisipaliteit en die Gert Sibande Distriksmunisipaliteit. Op grond hiervan sal die dorpe Arnot en Belfast deur die voorgestelde projek geraak word.

PROJEKBEHOEFTE EN BESKRYWING

Die kraglading rondom die gebiede van Nelspruit en Emthonjeni word hoofsaaklik deur die Praire- en Marathon-substasies voorsien. Deel van die transmissienetwerk in die Laeveld se verbruikerladingsnetwerk (Prairie, Acornhoek, Marathon, Simplon, Merensky, Infulene, Matola en Komatipoort Hooftransmissiesubstasie) is ten opsigte van stroomspanning asook termies beperk. Hierbenewens het Eskom se Kragroosterbeplanningsafdeling 'n uitvoerbaarheidsaansoek ontvang van Assmang Ferrochrome en Nkomati-myn met 'n totale aanvraag wat 200MW oorskry. Hierdie mynbou-aansoeke om lading sal regstreeks deur die nuwe Gumeni Hooftransmissiesubstasie (wat tans gebou word) voorsien word. Die voorgestelde Arnot-Gumeni transmissieprojek, wat sal help om die vraagstuk van die spanning- en termies beperkte verbruikerladingsnetwerk in die Laeveld te verlig, behels die volgende:

- Konstruksie van die voorgestelde 400kV dubbelstroom-transmissielyn van Arnot tot Gumeni substasie;
- Installering van 'n tweede 500MVA 400/132kV transformator by Gumedi-substasie.

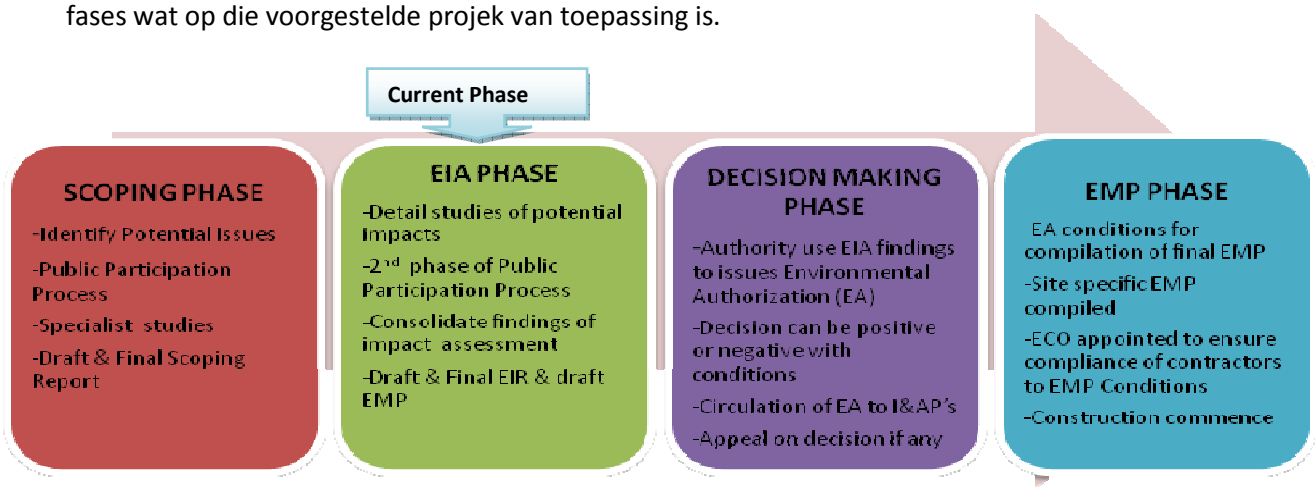
REGSRAAMWERK VAN TOEPASSING OP DIE VOORGESTELDE PROJEK

Die voorgestelde Arnot - Gumeni dubbelstroom 400kV transmissielyn en die installering van 'n tweede 500MVA 400/132kV transformator by Gumeni-substasie val binne 'n verskeidenheid vereiste wetgewing (Nasionale, Provinsiale en Plaaslike Regering-sfere) waaraan Eskom moet voldoen. Sleutelwetgewing wat op die projek van toepassing is, sluit Artikel 2 van Hoofstuk 1

van die Wet op Nasionale Omgewingsbestuur in, wat besonderhede verstrek van die beginsels van omgewingsbestuur waartydens daar in alle fases van die ontwikkeling voldoen moet word. Die Nasionale Waterwet (NWW) is die belangrikste wetgewing wat beide private en openbare waterverbruik in Suid-Afrika reguleer, soos relevant is ten opsigte van enige watergebruike wat ingevolge Artikel 21 deur die projek onderneem word. Die Wet op Erfenishulpbronne behels die beskerming van die argeologiese of paleontologiese terreine of meteoriete en vereis 'n permit vir die vernietiging of versteuring daarvan. Die Wet op Biodiversiteit maak voorsiening vir die bestuur en bewaring van Suid-Afrika se biodiversiteit binne die raamwerk van die Wet op Nasionale Omgewingsbestuur, en die beskerming van spesies en ekosisteme wat nasionale beskerming regverdig. Laastens is die Wet op Nasionale Omgewingsbestuur: Afval die vernaamste wetgewing wat ten doel het om afvalbestuur in Suid-Afrika te konsolideer en dit is van toepassing op enige aspek van die projek wat met enige afval te make het ..

OMGEWINGSIMPAKBEPALINGSPROSES

Die Omgewingsimpakbepaling (OIB) proses bestaan uit verskeie fases. Die huidige fase is die Omgewingsimpakfase. Die bogenoemde voorgestelde infrastruktuurontwikkeling is kragtens 2010 Omgewingsimpakbepalingsregulasies van die Wet op Nasionale Omgewingsbestuur, 1998 (Wet Nr. 107 van 1998) 'n gelyste aktiwiteit. Gelyste aktiwiteite word beskou as aktiwiteite wat die potensiaal het om 'n omvangryke of beduidende impak op die omgewing te hê. 'n Gelyste aktiwiteit wat in die bogenoemde regulasies verskyn, vereis omgewingsmagtiging van die bevoegde owerheid. Die onderstaande figuur verstrek besonderhede van die onderskeie OIB-fases wat op die voorgestelde projek van toepassing is.



Translation of figure:

Huidige fase

OMVANGBEPALINGSFASE	OIB-FASE	BESLUITNEMINGFASE	OBP-FASE
- Identifiseer moontlike kwessies - Openbare deelnameproses - Spesialisstudies	- Gedetailleerde studies van potensiële impak - Tweede fase van openbare deelnameproses	-Owerheid gebruik OIA-verslag om Omgewingsmagtiging (OM) uit te reik - Besluit kan positief of negatief met	- OA-voorwaardes vir samestelling van finale OBP - - Terrein-spesifieke OBP saamgestel

- Konsep- en finale Omvangbepalingsverslag	- Konsolidering van bevindings van Impakbepaling - Konsep- en finale OIV en konsep OBP	voorwaardes wees - Verspreiding van OA aan B&GP'e - Appèl teen besluit, indien enige	- - ONB aangestel om te verseker dat kontrakteurs aan OBP-voorwaardes voldoen - Konstruksie begin

OPENBARE DEELNAMEPROSES

'n Openbare deelnameproses (ODP) word kragtens Hoofstuk 6, Artikel 54 van R543 van die Wet op Nasionale Omgewingsbestuur, 1998 (Wet Nr. 107 van 1998) in die OIB-proses vereis. Ingevolge die OIA-regulasie moet Belangstellende en Geraakte Partye (B&GP'e) die geleentheid gebied word om op die voorgestelde projek kommentaar te lewer en seker te maak dat alle kwessies wat tydens die kommentaartydperk van die Omvangbepalingsfase geopper is, aangeteken is.

Die volgende is onderneem tydens die omvangsbepalingsfase van die openbare deelnameproses:

- Aankondiging van die projek
- Registrasie van B&GP'e
- Openbare & Belanghebbervergaderings
- Samestelling van Kwessies & Antwoorde-verslag (KAV)
- Aankondiging van die OIB-fase.

ALTERNATIEWE

In omgewingsbestuur is dit beste praktyk om verskeie alternatiewe te oorweeg voordat daar op 'n uitvoerbare alternatief besluit word. Tydens die identifisering en assessering van alternatiewe wat vir die voorgestelde projek oorweeg is, het die projekspan 'n sleutelrol gespeel in die oorweging en keuse van uitvoerbare alternatiewe. Die projekspan het uit die Omgewingsassesseringspraktisyn (OAP), spesialiste en lede van die publiek bestaan. Die volgende is as projekalternatiewe oorweeg:

- Belyningsalternatiewe:
  - Alternatief 1 (Oranje deurgang)
  - Alternatief 3(Pers deurgang)
  - Alternatief 5 (Groen deurgang)
- Onuitvoerbare Alternatief

BEVINDINGS EN AANBEVELINGS VAN SPESIALISTE

Uit die aanvanklike omvangbepalingsproses en die distellering van kwessies en gepaardgaande potensiële impakte, is die behoefte aan verskeie spesialisstudies geïdentifiseer. Die resultate van die spesialisstudies word hieronder saamgevat

Flora

Die resultate van die assessering van die flora het bevind dat die Groen deurgang (Alternatief 5) die geskikste en minder sensitief is terwyl die Oranje deurgang (Alternatief 1) die ongeskikste en mees sensitiefste is. In terme van voorkeur-deurgange is die Pers deurgang beskou as synde tussen die twee gange te lê.

Fauna

Assessering van die fauna het bepaal dat Alternatief 1 meer ooreenkom met habitatsoorte wat as soorte met 'n hoë ekologiese waarde beskou word, vergeleke met Alternatief 3 en 5. Alternatief 3 is egter die minste sensitief in terme van fauna-habitats en gevolglike die voorkeur-roetebelyning.

Avi–fauna

Die resultate van die assessering van avi-fauna toon dat Alternatief 1 en Alternatief 5 belangrike nes- en voerhabitat vir kraanvoëlspesies, veral die lelkraanvoël, bied, vergeleke met Alternatief 3. Alternatief 5 (gevolg deur Alternatief 1) deurkruis 'n groter aantal voorkeur-teelhabitats van kraanvoëls en ook meer vleilandsoorte vergeleke met die ander deurgange. Gevolglik kan die kruispunt van verskillende vleilandsoorte by Alternatief 5 en Alternatief 1 'n groter impak op kraanvoëls en watervoëls hê as Alternatief 3.

Vleilande

In terme van vleiland-assessering is die Oranje deurgang (Alternatief 1) en die Pers deurgang (Alternatief 3) kop aan kop as die gunstigste roete. Algeheel word die Pers deurgang (Alternatief 3) in terme van die oorweging van waterlope as die gunstigste roete beskou terwyl die Oranje deurgang (Alternatief 1) 'n sterk tweede opsie bly.

Visuele impak

Volgens die assessering van die visuele impak is die aanbevole roete vanuit 'n uitsigperspektief Alternatief 5 (Groen deurgang). Daar is egter op grond van visuele sensitiwiteit geen beduidende verskil met ander alternatiewe nie.

Erfenisimpak

Ommuurde terreine uit die Ystertydperk is hoofsaaklik rondom Alternatief 1 en 5 gekonsentreer met slegs enkeles naby Alternatief 3. Alternatief 3 is gevolglik die voorkeur-alternatief.

Sosiale impak

Die resultate van die assessering van sosiale impak het aangedui dat Alternatief 1 en Alternatief 5 vanuit 'n sosiale perspektief gevolg kan word. Op grond van die voorkeur wat deur die

mynboubedryf aan Alternatief 1 verleen word en die feit daar reeds ‘n goedgekeurde 400 kV lyn en twee 275 kV lyne in die nabye omgewing van Alternatief 5 bestaan, asook die moontlikheid dat die Eerstelingsfonteinmyn kan voortgaan, is Alternatief 5 redelik kompleks en selfs problematies. Alternatief 1 geniet voorkeur bo Alternatief 5.

Grond- en landboupotensiaal

Alternatief 1 geniet voorkeur wanneer die impakte op die streek se (onbewerkte) grond oorweeg word. Dit is belangrik om daarop te let dat die gebruik van grond wat reeds gewysig is (bestaande werke, neerlegsels, ens.) voorkeur moet geniet (en dus ‘n hoër rang moet dra) bo die onbewerkte grond wat in hierdie verslag geassesseer word. Hierdie aanbeveling word gedoen op grond van die hoë koste (tyd en geld) wat met die rehabilitasie en herstel van vatbare landbougrond (opbrengs en natuurlike herstel) gepaard gaan.

Stads- en streeksbeplanning

Volgens ‘n assessering van stads- en streeksbeplanning het Alternatief 1 en Alternatief 5 dieselfde grondgebruik, naamlik landbou en sporadiese mynbou en word daar geen groot ontwikkelinge of potensiële ontwikkelinge binne en langs die voorgestelde roetes beplan nie. Alternatief 3 raak die Maputo-deurgang asook sleutelgebiede waar toekomstige toerisme-ontwikkelinge binne die Maputo-deurgang beplan word en word dus nie aanbeveel nie.

Geologiese oorsig

Die geologiese oorsig wat onderneem is, het getoon dat Alternatief 5 in terme van ingenieurs- en geologiese beperkings die beste opsie is, terwyl Alternatief 5 beskou word as die een met die meeste ingenieurs- en geologiese beperkings.

Die resultate van die spesialisstudies is deur die OIB-span gebruik tydens die geïntegreerde assessering van die voorgestelde ontwikkeling. Die resultate van die integrasie en assessering is in hierdie Konsep Omgewingsimpakverslag geboekstaaf wat aan die publiek vrygestel is vir kommentaar.

KONSEP OMGEWINGSBESTUURSPLAN

DIE OBP sal die buitelyne skets van alle aktiwiteite wat onderneem sal word, waar hulle sal plaasvind, die verantwoordelike persone, alle moontlike omgewings- of sosiale impakte, versagtende maatreëls, rehabilitasieplanne, moniteringsmetodes, die frekwensie van monitering en prestasieaanwysers. Die OBP sal ‘n wetlik bindende, alleenstaande dokument wees wat gebruik sal word om te verseker dat Eskom voldoen aan al die voorwaardes van die Omgewingsmagtiging (OM) en Omgewingsimpakverslag (OIV).

OMGEWINGSIMPAKVERKLARING

In terme van flora, fauna en avi-fauna het die studiegebied ‘n ryk biodiversiteit. Talle Rooi Data-spesies is reg deur die taksa geïdentifiseer. Die belangrikste bedreigde spesie met ‘n hoë bewaringswaarde in die studiegebied is die kraanvoëlspesie. Meeste habitats wat met

kraanvoëlspesies geassosieer word, is as hoogs sensitiewe gebiede afgemerk en elke poging is aangewend om te verseker dat die voorkeur-deurgang hierdie gebiede vermy. Ander sensitiewe areas wat in ag geneem is, behels moontlike landbou (vermyding van spilpunte), sosiale impakte (voorkoming van verplasing, skool) en ander impakte op infrastruktuur. Mynbouaktiwiteite word beskou as een van die areas wat waarskynlik geraak sal word vanweë die grondgebruik in die gebied wat hoofsaaklik mynbouaktiwiteite behels.

Dit word voorsien dat die konstruksie en bedryf van ‘n transmissielyn ‘n negatiewe uitwerking op die omgewing sal hê. As gepaste versagtende maatreëls egter geïmplementeer word, word die felheid van die impak verminder. Na noukeurige oorweging van die sleutelaspekte van die omgewing (dit wil sê biofisiese, sosiale en ekonomiese aspekte), is die voorkeur-deurgang Alternatief 1 (Oranje deurgang). In terme van sosio-ekonomiese en omgewingsaspekte is daar minimale onderskeid tussen al drie belyningsalternatiewe. Die tegniese uitvoerbaarheid van die gebied om die voorgestelde kraglyne op te rig, is egter as ‘n aspek beskou in die keuse van die voorkeur-deurgang oorweeg.

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LIST OF ABBREVIATIONS

ABE:	Affirmative Business Enterprises
BID:	Background Information Document
CAA:	Civil Aviation Authority
DEA:	Department of Environmental Affairs
DSR:	Draft Scoping Report
DEIR:	Draft Environmental Impact Report
EA:	Environmental Authorization
EAP:	Environmental Assessment Practitioner
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment
EIR:	Environmental Impact Report
EMP:	Environmental Management Programme
GIS:	Geographical Information System
GPS:	Global Positioning System
I&APs:	Interested and Affected Parties
IDP:	Integrated Development Plan
IEM:	Integrated Environmental Management
kV:	Kilovolt
NEMA:	National Environmental Management Act (Act No.107 of 1998)
PWV:	Pretoria/Witwatersrand/Vereeniging
SDF:	Spatial Development Framework
PES:	Presence of Ecological State

TABLE OF CONTENTS BASED ON CHARPTER 3 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998), EIA REGULATIONS OF 18 JUNE2010.

Contents of the draft EIA Report and alignment with Section 28 Requirements (Content of Environmental Impact Report) of the regulation in terms of Chapter 3 of the National Environmental Management Act, 1998, are presented below.

June2010 Regulations ,Section 28 Requirements	Section in Draft EIA Report
(1) A EIA report must contain all the information that is necessary for a proper understanding of the nature of issues identified during EIA and must include- a) Details of- (i) The EAP who prepared the report; and (ii) The expertise of the EAP to carry out an environmental impact assessment;	Chapter 1: Section 1.3
b) A description of the proposed activity;	Chapter 4
c) A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is – (i) A linear activity, a description of the route of the activity;	Chapter 4
d) A description of the environment that may be affected by the activity and manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	Chapter 6
e) A details of the public participation process conducted in terms of sub regulation (1), including- (i) Steps undertaken in accordance with the plan of study; (ii) A list of persons, organisations and organs of state that were registered as interested and affected parties, (iii) A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and (iv) Copies of any representations and comments received from	Chapter 7 and Appendix D

June2010 Regulations ,Section 28 Requirements	Section in Draft EIA Report
registered interested and affected parties;	
f) A description of the need and desirability of the proposed activity;	Chapter 4: Section 4.7
g) A description of identified potential alternatives to the proposed activity; proposed activity or alternatives may have on the environment and the community that may be affected by the activity;	Chapter 5 and 7
h) An indication of the methodology used in determining the significance of potential environmental impacts;	Chapter 8: Section 8.4.3
i) A description and comparative assessment of all alternatives identified during the environmental impact assessment process;	Chapter 10
j) A summary of the findings and recommendations of any specialist report or report on a specialised process;	Chapter 9
k) A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measure;	Chapter 11
l) An assessment of each identified potentially significant impact, including- (i) Cumulative impacts; (ii) The nature of the impact; (iii) The extent and duration of the impact; (iv) The probability of the impact occurring; (v) The degree to which the impact can be reversed; (vi) The degree to which the impact may cause irreplaceable loss of resources; and (vii) The degree to which the impact can be mitigated;	Chapter 11 and 12
m) A description of any assumptions, uncertainties and gaps in knowledge;	Chapter 2
n) A reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any	Section 11

June2010 Regulations ,Section 28 Requirements	Section in Draft EIA Report
conditions that should be made in respect of that authorisation;	
o) An environmental impact statement which contains- (i) A summary of the key findings of the environmental impact assessment; and (ii) A comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;	Chapter 16
p) A draft environmental management programme containing the aspects contemplated in regulation **33**;	Appendix E
q) Copies of any specialist reports and reports on specialised processes complying with regulation **32**;	Appendix F
r) Any specific information that may be required by the competent authority; and	N/A
s) Any other matters require in terms of sections 24(4)(a) and (b) of the Act.	N/A

1. INTRODUCTION

Eskom generates approximately 95% of the electricity used in South Africa and approximately 45% of the electricity generated in Africa. Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural and residential customers and redistributors. The majority of sales are in South Africa, and therefore, additional power stations and power lines need to be constructed in order to meet the growing electricity demand. Eskom is responsible for providing reliable and affordable power to South Africa.

The growing demand for electricity places increasing pressure on Eskom's existing power generation and transmission capacity. Eskom is committed to implementing a sustainable energy strategy that complements the policies and strategies of National Government. Thus, Eskom wants to expand and upgrade the infrastructure in order to improve the reliability of electricity supply to the country, and in particular to provide for the growth in electricity demand in the Mpumalanga Province.

The study area covers the jurisdiction of two district municipalities and based on this the towns of Arnot and Belfast will be affected by the proposed project. The study area has various existing transmission lines infrastructure as listed below:

- Approved 400kV from Hendrina – Gumeni (construction due to start towards the end of 2012 or early 2013);
- Existing 275kV power line;
- Existing Arnot–Maputo 400kV power line; and
- Various Eskom Distribution lines.

The district municipalities are as follows:

- **Nkangala District Municipality**:
  - Emakhazeni Local Municipality
  - Steve Tshwete Local municipality

- **Gert Sibande District Municipality:**
  - Albert Luthuli local Municipality

An application for Environmental Authorisation was submitted to the National Department of Environmental Affairs (DEA). An environmentally sustainable development is where the parties involved accept their responsibilities in terms of the:

a. Constitution of South Africa, 1996 (Act No. 108 of 1996) that states that everyone has the right :

   - 'to an environment that is not harmful to their health or well-being', and
   - 'to have the environment protected, for the benefit of present and future generations, thorough reasonable legislative and other measures that -
     - Prevent pollution and ecological degradation;
     - Promote conservation, and

- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.'

b. National Environmental Management Act,1998 (Act No. 107 of 1998), which requires socially, economically and environmentally sustainable projects.
c. The Environmental Impact Assessment Regulations of 2010.

Baagi Environmental Consultancy cc, as Independent Environmental Consultants were appointed by Eskom Holdings SOC Limited: Transmission Division to manage and undertake the Environmental Impact Assessment (EIA) process for the purpose of obtaining Environmental Authorisation for the proposed project.

1.1 BACKGROUND

1.1.1 Approach to Scoping and EIA Phase

Taking into consideration that environmental management requires an integrated, holistic, multi-disciplinary approach, the input of various specialists were obtained at a scoping/desktop level to inform the scoping report and the way forward. A mandate was given to Baagi Environmental Consultancy to find a suitable, least environmentally sensitive and most socially acceptable alignment of a double circuit 400kV line between Arnot and Gumeni substations. The following approach was applied in an attempt to identify possible alignment alternatives:

a. Literature Review and Desktop Study Analysis

Eskom provided Baagi with the study area boundary, the two substations and key towns with the study area in GIS format (ESRI: shape files). GIS software (ESRI ArcGIS 9.2 program) was used to create a study area map, which indicates the location of the existing transmission power line, distribution power line and other infrastructure such as roads**.** The developed map was used as a point of departure for GIS analysis of the study area. The objective of GIS analysis was to come up with possible corridors that would have the least environmental impact and be socio-economically viable or feasible.

b. Site Visit

A reconnaissance level site visit was completed during November 2011. The persons present during the site visit were the Baagi team (project manager, Environmental Officer), Eskom team (project manager, line designer and surveyor), and specialists (Geotechnical, Flora, Fauna, Wetland, Social, Visual, and Avifauna). The specialists were involved at the scoping level and conducted detailed specialist studies during the environmental impact assessment phase of the project.

c. Post Site Visit Meeting

Information gathered during the site visit and desktop study was collected in order to understand the study area, and provide an amalgamated view, from the various specialists, of the possible alternative alignments that must be investigated further and the alternative that would be considered as being the most feasible and subsequently the preferred corridor.

Figure 1: Proposed Project Locality Plan

1.2 *PROPONENT*

Table 1: Project Proponent Details

PROPONENT DETAILS	
Company Name	Eskom Holdings SOC Limited
Contact Person	Ms Annah Motalane
Postal Address	P O Box 1091, Johannesburg, 2000
Physical Address	Maxwell Drive, Sunninghill Ext 3, Megawatt Park, Sandton
Telephone	011 800 4057
Fax	086 602 9207
Email	mosimaa@eskom.co.za

1.3 ENVIRONMENTAL ASSESSMENT PRACTITIONER DETAILS

Table 2: EAP Contact Details

ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)	
Company Name	Baagi Environmental Consultancy
Contact person	Mr Lordwick Makhura
Physical Address	88 Rubida Street, Murrayfield x1
Postal Address	P O Box 72847, Lynwood Ridge, Pretoria, 0040
Telephone	012 365 2546 x 7
Fax	012 365 3217
Email	baagi@ee-sa.com / makhural@baagi.co.za

Mr. Lordwick Makhura is the Principal member of Baagi Environmental Consultancy. He obtained a degree in Environmental Science and has a BSc (Hons), pending, from the University of Pretoria. He has at least seven years' experience in the Environmental Management Industry and is registered with the South African Association of Botanists and member of Impact Association of Impact Assessment South Africa (IAIAsa). Mr Lordwick Makhura has undertaken and compiled numerous Scoping and EIA reports for Eskom (refer to **Appendix A)**:

- Scoping/EIA process for the construction of a 2km 275 kV line from Glockner to Kookfontein substation;
- Upgrading of the Incandu substation;
- Final CEMP for 2x400kV (110km) lines from Spitskop - Dinaledi Transmission project;
- Final CEMP for 2x400kV (lines from Medupi - Delta (Massa) Transmission project; and
- Scoping/EIA for a 130km 400kV line from Ariadne-Venus substation.

Mr. Ryan Nel is an Environmental Scientist at Baagi Environmental Consultancy. He obtained a Bachelors Degree of Technology in Environmental Science and is currently completing a BSc (Hons) in Environmental Monitoring and Modelling at the University of South Africa. He has over four years experience in Environmental Consulting and Environmental GIS. Mr. Ryan Nel has been involved in various scoping and EIA as well as transmission related projects (refer to **Appendix A**):

- Final CEMP for 2x400kV (lines from Medupi - Delta (Massa) Transmission project;
- Scoping/EIA for a road diversion;
- Scoping/EIA for a gold recovery processing plant; and
- Scoping/EIA for in-pit tailings deposition.

Ms. Marita Oosthuizen has an MA Environmental Management where her mini-dissertation focussed on Public Participation within the South African context. She has more than 10 years of experience with Public Participation. She is a member of the International Association of Impact Assessment (IAIAsa) as well as a Member of and Secretary to the Board of the Southern African Affiliate of the International Association for Public Participation (IAP2 SA). Ms Marita Oosthuizen has undertaken numerous public participation process related to Scoping and EIA process (refer to **Appendix A)**:

- Public participation process for proposed 400kV transmission line from Ariadne to Venus substation in KwaZulu - Natal;
- Public participation process for the proposed Mercury - Perseus 400kV transmission line;
- Public participation process for the Highland Virginia Gas Production Right, Virginia area, Free State Province; and
- Public participation Process for the upgrading of the existing Erwat Welgedacht Water Care Works.

1.4 IMPACT ASSESSMENT PROCESS

In terms of the National Environmental Management Act (Act 107 of 1998, NEMA) as amended and its EIA Regulation published in August 2010, it is necessary to undertake environmental investigations as an integral part of project planning in order to obtain environmental authorisation for a proposed activity that may have a potentially negative effect on the environment. NEMA regulates a specific multi-phased process for studying these types of proposals – please refer to the **Figure 2** below:

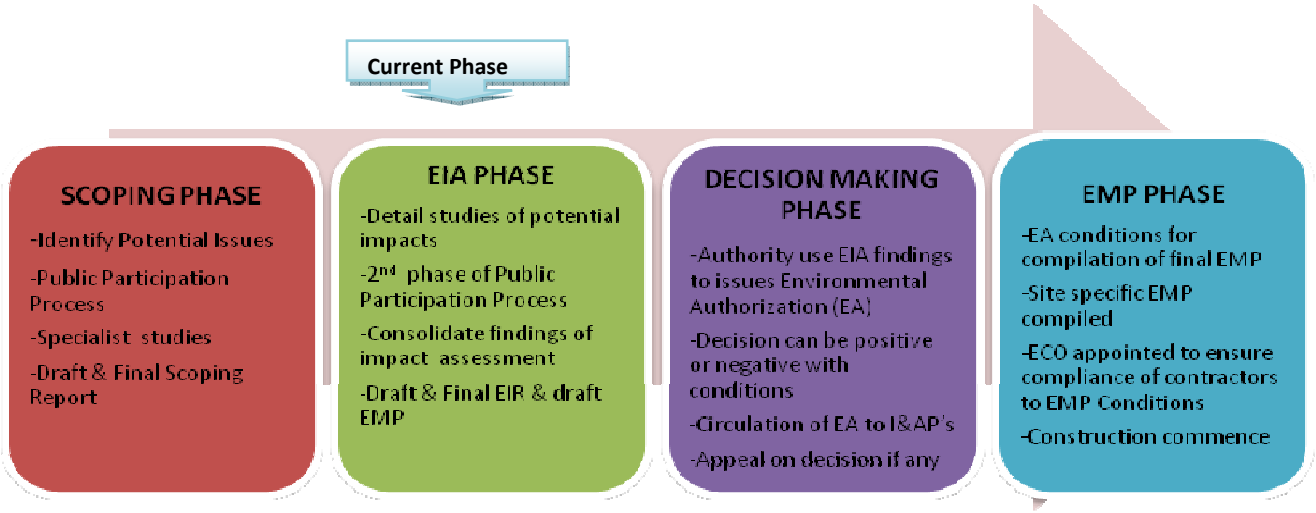

Figure 2:The Process Followed for this Environmental Impact Assessment

2. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

2.1 ASSUMPTIONS

- All the technical data and/or information provided by the proponent to the EAP and specialists are accurate and up-to-date.
- On completion of the EIR Report and Environmental Authorisation prior to the construction of the power line, the findings of EIR and EA must be incorporated in the compilation of the site specific EMP.
- The public participation process has been satisfactorily effective in identifying the critical issues which has raised and will be need to be addressed through specialist investigations and/or by the EAP during the EIA phase. Specialist input has thus been appropriately defined and an adequate scope of work provided to investigate the critical issues.
- The public participation process has sought to involve key stakeholders and individual landowners. The servitude negotiation team will contact all landowners if the positive environmental authorisation is received from the authority. It is assumed that, where participation has been sought from organizational representatives, that these parties have the authority to comment on behalf of their organization.
- Wherever applicable, information requested by I&APs during the scoping phase has been incorporated in the draft EIA report for perusal and comment. These requests will be tracked in the issues and responses report attached in **Appendix D**.
- Due to the interrelated nature of the biophysical, social and economic issues, it is assumed that individual specialists collaborated to discuss shared overlapping issues and impacts in order to establish complementary ways of avoiding, managing and mitigating impacts.

- Eskom and its contractors will implement the measures contained in the EMP, and that the EMP will be revised to include the necessary studies, plans, method statements and operational procedures prior to the commencement of construction and operational activities.

- A monitoring and evaluation system, including auditing, will be established and employed to track the implementation of the EMP, to ensure that management measures are effectively avoiding, minimising and mitigating impacts and that corrective actions are being undertaken to address shortcomings and non-performances.

2.2 LIMITATIONS

The strategic importance of the project requires that Eskom commence construction of the power line in 2014, therefore, the project programme is under significant pressure. This includes the time available to meet regulatory requirements such as environmental authorization, Final site specific EMP, which includes a specialist walk down process and the negotiation process of the final route.

The EIA study is confined within the boundary of the study area; therefore, the findings of the specialist studies are also confined within the boundary of the study area and pay special attention to the proposed corridors. The findings of this report are on a broad scale due to the nature of the study area. It is difficult to determine finer details of the impacts associasted with the proposed corridors as a result of the broad 2km width of the corridors. The finer details of the impacts can only be assessed during the EMP phase, whereby there will be a specialist walkdown process as well as compilation of the site-specific EMP.

Although the majority of the landowners within the proposed study area have been identified, the exact affected landowners, by the recommended post environmental authorisation, are required to be contacted by the servitude negotiation team for servitude agreements once environmental authorisation has been granted.

Limitations specific to each specialist study are given in each of the specialist reports (refer to **Appendix F**).

2.3 UNCERTAINTIES

Although the preferred corridor for the establishment of the double circuit 400kV line has been identified in this draft EIR, the exact positions of the pylons are not yet known as the corridor under investigated is 2km in width, and the servitude requirements for the double circuit 400kV line is 55m . The exact location of the pylons or towers will be finalized once Eskom makes available the tower profiles, that will contribute into the finalisation of the site specific EMP. The exact properties that will be affected by the final alignment of the route (55m servitudes) are also not yet known.

2.4 GAPS IN KNOWLEDGE

The impacts that are identified within this EIA process that are associated with investigated corridors, we do not know whether those impact will be affected come the final routing of the powerline during EMP phase

The final routing of the power line has not been determined and minor deviations from the proposed route corridor may occur to take account of inter alia the servitude negotiation process and specialist walk down process of the final route. Final alignment of the power line will need to take account of:

- Specific location, extent and functioning of wetlands (assessment should be carried out prior to determination of the precise route).
- Grave sites and cultural resources. Community and traditional leaders need to be consulted to determine the precise route, especially where it traverses tribal authority land and passes nearby settlements.
- The precise location of ecologically sensitive environments (in particular habitats associated with protected and critically endangered bird species, such crane species and protected plant and animal species).
- Individual conditions of agreement with landowners established during the servitude negotiations.
- The WULA is based on the watercourse crossing data as it pertains to the proposed route corridor. The removal of indigenous and protected trees permit as well as heritage permit should it be required based on the final alignment of the power line route.

3. LEGAL FRAMEWORK APPLICABLE TO THE PROPOSED PROJECT

3.1 NATIONAL RELEVANT LEGISLATION

3.1.1 National Environmental Management Act, 1998 (Act 107 of 1998)

There are various elements within the National Environmental Management Act that are relevant to the Arnot -Gumeni power lines. The 'polluter pays' concept is enforced to ensure that any party or parties, which undertakes any activity that may cause, causes or caused any pollution, must prevent, mitigate or remedy the effects.

Section 2 of Chapter 1 of the National Environmental Management provides details of the environmental management principles that should be adhere to all phases of the development. The consideration of various factors must be brought into focus:

- Avoidance/minimisation of the loss of biodiversity,
- Avoidance/minimisation of the disturbance of ecosystems,
- Avoidance/minimisation of pollution,
- Avoidance/minimisation of cultural and heritage sites,
- Avoidance/minimisation/recycling of waste,
- Responsible and equitable use of renewable and non-renewable resources, and
- Avoidance/minimisation/mitigation of adverse impacts.

In terms of the Government Notice of 2010 EIA Regulations, a number of activities are listed as requiring a full EIA process. The listed activities that are associated to this project are listed in **Table 3**.

Table 3: Listed activities that are applied by proponent for the proposed project

Relevant Notice and Activity Number	Activity Description	Relevance to project
R 544 No. 13	The construction of facilities or infrastructure for the storage, or for the storage and handling of dangerous goods, where such storage occurs in containers with a combined capacity of 500 cubic metres.	Storage of dangerous goods such as diesoline will occur at the construction site and camps.
R544 No 20	Any activity requiring a mining permit in terms of section 27 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) or renewal thereof.	The proposed project may need borrow pits for access road construction.
R 544 No. 38	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	The proposed 400kV power line will be constructed with the aim of replacing the existing 275kV power line. This listed activity will no longer apply to this project because the option to recycle one of the existing 275kV is not technically possible.
R 545 No. 8	Construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275kV or more, outside an urban area or industrial complex	The project will involve the construction of a double circuit 400kV transmission line outside urban areas or industrial areas.
R545 No. 15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed 20 hectares or more; except where such physical	The expansion of the Gumeni Substation will result in the physical alteration of undeveloped, vacant or derelict land. Gumeni substation is currently under construction and the proposed installation of the 2nd transformer space will be

	alterations take place for- (i)linear development activities; or (ii)agriculture or afforestation where activity 16 in this Schedule will apply.	reserved within the Gumeni substation and therefore this activity will no longer apply to this project.
R546 No. 4 (a) (ii) (aa), (cc), (ee) and (gg)	The construction of a road wider than 4 meters with a reserve less than 13.5 meters. (a) In Eastern Cape, Free State, KwaZulu-Natal**,** Limpopo, **Mpumalanga** and Northern Cape Provinces: (ii) Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.	Construction of roads will be constructed within the stated thresholds.

R546 No 12 (a) and (b)	The clearance of an area of 300 square meters or more of vegetation where 75% or more of the vegetative cover constitute indigenous vegetation. (a) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004. (b) Within critical biodiversity areas identified in bioregional plans.	The construction of the power line with its associated structures such as pylons, and the construction of a construction camp may require the clearing of vegetation of more than 300msquared meters. However, the construction camp will not be placed in high sensitive areas rather will be placed in built up areas and disturbed areas.
R 546 No. 13 (2) (c) (ii) (bb), (cc), (ff), (iii) (bb) and (dd)	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: (2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2012 (c) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, **Mpumalanga**, Northern Cape and Western Cape: (ii) Outside urban areas, the following: (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the	The construction of the power line with its associated structures such as pylons, and the construction of a construction camp may require the clearing of vegetation of more than 1 hectare.

	competent authority; (ff) Areas within10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (ii) In urban areas, the following: (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; (dd) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined.	
R546 No. 16 (a) (iii) and (iv)	The construction of: (iii) buildings with a footprint exceeding 10 square metres in size; or (iv) infrastructure covering 10 square metres or more. (a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape: (ii) Outside urban areas, in: (dd) Sensitive areas as identified in an environmental management framework as contemplated in	It is anticipated that the construction of the foundations for the pylons and other structures may occur within 32 meters of watercourses or critical areas as indentified in systematic biodiversity plans adopted by provincial authorities.

	chapter 5 of the Act and as adopted by the competent authority; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;	

3.1.2 The Constitution of the Republic of South Africa Act (Act 108 of 1996)

The Constitution of South Africa states that everyone has the right to an environment that is not harmful to his or her health or well-being and to have the environment protected for the benefit of present and future generations.

The Act implies that measures must be implemented to:

1. Prevent pollution and ecological degradation;
2. Promote conservation, and
3. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

In Accordance with Section 32 of the Constitution of South Africa everyone has the right to access –

(a) any information held by the state; and
(b) any information that is held by another person and that is required for the exercise or protection of any rights.

Relevance to Project

The construction of the 400kV power line and the installation of a 2nd 500MVA 400/ 132kV transformer at the Gumeni Substation, in accordance with the Constitution, will not be undertaken in a manner that results in environmental pollution and ecological degradation. Therefore, the design and planning, construction and operation phases should be carried out in a sustainable manner, preventing unjust harm to the environment.

3.1.3 National Water Act (Act 36 of 1998)

The National Water Act (NWA) is the main legislative piece that controls both private and public water use within South Africa. Section 19 of the National Water Act provides that:

- If there is land where there is an activity or process which causes, has caused or is likely to cause pollution of water resources, the person in control must take all reasonable measures to prevent such pollution from occurring, continuing or recurring.

Pollution is defined as the altering of the physical, chemical or biological properties of water rendering it less fit for anticipated beneficial use or making it potentially harmful to humans, aquatic and non -aquatic organisms, to the resources quality or to property.

In accordance with Section 21 of the National Water Act the following are considered as water uses and therefore need to be licensed:

a) Taking water from a water resource.
b) Storing water.
c) Impending or diverting the flow of water in a watercourse.
d) Engaging in a stream flow reduction activity.

e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).

f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.

g) "Disposing of waste in a manner which may detrimentally impact on a water resource.

h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.

i) Altering the beds, banks, course or characteristics of a watercourse.

j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

k) Using water for recreational purposes.

Relevance to Project

The Act calls for actions that will prevent and remedy the effects of pollution generated by its operations and those that will address emergency incidences. Activities that may be relevant to the construction of the power lines and the installation of a 2nd 500MVA 400/ 132kV transformer at the Gumeni Substation, and will be regarded as a water use, include:

- Constructing pylons within a watercourse as well as within the drainage area of a watercourse. This would cause an impediment or alteration of the watercourse.
- The accidental spillage and/or purposeful discharge of hazardous substances and/or waste generated during construction and decommissioning phases, into a watercourse or disposed in such a way it may be detrimental to a water resource.

If the abovementioned water uses are undertaken during either the construction or operational phase of the development a **Water Use Licence Application** will need to be undertaken with the Department of Water Affairs.

3.1.4 National Heritage Resources Act (Act 25 of 1999)

This Act is concerned with the protection of the archaeological or paleontological sites or meteorites. Furthermore, Section 36 of the National Heritage Resources Act states that:

(3) Any person who discovers archaeological or paleontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(3)(a) No person may, without a permit issued by South African Heritage Resources Agency (SAHRA) or provincial heritage resources Authority-

(a) destroy, damage , alter, exhume, or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage , alter, exhume, or remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Relevance to Project

A **Heritage Resource Permit** from SAHRA will be required for the disturbance, removal or destruction of any heritage site, archaeological site or paleontological site, burial ground, grave, or any public monument or memorial that may be affected by the proposed construction of the 400kV power line from Arnot to Gumeni. The use of existing old farm houses, older than 50 years, for offices or other facilities within the construction camps, may require a **Heritage Resource Permit** if any alterations are undertaken to the building.

3.1.5 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The Biodiversity Act provides for the management and conservation of South Africa's biodiversity within the framework of NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was established. The Biodiversity Act further requires landowners to manage and conserve South Africa's biodiversity for current and future generations. The National Spatial Biodiversity Assessment classifies areas as worthy of protection based on their biophysical characteristics, which are ranked according to priority levels.

Relevance to Project

The proposed power lines should be aligned in a manner that avoids threatened or protected ecosystems and should not use any plants categorised as either a weed or an invasive plant in the undertaking of mitigation, preventative or rehabilitation measures. Protected species found within the servitude and individual tower positions are to be taken into consideration and the respective **Protected Trees Removal Permit, Protected Species Removal and Relocation Permit** and **Indigenous Vegetation Clearing Permit** should be applied for prior to the commencement of indigenous vegetation clearing activities.

3.1.6 National Environmental Management: Air Quality Act (Act 39 of 2004)

The Act provides for the management of air quality in South Africa. It also works towards reforming the law regulating air quality in order to protect the environment by providing reasonable measures for the prevent of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government ; for specific air quality measures; and for matters incidental thereto.

Relevance to Project

The construction of the 400kV power line and the installation of a 2nd 500MVA 400/ 132kV transformer at the Gumeni Substation may cause the generation of dust which is governed under the regulations stipulated in the NEMAQA. The generation of high levels of dust **may require** an **Atmospheric Emissions Permit** under the NEMAQA.

3.1.7 National Environmental Management: Waste Act (Act 59 of 2008)

The National Environmental Management: Waste Act is the main legislative piece that aims to consolidate waste management within South Africa. Part 2 of the Waste Act details the general duty in respect to the management of waste by the holder of the waste. In accordance to Section 16(1) of the Waste act, 'a holder of waste must, within the holder's power, take all reasonable measures to:

a) avoid the generation of waste and where such generation cannot be avoided to minimise the toxicity and amounts of waste that are generated;

b) reduce, re-use, recycle and recover waste;

c) where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

d) 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;

e) prevent any employee or any person under his or her supervision from contravening this Act; and

f) prevent the waste from being used for an unauthorised purpose.'

Relevance to Project

The NEMWA requires classification of the waste that will be generated from the both construction and operation activities associated with the construction of thedouble circuit 400kV power line and the installation of the 2nd transformer at Gumeni Substation. Methods for reduction, re-use, recycling and recovery of the waste should be followed as well as specific requirements set out within the act for the storage, collection and transportation of waste and the use of authorised methods for the treatment, processing and disposal of the waste. Certain activities that may be undertaken during the construction and operation phases will require a **Waste Management Licence** include facilities for the storage, transfer, recycling, recovery and treatment of waste as well as the disposal of waste on land. At this stage waste licence is not required as per the nature of activities however should activities that affect this act emanate during the construction process waste permit may need to be applied.

3.1.8 National Environmental Management: Protected Areas Act (Act 59 of 2003)

The main objective of this Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. It is also for the establishment of a national register of all national, provincial and local protected areas. The act serves as a tool for management of those areas in accordance

with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas.

Relevance to Project

The double circuit 400kV power line and associated infrastructure such as the pylons, may transverse an ecological corridor. The construction activities, therefore, will have to be undertaken with consideration to the any standards and regulations stipulated within the NEMPAA.

3.1.9 Conservation of Agricultural Resources Act, 1983 (Act 84 of 1983)

The Act provides control for over utilisation of the natural agricultural resources in the Republic of South Africa in order to promote the conservation of soil, the water resources, vegetation and the combating of weeds and invader plants.

Relevance to Project

This act ensures that no plants categorised as either a weed or an invasive plant in the undertaking of mitigation, preventative or rehabilitation measures that are associated with construction and/or decommissioning activities.

3.1.10 Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)

The National Minerals and Petroleum Resources Development Act makes provision for equitable access to and sustainable development of the mineral and petroleum resources within South Africa. The objectives of the act are as follows:

a) recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic
b) give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources;
c) promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa;
d) substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources;
e) promote economic growth and mineral and petroleum resources development in the Republic;
f) promote employment and advance the social and economic welfare of all South Africans;
g) provide for security of tenure in respect of prospecting, exploration, mining and production operations;
h) give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
i) ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating.

Relevance to Project

The proposed double circuit 400kV power line and associated infrastructure such as pylons may be constructed within mining areas. The MPRDA regulates the construction of any infrastructure within mining areas and therefore, a **Section 53 Application** may need to be undertaken and

submitted to the DMR for the use of land contrary to the objects set out in the MPRDA. This one of the issues highlighted by the I&APs parties indicating the possibility of considering Section 53 application as the study area is predominantly affected by mining activities.

3.1.11 Civil Aviation Act (Act 23 of 2009)

The Civil Aviation Act provides provisions for regulations that prohibit the erection or the construction of any obstruction, exceeding a specified height, within a specified distance from an aerodrome. The Act also provides regulations for criteria of the lighting and marking of any obstruction, exceeding a specified height, within a specified distance from an aerodrome.

Relevance to Project

The proposed double circuit 400kV power line and associated infrastructure such as pylons may be constructed within close proximity to an aerodrome and therefore, the regulation set out in the Civil Aviation Act must be considered. An **obstacle approval** may need to be undertaken with the Civil Aviation Authority (CAA) for the proposed double circuit 400kV power line and associated infrastructure being constructed within close proximity to any aerodrome.

3.1.12 Occupational Health and Safety Act (Act 185of 1993)

The Act makes provision for the health and safety of persons at work and persons that are not employees against any hazards that may arise out of or in connection with the work related activities. The act has provisions regarding the maintenance and operation of plant and machinery, working conditions to the use of protective clothing and equipment.

Relevance to Project

The Occupational Health and Safety Act informs Eskom on measures and procedures to be incorporated regarding the safety and health of the persons on site.

3.1.13 Hazardous Substances Act (Act 15 of 1973)

The main objectives of the Hazardous Substances Act is to provide measures, norms and standards for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure. The Hazardous Substances Act also aims to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products.

Relevance to Project

The construction phase of the proposed double circuit 400kV power line and associated infrastructure may include the use of hazardous substances. The measures, norms and standards set out within the Hazardous Substances Act should be taken into consideration during the construction phase of the proposed activity.

3.2 Relevant Provincial Legislation

3.2.1 Mpumalanga Nature Conservation Act (Act 10 of 1998)

The main objective of this Act is to provide for the protection and conservation of indigenous, endangered and protected wildlife and vegetation within the Mpumalanga province. The Act

prevents the hunting and/or capturing of wildlife and the removal and/or destruction of vegetation.

Relevance to Project

Indigenous, endangered and protected flora and fauna species found within the servitude and individual tower positions are to be taken into consideration and the respective **Fauna/Flora Species Removal Permit** and **Indigenous Vegetation Clearing Permit** should be applied for prior to the commencement of construction activities.

3.3 Relevant Municipal Legislation

3.3.1 Nuisance By-laws

The by-laws regulating nuisances such as the generation of noise and dust within each of the respective municipalities, namely the Emakhazeni Local Municipality, the Steve Tshwete Local Municipality and the Albert Luthuli Local Municipality, should be taken under consideration during the construction, operation and decommissioning phases of the project.

Relevance to Project

The by-laws provide guidelines for the permissible and prohibited generation of noise and dust among other nuisances that may be produced by the proposed activity.

3.3.2 Waste Management By-laws

Waste management by-laws, both solid and sanitary, provide regulations for the management of waste generated by any activity within Emakhazeni Local Municipality, the Steve Tshwete Local Municipality and the Albert Luthuli Local Municipality..

Relevance to Project

These by-laws and subsequent regulations should be taken into consideration in regards to waste management during both the construction and decommissioning phases of the proposed activity.

3.3.3 Aerodrome By-laws

The Steve Tshwete Local Municipality aerodrome by-laws provide regulations on entering an area operating as an aerodrome.

Relevance to Project

These regulations need to be taken into consideration as there are numerous aerodromes within the study area that may be affected by the proposed activity.

3.4 Other Relevant Legislation or Policies Applicable to Eskom

3.4.1 Eskom Act, 1987 (Act No. 40 of 1987)

The Act sets out the objectives of Eskom, being the provision of a system by which the electricity needs of the consumers may be satisfied in the most cost effective manner, subject to resource constraints and the national interest. The National Energy Regulator of South Africa (NERSA)

exercises control over the performance of Eskom's functions and the execution of its powers and duties. The functions, powers, and duties of Eskom are set out in Section 12 of the Act.

3.4.2 Eskom Conversion Act, 2001 (Act 13 of 2001)

The objective of the Eskom Conversion Act is to convert Eskom into a public company in terms of the Companies Act, and to provide for powers and duties of Eskom.

3.4.3 Electricity Regulation Act, 2006 (Act 4 of 2006)

The Act governs the control of the generation and supply of electricity in South Africa, and the existence and functions of the Electricity Control Regulator.

3.4.4 White Paper on the Energy Policy of the Republic of South Africa (December 1998)

Policy objectives identified include increasing access to affordable energy services, improving energy governance, stimulating economic development (including the encouragement of cost-effective energy prices which include quantifiable externalities), managing energy related environmental and health impacts, and securing supply through diversity.

4. PROJECT OVERVIEW

4.1 STUDY AREA

The study area is located within the Mpumalanga Province, between Arnot and Machadodorp. The study area stretches from the east of Arnot Substation to the South of Gumeni Substation. The proposed 400kV power line will be constructed between Arnot substation, situated west of Carolina and Gumeni substation situated south of Machadodorp. The proposed transmission line will be approximately 60 km in length. There are existing transmission power lines and distribution lines between these two Substations (i.e. Hendrina- Gumeni, one Distribution line, and three Transmission line).The 2nd 500MVA 400 / 132kV transformer will be installed within the boundary of the Gumeni Substation, and will be situated in relatively close proximity to the existing 500MVA 400 / 132kV transformer.

The study area affects the following Municipalities' jurisdictions:

- **Nkangala District Municipality**
  - Emakhazeni Local Municipality
  - Steve Tshwete Local Municipality
- **Gert Sibande District Municipality**
  - Albert Luthuli Local Municipality

4.2 PROJECT DESCRIPTION

Proposed Arnot - Gumeni transmission project entails the following:

- Construction of the proposed 400kVdouble circuit transmission line from Arnot to Gumeni substation;
- Install 2nd 500MVA 400/132kV transformer at Gumeni substation.

4.2.1 Technical Specifications for the double circuit 400kV power line

4.2.1.1 Servitude

The proposed double circuit 400 kV transmission power line will require servitude of 55m (refer to **Figure 3**) in width, i.e. 27.5 m both sides of the centre line and cover a distance of approximately 60km in length. No permanent residence is allowed within the servitude. The servitude is required for the safe operation of the power line and reliability of electricity supply to consumers. The preliminary/scoping level studies have assessed an entire 2km wide corridor per alignment/corridor alternative. The 2km corridor provides sufficient coverage for the assessment of the power line, servitude and associated infrastructure such as access roads.

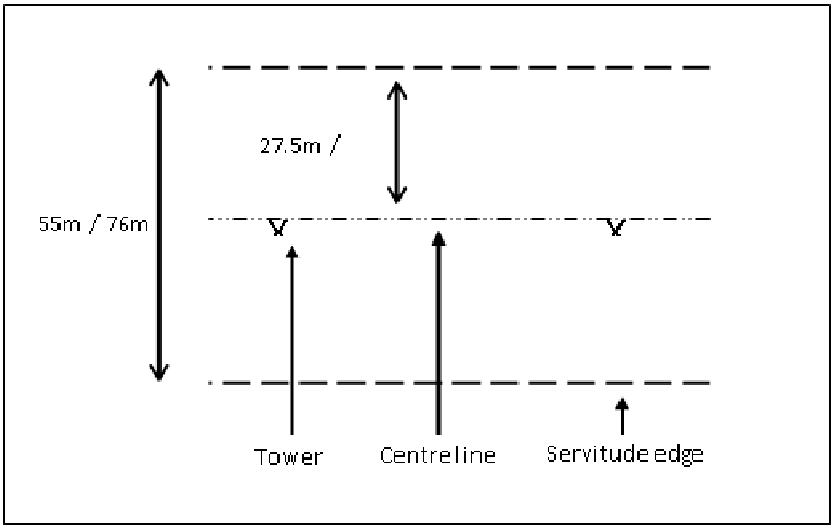

Figure 3: 400kV servitude illustration (ACER, 2009)

There are primarily five teams responsible for the excavation of foundations, concrete works, erection of steel structures, stringing of transmission cables, and rehabilitation. All activities, including vehicular access and the pylon anchors, are required to take place within the negotiated servitude and access routes. New roads may need to be constructed (depending on which route is selected) in order to access the transmission lines for construction and subsequent maintenance activities.

4.2.1.2 Construction Camps

The location of the construction camp will be determined during the EMP phase of the project once the alignment has been finalised. The construction camp will be situated within the 2km alignment corridor and will not be more than a hectare in extent. The construction camp will, where feasible and viable, utilise existing old farm houses instead of erecting new temporary offices and will be situated next to built - up areas such as towns and settlements.

4.2.1.3 Towers

Transmission line towers will be constructed in accordance with the latest designs available. Different towers are utilised under different circumstances. In the case of this project, it is envisaged that following tower types will be considered:

Photo 1: Guyed double circuit suspension tower.

Photo 2: Self - supporting double circuit suspension tower.

2.1.4 Infrastructure requirements

During construction, there will be a need for bulk services and infrastructure:

- **Water** - will be required for potable as well as construction use.
- **Sewerage** - A negligible sewerage flow is anticipated for the duration of the construction period. Onsite treatment will be undertaken through the use of chemical toilets
- **Access Roads** - Existing roads will be utilised as far as possible during the construction and operational periods. The use of roads on private property is subject to the provisions of an EMP that will be prepared for the project (with individual landowner specifications being determined during discussions with landowners during the servitude negotiation process). The flow of traffic to the site during the construction period will be relatively light and during operations there will be virtually no traffic.
- **Storm Water** - Great care will be taken in making sure that storm water drainage is carefully designed on all access roads. Storm water will have to be diverted into the surrounding fields at low energy levels, to make sure that significant erosion problems are avoided. Storm water will be managed according to the Eskom Guidelines for Erosion Control and Vegetation Management, as well as the provisions of the EMP.
- **Waste** - All solid waste will be collected at a central location at the construction site, and will be stored temporarily until removal to an appropriately permitted landfill site. Recyclable materials will be stored and removed to appropriate recycling facilities.
- **Generators** - Diesel generators will be utilised for the provision of electricity where there is no electricity connection nearby.

4.2.1.5 Access Roads

New roads may be needed in order to access the transmission lines for construction and subsequent maintenance activities. Particular attention will be paid to storm water and the management thereof, with erosion protection measures being put in place where indicated by the terrain (geology, soils and topography) and climate (for instance, typical rainfall patterns). Furthermore, access roads will be aligned and constructed within the provisions and specifications of private landowners. This is considered important for three primary reasons:

- The access road should fulfil multipurpose functions serving the needs of Eskom and the landowners.
- Landowners are acutely aware of sensitivities on their land, and will be in an excellent position to inform Eskom of optimum alignments.
- During and post construction, Eskom will be responsible for the maintenance of the access road.

The specifications for the access road will be contained within the Environmental Management Plan (EMP) that will be prepared for construction and which will become legally binding on Eskom and contractually binding on Eskom-appointed contractors (with special care being taken with river/stream crossings, where potential environmental impacts are greatest, with due consideration for licences that must be obtained from the Department of Water Affairs).

4.2.1.6 Storm Water Management

Particular attention will be paid to storm water and the management thereof, with erosion protection measures being put in place where indicated by the terrain (geology, soils, and topography) and climate (in particular, rainfall and high rainfall events in short periods of time).

4.2.1.7 Hazardous Substances

The hazardous substances referred to comprise fuels, oils and lubricants that will be stored and dispensed at the construction camps. Specifications for the storage and dispensing of fuels, oils and lubricants include the following:

- Types of fuels, oil and lubricants:
    - diesel;
    - petrol;
    - paint thinners; and
    - Insulating oil.
- No more than 20 litres of fuel and between 5 - 10 litres of oils and lubricants will be kept within the construction sites.
- Specifically designated areas;
- All fuels, oils and lubricants shall be stored above ground and under cover;
- Each designated area will be equipped with adequate fire protection equipment appropriate for the nature of the fuels, oils and lubricants that are stored and dispensed;
- All areas shall be properly signed in all applicable languages;
- All employees must be properly trained in the storage and dispensing of specific fuels, oils and lubricants,
- A specific procedure for emergency situations, including accidental spills, must be formulated and must be available on site at all times;
- Store all hazardous substances within a bunded area, underlain by a concrete slab, sloped towards a sump for spillage removal. The capacity of the bunded area should be 5 times the volume of the hazardous substances;
- Spill kits to be located at the hazardous substances site; and
- A file containing all MSDS for all hazardous substances on site should be available.

Specifications will be contained within an EMP that will be prepared for construction. This will become legally binding on Eskom and contractually binding on Eskom-appointed contractors.

4.2.1.8 Contractors

Most contractors have teams of between 40 and 50 people. The construction of transmission lines is a fairly technical activity and therefore the majority of contractors use their own teams of skilled and trained personnel for construction purposes. The opportunities for new/additional people are, therefore, fairly limited, although there will be a number of activities such as bush clearing and fencing with which local contractors can be involved.

4.2.2 Technical Specifications for the Transformer Installation of Gumeni Substation

A substation is an important element of electricity generation, transmission and distribution system. Its function is to transform voltages from high to low or the reverse, using transformers and other heavy-duty electric switch gear. A 2nd 500MVA 400/132kV transformer will be

installed within the Gumeni substation, which is required for the increased capacity expected by the construction of the double circuit 400kV line.

4.3 NEGOTIATIONS AND REGISTRATION OF SERVITUDES

Prior to the construction of a Transmission Line, Eskom Transmission is required to secure servitude rights through negotiations with affected landowners. Where existing servitudes are present, these need to be confirmed with the affected landowners.

The proposed Arnot-Gumeni Transmission Line will require the registration of a 55m wide servitude across all land traversed by the proposed power line. It is important to note that the registration of servitude does not mean that the holder of the servitude, (Eskom in this instance) becomes the owner of the land. It merely means that Eskom has the right to convey electricity and communications over the land, subject to conditions agreed between the Eskom Transmission and the affected landowners .A registered servitude gives Eskom certain defined rights for the use of that land. These include:

- Access to erect a transmission line along a specific agreed route;
- Reasonable access to operate and maintain/the line inside the servitude area; and
- The removal of tree and vegetation that will interfere with the operations of the lines.

The registration of servitudes can be a lengthy process, as it requires contractual negotiations with each affected landowner. Once the negotiations are complete, an application for the registration of servitude is lodged with the Provincial Deeds Office against the property deed. Eskom has appointed negotiators that will take this process forward should the application for the construction of the Transmission Line be granted.

4.4 CONSTRUCTION, OPERATION AND DECOMMISSIONING ACTIVITIES IN SEQUENCE

The construction of the Transmission Line will require approximately 24 months to complete. As previously mentioned, there are five main teams responsible for construction (namely teams for the excavation of the foundations, concrete works, erection of steel structures, stringing of transmission conductors and rehabilitation).

It should be noted that construction activities are not continuous and people will be employed throughout the process for long, but intermittent, periods of time. Therefore, it is anticipated that any impacts associated with construction workers are likely to be minimized as the low number of people employed over a large area.

Specification necessary for the construction camps will be contained within the EMP, with specialist input where required.

A summary of the different construction phases is outlined below:

4.4.1 Access Negotiations

Negotiations between landowner, contractor and Eskom Holdings SOC Limited are undertaken in order to determine access routes. Access routes are established through recurring use of the route(s)(i.e. they are not specially constructed roads) and are only constructed or upgraded under special circumstances.

4.4.2 Tower Pegging

The contractor appoints a surveyor to undertake this process. Once central line pegging has taken place, the surveyor sets out the footprint of the transmission line and towers. The centre points of the proposed route and pylons are marked as well as the position positioning of the tower peg is marked. The surveying team then makes the first basic track to the proposed site and pegs the position of the tower.

4.4.3 Gate Installation

Gates are installed where it is necessary to breach existing fence lines (refer to **Photo 3**). This is required to help with the access of roads that is utilized for operational and maintenance purpose of the power line. The EMP will specify criteria used for installation of the farm gates that will provide the access to the Eskom servitude.

Photo 3 - Example of Gate within a Farm

4.4.4 Excavation of Foundation

Holes for the towers are now excavated, with the size depending on the tower type and soil conditions. The holes are filled with concrete. During construction, fences will be temporarily erected around the holes as a safety precaution. The anchor holes will be covered with a safety plate.

4.4.5 Foundation for Steelwork

The foundation structures are positioned into the excavated holes (refer to **Photo 4**), which are tied together for support. This is dependent to the excavation of the foundation and vice versa.

Photo 4: Example of a Foundation for Steelwork

4.4.6 Foundation Pouring

A “ready-mix” truck, which contains 6 m^3 of concrete, now moves onto site and concrete is poured into the foundation holes. If there are difficulties in gaining access for the truck, concrete will be mixed on site.

4.4.7 Delivery of Steel to Tower Site

The steelwork is usually delivered to the site approximately one month after the foundation has been poured. Where possible, the steel is transported to the site by a truck. Access roads are clearly marked to facilitate this process.

4.4.8 Assembly Team, Punch and Paint

A team will assemble the galvanized steel towers. The tower is assembled whilst it is lying on the ground (refer to **Photo 5**). Every nut is screwed into the framework and painted with a non-corrosive paint ("punch and paint") first. This team also does the stringing of the conductors.

Photo 5: Examples of Stringing of the conductors

4.4.9 Operation and Maintenance

During operation, Eskom transmission requires access to the servitude to enable maintenance of the transmission line. This is likely to require access to the private properties. Maintenance is carried out at regular intervals, and is often done by helicopter so that supply is not disrupted. Maintenance activities are highly specialized and are therefore carried out by Eskom Transmission employees/contractors.

It is important that the servitude is cleared of vegetation occasionally to ensure that the vegetation does not interfere with the operation of the line.

4.4.10 Decommissioning

The process of decommissioning any transmission line will contain the following:

- The physical removal of the transmission line and towers would entail the reversal of the construction process.
- A rehabilitation programme would have to be agreed upon with the landowner before being implemented.
- The disposal of materials from decommissioned transmission line (steel, cabling, concrete, etc.) would be at an approved waste disposal facility. Alternatively, recycling opportunities could be investigated and implemented.
- Specific considerations regarding servitude and landowner rights would need to be negotiated with the landowner at the time of decommissioning and will be subject to the NEMA regulations and any other regulatory aspects which are affected at the time of decommissioning. **Decommissioning falls outside the scope of this EIA**.

4.5 USE OF SERVICES AND RESOURCES DURING CONSTRUCTION

4.5.1 Water

Water will be required for potable use and in the construction of the foundation for the towers. The water will be sourced from approved water use points at locations closest to the area of construction.

4.5.2 Sewerage

A negligible sewage flow is anticipated for the duration of the construction period. Onsite treatment will be undertaken, through the use of chemical toilets. The supplier will service the toilets periodically. A clear plan to control those temporary toilets will be outlined.

5.4.3 Roads

Existing roads will be utilized as far as possible during the construction and operational periods (refer to **Photo 6**). The use of roads on landowner property is subject to the provisions of EMP that will be prepared for the project with individual landowner specifications (refer to **Photo 7**) being determined during discussions with landowners as part of the negotiation process.

Photo 6: Example of Normal Access Roads

Photo 7: Example of Special Access Road

4.5.4 Storm Water Control

Storm water will be managed according to the Eskom Guidelines for Erosion Control and Vegetation Management, as well as the provisions of the project specific EMP.

4.5.5 Solid Waste Disposal

Eskom has a strong commitment to waste minimisation and recycling. All solid waste will be collected at a central location at each construction site and will be stored temporarily until removal for recycling or disposal at an appropriately permitted landfill site in the vicinity of the construction site. Where waste categorised or listed within the National Environmental Management Waste Act (Act 59 or 2008) are generated, specific requirements to deal with such waste will be included in the EMP.

4.5.6 Electricity

Given that Eskom is the main supplier of electricity in South Africa, it is well placed to provide electricity for use during the construction period. In addition, diesel generators will be utilised during the construction period.

Diesel generators will be utilized for provision of electricity during the construction phase.

4.5.7 Economics and Job Creation

Eskom will make use of a contractor or sub-contractors to do the construction. These will include Small, Medium and Micro Enterprises (SMMEs) as well as Affirmative Business Enterprises (ABEs).

It is important to note that the construction of transmission lines is a specialized undertaking and requires skilled people. It is therefore probable that the appointed contractors will bring in skilled labour from other areas. By implication, job opportunities for local people will be limited to unskilled jobs on site and in construction camps. Apart from direct employment however, local people and businesses will benefit through supply of goods and services to the appointed contractors.

4.6 PROJECTED TIME FRAMES

In order to stabilize the current situation and meet projected demand, the proposed Arnot - Gumeni Transmission line should be operational by 2016. Construction usually takes up to 24 months, therefore, Eskom wishes to commence with construction early in 2014.

4.7 THE NEED AND DESIRABILITY OF THE PROJECT

The power load around the Nelspruit and Emthonjeni areas are mainly supplied by the Praire and Marathon Substations. A Part of the transmission network in the Lowveld consumer load network (Prairie, Acornhoek, Marathon, Simplon, Merensky, Infulene, Matola and Komatipoort Main Transmission Substation) is voltage and thermally constrained. In addition, Eskom's Grid Planning Division has received a feasibility application from Assmang Ferrochrome and Nkomati mine with a total demand exceeding 200MW. These mining load applications will be supplied directly from the new Gumeni Main Transmission Substation. The following projects, which are now in execution phase were identified and recently approved by the Eskom Board to resolve the present and future network constraints:

- **Lowveld transformation enhancement (Execution)**
  - Marathon Transformation upgrade
  - New Malelane MTS integration.
- **Lowveld strengthening scheme phase 1 (Execution)**
  - Construction of the Hendrina - Gumeni 400kV line
  - Installation of a 500MVA 400/132kV transformer at Gumeni substation
  - Loop in Prairie - Machadodorp and Prairie - Witkloof 132kV lines into Gumeni substation
  - Establish 2 x 132kV feeder bays for Nkomati Mine supply.
- **Lowveld strengthening scheme phase 2 (Execution)**
  - Construction of the Gumeni – Marathon 400kV line

- Installation of a 800MVA 400/275kV yard at Marathon substation

All projects associated with the Lowveld transformation enhancement and Lowveld strengthening scheme phase 1 mentioned above are planned to be commissioned by the end of 2014. The existing network together with the planned network strengthening projects will be able to support the load forecasted.

According to the latest load forecast the combined load that will be supplied from the Gumeni and Prairie substation in year 2015 is 393MW. The trigger for additional strengthening is when the combined load supplied from the Prairie and Gumeni substations increases by an additional 200MW.

During the year 2008 in South Africa there was a crisis in power supply because the demand of electricity was beyond the supply capacity. Therefore, it is of a great need for Eskom to generate and optimise electricity supply and where possible upgrade of the existing facility to meet the high demand of electricity from the consumers, which is due to the fast growing economy of South Africa. It is statutory requirement that EIA be done on all projects that are within the activity list of EIA Regulations of 2010 before commencing with construction.

5. ALTERNATIVES

It is best practice in environmental management to consider various alternatives until a feasible alternative is chosen. During the identification and assessment of alternatives to be considered for the proposed project, the project team comprised a proponent, an Environmental Assessment Practitioner (EAP), specialists and members of the public, all play a key role in considering and selecting the viable alternatives.

Taking into consideration the nature, type and extent of the project, the following alternatives were identified: technology alternatives, alignment alternatives, source of energy alternative and No-Go alternative. Based on the findings of the Scoping Phase, the alignment alternatives and the No-Go alternative were assessed during the EIA phase of project, as per the requirements in the Environmental Impact Regulations. The criteria for selecting a suitable or viable alternative will take into consideration environmental constraints and socio-economical factors.

5.1 ALTERNATIVES CONSIDERED

5.1.1 Alignment Alternatives

During the Scoping Phase of the project, five proposed route alignments (Alternative 1 (Orange Corridor), Alternative 2 (Blue Corridor), Alternative 3 (Purple Corridor), Alternative 4 (Yellow Corridor) and Alternative 5 (Green Corridor)) were identified. All the alignment alternatives were investigated and rated within the scoping phase. The ratings of the alignment alternatives were based on the identified potential impacts associated within the study area. The purpose was to screen all the alignment alternatives in terms of the potential impacts that will eliminate unfeasible alignment alternatives and provide the viable alignment alternatives that will be assessed during the Impact Assessment Phase. The main aspects that were used in screening the alternatives during the Scoping Phase are as follows:

- Socio-economic aspects:
    - The construction of power lines over mining areas will reduce the amount of viable minerals that can be extracted therefore impacting on the Gross Domestic Product (GDP) of the area;
    - The construction of power lines within agricultural areas would reduce crop yield and impact on the local GDP;
- Environmental aspects:
    - Construction activities occurring within areas that are regarded as being highly sensitive with regards to the Mpumalanga Conservation Plan and specialist studies;
    - Construction within ecological corridors connecting sensitive habitats;
    - Proposed power line being within close proximity to wetlands and other surface water resources;
- Other critical aspects:
    - Existing infrastructure that may be affected by the proposed power line;

- Associated servitude which will increase the overall footprint. Construction adjacent existing power lines and servitudes will reduce the footprint size due to shared access roads etc;
- Cultural and heritage resources that may be affected by the proposed power line.

The screening of the alternative alignments during the scoping phase indicated that the potential environmental and socio-economic impacts for **Alternative 2** and **Alternative 4** are considered to be highly significant and therefore, **Alternative 2 and Alternative 4 were discarded and thereby omitted from the investigations undertaken during this Impact Assessment Phase (refer to Figure 4).**

Figure 4: The five alignment alternatives investigated during scoping phase

Overall, specialist findings and inputs from I&APs play a big role in determining which route is more suitable and which one is less suitable. Detailed specialist studies of the remaining three alignment alternatives and consultation with I&APs were undertaken during the EIA phase of the project. Alignments/scenarios can be proposed by I&APs and government departments (e.g. SAHRA) in the attempt to find the best possible corridor for the construction of the proposed double circuit 400kV power line from Arnot Substation to Gumeni substation.

The following sections contain descriptions of the remaining three proposed route corridors (**Figure 5**) which range from 55km to 60km in length. The alternative route alignments that were investigated during the Environmental Impact Phase of the project include **Alternative 1**, **Alternative 3** and **Alternative 5.**

5.1.1.1 Alignment Affected Farms

The three alignment alternatives transverse various farms throughout the study area. The farms, as per the respective alignment corridor, that are going to be affected are detailed in **Table 4**.

Table 4: Affected farms with the study area

Alternative 1 (Orange Corridor)	Alternative 3 (Purple Corridor)	Alternative 5 (Green Corridor)
Rietkuil 491	Rietkuil 491	Rietkuil 491
Nooitgedacht 493	Grootlaagte 449	Nooitgedacht 493
Leeupan 494	Tweefontein 458	Grootlaagte 449
Klipfontein 495	Mooifontein 431	Klippan 452
Strathrae 496	Wonderfontein 428	Wonderfontein 428
Goedehopp 498	Generaalsdraai 429	Kaalplaats 453
Van Wyksvlei 407	Leeuwbank 427	Leeuwbank 427
Frischgewaagd 409	Zoekop 426	Blesbokspruit 455

Alternative 1 (Orange Corridor)	Alternative 3 (Purple Corridor)	Alternative 5 (Green Corridor)
Welgevonden 412	Wintershoek 390	Blyvooruitzicht 383
Leeukloof 404	Rietvalley 387	Eerstelingsfontein 406
Leeuwkloof 403	Paardeplaats 425	Geluk 405
Driekop 387	Weltevreden 381	Camelia 461
Drenthe 402	Paardeplaat 380	Leeukloof 403
Dalmanutha 376	Berg-en-dal 367	Waaikraal 385
	Steynsplaats 360	Driekop 387
	Waterlop 367	Drenthe 402
	Driefontein 377	Dalmanutha 376
	De Goedehoop 362	
	Dalmanutha 376	

5.1.1.2 Alignment Selection Criteria

5.1.1.2.1 Alternative Alignments (Alternative 1 and Alternative 3)

Alternative alignments 1 and 3 were selected using the same method and criteria. The proposed alignments were selected through the use of satellite imagery and were based on the following criteria (refer to **Appendix G**):

- Length of proposed alignment;
- Existing transmission and distribution lines;
- Number of "bend points" in the alignment;
- Existing infrastructure;
- Topography; and
- Accessibility.

5.1.1.1.2 Alternative Alignment 5

Alternative 5 is the product of using a landscape model and the least cost approach. This alternative has been derived from technical construction specifications combined with perceived environmental sensitivities.

Using commercially available raster based GIS software; the least cost approach was applied to determine the location of a least environmentally sensitive but still socio-economically viable alignment. This approach makes use of a model consisting of landscape features such as geology, topography, soils, vegetation, land use and known infrastructure. Attributes within each landscape feature were ranked from one (1 – very low) to five (5 – very high) in terms of how a specific attribute within a landscape feature contributes to a specific environmental issue (for example threatened ecosystem and species, visual) or cost. Slopes, for instance, were classified into five classes ranging from 0 – 5°, 5 – 10°, 10 – 15°, 15 – 20° and 20° or more. Slopes of more than five degrees (5°) are associated with ridges and habitat diversity and potential threatened species, and would be assigned a value of five (5).

Similarly, engineers would rate the same slope also a five (5) because it would be technically more difficult and costly to construct infrastructure on steep slopes. In this case, the landscape model and least cost approach were used to determine a corridor that will have environmentally, socially and economically the least impact. The model is data-dependent and therefore the amount of data used determines the results of the model. For this study, the input data ranged in scale from 1: 250 000 (small scale) to 1: 50 000 (large scale), at a 100 m pixel resolution, thus each pixel representing one hectare (1 ha). The least cost approach algorithm searches through the landscape model from pixel to pixel to find the next pixel/area with a lower cost, whether environmentally or technically, than the surrounding pixels/areas. It continues with this process from the starting point, for example Arnot, until it reaches the end point, for example Gumeni.

Both the environmental and technical specialists were asked to rate the environmental attributes per landscape feature for their respective fields of expertise. This approach was not limited to the biophysical and technical specialists, but included the social specialists. The social specialist will rate/assign a five (5) to human related infrastructure such as a school, crèche, hospital or human settlement, while assigning/rating open spaces or natural environment where there are no structures, a one (1). Similarly with regard to vegetation, the model will determine where in the landscape a proposed development will have the least impact on vegetation. Thus a vegetation specialist will rate natural vegetation associated with protected areas a five (5), while rating areas associated with infrastructures such as roads and buildings a one (1) because such infrastructure has already had a major impact on the environment.

Once all the landscape features had been rated by the specialists in terms of their field of expertise, the model executed and created lines/pathways per field of expertise. These results were verified during the site visit in order to assess the model for future alterations or amendment. All the specialist layers based on the respective fields of expertise were combined together and a line/pathway generated that was buffered to accommodate a two (2) kilometre

wide corridor. The corridor obtained from the least cost approach was named the environmental and technical least impact line.

5.1.2. Alternative 1 (Orange Corridor)

The proposed Alternative 1 corridor will run parallel to the existing 400kV Arnot - Maputo power line, situated south of Arnot, thereafter Alternative 1 will run parallel to an existing distribution HV line in a north easterly direction. Alternative 1 will subsequently link up and run parallel to the approved Hendrina - Gumeni power line. Alternative 1 is approximately 56km in length and crosses over various roads including the R33 which is an important transport and economic route. Arnot Power Station aerodrome is situated 600m east of Alternative 1 alignment route and might be impacted on by the proposed 400kV power line.

Alternative 1 crosses over five major ravine systems, namely the Witkloofspruit, Waaikraaloop, Rietkuilspruit, Kwaaimanspruit and the Klien - Komati River, as well as various wetlands. The corridor also has the highest overlap with Highly Sensitive Aquatic Subcatchments (Mpumalanga Conservation Plan) and the second highest overlap of potential crane breeding watercourses. This implies that Alternative 1 will have significant impacts on various water bird species. Alternative 1 is also regarded as having a very high impact on avifauna as the areas within the corridor supports higher crane occurrences and nesting localities. According to the spatial representation of the Mpumalanga conservation plan on the study area, Alternative 1 traverses the greatest extent of highly significant, important and irreplaceable sites associated with the terrestrial biodiversity of the area as well as the greatest extent of sensitive flora habitats.

Within a socio-economic context, Alternative 1 contains moderate to high potential agricultural soils, however as a result of existing power lines, Alternative 1 has the least agricultural potential soils. Alternative 1 also contains the Siphakamile Combined School within the corridor. A Strathrae Colliery mine is also situated within the 2km corridor. The corridor also contains various heritage resources such as graves, farmsteads and other historical structures, as well as sites related to the Anglo-Boer War (1899-1902) and Iron Age stone walled sites.

5.1.3 Alternative 3 (Purple Corridor)

The proposed Alternative 3 corridor will run parallel to the N4 Maputo Corridor, situated north of Arnot and is considered to be the main link between Gauteng Province, Mpumalanga Province and Mozambique. Alternative 3 is approximately 60km in length and crosses over various roads including the R33 which is an important transport and economic route. An existing railway line, linking Machadodorp with Hendrina Power Station, transects various sections of the Alternative 3 route alignment. The St Micheil's and Fins Estate civil aerodromes are situated 490m North and 1.7km north of the Alternative 3 corridor respectively. There are aerodromes that can be potentially impacted on by the proposed Alternative 3 alignment.

Alternative 3 crosses over six major ravine systems, namely the Klien - Komati River, Driefontein Spruit, Blesbok Spruit, tributary of the Klien Olifants, De Geodehoop and the Leeuspruit, as well as various wetlands. This corridor as has the highest surface area of non-linear watercourses (e.g. pan wetlands) and the centre-line has the highest number of watercourse crossings of lengths greater than 400m. This implies that Alternative 3 may have significant impacts on various water bird species. Alternative 3 is also regarded as having a moderate impact on

avifauna as it is located along the N4 highway. According to the spatial representation of the Mpumalanga conservation plan on the study area, Alternative 3 traverses many highly significant, important and irreplaceable sites associated with the terrestrial biodiversity of the area as well as a fair amount of sensitive flora habitats. The victory mission, a potential heritage resource, was identified as being within the Alternative 3 corridor.

Within a socio-economic context, Alternative 3 contains moderate potential agricultural soils, which cover the majority of the corridor, thereby the Alternative 3 corridor contains the greatest extent of potential soils for agriculture. There are various settlements, schools (Arnot Colliery Primary School and Blomplaas Primary School) and tourism establishments that are located within the corridor and situated adjacent the N4 and railway line. The corridor also contains various heritage resources such as graves, farmsteads and other historical structures, as well as sites related to the Anglo-Boer War (1899-1902) and the Battle of Berg-end Dal/Dalmanutha.

5.1.4 Alternative 5 (Green Corridor)

Alternative 5 is approximately 55km in length and crosses the approved Hendrina - Gumeni power line as well as various roads including the R33, which is an important transport and economic route. Arnot Power Station aerodrome is situated 1100m south of Alternative 5 alignment route and may be potentially impacted on by the proposed double circuit 400kV power line.

Alternative 5 crosses over four major ravine systems, namely the Klien - Komati River, Blesbok Spruit, the Waaikraaloop and the Kwaaimanspruit, , as well as various wetlands. This corridor also has the highest combined watercourse surface area, the centre-line has the longest combined length and number of watercourse crossings, the centre-line has the highest number of crossings greater than 1 kilometre and the corridor contains the highest number of potential crane breeding watercourses. This implies that Alternative 5 may have significant impacts on various water bird species. Alternative 5 is also regarded as having a high impact on avifauna as the areas within the corridor supports higher crane occurrences and nesting localities According to the spatial representation of the Mpumalanga conservation plan on the study area, Alternative 5 traverses the least highly significant and important sites associated with the terrestrial biodiversity of the area as well as the smallest extent in terms of sensitive flora habitats.

Within a socio-economic context, Alternative 5 contains moderate to high potential agricultural soils, which cover a large extent of the corridor. Alternative 5 also contains various tourism establishments within the leeukloof area. Alternative 5 also transects various mining operations such as Gleco Mining and an Exxaro coal mine. The corridor also contains various heritage resources such as graves, farmsteads and other historical structures, as well as sites related to the Anglo-Boer War (1899-1902) and Iron Age stone walled sites.

5.1.4 No-Go Alternative

As a norm for any proposed development, the No-Go option should be considered as an alternative. To maintain the status quo is an attractive option for the reasons outlined below, but by not taking any action, Eskom Transmission would not be able to ensure consistent supply into Mpumalanga and therefore would be in contravention of the Grid Code (Transmission Licence). This would result in load shedding to protect the network from collapsing completely when one of the 400kV lines into Mpumalanga is out of service. Doing nothing would have a major impact on the economy of the region, as no new customers or load increase would be able to be accommodated by the network.

On a positive note this would reduce the impact on the aesthetic value of the natural environment, because the introduction of power lines into the landscape changes the sense of place (tourism impacts). It would also benefit the current status quo of the biophysical environment. However, the need for electricity is a national concern and not increasing the capacity to generate electricity within Mpumalanga Province could potentially stunt economic growth both in Mpumalanga and South Africa in general. Considering the need for a steady supply of electricity in the province and country in general, **this option is considered unrealistic and will not be evaluated further in the report**.

6. DESCRIPTION OF THE RECEIVING ENVIRONMENT OF THE STUDY AREA

6.1 DESCRIPTION OF SOCIAL ENVIRONMENT

6.1.1 Emakhazeni Local Municipality

The Emakhazeni Municipality is located between the PWV complex in Gauteng and Nelspruit in Mpumalanga on the N4 Maputo Corridor, which is considered to be the main link between Gauteng Province, Mpumalanga Province and Mozambique. The municipality is situated between the two major towns in Mpumalanga Province, namely Middelburg and Nelspruit and subsequently provides a link from Gauteng to the major tourism centres in Mpumalanga, specifically the Kruger National Park to the east and Pilgrim‟s Rest, Graskop, Lydenburg and Hoedspruit to the northeast.

The most dominant economic activity in the Emakhazeni area is farming and occupies the largest part of the physical area. Small towns such as Emakhazeni, Dullstroom and Waterval-Boven have developed throughout the area. These towns serve as service centres to the agricultural sector.

6.1.2 Steve Tshwete Local Municipality

The Steve Tshwete municipality covers an area of approximately 3993km^{2}and is situated within the Nkangala District Municipality approximately 130km east of Pretoria and 180km Northeast of Johannesburg. The majority of the population reside in the towns of Middelburg and Mhluzi.

The main economic activities within the Steve Tshwete Municipality are manufacturing, mining and agriculture. The municipality contributes approximately 29% of the Nkangala District GGP. The main industrial hub of the municipality is the town of Middelburg which contains various industries such as stainless steel production. Apart from Middelburg, activities such as Eskom Power Stations, coal and platinum mining and agriculture maintain the local economy.

6.1.3 Albert Luthuli Local Municipality

The Albert Luthuli Municipal is situated between Syde and Ekulindeni (Crysbestos) along the Swaziland and South African border in the east, towards Hendrina to the west and from Nooitgedacht and Vygeboom Dams in the north to Warburton in the south.

The municipality has various development concentrations spread across the region that can be categorized into five sub-regions, namely Carolina/Silobela; Elukwatini; Ekulindeni; Empuluzi and Tjakastad/ Badplaas. The R 38, R36 and R33 transect through the municipality and provide important transport and economic links for the Albert Luthuli Municipal area as well as other important areas in the Nkangala, Ehlanzeni and Gert Sibande regions.

The most dominant economic activity within the municipality, constituting approximately 80%of the total area, is agriculture. The remaining 20% of the municipality consists of limited

fragmented human settlements scattered across the region. The area is predominantly rural in character with small-scale socio-economic activities.

6.1.4 SOCIAL PROFILE

6.1.4.1 Population Figures

The population figures for the Nkangala District Municipality and relevant local municipalities are indicated in **Table 5**:

Table 5: Population Figures of Nkangala District Municipality (Statistics South Africa)

Area	*Population – Census 2001*	*Population – Community Survey 2007*
Nkangala District Municipality	1018 826	122 6500
Emakhazeni Local Municipality	43 007	32 840
Steve Tshwete Local Municipality	142 775	182 507

From the above table is clear that the Nkangala District Municipality and Steve Tshwete Local Municipality have an increase in population. The Emakhazeni Local Municipality population figures depict a slight decline of population from 2001 Census up until the 2007 Community survey.

The population figures for the Gert Sibande District Municipality and the relevant local municipality which fall within the study area are indicated in **Table 6**:

Table 6: Population Figures of Gert Sibande District Municipality (Statistics South Afirca)

Area	*Population – Census 2001*	*Population – Community Survey 2007*
Gert Sibande District Municipality	900 007	890 699
Albert Luthuli Local Municiplaity	187 936	194 083

The Gert Sibande District Municipality shows a decrease in population while there is a slightly increase of population in Albert Luthuli Local Municipality.

6.1.4.2 Education and Skills Level

6.1.4.2.1 Emakhazeni Local Municipality

About 30% of males and 37% of females over 20 years had no schooling in 2001. This was reduced to 15% for males and 27% for females by 2007, which indicate favourable

improvements in educational attainment over a period of 6 years. Employment opportunities are favourable in the municipality, particularly for males, as about 65% of males were employed in 2007. About a third of females were unemployed in 2001 compared to 14% of males in economically active ages. By 2007, this reduced to 12% for males and 16% for females. Also evident is that the improvements in employment are much more prominent for males rather than females by 2007. In general the municipality has better employment opportunities in the district.

6.1.4.2.2 Steve Tshwete Local Municipality

A total of 11% of the household heads have not received any schooling whilst a further 4% have only attended school up to Grade 2. This indicates a definite need within the municipality for ABET training. The employment rate of Steve Tshwete Local municipality is relatively low compared to the national average of between 25% and 30%.

6.1.4.2.3 Albert Luthuli Local Municipality

The current educational profile of the Albert Luthuli Local Municipality indicates that 34% of the population had either some primary or completed primary education, 36% had either some secondary or completed secondary education whilst only 15% had tertiary education. The current employment profile within the Albert Luthuli Local Municipality indicates that approximately 64% of the population is unemployed which is grossly higher than that of the national unemployment average.

6.1.5 INFRASTRUCTURE

6.1.5.1 Airfields

Three aerodromes (**Figure 6**) have been identified, that might be impacted on by the proposed double circuit 400kV power line, within the study area as well as within close proximity to the study area. The identified aerodromes are detailed in **Table 7**.

Table 7: Airfields within the study area and surrounding areas

Type	City/Town/Farm	Name	Latitude	Longitude
Civil	Arnot	Arnot Power Station	25.941183	29.809469
Civil	Waterloo 367 JT	St. Mitcheil's	25.710054	30149371
Civil	De Geodehoop 362 JT	Fins Estate	25.692173	30.166278

6.1.5.2 Power lines

There are various existing power lines within the study area which are as follows:

- Approved 400kV Transmission line from Hendrina – Gumeni (construction to start towards the end of 2012 or early 2013);
- Existing 275kV power line;
- Existing Arnot–Maputo 400kV power line; and
- Various Eskom Distribution lines.

6.1.5.3 Roads and Railways

The area has a well-developed road network, especially the N4 which stimulates development between the economic hub of the PWV and that of Nelspruit. Other important secondary corridors include the R33 which connects Belfast to Carolina and the R36 which connects Machadodorp to Carolina. Two railway lines, including various railway stations, exist within the study area, a railway linking Machadodorp with Hendrina Power Station and another linking Machadodorp with Ermelo.

6.1.5.4 Schools

The study area contains 12 schools of which 3 are combined primary and secondary schools and the remaining 9 are exclusively primary schools. The schools situated within the study area are as follows (refer to **Figure 7**):

- Sojuba Primary School;
- Morelig Combined School;
- Mthombomuhle Primary School;
- Arnot Colliery Primary School;
- Laerskool Rietkuil;
- Siphakamile Combined School;
- Eerstelingsfontein Primary School;
- Thokozani Combined School;
- Inhlanhla Primary School;
- Mmanyoni Primary School;
- Blomplaas Primary School; and
- Nhlupheko Primary School.

6.1.5.5 Mining Areas

There are various mining areas that are situated within the study area. Shown in **Figure 8** to **10** are the areas that have been identified as potentially being mining areas, exxaro surface and mining rights respectively. Identified mining areas include:

- Arnot Colliery
- Strathae Colliery
- Gleco Mining
- Shanduka Colliery
- Eerstelingfontein
- Belfast Project (Exxaro)

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6.1.6 TOURISM INDUSTRY

The tourism industry has been largely underdeveloped within Steve Tshwete, Albert Luthuli and the Emakhazeni Local Municipalities. There is a considerably high potential for recreation and tourism in the area, as there are few areas that have been developed for tourism purposes (e.g. resorts and hiking trails). Development of tourism will strengthen the economic base of the area and promote the area within the Mpumalanga context

6.1.6.1 Key tourism areas

Key tourism areas or sectors in the area include the following:

- Songivelo Game Reserve is the biggest game reserve within Albert Luthuli Municipality;
- The proposed new resort in Carolina will boost tourism in the area;
- Conferencing facility in Badplaas;
- game farms, fishing and sightseeing areas like the Nooitgedacht Dam next to Carolina
- a number of Bed and Breakfast accommodation;
- Lake Chrissiesmeer (wetlands) which has a large collection of bird and frog species in the country;
- Kruger National Park to the east; and
- Pilgrim's Rest, Graskop, Lydenburg and Hoedspruit to the northeast.

6.2. DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

6.2.1 Climate

The climate patterns within the western section of the study area is characterised by strong seasonal summer rainfall, with very dry winter periods. The average Mean Annual Precipitation (MAP) within this climatic zone is 726mm with a MAP range of between 650mm and 900mm. The climatic patterns differ within the eastern section of the study area due to change in topography. This climatic zone is characterised by topographic precipitation and mists throughout most months of the year. The average MAP is 858mm with a MAP range between 660mm and 1180mm, amplified by frequent mists. This section of the study area is frequented by frost, with an average of 21 frost days per annum (Mucina and Rutherford, 2006).

6.2.2 Geology

The main geological structures within the study area are the Transvaal and Karoo Supergroups with diabase intrusions. As shown in **Figure 11** the rocks originating from the main geological structures within the study area are shale in the eastern region and Arenite in the western region. The western region of the study area also contains dolerite, quartzite, basalt, gabbro and tillite instructions.

6.2.3 Topography

The topography within the western and south eastern sections of the study area range between 800m and 1800m above sea level. This area is characterised by slight to moderate undulating hills and plains and pan depressions. The eastern and north eastern sections of the study area contains high altitude plateaus, undulating plains, mountain peaks and slops as well as hills and deep valleys. The altitude range within these sections, range from 1260m to 2160m above sea level.

6.2.4 Surface Water

The study area is located within the Olifants Primary Catchment and the Inkomati Primary Catchment (**Figure 12**) and falls within the B12B, B12C, B41A, X21F, X11DX11C and X11A Quaternary Catchments (**Figure 13**). There are various dams and wetlands that are situated within the study area including the following river systems:

- Witkloofspruit;
- Waaikraaloop;
- Sewefonteinloop;
- Rietkuilspruit;
- Kwaaimanspruit;
- Klien - Komatie River;
- Driefontein Spruit;
- Blesbok Spruit;
- Tributary of the Klien Olifants;
- De Geodehoop; and
- Leeuspruit.

6.2.5 Soil and Agricultural Potential Component

The predominant agricultural capability within the study area ranges from high to low grazing and arable land use. The following land types (**Figure 14**) are associated with the line transects:

- Ac – red and yellow dystrophic and/or mesotrophic soils of variable depth, low to high agricultural potential;
- Ad – Red-yellow apedal, freely drained soils; yellow, dystrophic and/or mesotrophic;
- Ba – Plinthic catena: dystrophic and/or mesotrophic; red soils widespread, upland duplex and margalitic soils rare;
- Bb – Dystrophic and/or mesotrophic, red soils not widespread, low to high agricultural potential;
- Ea –One or more of: vertic, melanic, red structured diagnostic horizons, undifferentiated;
- Fa – Glenrosa and/or Mispah forms (other soils may occur), lime rare or absent in the entire landscape; and
- Ib – Miscellaneous land classes, rocky areas with miscellaneous soils.

6.2.6 Ecology

6.2.6.1 Regional Vegetation

The study area comprises of various vegetation units, which is due to the nature of the topography. The three regional vegetations units occurring within the study area (**Figure 15**) are the Eastern Highveld Grassland, the KaNgwane Montane Grassland and the Lydenburg Montane Grassland and. All three vegetation units fall within the grassland biome, of which the majority is considered endangered whilst the remaining vegetation is regarded as being vulnerable.

The Eastern Highveld Grassland is characterised by short dense grassland dominated by the usual highveld grass composition, namely *Aristida, Digitaria, Eragrostis, Themeda* and *Tristachya*, with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis africana, Diospyros lycioides* subsp *lycioides, Parinari capensis, Protea caffra, P. welwitschii* and *Rhus magalismontanum*). This vegetation unit is classified as endangered with only a small area conserved in reserves such as the Nooitgedacht Dam Nature Reserve. Approximately 44% of the Eastern Highveld Grassland has been transformed through cultivation, plantations, mining and urbanisation.

The KaNgwane Montane Grassland is characterised by a vegetation structure that is comprised of a short closed grassland layer with many forbs, and a few scattered shrubs on rocky outcrops. The KaNgwane Montane Grassland is regarded as being vulnerable and is fractionally conserved in nature reserve (Malalotja, Nooitgedacht Dam and Songimvelo). Approximately 30% of this vegetation unit has already been transformed by plantations of alien species, whilst a further 6% has been cultivated.

The Lydenburg Montane Grassland has predominately very low grasslands on the high-lying areas. The height of the grass sward increases on a lower slope and has an abundance of forb species. This vegetation unit is regarded as being vulnerable with only about 2.4% being conserved. The level of transformation is relatively high with approximately 23% of the grassland affected. The major drivers of transformation within the Lydenburg Montane Grassland are alien species plantations (20%) and cultivation (2%).

According to the Mpumalanga Conservation Plan (**Figure 16**), the majority of the terrestrial biodiversity within the study area is considered to have no remaining natural habitat remaining and of least concern. A fairly large section of the central part of the study area contains highly significant and important vegetation, which will need to be considered during the Impact Assessment phase. The areas of greatest concerns are the irreplaceable and protected vegetation fragments that are situated south of the orange and blue corridor and in the north within the purple corridor. These will need to be investigated further in the Impact Assessment phase.

6.1.6.2 Vegetation: Species of conservation concern

Most areas that constitute natural vegetation (in particular upland grassland on quartzite, sandstone and dolerite ridges) are considered as suitable habitat for the occurrence of conservation important species. Also, the direct relationship between threatened (or "near-threatened") species and areas where slopes are relative steep has been proven, and a subsequent high level of environmental significance is attributed to these particular areas. However, **Table 8** lists the conservation important taxa that could occur on the study area, and provides an indication of their potential occurrence.

Table 8: Red Data and Orange Listed plant species

Species	Flowering Season	Habitat	Probability of occurrence	Conservation Status
Red Data Listed				
Gladiolus malvinus	-	Dolerite outcrops in grassland at	Possible due to the presence of suitable habitat	Vulnerable

Species	Flowering Season	Habitat	Probability of occurrence	Conservation Status
		2 000 m.	on the northern extremity of the study area.	
Khadia carolinensis	-	Well-drained rocky outcrops, or the edge of sandstone sheets at 1 700 m.	High, could occur on the northern rocky grasslands of the study area.	Vulnerable
Prunus africana	December - June	Afromontane forest.	Possible.	Vulnerable
Miraglossum davyi	January	Grassland.	Could occur.	Vulnerable
Zantedeschia pentlandii	November – December	Rocky areas in grassland.	Probably extralimital (known from the Steenkampsberg region)	Vulnerable
Orange Listed				
Aloe reitzii var. *reitzii*	February - March	Rocky slopes in montane grassland.	Possible, known from the Belfast area - could occur on the extreme north-eastern parts of the study area.	Near-threatened
Boophone disticha	October-January	Grassland.	High, a widespread species on rocky grassland.	Declining
Callilepis leptophylla	August - January	Open grassland, especially on outcrops.	Widespread on rocky grassland.	Declining
Crinum bulbispermum	September – November	Along rivers and streams in damp depressions - mainly confined to black clay or sandy soils.	Widespread.	Declining
Eucomis montana	December – February	Rocky montane grassland.	High, upland rocky grassland.	Declining

Species	Flowering Season	Habitat	Probability of occurrence	Conservation Status
Gunnera perpensa	October- March	Upland streambanks and vleis.	Widespread.	Declining
Helichrysum homilochrysum	July - September	Cliff and ledges.	Possible from rocky grassland on the eastern part of the study area.	Rare
Hypoxis hemerocallidea	September-March	Grassland and mixed woodland.	High, likely to occur on natural grassland.	Declining
Khadia alticola	-	High-altitude montane grassland above 2 000 m.	Probably extralimital.	Rare
Ilex mitis	October – December	Riverbanks, streambeds and evergreen forest.	High, especially along steep ravines.	Declining
Protea parvula	December – January	Lydenburg Montane Grassland.	High, could occur on the eastern part of the study area.	Near-threatened
Riocreuxia aberrans	November - December	Exposed quartzite ridges.	Likely to occur on the eastern part of the study area.	Near-threatened

It is evident that the north-eastern part of the study area appears to hold the highest diversity of threatened, "near-threatened" or declining taxa, of which 14 species is likely to occur (corresponding to QDG 2530CA; see **Table 9**). *It clearly illustrates the importance of primary upland and rocky grassland seres near the Belfast district*.

Table 9: Number of threatened , near-threatened, declining or rare plant species

Quarter Degree	Number of species
2529DB	5
2530CA	14

2529DD	2
2530CC	0

6.2.7 Fauna

The proposed corridors will traverse through sections of extensive upland grassland and ridges, especially on the eastern section of the study area which could be suitable habitat for a variety of range-restricted mammal species. Likewise, the hillslope seeps and tributaries provide suitable habitat for a number of near-threatened and data deficient taxa that are wetland-dependant (e.g. the Spotted-necked Otter *Lutramacullicollis* and golden mole members of the genera *Amblysomus* and *Chrysospalax*). Although the study area is unlikely to hold large mammal species, it does support a population of the "Endangered" Oribi (*Ourebia ourebi*).

Most mammal species are in general highly mobile and therefore able to vacate areas should such adverse environmental conditions prevail. Therefore, direct impacts associated with construction activities on adult mortality are less likely to occur, although indirect impacts will have consequences on their “fitness” (e.g. the ability of a species to reproduce). However, persistent disturbances across extended temporal scales will eventually affect any population’s ability to sustain itself, and will more than likely result in total abandoning of a particular area.

Species most likely to be affected are either K-selected species or habitat specialists e.g. substrate specialists (e.g. golden moles). K-selected species are mostly long-lived species with slow reproductive rates, while habitat specialists are those restricted to a particular type of microhabitat or niche, being it structurally, altitudinal or floristic. Most of these species are therefore threatened, “near-threatened” or Red Listed.

Faunal compositions are believed to remain the same irrespective of the intensity of the construction activities (e.g. road construction) associated with the power lines, but the distribution and abundance of species could effectively change. Many habitat specialists (in particular those restricted to outcrops) could eventually suffer from local range contraction.

In addition, construction activities go hand in hand with high ambient noise. Although the construction phase is considered to be of short duration, many of the larger terrestrial species will vacate the study area during the construction phase and will become temporarily displaced.

Table 10 provides a list of threatened, “near-threatened” and conservation important faunal species with geographic distribution ranges sympatric (overlapping) to the study area.

Table 10: A list of threatened, "near-threatened" and conservation important faunal species

Scientific Name	Common Name	Conservation Status	Probability of Occurrence	Habitat
Mammals				
Amblysomus robustus	Robust Golden Mole	Endangered	Could occur	Edge of peatlands and seep zones.
Amblysomus sp. nr. *A. hottentotus*	Hottentot Golden Mole	Data Deficient	Widespread	Sandy soils and gardens.
Chrysospalax villosus	Rough-haired Golden Mole	Critically Endangered	Could occur (Belfast region)	Sandy soils along the edge of peatlands and seep zones.
Crocidura cyanea	Reddish-Grey Musk Shrew	Data Deficient	High	Dry terrain among rocks in dense scrub and grass, in moist places and in hedges. Wet vleis with good grass cover.
Crocidura flavescens	Greater Musk Shrew	Data Deficient	High	Mainly in disturbed areas and gardens.
Crocidura mariquensis	Swamp Musk Shrew	Data Deficient	High	Moist habitats, e.g. thick grass along riverbanks, reedbeds and in swamps.
Crocidura silacea	Lesser Grey-brown Musk Shrew	Data Deficient	High	Rocky areas in grassland.
Dasymys incomtus	African Marsh Rat	Near-threatened	Possible	Along rivers, streams and seeps with *Typha* and *Phragmites*.
Lutra maculicollis	Spotted-necked Otter	Near-threatened	High	Clear-flowing rivers and streams, especially upland rocky streams.
Myosorex cafer	Dark-footed Forest Shrew	Data Deficient	Could occur	Damp forested habitat.

Scientific Name	Common Name	Conservation Status	Probability of Occurrence	Habitat
Myosorex varius	Forest Shrew	Data Deficient	High	Confined to wetland habitats especially bogs, fens and swamps bordering grassland.
Ourebia ourebi	Oribi	Endangered	High (confirmed)	Upland grassland of primary condition and with a mosaic of tall and short grasses.
Panthera pardus	Leopard	Near-threatened (IUCN)	Possible, at extremely low densities	Varied and tolerant to a high diversity of habitat types.
Parahyaena brunnea	Brown Hyaena	Near-threatened (IUCN)	Status uncertain, possible	A savanna and grassland species, sometimes penetrating urban areas.
Reptiles				
Acontias breviceps	Short-headed Legless-skink	Near-threatened	High	Montane grassland
Homoroselaps dorsalis	Striped Harlequin Snake	Near-threatened	Possible	Outcrops and disused termitaria in grassland.
Tetradactylus breyeri	Breyer's Long-tailed Seps	Vulnerable	Possible	Short grassland and rocky areas in upland grassland.
Invertebrates				
Metisella meninx	Marsh Sylph	Vulnerable	High	Could occur along the many drainage lines, depending on the distribution of their host plant, *Leersia hexandra*.
Opistacanthus validus		Protected	High	Quartzite and sandstone rock exfoliations.

6.2.8 Avi-Fauna

In general, the study area is rich in bird species (mean of 229.25 spp, n=4 QDGs) which is explained by the high spatial heterogeneity (ridges and outcrops) in habitat and ecological condition of the grasslands (being of primary condition along the eastern parts of the study area). The number of bird species recorded for each quarter degree square ranges from 219 species at Moedig (2530CC) to as many as 243 species at Languitsig (2529DB).

Threatened and Near-threatened Species

The presence of extensive, undulating grassland and the presence of large endorheic pan systems are responsible for the observed diversity of Red listed bird species. Approximately 22.5 % (29 spp) of all regional and globally threatened and near-threatened species are present on the study area.

Those areas with high reporting rates were well-utilised by species such as the Greater Flamingo (*Phoenicopterus ruber*), Lesser Flamingo (*P. minor*), Southern Bald Ibis (*G. calvus*), Grey Crowned Crane (B. *regulorum*), Blue Crane (*Anthropoides paradiseus*), Blue Korhaan (*Eupodotis caerulescens*) and Secretarybird (*Sagittarius serpentarius*).

Non-threatened species

A number of other bird species are also likely to be affected by the proposed transmission line and include species such as the White Stork (*Ciconia ciconia*), Jackal Buzzard (*Buteo rufofuscus*) and a number of waterbird species pertaining to the Anatidae (ducks and geese), Phalacrocoracidae (cormorants), Anhingidae (darters), Ardeidae (herons and egrets) as well as Threskiornithidae (ibises).

6.2.9 Visual and Aesthetic Value

It is generally accepted that transmission lines reduce visual amenity and that visual amenity has a value to local residents and visitors to an area. The visual impact of transmission lines is much greater per kilometre than distribution lines because of the size of transmission pylons. The introduction of the new power lines on the landscape affects the natural view of the area, which leads to a change in the sense of place. Tourism areas are significant for local economic development and in many cases are earmarked to contribute to profitability and the mitigation of poverty by their aesthetic and recreational value. The optimal utilisation of these areas is important and fragmentation/sterilisation of and damage to the aesthetic value should be avoided. Detailed in **Figure 17** are the slope gradients within the study area providing information on the high-lying areas that may further increase the visual intrusion caused by the transmission lines.

6.2.10 Heritage Resources

A preliminary heritage desktop study was undertaken and the following heritage sites and resources were identified:

- **Informal graveyards and single graves**: Many sites have been identified in the area. These sites are located on the various farms within the study area. Many more unidentified grave sites in the area are expected.
- **Late Iron Age stone walled settlement sites:** The areas around Belfast and in the Arnot and Carolina areas are known to contain some of these sites.
- **Historical farmsteads and related structures:** Many old farmsteads are known to exist within the area.
- **Battlefield sites and monuments:** During the Anglo-Boer War (1899-1902) there were many battles around the area, and more notably the Battle of Berg-en D/Dalmanutha, for which there is a memorial near Belfast. There is also a British fortification from the same period on the farm Wemmershuis in the area, old graves (exhumed and reburied in the road reserve next to the new Carolina bypass) on the same farm, as well as an old Coach House from the late 19th century.
- **Other sites**: Include the Geloftefees Monument on the farm Steynsplaas. Although very little is known regarding the Stone Age heritage of the area, it is envisaged that sites and scatter of material could be encountered near rivers such as the Klein-Komati, Blesbokspruit. Witkloofspruit and others flowing through the area. The various pans in the area could also be a source of Stone Age occurrences, including Klippan, Grootpan, Leeupan and Rietpan.

7. PUBLIC PARTICIPATION PROCESS: SCOPING PHASE

Public participation forms an integral part of the full EIA process and the EAP is reliant on the Interested and Affected parties (I&AP's) to act upon their responsibility to participate in the process, to ensure adherence to the legal requirements as set out in NEMA.

Sections 54 to 57 of Regulation R543 of the EIA Regulations (August 2010) promulgated under the National Environmental Management Act No 107 of 1998 are applicable. The important elements relating to the public participation process that are required by the Regulations are the following:

- The manner in which potential Interested and Affected Parties (I&APs) were notified of the application for authorisation, and that a public participation process was mandatory.
- Opening and maintaining a register of the names and addresses of I&APs. These include all persons who have attended meetings, submitted comments, organs of State who have some form of jurisdiction in the assessment process, and all those who have requested that they be placed on the register as registered I&APs.
- Registered I&APs are entitled to comment, in writing, on all written submissions made to the competent authority by the applicant or the EAP managing the application, and to bring to the attention of the competent authority any issues which that party believes may be of significance when the application is considered for authorisation. The comments of registered I&APs must be recorded and included in the reports submitted to the competent authority.

During the Impact Assessment Phase, the focus was on informing public as well as registered I&APs about the project progress.

7.1 Updating of the I&AP Database

The Public Participation Process in the EIA Phase kicked off with an exercise to ensure that the team had the most up-to-date contact details of parties. The initial stages of the process were already in October/November 2010 and many of the contact details have changed since. This was no easy task, but every endeavour was made to create an up to date database of I&APs. During these conversations (and the e-mails sent) I&APs were invited to send their comments and concerns and to communicate with the P2 Team should they have any questions, etc.

7.2Notifying I&APs of Public Meetings to discuss the Findings of the DEIR as well as Availability of DEIR for Comment

Public meetings and Focus Group Meetings were held during the week of Monday 03 to Friday 07 December 2012. The following ways were used to notify people of the Public Meetings and the availability of the DEIR for public perusal and comment:

- Newspaper advertisements;
- Site Notices; and
- Notifications to existing registered I&APs.

Newspaper Advertisements

The table below indicates the newspapers and the publication dates used for announcement of the availability of the draft EIR:

Table 11: Newspaper Advertisements

Newspaper	Publication Date
Highvelder (English & Afrikaans version)	22 November 2012
Middleburg Observer (English & Afrikaans version)	23 November 2012
Highveld Herald (English & Afrikaans version)	22 November 2012
Kontrei Nuus (English & Afrikaans version)	16 November 2012

Public meetings Schedule

The table below indicates the place and time for public and time to discuss the findings of the DEIR

Table 12: it represents the place and date for Public meetings

DAY & DATE	TIME	PLACE
Monday 03 December 2012	10:00 – 12:00	**Machadodorp Farmers' Union Hall**
Tuesday 04 December 2012	19:00 – 21:00	**Wonderfontein Farmers Union**

7.3 Draft EIR Public Comment Period

The public comment period for the DEIR will be for a 40-days period starting 14 November 2012 until the 10 January 2012. All the interested and affected parties will be given opportunity to deliberate about the findings of the draft EIR during public and focus group meeting. **Table 14** shows where the hard and soft copies of the draft EIR were distributed to the public venues for perusal and comment. Registered Interested and Affected Parties were informed of the availability and they were requested to let the consultant know should they wish to receive CD-Rom copies.

Comments received on the Draft EIR will be incorporated into final EIR and will be taken up in the Comments Register (if it had to do with the report) or the Issues and Responses (Refer to **Appendix D**)

Table 13: Places were draft EIR was distributed

Place	Address	Contact Details	Contact Person
Wonderfontein Co-op	1 School Street, Wonderfontein	082 773 8776	Mr. Ferdie Brits
Afgri Carolina	C/o Voortrekker & Du Toit Streets, Carolina	017 843 1040	Eileen / Gerhard
Afgri Belfast	5 Duggan Street, Belfast	013 253 1168	Ms. Sandra Ferreira
BKB Co-op	19 Voortrekker Street, Machadodorp	013 256 0064	Ms. Marinda Mare
Steve Tshwete Municipality	Walter Sisulu Street & Wanderers Ave, Middelburg	013 249 7241	Mr. Mandla Mnguni

7.4 Summary of concerns raised during the EIA phase

Table 14: Summary of concerns raised during EIA process

Aspect	Issues raised
Alternatives (including Alignment)	The pans constitute a no-go
	Why can the previous alignment not be followed?
Archaeology and Heritage	There are many archaeological areas within the study area. These cannot be seen easily and a walk-down is required.
	Along the purple corridor (Alternative 3) there are Anglo-Boer war sites.
Compensation	We want monthly compensation and not a once-off payment.
Construction and Rehabilitation	Suggestions for the EMP.
Cumulative Impact	Will the double circuit affect the 55m servitude.
Ecology, Fauna and Flora	Wetlands and pans are no-go areas.
	There are many large endangered birds in the area (e.g. cranes, flamingos & vultures).
	There are important grassland species at Frisgewaagd.
	Orange & blue corridors (Alternative 1 and 2) have important protea species.
	From a botanical point of view, the purple corridor (alternative 3) is the preferred.

Aspect	Issues raised
	Application for a protected area to the east of the R33.
	Many Red Data and endemic species in the grasslands.
Economy	There is a need for local job opportunities.
Eskom Specific Issues	Will areas with little electricity receive more electricity due to this power line?
	Maintenance of servitude areas • Including use of herbicides. • Breach of EMP conditions. • Erosion. • Cutting fences.
	We do not want to have to police construction and maintenance contractors.
	Training of maintenance and contractor staff.
	The cumulative effect of the many power lines.
	Why can't the existing lines not just be upgraded?
	What is Eskom's future planning (including distribution planning)?
	What will the structures look like?
	Will old lines' EMPs be upgraded?
General	Will cell phone and TV signals be affected?

Aspect	Issues raised
	There is crop dusting in the area.
	Please follow farm visit protocol as developed by the Transvaal Agricultural Union.
Geology	There is undermining in the area and specialist studies will have to be conducted.
Health (Human and Animal, including electro-magnetic fields)	What is the effect of EMFs on people and animals
	Will the EMFs affect pace makers?
Infrastructure	The N4 may be altered at Wonderfontein.
	R35 may be changed.
	Transmission line crossings along National Routes must be at right angles.
Land-Use and Planning	There are areas with high potential agricultural land along the study area.
Need for the Project	Why does Eskom not take the power from Arnot to another substation?
	Chapter 17 of the Mine Health & Safety Act is also important.
Offers to assist and requests of Baagi	Various offers.
Process	Farm dwellers should also be contacted.
Property Values	Property values may drop, especially with a once-off payment.
Quality of Life / Sense of Place (including Visual Impact)	What will the towers look like?

Aspect	Issues raised
Safety	We do not want additional roads on farms as it gives access to criminals.
	We do not want to give 24hr access.
Surface Water	Wetlands need to be studied.
	Wetlands need to be spanned.
Technical Questions	Will the double circuit affect the 55m servitude?
	What is allowed within the 55m servitude?
	Is there a higher possibility of the line being struck by lightning?
	Why is so much power needed at Gumeni?
	Geotechnical, geophysical and risk assessment should be done for the mining areas.
	Can the line not go underground?
Water	Stay away from wetlands and watercourses by all means.
	No construction is allowed within 500m from a water body.

The public participation followed to date has culminated in the current Issues and Response Report, see **Appendix D**. The issues raised by all I&APs have been included in this report and have been taken into consideration by the Technical Team.

8. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

8.1. BACKGROUND

The EIA Team adopted a robust framework within environmental aspects arising from the influences of the proposed Arnot-Gumeni Transmission line that will be considered.

The key elements of the framework took the following into consideration:

- The concept of the sustainability, which considers the inter-related dimensions of the environment, viz. the social, economic, and biophysical dimensions, underpinned by a system of sound governance.
- Integrated planning in terms of Government strategies, Integrated Development Plans, Provincial Development strategies and the principles and practice of the co-operative governance.
- Legal/statutory requirements of South Africa (specifically, the National Environmental Management Act (Act 107 of 1998). The National Heritage Act (Act no 25 of 1999) and obligations that is associated with ratification of important international treaties, accords and agreements, for example, the United Nations Convention on Biodiversity.

8.2. SCOPING

Scoping was undertaken between January October 2011 and July 2012. Primary activities and/or products of scoping are outlined in **Table 15**.

Table 15: Key Activities and Deliverables of the Scoping Phase

Activities of Scoping Phase
Project Announcement
Public Participation
I&AP Identification
I&AP Engagement
Public and Focus Group Meetings
Technical Investigations
Identification of Issues
Draft Scoping Report Review
Compilation of Comments Report
Finalising Scoping Report

Submission of Report to DEA

8.3 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

The primary product of the Scoping Phase was the Final Scoping Report that was accepted by DEA on 05 September 2012. An important Section of the Final Scoping Report was the Plan of Study for the Environmental Impact Assessment (PoS for EIA), which provided information on the following:

- Which Specialist Studies would be undertaken;
- What would be investigated within each specialist study;
- How the investigation would be conducted;
- How potential impacts would be assessed;
- How the impact significance will be determined;
- The public participation activities; and
- The applicable times lines.

Thus, this Plan set the parameters for the Environmental Impact Assessment, the findings of which are contained in this Report.

8.4 ENVIRONMENTAL IMPACT ASSESSMENT PHASE

The aim of the Environmental Impact Assessment Phase is to investigate the environmental issues and concerns that were identified during scoping. The technical and public participation processes continue to interact at important stages to ensure that both processes build towards a comprehensive investigation of the issues identified. The main activities during the EIA Phase include:

- Undertake focused scientific studies to assess the issues of concerns;
- Maintain ongoing communication and participation with stakeholders;
- Integrate the findings into an Environmental Impact Assessment Report, inclusive of mitigation measures to ameliorate the effects of negative impacts and optimize positive ones; and
- Prepare an Environmental Management Plan.

For the purposes of assessing impacts, the project was divided into three phases, namely:

- **Construction Phase**

This phase involves the actual construction and all construction related activities on site, until the contractor leaves the site. Therefore, the main activities will be the establishment of construction camp sites, access routes, clearance of servitude to facilitate access, excavation of pits for tower foundation, erection of towers, movement of the construction workforce, equipment, construction vehicles and materials, etc. The above-mentioned activities will result in different types of impacts, some contributing to cumulative impacts.

- **Operational Phase**

This phase involves post construction activities, in particular, the transmission of power from one substation to the other. This phase includes the rehabilitation plan and monitoring system that will ensure that the impacts from the Construction Phase such as vegetation pruning, erosion control and the colonisation of area by alien species are continuously monitored and inspected. This phase also involves the maintenance of the facilities / towers to ensure continuous proper functioning of the equipment.

8.4.1 Technical Process Followed

In order to provide scientifically sound information with regard to the various issues identified, a number of specialist studies were commissioned. Specialists were tasked with assessing the possible impact of a 400kV power line on the receiving environment for each phase of the life cycle of the project (namely construction, operation and decommissioning as described above). The terms of reference guided each specialist to provide input that would ensure that issues and associated impacts were correctly understood and addressed, thereby enabling an integration assessment of the development proposal. The following specialist studies were commissioned:

- Flora Assessment;
- Fauna Assessment;
- Avi–Fauna (birds) Assessment;
- Wetlands Assessment;
- Visual and Aesthetics Assessment;
- Heritage Impact Assessment;
- Socio-Economic Assessment;
- Soil and Agricultural Potential Assessment;
- Town and Regional Planning Assessment.
- In addition to these specialist studies, information was also sourced on electromagnetic fields (based on specialist input obtained for other Eskom projects).

Specialists did not work in isolation, but were continuously communicating to discuss various aspects of the project during their investigations. An integrated approach was adopted to consider direct, secondary and cumulative impacts wherever possible.

Following the specialist studies, the EIA Team integrated the respective findings to provide a comprehensive understanding of the potential positive and negative impacts of the project. Information on certain project components and activities were fed into the EIA Process from other project team members that did not necessarily form part of the EIA specialist group.

The EIA Team used these results when they assessed the various alternatives during the integration process. The outcomes of the integration and assessment are documented in the report, released to the public domain for comment as a Draft Environmental Impact Report (DEIR).

8.4.2 Key Aspects Pertaining to Each Specialist Study

The key aspects of each specialist study will now be outlined.

8.4.2.1 Flora Assessment

The following aspects were addressed:

- A description of the current state of the flora in the areas traversed by the corridors, outlining important characteristics and components thereof, which may be influenced by the implementation of the proposed project or which may influence the proposed project during construction and operation.
- The identification of existing and future planned conservation areas.
- The identification and categorisation of Red Data species potentially affected by the proposed project.
- The identification of potential impacts (positive and negative, including cumulative impacts) of the proposed project on vegetation, and vice versa, during construction and operation.
- Map all sensitive features (including wetlands, drainage lines, habitats for threatened species and other areas of conservation significance) - superimposed on the proposed corridors.
- The identification of mitigatory measures that will enhance benefits and aid in avoiding or mitigating negative impacts and risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed project).
- The provision of clear guidelines to reduce damage to and loss of vegetation, to assist with rehabilitation where damage and loss are unavoidable and to reduce the risk of the spread of alien vegetation.
- The formulation of a clear and simple system to monitor impacts and their management, based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.

8.4.2.2 Faunal Assessment

The following aspects were addressed:

- A description of the current state of fauna in the areas traversed by the corridors, outlining important characteristics and components thereof - including species-specific habitats -which may be influenced by the proposed project or which may influence the proposed project during construction and operation.
- The identification of Red Data species potentially affected by the proposed project.
- The identification of potential impacts (positive and negative, including cumulative impacts) of the proposed project on fauna during construction and operation.
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed project).
- The formulation of a clear and simple system to monitor impacts and their management, based on key indicators.

8.4.2.3 Avi-Faunal (Bird) Assessment

The following aspects were addressed:

- A description of the current state of avi-fauna in the areas traversed by the corridors, outlining important characteristics and components thereof - including species-specific habitats and roosting/nesting sites - which may be influenced by the proposed project or which may influence the proposed project during construction and operation.
- The identification of Red Data and vulnerable species potentially affected by the proposed project.
- The identification of potential impacts (positive and negative, including cumulative impacts) of the proposed project on avi-fauna during construction and operation.
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed project).
- The formulation of a clear and simple system to monitor impacts and their management, based on key indicators.

8.4.2.4 Soil and Agricultural Potential Assessment

The following aspects were addressed:

- Description of current state of soil and agricultural potential within the study area. This outlined important characteristics and components thereof, which may be influenced by the proposed transmission line, or which may influence the proposed transmission line during construction and operation. Collaboration with the Geotechnical and Wetland specialists will be required in this regard.
- Description of the agricultural potential and soil types within the study area.
- The identification of the potential impacts (positive or negative, including cumulative impacts, if relevant) of the proposed transmission line on soil and agricultural potential during construction and operation. This aspect of study identifies sensitive “no-go” areas and also includes an analysis of construction constraints associated with the areas with high agricultural potential.
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impact and risks (to be implemented during design (i.e. pre-construction), construction and operation of the transmission line).
- The formulation of a simple system to monitor impacts and their management based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities’ policies.

8.4.2.5 Wetland Assessment

The following aspects were addressed:

- Description of the current state of wetland and surface water resources and key ground water resources (including geo-hydrological aspects) within the study area. This outlines important characteristics and components thereof, which may be influenced by the proposed transmission line, or which may influence the proposed transmission line during construction and operation.

- Description of the functionality of the wetlands within the study area.
- The identification of the potential impacts (positive or negative, including cumulative impacts, if relevant) of the proposed transmission line on wetlands during construction and operation. This aspect of study identifies the sensitive "no-go" areas and includes an analysis of construction constraints associated with wetlands.
- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impact and risks (to be implemented during design (i.e. pre-construction), construction and operation of the transmission line).
- The formulation of a simple system to monitor impacts and their management based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.

8.4.2.6 Visual and Aesthetics Assessment

The following aspects were addressed:

- Description of the visual landscape of the study area, with specific focus on topographical features that offer impact mitigation opportunities and constraints.
- Description of the area from which the project can be seen (the view shed), as well as the viewing distance.
- An assessment of the visual absorption capacity of the landscape (i.e. the capacity of the landscape to visually absorb structures and form placed upon it).
- The appearance of a transmission line from important or critical viewpoints within established and existing planned land uses/activities (e.g. nature reserve birds hide). Particular attention was paid to where the transmission line will traverse the Drakensberg escarpment.
- The identification of potential impacts (positive or negative, including cumulative impacts, if relevant) of the proposed development on the visual landscape during construction and operation.
- The identification of mitigatory measures for enhancing benefits and avoiding, reducing or mitigating negative impact and risks (to be implemented during design (i.e. pre-construction), construction and operation of the transmission line).
- The formulation of a simple system to monitor impacts and their management, based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and National Authorities policies.

8.4.2.7 Socio-Economic Assessment

The following aspects were addressed:

- Description of the current socio-economic environment within the study area, outlining important characteristics and components thereof, which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction or operation.
- The identification of potential impacts (positive or negative, regional and local, including cumulative impacts, if relevant) of the proposed development on the social

and socio-economic environment during construction and operation. This aspect of the study considers potential impacts on the existing infrastructure, nuisance impacts, possible traffic effects (in collaboration with the transport specialist), the transmission of diseases, in particular HIV/AIDS and health and safety impacts (including poaching and stock theft).

- The identification of mitigatory measures for enhancing benefits and avoiding or mitigating negative impacts and the risks (to be implemented during design (i.e. pre-construction), construction and operation of the proposed transmission line).
- The formulation of a simple system to monitor impacts and their management based on key indicators.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.

8.4.2.8 Heritage Assessment

The following aspects were addressed:

- The consideration of the impacts on Cultural Heritage resources arising from the construction and operation of the proposed transmission line and the infrastructure.
- Information were provided regarding the following:
    - Results of the survey of the construction footprint and the identification of cultural heritage resources that may be affected by the proposed infrastructure, or which may affect the proposed infrastructure during construction and operation.
    - Recommended mitigation measures for enhancing positive impacts and avoiding or minimizing negative impacts and risks (to be implemented during design, construction and operation).
- Formulation of protocol to be followed by Eskom for the identification, protection and recovery of cultural heritage resources during construction and operation.
- Liaison with SAHRA / AMAFA.
- Adherence to and compliance with the NEMA Regulations as well as provincial and national authorities' policies.
- The identification of known heritage resources that will be adversely affected by the proposed development.

8.4.2.9 Town and Regional Planning Assessment

The following aspects were addressed:

- The identification, description and mapping of all relevant existing and future planned developments within the areas traversed by corridors.
- The identification and mapping of land claims and land reform initiatives in the areas traversed by the corridors (where possible).
- The identification of geographic areas where the proposed project would be incompatible with existing and future planned developments and the land reform programme.

8.4.2.10 Electro-Magnetic Fields Assessment

No separate Electro-Magnetic Field (EMF) Assessment was commissioned as part of this EIA. This was because Eskom had recently completed a detailed study of effects of EMFs, which was externally reviewed by international specialists. The EIA Team used findings of this study to incorporate into this report in attempt to show the effect of the EMFs on people, plants and animals(Appendix F).

8.4.3 Assessment Criteria

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need.

The significance of the aspects/impacts of the process were rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts will be determined through a synthesis of the criteria below (refer to **Table 16**):

Table 16: Significance Criteria

Aspect		Definition
Probability		**This describes the likelihood of the impact actually occurring**
	Description	**Definition**
	Improbable	The possibility of the impact occurring is very low, due to the circumstances, design or experience.
	Probable	There is a probability that the impact will occur to the extent that provision must be made therefore.
	Highly Probable	It is most likely that the impact will occur at some stage of the development.
	Definite	The impact will take place regardless of any prevention plans and there can only be relied on mitigatory measures or contingency plans to contain the effect.
Aspect		**Definition**
Duration		**The lifetime of the impact**
	Description	**Definition**
	Short Term	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.
	Medium Term	The impact will last up to the end of the phases, where after it will be negated.
	Long Term	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.
	Permanent	The impact is non-transitory. Mitigation either by man or natural processes will not occur in

		such a way or in such a time span that the impact can be considered transient.
Aspect		**Definition**
Scale		**The physical and spatial size of the impact**
	Description	**Definition**
	Local	The impacted area extends only as far as the activity, e.g. footprint
	Site	The impact could affect the whole, or a measurable portion of the above mentioned properties.
	Regional	The impact could affect the area including the neighbouring residential areas.
Aspect		**Definition**
Magnitude/ Severity		**Does the impact destroy the environment, or alter its function**
	Description	**Definition**
	Low	The impact alters the affected environment in such a way that natural processes are not affected.
	Medium	The affected environment is altered, but functions and processes continue in a modified way.
	High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Aspect		**Definition**
Significance		**This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.**
	Description	**Definition**

	Negligible	The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.
	Low	The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.
	Moderate	The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.
	High	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

Table 17: The following weights were assigned to each attribute:

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Scale	Local	1
	Site	2
	Regional	3
Magnitude/Severity	Low	2
	Medium	6
	High	8
Significance	Sum (Duration, Scale, Magnitude) x Probability	
	Negligible	≤20
	Low	>20 ≤40
	Moderate	>40 ≤60
	High	>60

The significance of each activity was rated without mitigation measures (WOM) and with mitigation (WM) measures for both construction, operational and closure phases of the proposed development.

9. SPECIALIST FINDINGS AND RECOMMENDATIONS OF SPECIALIST REPORTS

This chapter provides a brief outline of the findings and recommendations by the specialists. A total of 10 specialist studies were undertaken by independent specialists (**Table 18**), the results of which are summarized in this chapter. Copies of the specialist reports are provided for in **Appendix F**.

With respect to Electro-Magnetic Fields (EMFs), no separate EMF Specialist Study was undertaken as part of this EIA. This is because Eskom had previously commissioned such a study (refer to **Appendix F**), which was externally peer-reviewed. The findings of this study are used to inform this EIA in addressing EMF-related matters.

Table 18: Details of Specialist Studies

Specialist Field of Study	Specialist	Organisation
Wetland	Mr. Retief Grobler	Imperata Consulting
HIA	Mr. Anton Pelser	Anton Pelser Consulting
Avifauna and Fauna	Mr. Lukas Niemand	Pachnoda Consulting
Flora	Mr. Willem de Frey	EkoInfo CC
Soil and Agricultural Potential	Mr. Paul Vermaak	Nepid Consulting
Visual Impact Assessment	Mr Karsten Drescher	Terralogix Consulting
Socio-Economic Assessment	Mrs. Ingrid Snyman	Batho Earth Consulting
Town & Regional Planning	Mr. Shady Molau	Bageso Housing and Development Consulting
Geotech Overview	Mr Karsten Drescher	Terralogix Consulting

9.1 FLORA

FINDINGS

The flora Assessment was conducted based on GIS modelling as well as fieldwork applying Braun-Blanguet Method whereby a plot system is used for data collection. As a result of this study, it was found that the following four vegetation units intersect the study area, the Eastern Temperate Freshwater Wetlands, the Eastern Highveld Grassland, the KaNgwane Montane Grassland and the Lydenburg Montane Grassland. The overview of the four regional vegetation units based on VEGMAP is described in **Table 19**.

In terms of land use, the study area is characterised by 16 land cover categories, which are associated with various land uses. The 75% of the study area is natural areas which are associated with livestock farming, whether domestic or game and disturbances while 25% of the study area is transformed.

Mpumalanga Parks Board Conservation Plan provides the information of areas of conservation value or importance (refer to **Figure 18**). This data source highlights the distribution and extent of nature reserves and irreplaceable areas in terms of biodiversity and reaching conservation targets. Approximately 37% of the study area is considered to be of high conservation significance on a provincial scale or level. In terms of percentage cover as per the study area, No Natural Habitat Remaining has high percentage of 40%, which is low in terms of conservation significance. Least concern has 23% of cover but it has low conservation significance. Importance and Necessary, Highly Significance, Irreplaceable and protected areas share 37% which is for high conservation value. It must be indicated that protected trees cover 0% percent of surface cover of which out of total 98320 of surface in hectares, protected areas only cover 28 percent of the entire study area.

In terms of the species diversity (regional context) a total of 112 species within Mpumalanga is considered to be threatened (Vulnerable, Endangered and Critical Endangered) in terms of the IUCN Red Data criteria. Of the 112 species, 76 species (86%) are considered to be Vulnerable, 25 species (22%) are considered to be Endangered, and 11 species (10%) are considered to be Critical Endangered. The 112 species represent 38 plant families of which the following seven (7) families contain more than 50% of the species: Apocynaceae; Asphodelaceae; Fabaceae; Gesneriaceae; Iridaceae; Orchidaceae; Zamiaceae. As shown in **Figure 19**, flora sensitivity areas that were modelled based on the environmental attributes such as geology, land form and vegetation that are associated with the threatened Red Data Flora occurring in Mpumalanga. The model shows the potential distribution and extent of flora sensitive areas within the landscape.

Table 19: regional vegetation units present within the study area from Vegmap

Ecosystem	Aquatic	Terrestrial		
Regional vegetation unit	Eastern Temperate Freshwater Wetlands	Eastern Highveld Grassland	KaNgwane Montane Grassland	Lydenburg Montane Grassland
General description	Flat landscape or shallow depressions filled with (temporary) water bodies supporting zoned systems of aquatic and hygrophilous vegetation of temporarily flooded grasslands and ephemeral herblands	Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya etc)* with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis africana, Diospyros lycioides* subsp *lycioides, Parinari capensis, Protea caffra, P. welwitschii and Rhus magalismontanum*)	Largely comprised of undulating hills and plains that occur on the eastern edge of the Escarpment. This unit is transitional between the Highveld and Escarpment and contains elements of both. The vegetation structure is comprised of a short closed grassland layer with many forbs, and a few scattered shrubs on the rocky outcrops.	High-altitude plateaus, undulating plains, mountain peaks and slopes, hills and deep valleys of the Northern Escarpment region, supporting predominantly very low grasslands on the high-lying areas. Height of the grass sward increases on the lower slopes. The grassland is very rich in forb species.
Biogeographically Important Taxa	1		6	24
Endemic Taxa	4		4	25
Threats	Some 15% has been transformed to cultivated land, urban areas or plantations. In places intensive grazing and use of	Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact. No serious	It is well suited for afforestation and 30% has already been converted to plantations of alien trees. A further 6% is	The level of transformation is relatively high at 23%, with mostly alien plantations (20%) and cultivated lands (2%).

	lakes and freshwater pans as drinking pools for cattle or sheep cause major damage to the wetland vegetation.	alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed areas.	under cultivation.	
Conservation status	Least threatened	Endangered	Vulnerable	Vulnerable

Based on the **Ecosystem diversity**, the floristic composition recorded was used in a TWINSPAN analysis, which resulted in the identification of five (5) vegetation clusters/ units. These five clusters represent four vegetation communities, of which the first community is related to moist grassland, whether seasonally, or temporary wet, and the other three with edaphic/ terrestrial grassland. The four communities are (refer to **Figure 20**):

- **Temporary or seasonally moist grassland associated with sandy clay loam soils** Phytosociological name: *Monopsis decipiens - Senecio achilleifolius* moist grassland in low lying areas, temporary or seasonally saturated. This community occurs away from ridges (below 5°/ 8% slopes), in areas where there is an increase in the probability in the landscape for water to accumulate.

- **Shrub dominated utilised grassland on sandy clay loam soils with surface rock derived from mudrock**. Phytosociological name: *Brachiaria serrata - Diospyros lycioides* shrub dominated sub-climax grassland on fine textured, rocky soils derived from mudrock. This community occurs on steeper slopes, mainly in the lower lying areas of the study area towards the east, due to it steeper slopes, it is less likely for water to accumulate in it.

- **Shrub Climax grassland on loamy sand soils derived from** sandstone Phytosociological name: *Helichrysum acutatum - Themeda triandra climax* grassland on coarse textured soils derived from sandstone. This community occurs on gentler slopes, mainly in the higher lying areas of the study area towards the west, due to its gentler slopes, it is more likely for water to accumulate in it

- **Short climax grassland on highlying areas associated with very shallow, sandy soils large rocks and boulders on quartzite rock** Phytosociological name: *Stachys natalensis - Monocymbium ceresiiforme* short grassland on large outcrops with very shallow, very coarse textured soils derived from quartzite. This community occurs on the higher lying areas, mainly crests of the study area The quartzite is more resistant to weathering while its position in the landscape results in the removal of finer materials, resulting in coarser textured soils being present

According to the specialist study, these four communities are typical of the remaining grassland in the landscape, which has not been ploughed due to being either too wet, too shallow, too steep, too rocky or a combination of these factors. It is expected that the remaining grassland in the west will experience higher grazing pressure than the grassland to the east, where the landscape is more intact . The increase in estimated cover abundance of grass species associated low grazing pressure (decreaser species) from west to east and an decrease in increaser species (high grazing pressure), supports this statement.

Based on Species diversity, the following key aspects of species diversity have been attained:

- **Species richness**

A total of 245 species were recorded during the survey, representing 57 plant families, of which 165 species (68%) are forbs, 63 species (26%) are grasses/ gramnnoids and 14 species (6%) are woody species.

- **Threatened and protected species**

Two threatened (Vulnerable, Endangered, Critical Endangered) plant species according to the latest Red Data flora assessment from SANBI, was recorded during the survey, namely *Crassula setulosa* Harv. var. *deminuta* (Diels) Toelken (Vulnerable) and *Helichrysum aureum* (Houtt.) Merr. var. *argenteum* Hilliard (Vulnerable). *Crassula setulosa* was observed in community 4. It is evident that these species occur throughout the study area where natural vegetation is remaining. In this case should one this protected species need to destroyed or translocated a permit of the removal of this species will be required.

- **Medicinal Plants**

Nine species with medicinal properties were recorded within the survey; they are *Centella asiatica, Elephantorrhiza elephantina, Eucomis autumnalis subsp. autumnalis, Hypoxis hemerocallidea, Pelargonium luridum, Pellaea calomelanos var. calomelanos, Pentanisia prunelloides subsp. prunelloides, Scabiosa columbaria* and *Vernonia oligocephala.* These species were present throughout the study area (Table 15); they do not have specific conservation status, but do run the risk of being exploited during the construction phase in the vicinity of construction camps.

- **Alien invasive species**

No alien invasive species were recorded in the natural areas that were sampled during the survey. However, declared alien invasive woody species are present within the landscape, mainly associated with forestry for example Acacia mearnsii (Wattle) and *Eucalyptus* species (Bluegum) and *Pinus* (Pine). Other weeds and/ declared invasive species will occur in the cultivated lands or old fields.

It has been observed in terms of localised species biodiversity hotspot that rocky areas present high localised biodiversity hotspot

RECOMMENDATIONS

The assessment and evaluation of the suitability and sensitivity were based on two models: Namely flora sensitivity model and Mpumalanga Parks Board Conservation Plan. Both of the models found Green corridor (Alternative 5) as the most suitable and less sensitive while Orange corridor (Alternative 1) it was found to be less suitable and most sensitive. The Purple corridor it was found to be in the middle between the two corridors in terms of the preference of corridors (**Table 20**). Therefore, a purple corridor qualifies to be the second option to the preferred Green corridor.

Table 20: Overview of the extent and percentage cover of conservation priority areas within the landscape per two kilometre route alternative corridor based on Mpumalanga's Conservation Plan

Route corridors	Alternative 01	Alternative 03	Alternative 05
ASSESSMENT	**Surface (ha)**	**Surface (ha)**	**Surface (ha)**
No Natural Habitat Remaining	2734	4670	5275
Least Concern	3408	3974	3155

Important & Necessary	1106	1643	1187
Highly Significant	3283	761	850
Irreplaceable	184	114	
TOTALS	10715	11163	10468
ASSESSMENT	**Surface (ha)**	**Surface (ha)**	**Surface (ha)**
No Natural Habitat Remaining	26%	42%	50%
Least Concern	32%	36%	30%
Important & Necessary	10%	15%	11%
Highly Significant	31%	7%	8%
Irreplaceable	2%	1%	0%
TOTALS	100%	100%	100%
Sensitivity	Most		Least
Suitability	Least		Most

9.2 FAUNA

This study was based on fieldwork as well as a desktop study analysis. The importance of regional vegetation units within this study is crucial, because vegetation serves as habitat for faunal life. Impacts of the transmission lines on fauna species consists of disturbances caused during the construction and maintenance phase. These include the construction and positioning of the tower structures, laydown areas, construction camps as well as a number of access roads.

During the construction phase, it is possible that areas corresponding to the footprint of the proposed pylon structure could provide habitat for conservation important fauna species. Typical examples include damage and disturbances caused to rocky grassland and dolerite outcrops. These features are the preferred habitat for protected scorpion species (namely *Opistacanthus validus*) or rupiculous reptile taxa that seek shelter between the various rock layers. Species most likely to be affected are either "K-selected" species or habitat specialists e.g. substrate specialists (e.g. certain invertebrate and reptile species). K-selected species are mostly long-lived species with slow reproductive rates, while habitat specialists are those restricted to a particular type of microhabitat or niche, being it structurally, altitudinal or floristic. Therefore, these species often seek shelter when threatened rather than running away and are invariably associated with rocky grassland, upland seeps or riparian vegetation zones.

Faunal compositions are believed to remain the same irrespective of the intensity of the construction activities associated with the transmission line, but the distribution and abundance of species could effectively change. Many habitat specialists (in particular those restricted to the rocky grasslands) could eventually suffer from local range contraction should their habitat be altered in a significant manner.

In considerations of the overview of threatened, near-threatened and conservation-dependant fauna species; the study area provides suitable habitat for a diversity of conservation-dependant fauna which is attributed to the high spatial heterogeneity of the landscape and various drainage lines (refer to **Table 21**). The proposed alternatives will traverse through sections of extensive upland grassland and ridges, especially on the eastern section of the study area which could be suitable habitat for a variety of range-restricted mammal species. Likewise, the hillslope seeps and tributaries provide suitable habitat for a number of near-threatened and data deficient taxa that are wetland-dependant (e.g. the Spotted-necked Otter *Lutra macullicollis* and golden mole members of the genera *Amblysomus* and *Chrysospalax*). Although the study area is unlikely to hold large mammal species, it does support a population of the "Endangered" Oribi (*Ourebia ourebi*).

Table 21: A list of threatened, "near-threatened" and conservation important faunal species likely to occur on the study area

Scientific Name	Common Name	Conservation Status	Probability of Occurrence	Habitat
Mammals				
Chrysospalax villosus	Rough-haired Golden Mole	Vulnerable**	Could occur	Sandy, well-drained soils along upland seeps
Amblysomus septentrionalis	Robust Golden Mole	Near-threatened**	Could occur along upland seeps and drainage lines	Mainly along the edges of seep zones dominated by Ouhout (*Leucosidea sericea*). Also gardens.
Amblysomus hottentotus	Hottentot Golden Mole	Data Deficient*	High - a widespread golden mole on the study area.	Sandy soils in gardens and even wattle plantations.
Crocidura cyanea	Reddish-Grey Musk Shrew	Data Deficient*	High – likely to occur on most of the available natural habitat types.	Dry terrain among rocks in dense scrub and grass, in moist places and in hedges. Also vleis with good grass cover.
Crocidura flavescens	Greater Musk Shrew	Data Deficient*	High - likely to occur.	Often partial to disturbed areas and rural gardens.
Crocidura fuscomurina	Tiny Musk Shrew	Data Deficient*	High, likely to occur on most of the natural habitat types.	Wide habitat tolerance.
Crocidura hirta	Lesser Red Musk Shrew	Data Deficient*	High – likely to occur along moist grassland areas bordering drainage lines and impoundments.	Moist situations along drainage lines.
Crocidura mariquensis	Swamp Musk Shrew	Data Deficient*	High - – likely to occur along moist grassland bordering drainage lines and	Moist habitats, e.g. thick grass along riverbanks, reedbeds and in swamps.

Scientific Name	Common Name	Conservation Status	Probability of Occurrence	Habitat
			impoundments.	
Myosorex varius	Forest Shrew	Data Deficient	High, likely to occur along the drainage lines bordered by *Breonadia salicina* woodland	Wetlands with dense cover.
Miniopterus natalensis	Natal Long-fingered Bat	Near-threatened*	Likely to occur, although considered to be a foraging visitor.	Open grassland.
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Near-threatened*	High - could occur.	Varied, although partial to caves and rock exfoliations.
Graphiurus platyops	Rock Dormouse	Data Deficient*	High – especially on the ridges.	Rocky areas.
Dasymys incomtus	African Marsh Rat	Near-threatened*	Could occur - a wetland species that could be present along the drainage lines.	Well-vegetated wetlands (dominated by *Phragmites* & *Typha*).
Lemniscomys rosalia	Single-striped Mouse	Data Deficient*	High, likely to be present .	Tall grasslands, also secondary grassland.
Lutra maculicollis	Spotted-necked Otter	Near-threatened*	High, likely to occur along the perennial streams (especially the Komati River system).	Clear streams and rivers as well as dams.
Poecilogale albinucha	African Striped Weasel	Data Deficient*	Could occur.	Varied but prefers grassland seres with a high density of rodent prey.
Mellivora capensis	Honey Badger	Near-threatened*	High, could occur on all the habitat types.	Varied, also cultivated areas.

Scientific Name	Common Name	Conservation Status	Probability of Occurrence	Habitat
Parahyaena brunnea	Brown Hyaena	Near-threatened**	Could occur although rare.	Varied.
Leptailurus serval	Serval	Near-threatened*	High - a widespread species likely to occur on moist grassland bordering drainage lines and impoundments.	Moist savanna and tall grassland.
Panthera pardus	Leopard	Near-threatened**	Possible although considered to be unobtrusive and occasional.	Varied.
Ourebia ourebi	Oribi	Endangered*	High - confirmed from the eastern parts of the study area.	Upland mixed primary grassland with localised patches of tall grassland (roosting sites).
Herpetofauna				
Homoroselaps dorsalis	Striped Harlequin Snake	Near-threatened**	Could occur.	Rocky grassland and disused termitaria.
Acontias breviceps	Short-headed Legless Skink	Near-threatened**	High - likely to occur.	Upland primary grassland.
Tetradactylus breyeri	Breyer's Long-tailed Seps	Vulnerable**	High - an obligate Highveld grassland species.	Rocky primary grassland.
Invertebrates				
Metisella meninx	Marsh Sylph	Vulnerable***	High, an obligate wetland species.	Highveld seeps dominated by *Leersia hexandra*.
Opistacanthus validus		Protected****	High, associated with the rock exfoliations.	Ridges with exfoliated rock and crevices in rocky grassland.

Table 22 and figure 21 represent the sensitivity analysis of the areas comprising of potential sensitive elements based on the following ecological zones:

Table 22: Represents the areas of ecological value that provide critical habitat to fauna taxa

Ecological Zone: Zone 1	Ecological Zone: Zone 2	Ecological Zone: Zone 3
Upland and rocky grassland of primary composition with a high anticipated floristic richness;	Large ephemeral pans that provide foraging habitat for large numbers of "near-threatened" Greater Flamingo and Lesser Flamingo	The extensive grassland units provide an important interconnected corridor for faunal species. These grasslands have the inherent potential to provide habitat for a number of threatened and conservation important faunal species, in particular mammal, bird and reptile taxa (e.g. Oribi, Secretarybird, White-bellied Korhaan and Denham's Bustard);.
High density of threatened and near-threatened faunal taxa	Large ephemeral pans that provide habitat for large congregations of waterfowl, wading birds and Palaearctic wader species	The rocky grassland shows high spatial heterogeneities (based on the quartzite and dolerite outcrops), thereby contributing to a myriad of microhabitat types and niche space. This high diversity in microhabitat types are the main reason for the high expected faunal richness
Occurrence of extensive upland seeps responsible for high reporting rates of Wattled Cranes.		• The Komati River system provides suitable roosting and foraging habitat for the "Near-threatened" Spotted-necked Otter and maintains a high connectivity with adjacent habitat types and wetland features of similar structure and composition beyond the borders of the study area. Therefore, these units have the inherent potential to function as important dispersal corridors and flyways for both mammal and bird species since it increased the probability of colonisation of areas outside of the study area, thereby reducing genetic isolation of residing populations.

RECOMMENDATIONS

It is evident from **Figure 21** that Alternative 1 corresponds to more habitat types of high perceived ecological value when compared to Alternative 3 and 5. The following are measures recommended that need to be implemented during the construction and operation phases:

- The attached sensitivity map should be used as a decision tool to guide the layout design of the proposed development - all wetland areas (including man-made areas), upland primary grassland, ridges and outcrops (irrespective of their surface area) are regarded as sensitive habitat units;
- The quartzite and dolerite grassland provide important refuge for reptile and range-restricted invertebrate taxa. Therefore, these areas should be avoided during the construction phase to prevent unnecessary damage or disturbances;
- The construction of “new” access roads should be limited, and existing roads should be used during the construction phase. It is suggested that the construction of roads be avoided and that all access roads be limited to grassy "tracks";
- Where possible, the servitude below the line should be left natural and is not allowed to be burned on an annual basis. The unnecessary removal of natural vegetation should be avoided;
- The extent of the construction sites and access roads should be demarcated on site layout plans and should be restricted to disturbed areas or those identified with low conservation importance. Therefore, no construction personnel or vehicle may leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors;
- Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of eroded areas should be undertaken;
- Open fires is strictly prohibited and only allowed at designated areas;
- Harvesting of firewood or any plant material (for medicinal or cultural purpose) during the construction phase is strictly prohibited. Labour or personnel shall only assist with the removal of plant matter if requested to do so by the ECO;
- Hunting/snaring is strictly prohibited. Any person found hunting or in the possession of any indigenous animal (including invertebrate taxa) should face disciplinary measures, following the possible dismissal from the site;
- Intentional killing of any faunal species (in particular invertebrates and snakes) should be avoided by means of awareness programmes presented to the labor force. The labor force should be made aware of the conservation issues pertaining to the taxa occurring on the study area. Any person found deliberately harassing any animal in any way should face disciplinary measures, following the possible dismissal from the site;
- If any subterranean/fossorial reptile, scorpion or mammal species is recovered during the construction phase, this species must be relocated to the nearest area or

natural open space with suitable habitat for the particular species to continue its life history. If accidentally killed, then this species should be adequately preserved as a "voucher" specimen (with the assistance and knowledge of the ECO). These specimens may contribute towards a better understanding of biogeography and animal systematics; and

- All construction activities must be limited to daylight hours

9.3. AVIFAUNA ASSESSMENT

FINDINGS OF THE AVIFAUNA

This study was based on fieldwork, literature review as well as a desktop study analysis (GIS). According to the specialist study, bird diversity is positively correlated with vegetation structure, although floristic richness is not regarded to be the single most important contributor of observed patterns in bird abundance and spatial distribution.

In general, the study area supports a fairly high diversity of bird species as explained by the high spatial heterogeneity provided by the different habitat and vegetation types. The number of bird species recorded for each quarter degree square ranges from 219 species at Moedig to as many as 243 species at Languitsig. The presence of extensive, undulating grassland and the presence of large endorheic pan systems are responsible for a the observed diversity of threatened and near-threatened bird species. Approximately 22.5 % (29 spp) of all regional and globally threatened and near-threatened species are present on the study area.

Table 23 summarises the threatened and near-threatened species that could potentially occur on the study area based on the SABAP1 database. It is evident that the highest reporting rates (according to Harrison *et al*., 1997) were recorded from the western part of the study area (2529DD - Wonderfontein) which is represented by high numbers of flamingo species that occur on the large pan systems. Other parts of the study area with moderate-high reporting rates correspond to 2530CC (Moedig), an area sustaining patches of extensive primary grassland that support high numbers of large terrestrial bird species (e.g. Secretarybird, Blue Crane and White-bellied Korhaan). Some of the threatened and near-threatened species observed on the study site during the site visits include the Greater Flamingo (*Phoenicopterus ruber*), Lesser Flamingo (*P. minor*), Southern Bald Ibis (*G. calvus*), Wattled Crane (*Bugeranus carunculatus*), Blue Crane (*Anthropoides paradiseus*), Blue Korhaan (*Eupodotis caerulescens*), White-bellied Korhaan (*E. senegalensis*), Denham's Bustard (*Neotis denhami*), Black-winged Lapwing (*Vanellus melanopterus*), Yellow-breasted Pipit (*Anthus chloris*) and Rudd's Lark (*Heteromirafra ruddi*).

According to **Figure 22**, the southern parts of the study area are more sensitive due to high reporting rates of threatened and near-threatened species. There is little difference between the corridors when the reporting rates for Red listed species are superimposed, although the northern section of Alternative 3 appears to traverse an area with lower reporting rates.

Examination of the Mpumalanga conservation plan correlates positively with the reporting rates as shown in **Figure 22** and **Table 22**. **Figure 23** demonstrates that the southern and central parts of the study area are highly significant with scattered areas flagged as being irreplaceable. The irreplaceable areas are flagged based on the occurrence of large concentrations of flamingo species and the breeding occurrence of Wattled Cranes. Non-threatened bird species with a high susceptibility towards power line interactions include the White Stork (*Ciconia ciconia*), Abdim's Stork (*Ciconia abdimii*), Jackal Buzzard (*Buteo rufofuscus*), African Fish Eagle (*Haliaeetus vocifer*) and a number of waterbird species pertaining to the Anatidae (ducks and geese), Ardeidae (herons and egrets), Threskiornithidae (ibises) and Cerylidae (large aquatic kingfishers).

Figure 24 shows the cadastral farm properties on the study area where cranes occur or are known to breed. Based on the occurrence of cranes on the study area, it is evident that Alternative 1 and Alternative 5 provide important nesting and foraging habitat for crane species (**Table 22**), in particular the Wattled Crane when compared to Alternative 3. The importance of potential crane nesting habitat (especially Wattled Crane and Grey Crowned Crane nesting areas on the proposed corridors is reiterated by the number of anticipated wetland intersections. The wetlands also function as dispersal routes or flyways for waterfowl. Alternative 5 (followed by Alternative 1) intersects a greater number of priority crane breeding habitat and also more wetland types when compared to the other corridors. Therefore, the intersection of the different wetland types by Alternative 5 and Alternative 1 could have a greater impact on cranes and waterfowl than Alternative 3.

Table 23: An overview of the percentage of crane occurrence and breeding confirmed from each transmission line alternative.

Crane breeding & occurrence (EWT, 2012)	Alternative 1	Alternative 3	Alternative 5
	Hectares	Hectares	Hectares
Breeding	3139	916	2741
Occurrence	2014	824	1350
	%	%	%
Breeding	**27.9**	7.7	26.1
Occurrence	**17.9**	7	12.8
Total (combined breeding & occurrence)	**45.8**	**14.7**	**38.9**

Table 24: The reporting rates (%) for each threatened and near-threatened species (Barnes, 2000; IUCN, 2012) likely to occur on four quarter degree squares.

CR – Critically Endangered, EN - Endangered, VU - Vulnerable and NT – Near-threatened. Species highlighted in **red** are critically endangered or endangered, and very susceptible to habitat transformation and disturbance. Species highlighted in **black bold** are especially vulnerable to power line collision.Total values in red refer to QDGS with a high presence of threatened and near-threatened species.

QDGC Species	Global Status	Regional Status	2529DB Languitsig	2530CA Belfast	2530CC Moedig	2529DD Wonderfontein
African Finfoot	-	VU		1		2
African Grass Owl	-	VU	2	1		
African Marsh Harrier	-	VU	3	6	7	2
Black Stork	-	NT	2	1		2
Black-bellied Bustard	-	NT	2	2		2
Black-winged Lapwing	-	NT	2	3	3	2
Black-winged Pratincole	NT	NT				2
Blue Crane	**VU**	**VU**	**17**	**34**	**24**	**2**
Blue Korhaan	**NT**	**NT**	**5**	**2**	**11**	**11**
Broad-tailed Warbler	-	NT		2		
Caspian Tern	-	NT				2
Cape Vulture	VU	VU		4		

QDGC Species	Global Status	Regional Status	2529DB Languitsig	2530CA Belfast	2530CC Moedig	2529DD Wonderfontein
Denham's Bustard	**NT**	**VU**	**2**	**10**	**4**	**2**
Greater Flamingo	**-**	**NT**	**16**		**3**	**50**
Greater Painted Snipe	-	NT		1		
Grey Crowned Crane	**EN**	**VU**	**3**	**25**	**7**	**5**
Half-collared Kingfisher	-	NT	2	2	3	
Lanner Falcon	-	NT	2	3	1	
Lesser Flamingo	**NT**	**NT**	**3**		**4**	**29**
Lesser Kestrel	-	VU	6		1	7
Maccoa Duck	NT	-	5		1	29
Saddle-billed Stork	EN	EN		2		
Secretarybird	**VU**	**NT**	**2**	**12**	**21**	**2**
Southern Bald Ibis	VU	VU	23	11	29	23
Wattled Crane	**VU**	**CR**	**3**	**15**		**2**
White-bellied Korhaan	**-**	**V**	**2**	**2**	**17**	**2**
White-winged Flufftail	EN	CR		5		
Yellowbilled Stork	-	NT			3	
Yellowbreasted Pipit	VU	VU	2	1		

QDGC Species	Global Status	Regional Status	2529DB Languitsig	2530CA Belfast	2530CC Moedig	2529DD Wonderfontein
Average Totals			**5.20**	**6.59**	**8.69**	**9.37**

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RECOMMENDATIONS

The following recommendations have been suggested for this proposed power line development:

- A “walk-through” of the selected route must be conducted prior to the construction phase;
- The construction sites must be confined to disturbed areas or those identified with low conservation importance. All construction sites must be demarcated on site layout plans (preferably), and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction sites that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors;
- A natural buffer zone (to be announced by the wetland specialist) should be allowed between the line servitude and any wetland or other sensitive habitat type;
- All road networks must be planned with care to minimize dissection or fragmentation of important avifaunal habitat type. Where possible, the use of existing roads is encouraged. Access must be determined during the “walk-through” process;
- The breeding status of threatened species, in particular bustards and korhaan species, Yellow-breasted Pipit and Rudd's Lark should be evaluated prior to construction/decommissioning. If breeding is confirmed, the nest site must be barricaded and appropriately buffered (by at least 500 m). Construction/ decommissioning activities shall only commence once the fledglings are successfully reared and has left the nesting site;
- Construction activities are not allowed within 1000 m of a known crane breeding site – even when the nesting site is not in use/occupied;
- Depending on the crane species, construction activities should cease during the peak breeding period when within 1 km of a nesting site: November to December. The breeding status of known nesting sites should be verified by a representative of EWT;

9.4. WETLAND (WATERCOURSE ASSESSMENT STUDY)

FINDINGS

The surface watercourse identification and assessment investigation study was done based on a desktop component as well as fieldwork. It must be emphasised the impact of power line can be avoidable spanning over the wetland areas but it is not always the case. The study area falls within the two water management areas which are Olifants River Water Management Area and Nkomati Water management Area. Olifants cover most part of the western and north western portion of the study area while the Nkomati covers the remainder of the study area. **Table 24** shows the detail of the quaternary catchments associated with the respective water management catchments. It has been noted that all of the perennial rivers prevalent within the study area all have conservation value status which are critically endangered or endangered (**Figure 25**).

Table 25: Indicates the mean annual precipitation (MAP), mean annual runoff (MAR) in million cubic meters (mcm), mean annual evapotranspiration (MAE), Ecological Importance and Sensitivity (EIS) class, and Present Ecological State (PES) per Water Management Area and Quaternary Catchment in the study area.

Quaternary Catchment	Rainfall (MAP)	Runoff (MAR)	Evapotranspiration (MAE)	EIS class	PES Category
Olifants Water Management Area (WMA)					
B12B	695 mm	21.41 mcm	1552 mm	Moderate	Class D: Largely Modified
B12C	707 mm	19.24 mcm	1552 mm	Moderate	Class C: Moderately Modified
B41A	714 mm	41.97 mcm	1500 mm	Moderate	Class C: Moderately Modified
Inkomati Water Management Area (WMA)					
X11C	715 mm	10.30 mcm	1435 mm	High	Class C: Moderately Modified
X11D	744mm	40.70 mcm	1414 mm	Moderate	Class C: Moderately Modified
X11E	761 mm	21.10 mcm	1390 mm	Moderate	Class C: Moderately Modified
X21F	757 mm	40.86 mcm	1348 mm	Moderate	Class C: Moderately Modified

THE KEY ASPECTS CONSIDERD FOR WATERCOSURSE DESCRIPTION, DELINEATION AND ASSESSMENT

- **Watercourse Types**

In terms of watercourse types the National Wetland Classification System (NWCS) categorises wetlands into one of the seven hydro-germophic (HGM) units and these includes the following:
Channelled valley bottom
Depression (Pan)
Flat
Floodplain
Seep
Unchanelled valley bottom
Valleyhead seep

- **Watercourse Delineation**

Watercourses were delineated within each alternative corridor through onscreen digitising with aerial photographs, a surface wetness model, and existing drainage line spatial datasets as background features (**Figure 26**).
Demarcated watercourses were classified into two inclusive groups (**Figure 26**):

- *Linear watercourses* include watercourse systems that are distinctly connected to the drainage network. Examples include rivers, headwater drainage lines, and several wetlands (channelled and unchannelled valley bottoms, floodplains, as well as connected seepages and, flats).
- *Non-linear watercourses* include watercourses systems that are not distinctly connected to the drainage network nor do they commonly have a linear alignment. The most prominent examples include depression (pan) wetlands and seepage wetlands that surround them, other examples include non-connected flat and seepage wetlands.

The route alternatives avoid the cluster of large depression (pan) wetlands in the western portion of the study area .These depression pans include Klippan, Grootpan, Leeupan, Blinkpan, and Rietpan among others.

Drainage lines in headwater positions are expected to often contain wetland conditions in the form of seepage supported by high annual rainfall and favourable geological strata, including the presence of dolerite intrusions. Demarcated watercourses indicated in **Figure 26** which will require further field verification to refine the accuracy of their boundaries and possibly include additional watercourses. Smaller and more indistinct depression and seepage wetlands are more likely to be affected by additions.

- **Watercourse Crossings**

According to the specialist study, Alternative 1 has the lowest number of watercourse crossings and the shortest combined crossings distance of all the alternatives, while Alternative 5 has the highest number and longest total crossing distance (**Table 25; Figure 27**). It is expected that watercourse crossings of up to 400 metre can be spanned fairly simply by 400kV towers. Alternative 3 has the highest number of crossings in excess of 400 m and will therefore in theory require several towers within wetland or watercourse areas. However, most of the 400 m plus crossings range between 400-750 metre (10 in total) in Alternative 3, while both Alternative 1 and 5 contain a crossing in excess of 1 km (**Table 25**). These long crossings are associated with watercourses that are aligned parallel with the proposed 400kV center-line. It is expected that crossings lengths can be reduced by moving individual pylons within the corridor.

The use of crane species breeding location information was used to flag the wetlands and other watercourses that are of a conservation value as they provide breeding sides for this critically endangered crane species. It is widely known that crane species are more associated with wetland areas that pristine or untransformed. **Figure 28** represent the potential crane breeding watercourses within the study area.

Table 26: Combined watercourse crossing length along the centre-line for each alternative; highest values indicated in bold.

Alternative Name	Combined length of watercourse crossings along centre-line	Number of watercourse crossings per centre-line
Alternative 1	7.77 km	37
Alternative 3	12.40 km	41
Alternative 5	**12.68 km**	**44**

In summary of the specialist findings, in terms of the assessment of the suitable corridor, the most favourable route is a close match between the Orange Corridor (Alternative 1) and Purple Corridor (Alternative 3). It must be emphasised that the impact mitigation on potential watercourse crane breeding habitats is expected to be more difficult to achieve. This is due to the sensitivity of crane species to new watercourse impacts for breeding habitat selection, specifically Wattled cranes. In overall, the Purple Corridor (Alternative 3) is regarded as the most favourable route from a watercourse consideration, while the Orange Corridor (Alternative 1) remained the close second option.

RECOMMENDATIONS

- All drainage lines, depressions (pans), other wetlands and riparian areas are regarded as sensitive landscape features. These areas should therefore be avoided by all practical means and no construction may be undertaken in these areas without the necessary environmental authorization and adherence to mitigation measures.
- It follows, that construction impacts should be avoided or reduced as far as possible in watercourses and headwater drainage lines due to their vulnerability to erosion and potential to support rare and protected biodiversity.
- It is especially important that wetlands associated with breeding sites receive additional attention. Recommendations made in the avifauna report should be adhered to in order to help mitigate construction, operation and decommission phase impacts.
- GIS watercourse delineation shapefiles produced in this study should be used by the Eskom engineers and planner to help find a best fit route alignment in the selected alternative corridor. Such as best fit would require planning input to reduce the number of watercourse crossings and the number of crossing lengths that cannot be spanned. The extent and positioning of watercourse boundaries can then be refined through a field verification process along the final alignment.
- It is strongly recommended that individual watercourses should be demarcated along the selected alternative centerline during a Walk Down Phase. This will enable a more accurate identification and demarcation of wetlands, rivers and other watercourses as defined by the National Water Act (NWA), Act 36 of 1998.
- Information obtained from such as walk down component can then be included as part of an EMP.
- Watercourse boundaries should be marked for the construction team to ensure easy identification and trigger appropriate mitigation measures/actions.
- Any water use in a watercourse that is unavoidable during the construction phase of the proposed project will require a Water Use License from the Department of Water Affairs. Water Use, as defined by the NWA, include the following.
  (c) impeding or diverting the flow of water in a watercourse
  (i) altering the bed, banks, course or characteristics of a watercourse

- It is important to determine whether new project-related infrastructure structures in watercourses will be permanent or temporary. Water Use License requirements for permanent structures, such as road crossings, are expected to require more thorough mitigation compared to temporary watercourse road crossing structures.
- The creation of new permanent watercourse road crossing structures should be kept to the absolute minimum.
- Additional recommendations associated with watercourse impact mitigation measures should also be adhered to.

9.5 SOIL AND AGRICULTURAL POTENTIAL

FINDINGS

The assessment of the soil and agricultural potential was based on literature review as well as fieldwork. According the specialist study, the soils of the area are relatively deep poorly drained soils, moderate to fine textured silty and clay loams, implying that during a construction or development process be difficult to work (drying out should be avoided).

The major soil forms encountered are of the structured pedocutanic phase, Swartland, Valsrivier and, along with some hydromorphic forms, including the Sepane Form soils. There are both structured as well as limited non-structured soils of varying strengths associated with the area studied. These soils range from high quality agricultural soils with extremely good economic potential, to shallow, poor quality soils that are at best useful as grazing lands, as well as wet sensitive soils that are best conserved as wilderness land, and which will require high levels of management if they are going to be affected. **Table 26** below shows the comparisons of the alternatives based on areas that have soil that is of high agricultural potential.

Table 27: Comparison of the soil based on agricultural suitability

Alternative 1	Alternative 3	Alternative 5
Moderate to high potential agricultural soils • Good Agricultural Potential o Apedal, low structure o Predominantly red and yellow/red soils o Moderate clays o Suitable drainage/ permeability's o Gently sloping terrain • Poor Agricultural Potential o Ferricrete and plough-pans in areas (≥300mm) o Relatively highly	Moderate potential agricultural soils • Good Agricultural Potential o Predominantly red and yellow/red soils o Suitable drainage/ permeabilities o Gently to moderate sloping terrain • Poor Agricultural Potential o Ferricrete and plough-pans in areas (300-400mm) o Well highly developed farming areas	Moderate to high potential agricultural soils o Good Agricultural Potential o Predominantly red and yellow/red soils o Suitable drainage/ permeabilities o Gently sloping terrain • Poor Agricultural Potential o Ferricrete and plough-pans in areas (300-400mm) o Well highly developed farming areas o Apedal to low soil

developed farming areas ○ Limited hydromorphic soils (wetlands & drainage zones)	○ Apedal to moderate structures ○ Moderate to high clays ○ High prevalence of hydromorphic soils (wetlands zones)	structure ○ Moderate clay content ○ Limited hydromorphic soils (wetlands & drainage zones)

RECOMMENDATIONS

Alternative 1, is thus the preferred option when considering the impacts on the region (un-impacted), lands in the areas. It is wise to note that the use of already altered lands (existing works, lay-down areas, etc.), should be prioritised (and thus ranked higher), over the un-impacted lands assessed in this report. This recommendation is made due to the high costs (time and money) associated with rehabilitation and recovery of viable arable lands (yield and natural recoverability).

9.6 VISUAL IMPACT ASSESSMENT

FINDINGS

According to the specialist study, GIS was extensively used as a tool for data collection as well as analysing data. This was complemented by fieldwork where site photographs were taken and analysed in detail. The specialist applied visual exposure analysis using the Digital Terrain Model (DTM) and derivatives thereof, to determine the extent to which the topography of the study area exposes or hides human structures. The landform position, slope position, relative elevation and ruggedness were used to determine the visual exposure score (refer to **Appendix F**).

A Land Use Raster Dataset was created using land use (ENPAT), conservation (ENPAT), natural features, formal protected areas and informal protected areas. Land Use Analysis was used to determine the viewer sensitivity value. The photographs that were taken during the site visit were described and used to derive viewer sensitivity and visual contrast in determining the visual impact. The areas are described in terms of land, water, vegetation and structures. Photographs that were taken during the site visit form part of the respective site descriptions (e.g. **Photo 10**).

In terms of visual impact, Viewshed analyses for the different alternatives were done to determine the modelled visibility, limited to a distance of 3000m. At a distance of more than 3000m a power line becomes such a small component of the visual scene that it is regarded as insignificant. The viewshed results were reclassified into five classes. Class 5 represents portions of an alignment that can be seen from many locations, class 1 represents portions of an alignment that can be viewed from a few locations. The results are shown in **Figures 29** to **31**. Furthermore, the visual impact is modelled by combining the visual sensitivity with the viewshed results – the results are shown in **Figures 32** to **34**. According to specialist study, the recommended route from view perspective is Alternative 5 (Green corridor), however there is no significant difference with other alternatives based on visual sensitivity.

Photo 8: Represents the site description in terms of the visual assessment

9.7 HERITAGE IMPACT ASSESSMENT

FINDINGS

According to the specialist study, the method used for data collection was namely a literature review and field work. A survey of literature was undertaken in order to obtain background information regarding the cultural heritage (archaeology and history) of the area. The assessment was undertaken partially on foot, although large sections were traversed by vehicle. Areas with the potential of containing archaeological and other sites were focused on during the study. The key heritage features identified were historical sites, Iron age and Stone age (**Appendix F**).

No Early Iron Age sites are known to exist in the area, although there are a fairly large number of Late Iron Age stone walled sites in the bigger geographical area that includes Lydenburg, Dullstroom, Machadodorp, Badplaas and Belfast. The Historical sites in the include farmsteads, historical graves and graveyards (**Photo 11**), sites associated with the Anglo-Boer War and others. No Stone Age sites or finds (individual tools or scatters of tools) were identified in the area. However, it is possible that tools will be located along the banks of rivers or spruits, as well as the various pans found in the area. Photographs (**Photo 11-13**) of heritage resources were taken during fieldwork where heritage resources or features were identified. From specialist point view the corridor that is recommended is Alternative 3 (Purple corridor) as it affects less heritage features as compared to other corridors.

Photo 9: Typical cemetery identified within the study area

Photo 10: The identified historical farm cemetery close to Berg-en Dal Monument

Photo 11: The identified old coach House on Wemmershuis

9.8 SOCIO-ECONOMIC IMPACT ASSESSMENT

FINDINGS

The study was conducted in way that aspects of social, economic and tourism that goes in hand with economic issue was captured. The affected municipalities will not be described here because they have been extensively described under social receiving environment chapter. The data was gathered in two ways which are primary data and secondary data:

- **Primary data** assisted the consultants in establishing the social setting and characteristics of the study area, as well as the key economic activities. Interviewing of 'key' persons also formed part of the research process; and
- **Secondary data,** which was not originally generated for the specific purpose of the study, were gathered and analysed for the purposes of the study. Such data included the census data, project maps, local histories, planning documentation such as the draft Integrated Development Plans (IDP) and Strategic Development Frameworks (SDF) of the various municipalities found in the study area.

The general findings and recommendations of the socio-economic based on the corridors are presented in **Table 28**.

Tourism Overview

The Nkangala District offers considerable tourism potential. The economy of the eastern areas of the District is already growing due to the increasing popularity of tourist destinations in the Emakhazeni Local Municipality area. The natural beauty, rural character and popularity of fly-fishing are the main attractions to this area. The north western areas of the District also offer opportunities for tourism, through the consolidation of the various nature reserves and open spaces in this area.

The demarcation of a tourism belt and focus areas in the Nkangala District will serve to promote and enhance the tourism potential in this area. It should be noted that the intention is not to reserve this area purely for tourism developments or to exclude tourism developments from any other area in the region. The intention is rather to focus investment and incentives in this area, to the benefit of poor communities in the northern regions and rural areas. This tourism belt incorporates sensitive wetlands and conservation areas, nature reserves and some of the proposed ecological corridors in the District. The protection of these areas should thus be of high priority as part of this concept.

Tourism facilities should be promoted within this belt, but in terms of the following guidelines:

- Protection of prime agricultural land;
- Ability to provide adequate infrastructure services to the developments;
- Environmental protection and conservation; and
- Protection of the rural character and scenic qualities of the area.

Economy Overview

Farming is the dominant economic activity in the Emakhazeni Local Municipality area occupying the largest part of the physical area. Small towns have developed throughout the area, which serve as service centres to the agricultural sector. Smaller mining activities are being initiated within the local municipality boundaries. The local economy of the Steve Tshwete Local Municipality is one of the largest in the district economy dominated by the mining sector, followed by the mining sector. Various Eskom power plants are also found in the area. Informal and secondary economy employment also plays an important role in income to households, but formal figures with regards to these sectors are not readily available.

Table 27 represents the mines that contribute positively to the economy of the local community and province in general.

Table 28: it represents the mining areas within the area

ROUTE ALTERNATIVE	MINING RIGHTS	SURFACE RIGHTS	COMPANY INVOLVED
Alternative 1: (Orange)	Arnot Colliery Strathrae Colliery	Arnot Colliery Strathrae Colliery Arnot South	Exxaro North Block Complex (NBC) of Exxaro
Alternative 3: (Purple)	Arnot Colliery Belfast Block projects	Glisa South	Exxaro Exxaro
Alternative 5: (Green)	Arnot Colliery Eerstelingsfontein Sumo Colliery (defunct since 2000)	Eerstelingsfontein	Exxaro NBC of Exxaro

Table 29: Findings and recommendations of the socio-economic assessment

ALTERNATIVE 1	ALTERNATIVE 3	ALTERNATIVE 5
The Siphakamile Combined School is in close proximity to the Strathrae mining activities within the corridor of Alternative 1. This sensitive receptor should be avoided.	Various settlements are located within the corridor and situated adjacent the N4 and railway line. Homesteads and dwellings would thus have to be avoided to limit the negative impacts with regards to the visual intrusion of power lines, as well as the daily living and movement patterns of the residents.	Construction of an additional power line along Alternative 5 would develop a so-called industrial corridor due to the presence of a 275 kV transmission line and the approved Hendrina-Gumeni transmission line along this corridor. Negative impacts would thus be concentrated within one area, although it could have severe negative impacts for the property owners due to the possible devaluation of the properties. The intensity of this impact would depend on the type of activities undertaken on the various properties in that area. It should, however, be noted that the servitude areas could still be used for agricultural activities and grazing.
Centre pivot irrigation systems within the corridor should be avoided.	The influx of workers within the more densely populated areas could have a marked influence on the social networks and the influx of jobseekers with subsequent negative social consequences within these areas are highly likely	Centre pivot irrigation systems within the corridor should be avoided.
The Strathrae mining activitiesis mostly underground mining which makes the development of a power line in this area plausible	Buffer zones between the proposed transmission line, railway line and distribution lines found within the corridor would make the alignment challenging. Crossing of these lines, the railway line, as well as the N4 would further complicate	Within Alternative 5, it should be noted that the Eerstelingsfontein Colliery is in the planning phases with its Integrated Water Use License Application (IWULA) still to be completed. There is thus the possibility that this mine would

ALTERNATIVE 1	ALTERNATIVE 3	ALTERNATIVE 5
	the construction process.	develop within the corridor.
During the public participation process Exxaro and Shanduka mining have indicated that Alternative 1 is their preferred alignment option.	Some schoolswithin the corridor such as the Arnot Colliery Primary School and the Blomplaas Primary School should be avoided.	Care should still be taken to follow an alignment in close proximity to the existing alignment and the Hendrina-Gumeni line to limit any possible negative impact on the tourism establishments in the Leeukloof area.
Construction of an additional power line along Alternative 1 would develop a so-called industrial corridor due to the presence of a transmission line and distribution lines along this corridor. Negative impacts would thus be concentrated within one area, although it could have severe negative impacts for the property owners due to the possible devaluation of the properties. The intensity of this impact would depend on the type of activities undertaken on the various properties in that area. It should, however, be noted that the servitude areas could still be used for agricultural activities and grazing.	Existing and proposed mining activities within the corridor could be negatively affected by the proposed power line and vice versa.	The Arnot Aerodrome near Arnot Substation in close proximity to Alternative 5 should be avoided. Safety zones should be determined and adhered to.
Care should still be taken to follow an alignment in close proximity to the existing alignment and the Hendrina-Gumeni line to limit any possible negative impact on the tourism establishments in the Leeukloof area.	Centre pivot irrigation systems within the corridor should be avoided. Centre pivots found along Alternative 3 should be avoided.	
The Arnot Aerodrome near Arnot Substation in	Landing strips and an airfield in close proximity to	

ALTERNATIVE 1	ALTERNATIVE 3	ALTERNATIVE 5
close proximity to Alternative 1 should be avoided. Safety zones should be determined and adhered to	the corridor should be avoided.	
	Various tourism establishments (as indicated under section **Error! Reference source not found.**) along or near this route could be negatively affected due to the negative impact on the scenic quality and "sense of place" of the area.	

9.9 TOWN AND REGIONAL PLANNING ASSESSMENT

FINDINGS

The assessment encompasses various disciplines, which includes Town and Regional Planning where an overview of the Spatial Development Frameworks (SDF) and Integrated Development Plan (IDP) of the Municipalities that are affected were conducted in order to form a broad understanding of the potential areas of conflict between land uses and the proposed power line. The proposed three main (Orange, Purple and Green) alternatives for the proposed power line find its way through the following Municipal areas in the Mpumalanga Province:

- Nkangala District Municipality
- Emakhazeni Local Municipality
- Steve Tshwete Local Municipality
- Gert Sibande District Municipality
- Chief Albert Luthuli Municipality

Land claims by communities or persons for the return of their past ownership or occupation of land, which they lost because of Apartheid Law, may lead to complicated land tenure issues and time constraints. The Land Claims Commission is responsible for these matters and areas affected by land claims should be avoided. However, according to the Land claims report, there are 721 land claims registered in the Nkangala District. These claims are located on 271 properties. The largest number of claims submitted are in the Steve Tshwete Municipality (270), followed by Emakhazeni (159), and then Thembisile (133) (**Figure 35**).

The land claims are usually lodged on a farm not the portion of the farm. It is only on the gazetted stage where the proper survey is done in relation to the portions claimed within the holistic claimed farm. For the purpose of this report we have looked at the holistic farms within the project study area (not portions within the farms) because it is only after the gazetted phase where specific portions will be made available for public information.

Table 29 below represents the finding of potential development and other key land uses that may be transverse by the proposed corridors in terms of the spatial development framework or integrated development plan. From town and regional planning point of view is Alternative 1 and Alternative 5 whereby they all posses the same land use character, which is agriculture and drops of mining and there are no major developments or potential developments earmarked within and along the proposed routes.

Table 30: It represents the assessments of alternatives as per spatial development framework of municipality

ALTERNATIVE 1 (ORANGE CORRIDOR)	ALTERNATIVE 3 (PURPLE CORRIDOR)	ALTERNATIVE 5 (GREEN CORRIDOR)
Despite the mining activities, there are no major future or proposed development activities along this route.	In terms of the spatial development framework of Nkangala district municipality there are existing settlements within the belt of the N4 highway.	Despite the potential mining activities, there are no major developments (residential or business activities along this route.
There is no major infrastructure investment plan along this route. The route is characterized by high potential agricultural activities and only traverse through tourism corridor along the R33 road as per SDF.	The eastern regions (Emakazeni Municipality) of the Nkangala District already offer a variety of tourism opportunities associated with the scenic qualities, wetlands and conservation areas. A large part of the Emakhazeni Municipality forms part of the Tour Triangle, an area designated for tourism facilities associated with fly-fishing as part of the N4 Maputo Corridor initiative. This Tourism Belt incorporates sensitive wetlands and conservation areas, nature reserves and some of the proposed ecological corridors in the District, and according to the SDF the protection of these areas should be of high priority as part of the concept. Alternative 3 cut though this Tourism belt.	The route is characterized by high potential agricultural activities and only traverse through tourism corridor along the R33 Road.
The route curves away from the tourism belt and focus areas (on the east of Nooitgedatch Dam) to join Alternative 3	In terms of the hierarchy of secondary service centres in the Nkangala district, a distinction can be	There is already an approved 275 kV transmission along the same corridor, which enhance the amalgamation of similar land uses and zonings

ALTERNATIVE 1 (ORANGE CORRIDOR)	ALTERNATIVE 3 (PURPLE CORRIDOR)	ALTERNATIVE 5 (GREEN CORRIDOR)
	made between the existing and evolving centres. Delmas and Belfast are existing secondary service centres in the District, which fulfil the function of a central place to the surrounding rural areas and small villages. The prominence of these centres should be protected and enhanced through service maintenance in terms of the Nkangala District SDF. Alternative 3 have a negative effect on the Belfast service centre. See attached Map below for more information.	
The existing transmission line and distribution lines along this corridor will justify the optimisation of the already invaded sensitive area. The servitude areas along the route could still be utilised for agricultural purpose and grazing. It Has the lowest number of land claims	Various settlements are located within the corridor and situated adjacent the N4 and railway line. It has the highest number of land claims.	It has 8 recorded land claims, which are low compared to Alternative 3

RECOMMENDATIONS

From Town and Regional Planning point oif view the recommended corridor is Alternative 1 and Alternative 5. Alternative 3 is not preferred due to its impact on the future and current infrastructure planned along the corridor.

9.10 GEOTECHNICAL OVERVIEW

FINDINGS

The purpose of the geological assessment was to provide a better understanding of the geological stability of the area whereby recommendations can be made with regard to type of foundations required as the condition of the area for power line construction. A geological engineer was approached to provide the geological overview based on the following factors: flooding potential, Mine subsidence, heave potential, excavatability, unstable slope and dispersive soils.

In terms of mine subsidence, the study area and surrounding area is covered with mining activity, both opencast and underground. A severe threat to the pylons of a power line is underground mining activity that occurred closed to surface with the possibility of the surface subsiding after the pylons have been placed. As far as it could be determined the areas of undermining and potential subsidence cannot directly be identified using airborne geophysics. Is has however been shown that dykes tend to show on aeromagnetic data and that these areas have not been mined by coal mines as they present a barrier.

Unstable slope are generally associated with the slope of more than 12° whereby it makes construction difficult and can have significant cost implications. Heave potential is associated with the areas covered by active, expansive or swelling soils, which undergo volume changes during wetting and drying. The distribution of the swelling soil is shown in **Figure 36** within the study area. In terms of excavatability of soil or rock is an engineering geological factor that as such does not directly pose any danger to structures. **Figure 37** represents the engineering geological constrain of the study area.

RECOMMENDATIONS

From geotechnical point of view the recommended corridor to establish double circuit 400kV line is alternative 5 (green corridor).

9.11 GEOPHYSICS STUDY

FINDINGS

The geophysics specialist was involved in stage 1 level which to gather the general undermining risk associated with the corridors under investigations. According to the specialist the study area falls within a region of South African notorious for its coal deposits. Coal mining is the dominant mining acitivity within the study area.

Alternative 3 and Alternative 5 are most likely to be subject to future interactions with new mining operations as the underlying geology dominating these routes are usually associated with containing mineable coal reserves.

RECOMMENDATIONS

From general undermining risks areas identified the following can be recommened:

- Route 1, 3 and 5 potentially have low to high risk interaction with surface and undermining associated with the Arnot mining operation. The extent of this interaction is believed to be limited within the extent of the route traversing the Arnot mine lease area.
- In addition to above Route 3 may have low to high risk interaction with undermining associated theGlisa mining operation. The extent of this interaction is believed to be limited within the extent of the route traversing the Glisa mine lease area.
- In addition to above Route 1 may have low risk interaction with open cast mining associated with the Strathrea opencast mining operation, should future mining be planned to extend in a southerly direction. The extent of this interaction is believed to be limited within the extent of the route traversing the respective mine lease area.
- In addition to above Route 5 may have low to high risk interaction with opencast mining associated with the unidentified mining operation found approximately 14km along the route from the Arnot substation.

9.12 ELECTRO-MAGNETIC FIELD (EMF) ASSESSMENT

Power system frequencies (50Hz) (static or low frequency) are much lower than the frequencies of electromagnetic energy experience in other instances. For example, radio broadcasting uses 88-108 MHz and microwave systems operate at 2.4 GHz (high frequency or radio frequency). This is important to note when assessing the potential biological effects as the safety precautions differ greatly. Safety precautions in for power lines are based on

limiting field levels that may induce electric current in the subject that are considered harmful.

According to the EMF study commissioned Eskom in 2006 (**Appendix F**), Electro-Magnetic Fields (EMF) are created, in varying levels, with the generation and the use of electricity and at the frequency of the electrical power system. In South Africa, electric power is supplied as an alternating current (AC) at a frequency of 50 Hz, i.e. electric current flowing in system changes direction 50 times per second.

At low frequency of 50 Hz two fields exist, viz.

- Electric field - Electric fields are produced by the presence of electric charges and therefore, the voltage (V) applied to a conductor. Voltage on a system is generally stable. Notably, electric fields decrease with an increase in distance from a source. Electric fields levels are measured in Volts per metre (V/m), but are generally reported as kilovolts per metre (kV/m) due to the levels reported in power system environments. Electric fields can be reduced (shielded) fairly easily.
- Magnetic field - Magnetic fields are produced by the current flowing (i.e. the movement of electric charge) on a conductor. Electric current is measured in Ampere (A) and may vary depending on the number of devices (i.e. the load), supplied by the system. As the load changes so does the magnetic field. As is the case with electric fields, it also decreases with an increase in distance from the source. Magnetic field levels are measured in Tesla (T), but more generally reported as microtesla (µT). While magnetic field can be reduced, this requires special engineering techniques and line design.

Tables 30 and **31** summarises some typical electric and magnetic field levels in various environments. On a clear sunny day, a natural electric field is a few tens of V/m, but can increase to several thousand V/m during a thunderstorm. The natural magnetic field, in Johannesburg, is in the order of 30µT and may vary up to 70µT at the North or South Pole. However, the field is considered static and varies very slowly with time.

Interestingly, as shown in **Table 31** (magnetic), some appliances, particularly those with electric motors (for example, vacuum cleaners and electric drills) can generate magnetic field levels similar to those of transmission lines, albeit that exposure time is usually of short duration.

Table 31: Typical Electric Field Levels Encountered in Various Environments and Close to Household Appliances

Description	Maximum Electric Field (V/m)	Electric Field at Servitude Boundary(V/m)	Electric Field (V/m)
765kV transmission line	7,000(or 7kV/m)	2,500 (servitude 80 m)	
400kV transmission line	4,700(or 4,7kV/m)	1,500(servitude 47 m)	
Near typical domestic appliances			10 – 250
Typical levels in homes			1 -10
Typical levels outside homes			< 1

Table 32: Typical Magnetic Field Levels Encountered in Various Environments and Close to Household Appliances

Description	Maximum	Magnetic Field at	Magnetic Field

	Magnetic Field (µT)	Servitude Boundary (µT)	(µT)[18]
765 kV transmission line (current of 560A)	6	1.5 (servitude 80m)	
400kV transmission line (current of 560 A)	10.5	2.5 (servitude 47 m)	
Vacuum cleaner, electric drill			2 -20
Hairdryer			0.01 -7
Dishwasher			0.6 -3
Washing machine			0.15 - 3
Fluorescent lamp			0.15 -0.5
Ambient field inside homes			0.01- 0.2

Many studies (epidemiology, laboratory and live animal) have been conducted over the past three to four decades to determine whether health effects may arise from exposure to EMFs. The main focus of the research has been on a possible association between long-term exposure to magnetic fields and childhood leukaemia. The suggestion for this health outcome stems mainly from some of the epidemiological studies. This has, however, not been confirmed by controlled laboratory studies. *In conclusion, there is no evidence of a casual relationship between magnetic field exposure and childhood leukaemia and no dose-response relationship has been shown to exist between EMF exposure and biological effects.* Likewise, studies on behaviour, reproduction, health, meat and milk production have found minimal or no effects of EMFs on animals. Similarly, studies have found no significant effect of EMFs on plant growth, crop production and seed germination.

The absence of evidence on health effects is generally not considered to mean evidence of the absence of health impacts and has resulted in some scientist advocating caution and finding ways to avoid and / or reduce exposure. The guideline for EMF exposure set by the International Commission for Non-Ionising Radiation Protection (ICNIRP) (an organisation formally recognised by the World Health Organisation) (see Table 32) receive worldwide support and is endorsed by the Department of Health in South Africa, as well as the South African Forum for Radiation Protection.

Utilities in South Africa involved in the generation and distribution of electrical energy are bound by the Occupational Health and Safety Act (Act 85 of 1993) to provide such services in a safe manner. However, there are currently no regulations under the Hazardous Substances Act (Act 15 of 1973) in terms of exposure to power frequency EMFs in South Africa. As such ICNIRP guidelines are used for assessing human exposure to these fields.

Table 33: Electric and Magnetic Field Exposure Guidelines as set by the ICNIRP (1998)

	Electric Field (kV/m)	Magnetic field (µT)

Reference level [21] :		
Occupational	10	500
Public	5	100
	Current density (mA/m^2)	
Basic restriction:		
Occupational	10	
Public	2	

10. COMPARATIVE ASSESSMENT OF THE ALIGNMENT ALTERNATIVES IN TERMS OF PREFERENCE

The comparative assessment of the alignment alternatives within the study area is represented on the table below.

Table 34: it represents the comparative assessment of the alignment alternatives based on the socio-economic and environmental aspect of the study area

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
Flora	Highest percentage of sensitive flora habitats and conservation priority areas.	Contains a moderate amount of sensitive flora habitats and conservation priority areas.	Contains the least amount of sensitive flora habitats and conservation priority areas.	Route Alternative 5 is the least sensitive in terms of the vegetation and therefore the preferred route alignment. The second preference is Alternative 3
Fauna	Transverses the highest percentage of habitat types of high perceived ecological value.	Transverses the least amount of habitat types of high perceived ecological value when compared to the other alternatives.	Transverses a moderate percentage of habitat types of high perceived ecological value.	Route Alternative 3 is the least sensitive in terms of the fauna habitats and therefore the preferred route alignment.
Avi-Fauna	Intersects and transverses numerous priority crane breeding habitats and wetland types. Also contain important nesting and foraging habitats for crane species.	The low crane occurrence or nesting localities on farm properties and the presence of a busy highway/transport network alongside the proposed corridor	Intersects and transverses the highest percentage of priority crane breeding habitats and wetland types. Also contain important nesting and foraging habitats for crane species.	Alternative 1 and 5 will have more eminent impacts when compared to Alternative 3. Therefore, Alternative 3 is regarded as the “better” option when compared to the other corridors.
Wetland	The corridor has the highest	The corridor has the highest surface area of non-linear	The corridor has the highest combined watercourse	Alternative 3 is regarded as the most favourable route selection from a

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
	overlap with Highly Sensitive Aquatic Subcatchments areas and contains the second highest surface area and number of Potential crane breeding watercourses.	watercourses (e.g. pan wetlands) and the centre-line has the highest number of crossing lengths greater than 400 m.	surface area. The centre-line has the longest combined length and number of watercourse crossings and the highest number of crossings greater than 1 kilometre. The corridor contains the highest surface area and number of Potential crane breeding watercourses	watercourse consideration, while Alternative 1 is regarded as second most favourable route. Alternative 5 should not be considered from a watercourse impact aspect.
Heritage (HIA)	The corridor contains various heritage resources such as graves, farmsteads and other historical structures, as well as sites related to the Anglo-Boer War (1899-1902) and Iron Age stone walled sites.	The corridor contains various heritage resources such as graves, farmsteads and other historical structures, as well as sites related to the Anglo-Boer War (1899-1902) and the Battle of Berg-end Dal/Dalmanutha.	The corridor contains various heritage resources such as graves, farmsteads and other historical structures, as well as sites related to the Anglo-Boer War (1899-1902) and Iron Age stone walled sites.	Iron Age stone walled sites are mainly concentrated around the Alternative Routes 1 and 5 with only a few close to Route 3. Alternative 3 would therefore, be the preferred alternative.
Soil & Agricultural Potential	There is an existing corridor which cover 50% of the distance of the Alternative, thereby reducing the impact on unaltered land. The corridor contains moderate to high potential agricultural soils.	There is an existing corridor which cover 10% of the distance of the Alternative, thereby increasing the impact on unaltered land. The corridor contains moderate potential agricultural soils.	There is an existing corridor which cover 20% of the distance of the Alternative, thereby increasing the impact on unaltered land. The corridor contains moderate to high potential agricultural soils.	Alternative 1, is thus the preferred option when considering the impacts on the region (un-impacted), lands in the areas.

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
Visual (VIA)	Alternative 1 is regarded as having a moderate to high visual impact.	Alternative 3 is regarded as having a the highest visual impact in comparison to the other corridors.	Alternative 5 is regarded as having a the lowest visual impact in comparison to the other corridors.	The analysis shows that in terms of visual impact, Alternative 5 is the best option.
Geotech	Alternative 1 is regarded as having moderate to high engineering geological constrains.	Alternative 3 is regarded as having the highest engineering geological constrains in comparison to the other corridors investigated.	Alternative 5 is regarded as having the least engineering geological constrains in comparison to the other corridors investigated.	The analysis shows that in terms of engineering geological constrains, Alternative 5 is the best option.
Geophysics	In addition to above Route 1 may have low risk interaction with open cast mining associated with the Strathrea opencast mining operation, should future mining be planned to extend in a southerly direction. The extent of this interaction is believed to be limited within the extent of the route traversing the respective mine lease area.	In addition to above Route 3 may have low to high risk interaction with undermining associated theGlisa mining operation. The extent of this interaction is believed to be limited within the extent of the route traversing the Glisa mine lease area.	In addition to above Route 5 may have low to high risk interaction with opencast mining associated with the unidentified mining operation found approximately 14km along the route from the Arnot substation	According gto geophysics, alternative 1 has the low risk interaction with mining activities.

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
SIA	The following social aspects are associated with Alternative 1: • The Strathrae mining activities is mostly underground mining which makes the development of a power line in this area plausible. • The Siphakamile Combined School is in close proximity to the Strathrae mining activities within the corridor of Alternative 1. • Exxaro and Shanduka mining have indicated that Alternative 1 is their preferred alignment option. • Construction of an additional power line along Alternative 1 would develop a so-called industrial corridor due to the presence of a transmission	The following social aspects are associated with Alternative 3: • Various settlements are located within the corridor and situated adjacent the N4 and railway line. • The influx of workers within the more densely populated areas could have a marked influence on the social networks. • Buffer zones between the proposed transmission line, railway line and distribution lines found within the corridor would make the alignment challenging. • There are schools within the corridor such as the	The following social aspects are associated with Alternative 5: • Construction of an additional power line along Alternative 5 would develop a so-called industrial corridor due to the presence of a 275 kV transmission line and the approved Hendrina-Gumeni transmission line along this corridor. Negative impacts would thus be concentrated within one area. • Eerstelingsfontein Colliery is in the planning phases with its Integrated Water Use License Application (IWULA) still to be completed • possible negative impact on the tourism establishments	Both Alternative 1 and Alternative 5 could be followed from a social perspective. However, based on the preference by the mining industry for Alternative 1 and the fact that there is approved 400kV line and two 275 kV lines are already present in close proximity to Alternative 5, as well as the possibility that the Eerstelingsfontein mine would go ahead and that will make alternative 5 to be rather complex if not problematic, Alternative 1 could be more preferred than Alternative 5.

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
	line and distribution lines along this corridor. Negative impacts would thus be concentrated within one area. • Possible negative impact on the tourism establishments in the Leeukloof area. • Arnot Aerodrome near Arnot Substation in close proximity to Alternative 1.	Arnot Colliery Primary School and the Blomplaas Primary School. • Existing and proposed mining activities within the corridor could be negatively affected . • Landing strips and an airfield in close proximity to the corridor. • Various tourism establishments along or near this route could be negatively affected.	in the Leeukloof area. • The Arnot Aerodrome near Arnot Substation in close proximity to Alternative 5 should be avoided.	
Technical Viability	The existing mining activites within the corridor that is managed by Exxaro and there is existing 400kV from Arnot substation to Maputo while where the corridors bend	In terms of the infrastructure this corridor has existing Sasol pipeline servitudes, railway line servitudes as well as approved petroline that is	On this corridor it contains two existing 275kV transmission line that run parallel to Prairie substation and there is new approved 400kV transmission line that	Alternative 3 is not technically feasible to build the new 400kV double circuit line along an approximate 40km of existing Sasol pipeline, with another approved petro line also being planned as well as the existing railway line (refer

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
	towards Gumeni substation there is distribution line. In principles to built line next to existing transmission and distribution line technically is not problematic. However, it becomes more problematic if there will be crossings of two high voltages line of the transmission. In this case it is unlikely that there will crossings of the transmission lines but there is possibility of crossings of proposed transmission line to distribution and it is technically achievable. In terms of the mining activities it is possible to find a way through the mining area considering that the proposed corridor is 2km in width.	yet to be constructed all these infrastructure area along the N4. In other words all this linear infrastructure are running parallel to each other along the N4 and if this proposed power line is considered to be constructed will be also running parallel with this existing linear infrastructure. Furthermore, there are existing mining areas affected by this corridor. The limiting technical issues encountered on this corridor implied safety implications close to schools on the route along the pipeline is the most worrying (steady state induction, transient induction such as lightning or flashovers, and transferred transient voltages through fences, cables and railway systems nearby). The safety	will be from Hendrina substation to Gumeni and pass to Marathon substation. There is also other distribution that are affected by this corridor although they are more around Gumeni substation area. there will be potential of crossing over of the transmission lines and distribution lines. In most cases, the crossings of transmission line over distribution often does not pose technical challenges however the crossings of transmission lines (high voltage) to another transmission pose some technical challenges. For example, in this case the proposed double circuit 400kV line it carries double high voltages conductors and for it to cross over the hendrina-gumeni-marathon 400kV line as well as two	to figure 39). The longer the power line run parallel to this pipelines and railway line that parallelism will lead to the very long exposure and the zone of influence around the pipe and power line is much much wider (6km or more from both). The longer the parallelism, the wider the zone of mutual influence. Alternative 5 could be pursued but it has huge potential technical issues of crossings over the existing high voltages (transmission lines) as well as distribution lines. Another technical issues is to populate all the power lines in the same area pose a risk zone during the unforeseen natural disasters. This alternative technically will pose challenges in terms of the crossings. Alternative 1 is the preferred corridor technically because of the nature of the existing infrastructure and land use.

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
		of Sasol maintenance and construction teams inside the pipeline servitude will also be a contentious issue unless controlled by costly measures even during construction (for a distance of 40km). Shorter fault clearance times on the new power line may have to be enforced to meet safety requirements and these may be expensive if at all possible. Corrosion prevention is another issue, which will put a burden of the Eskom Grid in terms of maintenance (over and above the costs involved to install mitigation) and lead to certain technical challenges to prevent tower footing corrosion close to cathodic protection systems of the pipelines. Constructability issues	existing 275kV line will definitely pose technical difficulties and it will be an huge risk for Eskom to do that.	

Specialist Study	Alternative 1	Alternative 3	Alternative 5	Summary
		around certain towers that could end up close to the pipe is another potential issue, considering the risks when excavation or blasting with dynamite into rock for tower foundations		

Table below is a summary of the recommendations of the various specialists based on the corridors preferences:

Table 35: Summary of Specialist Comparison of Alignment Alternatives in terms of preference

Specialist Study	Alternative 1	Alternative 3	Alternative 5
Flora	0	X	X X
Fauna	0	XX	0
Avi-Fauna	0	XX	0
Wetland	X	XX	0
Heritage (HIA)	X	XX	X
Soil & Agricultural Potential	XX	X	0
Visual (VIA)	X	X	XX
Socio-Economic	XX	0	X
Town Planning & Regional	XX	0	XX
Technical viability	XX	0	X

BOX: The colour used on the columns of the table above represent the colour code of the investigated corridors. Double XX stand for first preference and single X stand for second preference and where there is 0(zero) it means it is not recommended at all.

In overall, there is no clear cut preference of the corridors as per specialist preferences are concern. As we assess this proposed project under the principles of sustainable development which are based on three dimension factors namely; social, economic and environment. From social and economic point of view the preferred corridors point are Orange corridor and Green corridor.

From environmental point of view the preferred corridor is Purple corridor although vegetation specialist its preference is green corridor but then the majority of the specialists goes with purple corridor. Orange corridor was considered highly sensitive from environmental point of view but only wetland specialist had orange corridor as second option purely because wetlands impacts can be avoided by spanning over the pylons.

The nature of the land use within the study area makes it very difficult to have clear differences between economic and social issue in terms of the alternatives under investigations. The dominant land uses within the study area is agriculture and mining and this two land uses are all directly impacted by this proposed corridors. All the corridors do transverse all the mining areas and therefore the mining activities will not be the differentiator of the corridors in terms of preferences. The technical viability along the corridor is the key in determining the corridor preferences. Figure 38 shows the existing and future planned infrastructure that will quite influential in determining the viability of the corridor to establish double circuit 400kV line.

11. IMPACT ASSESSMENT WITH THE PROPOSED MITIGATION MEASURES FOR THE PROPOSED PROJECT

The purpose of this section is to identify potential impacts and to recommend mitigation measures to minimise detrimental environmental impacts. The following are identified as possible activities that will have impacts on the environment.

11.1 IMPACTS ON FLORA

As outlined in the specialist report, once established, the power lines have no to very low impact on the vegetation within the study area. This was confirmed during the site visits when the existing power line was observed. No evidence of soil erosion or other disturbances due to the power line was observed, exploitation of the veld in terms of grazing and quarries was found to have a much more significant impact than the established power line. The major concern is in terms of the edge effects of the construction phase:

- Unauthorised off-road driving;
- Removal of medicinal or aesthetic plants; and
- The harvesting of wood from drainage lines, outcrops or bush clumps for warming and cooking.

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

The following impacts were identified as potentially influencing ecological processes and functioning of the study area itself as well as on regional and provincial scale:

- Removal of vegetation at construction camps and burrow pits;
- Harvesting of medicinal plants and wood;
- Construction of access roads; and
- Alien vegetation control at construction camps, within servitudes and along access roads.

11.1.1 Mitigation measures

The following obligatory recommendations are applicable to the project area:

- Placing construction camps in all ready transformed areas such as cultivated fields or revamping derelict homesteads or other abandoned infrastructure can mitigate this impact. New burrow pits should be kept to the minimum; existing one should rather be used than new ones created. If successfully mitigated, the impact on the vegetation could be considered low on a local scale in the long term.
- Construction companies should make sure that the necessary medical facilities are available for their staff on site. The Health and Safety Act will most probably cover this aspect.

- Gas and electrical cooking facilities should be provided. The same apply to heating during the winter months. Open fires should be discouraged and only used under controlled circumstance, as the area is prone to large fires on a regular basis (Figure 15). Care should be especially taken during the late winter/ early spring months (June, July, August, September). If successfully mitigated, the impact on the vegetation could be considered low on a local scale in the long term.
- Where possible existing routes into rugged terrain should be used and enhanced. If the access roads are required to cross green fields (untransformed) areas, it is strongly recommended that the plants present be surveyed, collected for documentation at SANBI, medicinal plants rescued instead of being destroyed and rare or threatened species moved to nurseries for re-establishment after construction or used for rehabilitation in areas where construction activities had result in the significant loss of natural vegetation. If successfully mitigated, the impact on the vegetation could be considered moderate on a local scale in the long term.
- Where encountered, declared alien vegetation should be controlled and the spread thereof proactively managed. Declared alien vegetation should be controlled and removed in compliance with the Conservation of Agricultural Resource Act and the National Environmental Management Biodiversity Act. If successfully implemented, the impact on the vegetation could be considered moderately positive on a local scale in the long term.

Table 36: Assessment of Impacts (Flora)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance rate
Loss of natural vegetation	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Degradation of vegetation	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Harvesting of medicinal plants and wood	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	3	3	2	3	High
	With management	3	3	2	2	Low
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Loss of natural vegetation	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Degradation of vegetation	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	3	3	2	3	High

	With management	3	3	2	2	Low
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Loss of natural vegetation	Without management	3	3	1	4	Low
	With management	3	2	1	2	Very
Degradation of vegetation	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	3	3	2	3	High
	With management	3	3	2	2	Low
Control of alien vegetation	Without management	3	3	4	3	High
	With management	3	3	4	3	Moderate
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Loss of natural vegetation	Without management	3	3	1	4	High
	With management	3	2	1	2	Moderate
Degradation of vegetation	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Erosion associated with off-road driving and poor storm water management	Without management	3	3	2	3	High

	With management	3	3	2	2	Low
Infringement on rare or sensitive flora habitat	Without management	4	4	2	3	High
	With management	4	4	2	3	Moderate
Control of alien vegetation	Without management	3	3	4	3	High
	With management	3	3	4	3	Moderate

11.2 IMPACTS ON FAUNA

11.2.1 Potential Impacts

The following impacts were identified as potentially influencing ecological processes and functioning of the study area itself as well as on regional and provincial scale:

- Loss of primary upland and rocky grassland;
- Loss of conservation important faunal species;
- Disturbances caused during the construction phase;
- Disruption of functional ecological habitat types (rocky grassland and wetlands);
- Disturbances associated with maintenance procedures;
- Maintenance of the vegetation on the power line servitude; and
- Increased hunting, poaching and removal of fire-wood.

11.2.2 Proposed Mitigation

The following obligatory recommendations are applicable to the project area:

1. *A "walk-through" of the selected route must be conducted prior to the construction phase*:

    - The "walk-through" will aim to identify areas where conservation-dependant species are likely to occur; and
    - When a threatened or near-threatened faunal species/population is identified, a route/pylon deviation is advised to minimise the interference of the servitude/pylon footprint on the respective faunal species/population;

2. Mandatory measures to be implemented during the construction and operational phases:

- The attached sensitivity map should be used as a decision tool to guide the layout design of the proposed development - all wetland areas (including man-made areas), upland primary grassland, ridges and outcrops (irrespective of their surface area) are regarded as sensitive habitat units;
- The quartzite and dolerite grassland provide important refuge for reptile and range-restricted invertebrate taxa. Therefore, these areas should be avoided during the construction phase to prevent unnecessary damage or disturbances;
- The construction of "new" access roads should be limited, and existing roads should be used during the construction phase. It is suggested that the construction of roads be avoided and that all access roads be limited to grassy "tracks";
- Where possible, the servitude below the line should be left natural and is not allowed to be burned on an annual basis. The unnecessary removal of natural vegetation should be avoided;

- The extent of the construction sites and access roads should be demarcated on site layout plans and should be restricted to disturbed areas or those identified with low conservation importance. Therefore, no construction personnel or vehicle may leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors;
- Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of eroded areas should be undertaken;
- Open fires is strictly prohibited and only allowed at designated areas;
- Harvesting of firewood or any plant material (for medicinal or cultural purpose) during the construction phase is strictly prohibited. Labour or personnel shall only assist with the removal of plant matter if requested to do so by the ECO;
- Hunting/snaring is strictly prohibited. Any person found hunting or in the possession of any indigenous animal (including invertebrate taxa) should face disciplinary measures, following the possible dismissal from the site;
- Intentional killing of any faunal species (in particular invertebrates and snakes) should be avoided by means of awareness programmes presented to the labor force. The labor force should be made aware of the conservation issues pertaining to the taxa occurring on the study area. Any person found deliberately harassing any animal in any way should face disciplinary measures, following the possible dismissal from the site;
- If any subterranean/fossorial reptile, scorpion or mammal species is recovered during the construction phase, this species must be relocated to the nearest area or natural open space with suitable habitat for the particular species to continue its life history. If accidentally killed, then this species should be adequately preserved as a “voucher” specimen (with the assistance and knowledge of the ECO). These specimens may contribute towards a better understanding of biogeography and animal systematics; and
- All construction activities must be limited to daylight hours

Table 37: Assessment of Impacts (Fauna)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Sensitive faunal habitat loss/degradation: construction related	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Sensitive faunal habitat loss/degradation: tower placements	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Loss/disruption of mammal migration routes	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Loss of regional ecosystem processes, functions and services	Without management	3	3	2	3	High
	With management	3	3	2	2	Low
Air, soil and surface water pollution: construction phase	Without management	2	3	1	4	Moderate
	With management	1	2	1	3	Low
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Sensitive faunal habitat loss/degradation: operation (maintenance)	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Loss/disruption of mammal migration routes	Without management	3	3	1	4	Moderate

	With management	3	3	1	2	Low

11.3 IMPACTS ON AVI-FAUNA

11.3.1 Potential Impacts

The potential impacts regarding transmission lines on birds are follows:

- Electrocution;
- Collision;
- Loss of habitat and disturbances; and
- Poaching and trade of birds.

11.3.2 Proposed Mitigation

There are numerous ways to ameliorate or mitigate bird impacts imposed by power line interactions. Probably the best way is to proactively avoid areas where the potential for bird interaction is evident by means of subsequent route deviations or modifications. However, route deviations are not always financially plausible unless significant bird mortalities or habitat destruction is inevitable. An option to overcome bird collisions is to replace overhead lines with underground cables. This method does come at a huge expense, and construction activities could irreparably damage sensitive habitat types. It is also more time-consuming to repair faults on underground *versus* overhead cables.

The following obligatory recommendations are applicable to the project area:

1. A “walk-through” of the selected route must be conducted prior to the construction phase:

    - The ”walk-through” will aim to identify areas where marking of lines by means of “deterrent devices” is considered to be beneficial or compulsory;
    - All intact/primary grassland, wetland, river and drainage line crossings should by default be marked;
    - Where the line crosses a wetland/river, the actual crossover span as well as one span on either side of the wetland/river/ should be marked;
    - Marking devices to be used should include large Double Loop Bird Flight Diverters. Spans in close proximity to crane nesting sites or areas known to provide foraging habitat, as spans in close proximity to pans should be marked by alternating between Double Loop Bird Flight Diverters and the Inotec BFD88;
    - All devices should be applied in a staggered fashion to the phase while alternating between black and white diverters. The maximum distance between the diverters should not exceed 5 m; and
    - A representative of EWT (preferably a field officer affiliated with the Highveld Crane Conservation Project) with a good local knowledge of the area should assist during the ”walk-through”.

2. Mandatory measures to be implemented during the construction phase:

- The construction sites must be confined to disturbed areas or those identified with low conservation importance. All construction sites must be demarcated on site layout plans (preferably), and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction sites that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors;
- A natural buffer zone (to be announced by the wetland specialist) should be allowed between the line servitude and any wetland or other sensitive habitat type;
- All road networks must be planned with care to minimize dissection or fragmentation of important avifaunal habitat type. Where possible, the use of existing roads is encouraged. Access must be determined during the “walk-through” process;
- The breeding status of threatened species, in particular bustards and korhaan species, Yellow-breasted Pipit and Rudd's Lark should be evaluated prior to construction/decommissioning. If breeding is confirmed, the nest site must be barricaded and appropriately buffered (by at least 500 m). Construction/ decommissioning activities shall only commence once the fledglings are successfully reared and has left the nesting site;
- Construction activities are not allowed within 1000 m of a known crane breeding site – even when the nesting site is not in use/occupied;
- Depending on the crane species, construction activities should cease during the peak breeding period when within 1 km of a nesting site: November to December. The breeding status of known nesting sites should be verified by a representative of EWT;
- It is recommended that the “cross-rope suspension” type tower be used for the proposed transmission line;
- A representative of EWT (preferably a field officer affiliated with the Highveld Crane Conservation Project) should oversee the construction activities and act as a temporary Environmental Control Officer;
- Open fires is strictly prohibited and only allowed at designated areas; and
- Killing or poaching of any bird species (in particular cranes) should be avoided by means of awareness programmes presented to the labour force. The labour force should be made aware of the conservation issues pertaining to the bird taxa occurring on the study area. Any person found deliberately harassing any bird species in any way should face disciplinary measures, following the possible dismissal from the site.

Table 38: Assessment of Impacts (Avi-Fauna)

CONSTRUCTION PHASE						
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Collision	Without management	3	1	6	2	Moderate
	With management	1	1	2	4	Low
Loss of habitat & disturbance	Without management	3	2	6	4	Moderate
	With management	1	1	2	2	Low
Poaching & trade of birds	Without management	3	1	2	2	Low
	With management	1	1	1	2	Neligible
OPERATION PHASE						
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Collision	Without management	3	3	8	4	High
	With management	3	2	6	4	Moderate
Loss of habitat & disturbance	Without management	3	2	6	4	moderate
	With management	3	1	2	2	Low

Poaching & trade of birds	Without management	3	3	2	2	Low
	With management	2	1	2	2	Negligible

11.4 IMPACT ON WETLANDS

11.4.1. Potential Impacts

The potential impacts regarding transmission lines on birds are follows:

- Compaction of watercourse soils;
- Changes to the hydrological regime caused by infrastructure construction in watercourses;
- Decrease in water quality;
- Loss of wetland, riparian, and drainage line vegetation and habitat as a result of pylon construction, new quarries and created construction camps;
- Increased sedimentation and erosion; and
- Encroachment of invasive alien vegetation into watercourses.

11.4.2 Proposed Mitigation

The following mitigations measures are proposed obligatory recommendations are applicable to the project area:

- Avoid driving on watercourses during construction of the transmission line to prevent vehicle track incisions and the potential for channel initiation. Where this is unavoidable, crossing structures should be in place across affected wetlands and other watercourses. These crossing structures can include the following:
    - A wearing course (wear surface) should be added as a surface layer on top of geotextile fabrics, which forms base for surface capping.
    - A wearing course (surface cap) of good quality clastic or gravel material also has the potential to reduce surface scour by creating a mix that will easily bind together and minimise detachment of particles.
    - Geotextiles provide four important functions in temporary road and trail surface construction that includes separation, drainage, reinforcement, and stabilisation.
    - Geotextiles work as separation fabrics when they are placed between gravel caps and underlying soils to prevent the materials from mixing.
    - Additional benefits of such as crossing structure include:
    - It defines a single route alignment for vehicle travel.
    - Provides a ‘wear and carry’ surface over unsuitable and easily compactable wetland soils.
    - This results in a stable, durable crossing surface for vehicle access, including heavy motor vehicle traffic.
    - Halts the widening and the development of braided crossing sections, while formerly used track alignments are allowed to naturally stabilise and revegetate.
- Restrict the construction of infrastructure in watercourses as far as possible.

- Pylon construction in wetland, riparian and wash buffer zones should only be allowed in exceptional circumstances where these areas cannot be spanned.
- All unavoidable overlap between individual pylons and along road crossings in demarcated watercourses will require a Water Use License (WUL) in order to be allowable. Efforts should therefore be undertaken during the planning phase and proposed walk down phase to avoid infrastructure overlap as far as possible.
- Construction and maintenance tracks and roads should also be located outside of watercourses (see impact 1.).
- No pylons, construction camps or quarries should not be constructed within watercourses (i.e. wetlands, riparian habitat, and headwater drainage lines).
- The smallest possible footprint should be utilized and positioned as close to the boundary of the affected watercourse in cases where pylon construction in a watercourse is unavoidable.
- Pylon construction activities in these areas should be completed in the shortest possible time and preferably during the dry season.
- Excavated watercourses should be re-sloped to a stable gradient (e.g. at least a slope of 1:3), revegetated with naturally occurring indigenous species or annual grass species such as *Eragrotis tef*, and covered with biojute to help facilitate revegetation soon after construction.
- Pylons in wetlands or other watercourses should not be located on steep slopes, channels or other surfaces with visible erosion features.
- Please note that these pylon construction recommendations are the last mitigation option and all other attempts should first be attempted to prevent pylons in watercourses. Infrastructure construction in watercourses would also require a WULA.
- Road crossings should make provision for dispersed flow and energy dissipation. Refer to the abovementioned recommendation regarding pylon (tower) construction in watercourses.
- Management of roadside drainage is the most effective way of controlling sediment runoff from unsealed roads.
- To minimise sediment load, an unsealed road network should have an emphasis on slowing drainage flows and dispersing them more frequently.
- Stormwater should be diverted away from the road early and often, so as to reduce the catchment area of the road.
- The use of drains, such as table drains and cut-off drains, should not be used in any of the watercourse crossings. These types of drains typically have concentrated high-velocity flows and can frequently form channels within the watercourse. These channels provide an easy pathway for sediment to reach streams and adversely impact on water quality.
- Alternative options for stormwater control should therefore be considered. These include the use of:

- Grass swales.
- Entrenched rock (rip rap) aprons.
- Sediment traps, such as hay bales or silt traps. These structures do, however, require maintenance.
- Vegetated buffer/ filter strips. The use of vegetation in the watercourse, especially downstream of unsealed road surfaces, will help to provide soil stability and reduce sediment input. It is important to use local and indigenous plant species.

- Permanent crossing structures across channelled watercourses can include unvented fords that are constructed of riprap, gabions, or concrete to provide a stream crossing without the use of pipes. Water will periodically flow over the crossing.
- If the construction of a crossing is unavoidable make sure that substrate continuity in the watercourse is maintained within upstream and downstream portions of the channel bed.
- Unvented fords are best suited for ephemeral or intermittent streams (streams that are dry most of the year). Unvented fords may also be used across some shallow, low velocity perennial streams.
- Other important best management practices associated with ford design, construction, operation and maintenance that should be adhered to as far as possible, include (Anon 2006):
  - Where possible locate crossings on straight channel segments (avoid meanders).
  - To the extent possible align crossings perpendicular to the stream channel.
  - Minimize the extent and duration of the hydrological disruption.
  - Use appropriate energy dissipaters and erosion control at the outlet drop.
  - Minimize impact to riparian vegetation during construction
  - Prevent excavated material from running into water bodies and other sensitive areas.
  - Use appropriate sediment barriers (silt fence and hay bales).
  - Dewater prior to excavation.
  - Check construction surveys to ensure slopes and elevations meet design specifications.
  - Use appropriately graded material (according to design specifications) that has been properly mixed before placement inside the structure.
  - Compact bed material.
  - Tie constructed banks into upstream and downstream banks.
  - Evaluate structure stability.
- Transmission line infrastructure (e.g. pylons) should be located outside of demarcated watercourses with a buffer of 50 m to avoid edge effects and opportunity for the encroachment of invasive alien plant species.
- Restrict the clearing of watercourse vegetation as far as possible. Areas that have been cleared should be revegetated with indigenous species after construction.

- Compile and implement an alien plant control program during the operational phase of the project.

Table 39: Assessment of Impacts (Wetlands)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Compaction of watercourse soils	Without management	3	4	2	4	High
	With management	1	2	1	2	Moderate
Surface flow modifications caused by access and maintenance road crossing structures	Without management	2	3	1	4	High
	With management	1	1	1	3	Moderate
Establishment of a substrate discontinuity and hence dispersal barrier as a result of the construction of a watercourse road crossing	Without management	2	3	1	3	Moderate
	With management	1	2	1	2	Low
Pollution damage a result of construction vehicle refuelling and spills in drainage lines	Without management	3	4	2	4	High
	With management	2	3	1	2	Moderate

Loss of drainage line vegetation and habitat as a result of tower construction, new quarries and created construction camps	Without management	2	3	1	3	Moderate
	With management	1	2	1	2	Low
Erosion damage in the form of channel bank and bed scour, as well as head cut development at permanent road crossings and towers in watercourses. Erosion risks are greatest during flooding or high rainfall events	Without management	3	2	1	3	Moderate
	With management	2	1	1	1	Low
Encroachment of invasive alien vegetation in response to soil disturbances and deteriorating water quality	Without management	3	3	1	3	High
	With management	2	2	1	1	Moderate
Surface flow modifications caused by road access crossing structures to reach towers in or across watercourses that need to be removed. *Only relevant to alternatives 1a and 1b.*	Without management	3	3	1	3	High

	With management	2	1	1	2	Moderate
Removal of tower structures in watercourses. *Only relevant to alternatives 1a and 1b.*	Without management	3	3	1	4	high
	With management	3	2	1	2	Low
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Compaction of watercourse soils	Without management	3	4	2	4	High
	With management	2	2	1	2	Moderate
Surface flow modifications caused by access and maintenance road crossing structures	Without management	2	3	2	3	Moderate
	With management	1	2	1	2	Low
Establishment of a substrate discontinuity and hence dispersal barrier as a result of the construction of a watercourse road crossing	Without management	2	3	1	3	Moderate
	With management	1	2	1	2	Low

Pollution damage a result of construction vehicle refuelling and spills in drainage lines	Without management	2	3	2	4	high
	With management	3	2	1	2	Moderate
Loss of drainage line vegetation and habitat as a result of tower construction, new quarries and created construction camps	Without management	3	3	3	4	High
	With management	3	2	1	2	Moderate
Erosion damage in the form of channel bank and bed scour, as well as head cut development at permanent road crossings and towers in watercourses. Erosion risks are greatest during flooding or high rainfall events	Without management	3	4	1	4	High
	With management	2	2	1	2	Moderate
Encroachment of invasive alien vegetation in response to soil disturbances and deteriorating water quality	Without management	3	3	2	4	High

	With management	2	1	1	3	Moderate
Surface flow modifications caused by road access crossing structures to reach towers in or across watercourses that need to be removed. *Only relevant to alternatives 1a and 1b.*	Without management	3	3	1	3	High
	With management	2	1	1	2	Moderate
Removal of tower structures in watercourses. *Only relevant to alternatives 1a and 1b.*	Without management	3	3	1	4	High
	With management	2	2	1	3	Moderate

11.5 IMPACTS ON AGRICULTURE

11.5.1 Potential Impacts

The potential impacts on agricultural activities include:

- Impact on stock farming activities;
- Impact on timber farms and plantations; and
- Impact on agricultural and irrigation activities.

11.5.2 Potential Mitigation

The following mitigation measures are proposed:

- Eskom should discuss the construction schedule and activities with the affected farmers to enable them to plan their farming activities and animal movement accordingly.
- Conditions and/or specific requests relating to construction activities raised by property owners should be included in the EMP.
- Placement of the line and towers should preferably not impact on income generating activities.
- Sensitivities with regards to farming practices should be considered when finalising a line alignment.
- The location of the construction camp where workers would be housed should be carefully considered to limit any possible negative social impacts.
- The construction camp should be located near support services, and ideally not in the vicinity of residential dwellings.
- Construction camp management should adhere to the EMP specifications.

Table 40: Assessment of Impacts (Agriculture)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Impact on Stock farming activities	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Impact on timber farms and plantations	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Impact on Agricultural and Irrigation Activities	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Impact on Stock farming activities	Without management	3	3	1	4	High
	With management	3	2	1	2	Moderate
Impact on timber farms and plantations	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Impact on Agricultural and Irrigation Activities	Without management	3	4	1	4	High
	With management	2	3	1	3	Moderate

11.6 IMPACTS ON THE SOCIO-ECONOMIC ASSESSMENT

Table 39 below represents the proposed potential impacts and mitigation measures in relation to socio-economic aspect of the project.

Table 41: It represents the proposed impact and associated mitigation measures for socio-economic aspect

Potential Impacts	Proposed Mitigation measures
Impacts on Existing Residential area	• Should relocation be required, residents should be resettled nearer to their places of work and amenities. • Avoid placing the transmission line in close view of restaurants and accommodation facilities where the visual beauty of the area is the main attraction. • Careful consideration should be given to the tower designs in order to minimise impacts on existing structures and activities on affected properties. • Careful consideration should be given to the final route alignment and tower placements to ensure minimal disruption of resources and infrastructure, especially on the smaller properties. • Where possible, towers should be placed on the border of properties. The negotiation process would have to determine whether this is acceptable for the property owners involved and whether feasible. • Avoid placing the transmission line across properties used for eco-tourism and leisure activities, such as horse riding and horse-based tourism. Should avoidance not be possible, the alignment should avoid the main activity areas and preferably be placed on the border of the properties.
Impacts on Schools	• Should Alternative 1 or 3 be the preferred alignment, special attention should be given to avoid the schools as indicated • Movement of vehicles on routes used by learners and pedestrians should be avoided, especially during peak times • Maintenance personnel should travel in a marked vehicle and should wear uniforms to ensure that the personnel are easily identifiable as Eskom personnel • Ideally permission should be sought before entering school properties
Impacts on Tourism	• Deviating line alignments away from tourism establishments and activities throughout the study area could

Potential Impacts	Proposed Mitigation measures
	serve as mitigation measure • Representatives of tourism establishments that would be affected by the transmission line construction should be consulted prior to the construction phase with regards to the construction schedules, transportation routes, construction of additional access roads and construction methods to be used • Eskom should keep the construction of access roads to a minimum and rather use the existing infrastructure, as the construction and maintenance of these roads are very costly, impact on the residents' daily living and movement patterns, and create a potential for erosion • Workers should be easily identifiable • Activities should adhere to normal working hours • The movement of construction vehicles should be limited to off-peak periods (where possible) • Machinery and vehicles should be in good working order to limit excessive noise pollution • Avoid placing the transmission line in close view of restaurants and accommodation facilities where the visual beauty of the area is the main attraction point; • Avoid placing the transmission line across properties used for eco-tourism and leisure activities such as fly fishing and other outdoor recreational activities. Should avoidance not be possible, the alignment should avoid the main activity areas and preferably be placed on the border of the properties
Disruption in daily living and movement patterns and proximity of homestead	• Property owners that would be affected by the transmission line construction should be consulted prior to the construction phase with regards to the construction schedules, transportation routes, construction of additional access roads and construction methods to be used • Eskom should keep the construction of access roads to a minimum and rather use the existing infrastructure, as the construction and maintenance of these roads are very costly, impact on the residents' daily living and

Potential Impacts	Proposed Mitigation measures
	movement patterns, and create a potential for erosion • Workers should be easily identifiable • Activities should adhere to normal working hours • The movement of construction vehicles should be limited to off-peak periods (where possible) • The movement of construction vehicles in areas where sensitive receptors are situated e.g. schools and pedestrians should be limited • Machinery and vehicles should be in good working order to limit excessive noise pollution • Consideration should be given to the placement of the towers and the type of towers that would be used. Towers with the smallest footprint (e.g. double circuit structures) with its associated more confined impact would be preferable • Maintenance personnel should travel in a marked vehicle and should wear uniforms to ensure that the personnel are easily identifiable as Eskom personnel • Ideally permission should be sought before entering properties
Impact on Land Value	• During the construction process the EMPR should be strictly adhered to • The negotiation process between Eskom and the property owners should be concluded as rapidly as possible and compensation should be undertaken immediately thereafter • Placement of the power line along the farm boundaries where possible would limit the possible negative economic impacts • Tourism establishments should preferably be avoided

Potential Impacts	Proposed Mitigation measures
Inflow of workers	• Eskom and the contractors should maximise the use of local labour where possible by developing a strategy to involve local labour in the contractor teams and construction process. • Before construction commences, representatives from the local municipality and community-based organisations, as well as neighbouring and/or affected residents should be informed of the details of the construction company (contractor), size of the workforce and construction schedules. • Conditions stipulated by property owners in terms of the construction activities should be implemented and monitored. • Contractors and temporary employees should behave fittingly at all times. • Workers should receive fines if they do not adhere to the conditions, rules and regulations. • Workers should be made aware of property owners' concerns regarding construction work on their properties so that they are familiar with the sensitive issues. • A specific contact person should be identified to allow community members and property owners to easily direct their queries and concerns and obtain general information regarding the construction process • Eskom personnel should preferably not access private properties without prior notification of the property owners. • Eskom maintenance personnel should be in possession of the required identification documents and clothing when undertaking maintenance work. • Vehicles used should be clearly marked. • Eskom personnel should behave properly at all times
Influx of Job seekers	• The number of job opportunities available as part of the proposed project and the recruitment process

Potential Impacts	Proposed Mitigation measures
	should be clearly communicated • The communication strategy should ensure that unrealistic employment expectations are not created • The use of local labour should be maximised through contractual conditions set for the sub-contractors
Impacts on airfields	• The details of the preferred route alignment and position of the aerodromes should be communicated and negotiated with the Civil Aviation Authority's Obstacle Section to obtain the necessary approvals from them, in the event that the proposed power line would be in close proximity to such airfields • Special conditions or regulations to adhere to in the vicinity of the airfields should be communicated and clearly noted by the contractors
Local Economic contribution	• Local procurement should be aimed at local businesses as far as possible. • Local sourcing of materials would assist in providing more economic and employment opportunities for the local people. • Maximise the use of local labour even if the number of locals that would be employed would be limited. • Accommodate, but regulate the activities of vendors in the vicinity of the construction areas and at the construction camps • Eskom should aim to turn the indirect local economic benefits into direct local and regional benefits through the provision of stable and sufficient electricity supply to the region thereby stimulating the local economy and by ensuring investor confidence in the region
Employment Opportunities	• It is recommended that the contractor and subcontractor employ semi-skilled and unskilled labour from the study area to avoid conflict between locals and outsiders with regards to the securing of employment.

Potential Impacts	Proposed Mitigation measures
	• Eskom should stipulate in their contracts with the contractors that local labour should be used for e.g. bush clearing, road construction and fencing. • Ward councillors could assist in determining available local labourers that could be considered for possible employment. • Eskom should ensure an equitable process whereby minorities and previously disadvantaged individuals (women) are also taken into account. • It is recommended that Eskom implements a skills audit and develops a skills database. • Capacity building and skills transfer should immediately commence to ensure that locals are employable. • It should be ensured that contractors use local skills, or train semi-skilled people or re-skill appropriate candidates for employment purposes where possible. • On-site training should focus on the development of transferable skills (technical, marketing and entrepreneurial skills) to ensure long term benefits to the individuals involved • Should opportunities arise for employment during the operational phase, Eskom should consider locals for any intermittent or permanent opportunities.
Health risks	• Eskom and the local municipalities should regular inspect the servitude and put a strategy in place to deal with any possible illegal “squatting” in the servitude areas. • The safety exclusion zone should be strictly adhered to • Homesteads and dwellings should be avoided when finalising a route alignment • Careful consideration should be given to the location of the construction site where workers would be accommodated

Potential Impacts	Proposed Mitigation measures
	• Littering should be prevented by ensuring adequate facilities at the construction sites to dispose of refuse • Sufficient water and sanitation facilities should be provided for the workers on site during the construction period • Informal vending stations (if it occurs) should be closely monitored to ensure that no environmental pollution occurs • Local labour should be employed as far as possible. • An HIV / Aids awareness campaigns should be focused on the contract workers. • Adequate water supply and sanitation related facilities should be provided to the workers at the construction sites. • Local labour should be employed as far as possible to avoid additional pressure of outsiders on the existing services
Community infrastructure	• Eskom should contact the relevant government departments and other possible stakeholders regarding the possible impact on infrastructure prior to construction. Written agreement should be sought from these affected parties to allow the project proponent to cross the various types of infrastructure. • Construction schedules should again be discussed and finalised with the affected government departments and other affected stakeholders prior to the construction commencement date • Rehabilitation of new access roads for construction vehicles should be undertaken as soon as the construction process allows. • There should be strict adherence to speed limits when using local roads and when travelling through residential areas.

Potential Impacts	Proposed Mitigation measures
	• Access routes and access points for heavy construction vehicles should be indicated to warn motorists of the movement of these vehicles. • Limit the movement of construction vehicles to off-peak periods (where possible) • Conditions to access farms should be discussed during the negotiation phase • An Environmental Control Officers and Farm Liaison officer could be appointed to ease communication between the property owners and Eskom • Maintenance personnel should travel in a marked vehicle and should wear uniforms to ensure that the personnel are easily identifiable as Eskom personnel • Maintenance personnel should keep to the service roads • Maintenance vehicles should be operated according to all road regulations • Maintenance vehicles should be in good working order • Ideally permission should be sought before entering properties

Table 42: Assessment of Impacts (Socio-Economic)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Impacts on Existing Residential area and Estates	Without management	3	1	6	4	Moderate
	With management	3	1	2	4	Low
Impacts on Towns and Dense settlement	Without management	3	1	2	2	Low
	With management	1	1	1	2	Negligible
Impacts on Schools and College	Without management	3	2	6	4	Moderate
	With management	3	1	2	4	Low
Impact on Land Value	Without management	3	2	6	4	Moderate
	With management	3	1	2	4	Low
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Impacts on Existing Residential area and Estates	Without management	3	1	2	4	Low
	With management	1	1	2	2	Negligible
Impacts on Towns and Dense settlement	Without management	3	3	6	4	Moderate
	With management	3	2	2	2	Low
Impacts on Schools and College	Without management	3	2	6	4	Moderate

	With management	3	2	2	2	Low
Impact on Land Value	Without management	4	3	6	4	High
	With management	3	2	6	2	Moderate

11.7 IMPACTS ON THE VISUAL ENVIRONMENT

11.7.1 Potential Impacts

The potential impacts on the visual environment include:

- Impact on sense of place;
- Visual Intrusion and reduction of open space;
- Deposition of litter; and
- Night light.

11.7.2 Proposed Mitigation

The following mitigation measures are proposed:

- Avoid placing the proposed transmission line within nature reserves and conservation areas.
- Consider placing the proposed transmission line along the N3 for sections of the route, if the property owners agree.
- Careful consideration should be given to the type of towers to be used to ensure the least intrusive technology possible.
- Avoid tourism nodes where possible.
- Mitigation measures as proposed by the Visual Impact Assessment should be strictly adhered to.
- No litter, refuse, waste, rubble and builder's waste generated on the premises are to be placed, dumped or deposited on adjacent/surrounding properties including road verges, roads or public places and open spaces during or after the construction period of the proposed development. Refuse must be disposed of at a dumping site approved by the Council. Site cleaning and screening of storm water outlets is essential to prevent large debris from impacting on stream banks downstream of the site. Dustbins must be provided at strategic places within the construction area, and cleared at regular intervals as required to avoid overflow.
- The construction site must be kept in a clean and orderly state at all times. All signs and advertisements erected for the development and within its confines must be in line with the guidelines of the South African Manual for Outdoor Advertising Control.
- Security lights in the construction camp are to be angled downwards and into the centre of the site to avoid disturbance to adjoining residents. No tall lighting masts are to be erected or operated during the construction or operational phases. Only standard height lighting poles (shorter than 3m) may be used.

Table 43: Assessment of Impacts (Visual)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Impacts on Existing Residential area and Estates	Without management	3	3	2	4	Moderate
	With management	3	2	1	2	Low
Impacts on Towns and Dense settlement	Without management	3	3	4	4	Moderate
	With management	3	3	2	2	Low
Impacts on Schools and College	Without management	3	3	1	4	Moderate
	With management	1	2	1	2	Low
Impact on Land Value	Without management	4	3	3	3	High
	With management	3	1	2	2	Moderate
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Impacts on Existing Residential area and Estates	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Impacts on Towns and Dense settlement	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Impacts on Schools and College	Without management	3	4	2	3	Moderate

	With management	2	3	1	2	Low
Impact on Land Value	Without management	4	3	4	3	High
	With management	3	1	2	2	Moderate

11.8 IMPACTS OF THE CONSTRUCTION CAMPS

11.8.1 Potential Impacts

The potential impacts of the construction camps include:

- Health risk;
- Safety and security risks;
- Deposition of contaminants;
- Stockpiling of Construction Materials; and
- Oil Spillages.

11.8.2 Proposed Mitigation

The following mitigation measures are proposed:

- Staff or personnel should be properly trained in handling of their equipments in order to avoid oil spillage that will increase deposition of contaminants. Construction camps should not be positioned in areas that has natural vegetation, preferably highly transformed area or already paved areas that do not have conservation value should be used.
- Construction vehicles should take into cognizance of peak hour traffic and they should avoid movement during those period. The speed of construction vehicles within the built up area should be limited to 40km/h.
- Careful consideration should be given to storm water control that will result in compaction or paving of surfaces within construction camps.
- Clearance of vegetation should only be done on areas that deem absolutely necessary.
- The areas to be cleared for roads and services should be restricted only to those that are essential for the operation and should be clearly demarcated. Construction vehicles and workers should not stray from these areas. All building rubble from the demolition of current structures is to be removed immediately in appropriate manner. The period between vegetation clearing and construction of the infrastructure must be kept to a minimum.
- Stockpiles are to be covered during windy conditions and material stockpiled for longer periods should be retained in a bermed area. Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to be eroded or where water would naturally accumulate.
- Refuse collection should take place on a regular basis. A litter patrol around the construction area is to take place twice a week to collect any litter that may have been strewn around. Adequate provision must be made for sanitation of the construction workers. Chemical toilets on site are to be emptied regularly so as to prevent overflow. In addition, construction materials that are left over after completion of the development are to be removed from the site and disposed of in an appropriate manner.

- Storage of potentially hazardous materials should be above the 100-year flood line, or as agreed with the ECO. These materials include fuel, oil, cement, etc. Surface water draining off contaminated areas containing oil and petrol must be channelled towards a sump, which will separate these chemicals and oils. Oil residue shall be treated with oil absorbent products such as Drizit or similar and this material removed to an approved waste site.

Table 44: Assessment of Impacts (Construction Camps)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Health risk	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Deposition of contaminants	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Stockpiling of Construction Materials	Without management	3	3	1	4	Moderate
	With management	3	3	1	2	Low
Oil Spillages	Without management	3	3	4	4	High
	With management	2	2	2	2	Low
Increase volume of Traffic	Without management	3	4	2	4	High
	With management	2	3	1	2	Moderate
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Health risk	Without management	3	3	2	4	High
	With management	2	2	1	2	Low
Deposition of contaminants	Without management	3	3	1	4	Moderate

	With management	2	2	1	2	Low
Stockpiling of Construction Materials	Without management	3	3	3	2	Moderate
	With management	2	1	2	1	Low
Oil Spillages	Without management	2	4	2	3	Moderate
	With management	1	2	1	2	Low

11.9 CRIME, SAFETY AND SECURITY

11.9.1 Potential Impacts

The potential impacts include:

- Safety of personnel and equipment;
- Increase activity and vigilance;
- Decrease in uncontrolled criminal areas; and
- Increased crime and reduction in personal safety.

11.9.2 Proposed Mitigation

The following mitigation measures are proposed:

- The associated risk of increased crime due to work staff being located on site would be reduced if the number of staff and people on site were limited. The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and the National Building Regulations.
- Ensure that the handling of equipment and materials is supervised and adequately instructed. The entrance will have to be supervised to monitor entry and exit.
- Adequately barricade any exposed excavations or erect warning signs to notify the public of the inherent dangers. The contractor must have 24-hour security during the construction phase.
- Ensure that construction vehicles are under the control of competent personnel.
- Adequate facilities should be provided on site to treat emergencies to staff.
- No fires should be allowed on site.
- Access should be limited to the construction crew camp only to the workforce. Congregation of informal workers in front of the entrance/exist road should not be allowed. Vehicles used for construction are to be in good working condition, and not the source of excessive fumes.
- The maintenance of fire breaks by landowners is of critical importance.
- The servitude should be monitored on an ongoing basis.
- Eskom should take a strong stance with regard to the illegal entering of the servitude areas and people erecting building in the servitude. Such dwellings should be removed immediately.
- Eskom should, in conjunction with the local municipalities, develop an emergency management plan to specifically deal with the increased risk of fires from possible flash overs.
- Eskom should engage with the Working on Fire Programme managers to ensure the threat of wildfire is managed.

Table 45: Assessment of Impacts (Crime, Safety and Security)

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Safety of personnel and equipment	Without management	3	3	1	4	moderate
	With management	3	2	1	2	Low
Increase activity and vigilance. Decrease in uncontrolled criminal areas.	Without management	3	3	1	4	moderate
	With management	2	3	1	2	Low
Increased crime and reduction in personal safety	Without management	3	3	1	4	moderate
	With management	2	2	1	2	Low
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Safety of personnel and equipment	Without management	3	3	1	4	Moderate
	With management	3	2	1	2	Low
Increase activity and vigilance. Decrease in uncontrolled criminal areas.	Without management	3	3	1	4	Moderate
	With management	3	3	2	2	Low
Increased crime and reduction in personal safety	Without management	2	3	2	3	Moderate
	With management	1	2	2	1	Low

11.10 IMPACT ON MINING ACTIVITIES AND MINING AREAS

11.10.1 Potential Impacts

The potential impacts include:

- Fire risk associated mining activities and the presence of power lines;
- The economic and safety risks due to power line;
- The foundation stability of the power lines due to underground mining;
- Indirectly impacting on Gross Domestic Product (GDP); and
- Effects on the mineral production and life of mine

11.10.2 Proposed Mitigation

The following mitigation measures are proposed:

- Different types of towers (if technically and economically feasible) should be considered to limit the negative impacts on the mining activities
- Buffer zones around areas where blasting takes place should be considered
- Mine representatives should be involved with finalisation of the detailed alignments and tower positioning to ensure the least impact on mining activities
- Where the proposed transmission line would be in close proximity to mining activities, it should be clearly marked with e.g. reflective equipment
- Cable heights and low points should be indicated by clearance warning signs. Clearance heights should thus be measured
- Vehicle movements in close proximity to power lines should be undertaken on dedicated route travelling plan
- Different equipment and vehicles should adhere to their specific clearances from power lines. This should be stipulated in the mining safety plans.
- Mining safety plans with regards to power lines should be strictly implemented

Table 46: Impact assessment of Mining activities

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
Fire risk associated mining activities and the presence of power lines	Without management	3	3	6	2	moderate
	With management	3	2	2	1	Low
The economic and safety risks due to power line	Without management	3	2	6	2	moderate
	With management	2	1	2	2	Low
The foundation stability of the power lines due to underground mining	Without management	3	1	6	4	moderate
	With management	2	1	2	2	Low
Indirect impact on Gross Domestic Product (GDP)	Without management	3	3	8	2	High
	With management	3	2	6	1	Low
Effects on the mineral production and life of mine	Without management	3	2	8	4	High
	With management	3	1	6	2	Moderate
Nature of Impact	**Management Measures**	**Duration**	**Scale**	**Severity**	**Probability**	**Significance**
Fire risk associated mining activities and the presence of power lines	Without management	3	3	6	4	High
	With management	3	2	6	2	Moderate
The economic and safety risks due to power line	Without management	3	2	8	2	Moderate
	With management	3	1	6	2	Moderate

The foundation stability of the power lines due to underground mining	Without management	2	1	2	2	Low
	With management	1	1	2	1	Negligible
Indirectly impacting on Gross Domestic Product (GDP)	Without management	3	2	6	2	Moderate
	With management	3	1	6	2	Low
Effects on the mineral production and life of mine	Without management	3	2	6	4	Moderate
	With management	3	1	2	4	Low

12. CUMULATIVE IMPACTS

Cumulative impacts imply the sum total or combined impacts (positive and negative) associated with the proposed development whether on a local or regional scale. In terms of the EIA regulations, a cumulative impact in relation to an activity means “the impact of an activity that itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar of diverse activities or undertakings in the area”. This section describes the following cumulative impacts:

12.1 Impacts on Airfields and effectiveness of Fire Fighting

The proposed power line may impact on the airfield landing strips where light aircrafts and choppers land during fire fighting. In this case, the position of the proposed power lines should take into account the airfields’ landing strips within the study area and the effects of power line on fire fighting capabilities. It must be emphasised that during the preparation of tower profiles for the final route there must be careful consideration of the existing airfields during the design phase. Should the preferred corridor affect the airfields, CAA standards must be incorporated into the designs of tower profiles into to avoid the effects of power lines on airfields as well as on the effectiveness of fire fighting capabilities within thin the area.

12.2 Impacts on Mining Activities and Infrastructure

There are various mining activities occurring within the study area. All the corridors will have somehow an effect on the mining activities due to the area being a predominantly mining activity land use. It is important to emphasise that the final route must avoid having effects on the key mining operation areas and if the power lines will somehow transverse the mining property (Arnot coal mine and Strathrae Colliery both owned by Exxaro) the design of the towers profiles must be positioned on the edge of property, so as not to hinder the operational of the mining due to the new power line. Arnot coal mine is affected by all corridors because the mine covers most of the area around Arnot powerstation. If not properly planned, the power line may potentially affect the lifespan of the mine which will result in having a negative impact on the local economic development as a result of people losing jobs from the subsequent new introduction of the power line in an area that is critical to the mine operation.

12.3 Impacts on Agricultural Activities

There are various agricultural activities occurring within the study area. The cumulative impact of construction the proposed 400kV power line parallel to existing power lines within agricultural activities may further reduce crop yields and infrastructure development. In some areas the landowners have three to four existing power lines in their property (green corridor). This has resulted in landowners containing other existing corridors being resistant to additional developments. The proposed Eskom power line will add to this pressure should the green corridor be the preferred route.

12.4 Impacts on Ecological Resources

The cumulative impact of construction of the proposed double circuit 400kV power line parallel to existing power lines within significant ecological resources, such as wetlands, drainage areas and ecological corridors, would cause further habitat fragmentation and habitat degradation in sensitive ecosystems. The proposed Eskom power line ideally should follow the existing power lines where there are existing impacts as the other viable areas in the study areas have been occupied by various land uses such as mining activities, agricultural activities and tourism gateway. If the proposed Eskom power line project will follow the existing line as an ideal option then this will contribute to the pressure of habitat fragmentation and/or habitat destruction.

13. RESIDUAL IMPACTS

Residual impacts are those that are likely to remain, notwithstanding the implementation of mitigation measures. Potential residual impacts are those associated with the following:

- Limited Faunal displacement and destruction;
- Limited Floral destruction;
- An increase in ambient noise levels;
- Reduce viability of agricultural potential land;
- Visual Impact; and
- The maintenance of the storm water management system to ensure limited effect on the valley bottom and sites further down the system is essential especially on the substation sites.
- The potential collision and electrocution of birds within the area
- Limitation of the operation of the mines within the area

14. DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM

An important component of the EIR is the section dealing with the EMP (refer to **Appendix E**) for construction and operation of the project. The purpose of the EMP is to provide management responses that will ensure impacts resulting from the development are minimised. In this regard, the EMP provides a critical link between the mitigation measures described in the EIR and their actual implementation. The objectives of the EMP are thereby, to ensure that:

- Environmental management conditions and requirements are implemented from the start of the project;
- The contractor is able to and shall include any costs of compliance with this EMP into the tender price;
- Precautions against environmental damage and claims arising from such damage are taken timeously;
- The completion date of the contract is not delayed due to environmental problems with the landowner, grid staff, communities or regulatory authorities arising during the course of the project execution;
- The asset created conforms to environmental standard required by ISO 14001 and Transmission Policy;
- Eskom Project manager and Contractor take into consideration the landowner special conditions in regards to the substation and the power lines which transverses private property;
- Environmental conditions stipulated in the Environmental Authorisation (EA) are implemented;
- Resolve problems and claims arising from damaged immediately to ensure a smooth flow of operations;
- Implementation of this EMP for the benefit of all involved; and
- Preservation of the natural environment by limiting destructive activities on site.

15. OPINION ON AUTHORIZATION OF THE PROJECT

The need for electricity is for the benefit of the country for the economic development as well as social upliftment for the surrounding community. During the year 2008 in South Africa there was a crisis in power supply because the demand of electricity was beyond the supply capacity. The proposed 400kV double circuit line from Arnot-Gumeni substation and installation of 500MVA 400/132kV transformer is required to strengthen the Lowveld region because of the power demand and future projection of power demand in the area.

It must be emphasised that, environmentally, the key impacts of the power lines are on birds through collision, electrocution and habitat destruction. This impact will be experienced during the construction and operation phase of the project while the physical extent of which ranges up to medium to high. The socio-economic impacts that are envisaged will be on the mining activities that may potentially be affected during construction and operation of the power line and the impacts ranged from medium to high. It is envisaged that impacts during the preconstruction and construction phase can be satisfactorily managed. The high socio-economic spinoffs from improved power availability are anticipated, both for localised economic activities as well as regional and national economy.

All comments received during Public Participation Process and detailed specialist reports are included in this Draft Environmental Impact Report. The management of the impacts identified in the EIA for construction and operation phases through a comprehensive range of programmes and plans contained in the EMP. In considerations of the programmes and plans contained within the EMP as well as designs, engineering and construction that will be major factors in reducing the potential impacts, which is assumed will be effectively implemented on the proposed double circuit 400kV line, it is therefore the opinion of the EAP that the activity should be authorised.

In authorising the proposed double circuit 400kV line from Arnot to Gumeni substation and installation of the transformer in Gumeni substation the following conditions should form part of the EA:

- Strict environmental control must be applied by the proponent on contractors and staff to ensure that the impact on the areas is limited;
- The EMPR in its totality must be adhered to;
- On completion, a management plan must be drawn up for the management of the sensitive areas;
- A Specialist walk down is critical for compilation of final site-specific Construction EMPR;
- A rehabilitation plan needs to be compiled for implementation after construction process;

- All mitigation measures proposed needed to be carried forward in the implemented of the project;
- The appointment of independent ECO is required to ensure the compliance of EA and EMPR conditions; and
- During Negotiation process of acquiring the servitude by applicant, we recommend that all land owners conditions be captured and carried forward to form part of final Environmental Management Programme.

16. ENVIRONMENTAL IMPACT STATEMENT

16.1 INTRODUCTION

The Environmental Impact Assessment study conducted for the proposed double circuit 400kV line between Arnot-Gumeni substation is believed to fulfil the NEMA EIA regulation 2010. The necessary steps have been taken to provide Interested and Affected Parties to participate in the identification of project impacts, alternatives and other issues that deemed further investigation during the EIA process.

The specialist studies were conducted in relation to key issues identified during the scoping process. The specialist studies conducted covered the biophysical, social, cultural and economic environment while addressing issues pertaining the project alternatives as well as potential impacts whereby mitigation measures were recommended.

16.2 GENERAL FINDINGS

16.2.1 Biodiversity Component

It was found that the study area is rich in biodiversity in terms of flora, fauna, and avi-fauna and numerous Red Data species were identified across the taxa. Geological, the areas have various rock formations that provide various excavability potential within the study area. The geological impacts as per the proposed power lines is very insignificant. Traditionally, power lines have not had a significant impact on vegetation as they can span over habitats and only big trees that can have interferences with the power lines are cleared. In principle, power lines have negligible impacts on grassland ecosystems. There are protected trees and red data species identified within the study area and permits to remove them will be required should they be affected by final routing of the power line.

The most notable threatened species of high conservation value within the study area are crane species. Most habitats associated with crane species were delineated or marked as highly sensitive areas and all efforts were made to ensure that the preferred corridors avoided those sensitive areas. However, some of those sensitive habitats could not be avoided as per the nature of the study area, however, the proposed mitigations will be strictly implemented to avoid the adverse effect of the proposed power line on those habitats.

The most sensitive habitats are associated with wetlands areas, however impacts of power lines on wetlands could be avoided thorough spanning the power lines over wetland. The effects of power lines on wetland ecosystem is the biota that relies on it as a habitat or breeding site. In such cases, the birds are mostly associated with wetlands ecosystem and birds are vulnerable to power line. In terms of faunal species, they rely on the vegetation as their habitats, which means the impact on vegetation is directly and indirectly affecting their distribution and survival. Species such as Oribi is one of the endangered species that occur within the study area. The construction and operation of transmission lines will have

negative effects on the environment. However, when appropriate mitigations are implemented, the intensity of the impacts will be reduced.

16.2.2 Socio-Economic Component

The aspect of socio-economic profile of the study area was based on the current land use and other infrastructure that might be impact and lead to social and economic implications due to the introduction of the study area. Socially avoiding resettlement, school, and other infrastructure whereby the preferred corridors should avoid those areas. Economically, care should be taken in areas where there is mining activities because this could lead to the economic impacts within the region or province. The following are expected socio economic impacts (positive and negative):

- Impacts on Existing Residential area
- Impacts on Schools
- Impacts on Tourism
- Disruption in daily living and movement patterns and proximity of homestead
- Inflow of workers
- Impacts on airfields
- Employment opportunities
- Local Economic contribution
- Mining activities and mining areas

Visually the power lines will change the sense of place and causes issues in areas of high eco-tourism although in this case, the anticipated impacts are likely to be insignificant due to the study area being predominantly mining activities, which by their own rights cause visual impacts.

Other sensitive areas that were taken into cognizance were based on agriculture in terms of commercial (avoiding centre pivot point). It is important to avoid areas with high agricultural potential as agriculture is one the biggest contributors of the GDP of Mpumalanga Province.

16.2.3 Technical Viability Component

In this component the existing land uses, topography as well as infrastructure determine the viability of establishing the double circuit 400kV line within the area. In this case, areas which include the existing Maputo corridor, the N4, railway lines, gas pipeline and future planed petro-line pipeline will be problematic to establish a double circuit 400kV line that will run parallel to those existing infrastructure due to technical safety issues associated with the zone of influence of the existing infrastructure, which will require approximately 4 to 6km from the Maputo corridor. The Maputo corridor is affected by Alternative 3 (purple corridor) in the study area. Other technical issues can be posed by existing high voltages within the same area, which poses challenges when the crossings should occur as it is difficult to cross to high voltages. In this case it is impossible for double circuit 400kV line to cross over single 400kV line as well as the other two existing 275 kV lines. The corridor

within the study areas that pose these technical challenges is Alternative 5 (green corridor). Other technical challenges will be crossing mining areas, where tower designs will be instrumental in this regards. Alternative 1 (Orange) potential technical challenge may involve double circuit crossing over distribution lines and some mining areas.

16.3 ALTERNATIVES

16.3.1. Alignment Alternatives

The detail description of this alignment alternative is well documented under the alternative chapter of this report. The three alignment alternatives have been investigated in detail and on these three possible corridors, one will be used for establishing double circuit 400kV line. It must be indicated that from socio-economic and environmental aspects all the corridors posses more or less the same impact and there is no clear cut favourable corridors based on those aspects. This is due to the nature of the study area which is based on the land use activities as well the existing infrastructure within the area.

Alternative 5 is not preferred by wetland, avi-fauna, fauna, soil and agricultural potential while the specialists that prefer it are flora, geotechnical, visual. Alternaative 3 is not preferred by the following specialist socio-economic, town and regional planning and soil and agricultural potential while the specialists that prefer alternative 3 is avifauna, wetland, flora, fauna (biodiversity specialist) and heritage specialist. Alternative 1 is not preferred by avi-fauna, fauna, and flora while the specialists that prefer it are wetland, socio-economic, town & regional planning, soil and agricultural potential, visual.

After careful consideration of the key aspects of environment (i.e. biophysical, social and economic aspects), the preferred corridor is Alternative 1 (Orange corridor). There was minimal distinction in terms of socio-economic and environment between all the three alignment alternatives, however, the technical viability of the area to establish the proposed power lines was considered as an aspect to arrive at the decision for selecting the preferred corridor.

16.3.2. No-Go Alternatives

The no-go alternative would maintain the existing status quo whereby the current network is under the strain to provide power to customers within the Lowveld customer networks for transport of petroleum to the Lowveld. Implementation of the no-go alternative would mean that the potential benefits of the proposed project would not transpire which involve the following;

- Strengthening of Lowveld region which will ensure steady supply of electricity
- To support economic development within the area
- To be able to support the current and future developments within the area
- Direct economic benefits of the development proceeding, including the creation of employment.

Therefore, this no-go alternative was considered to be **unrealistic**. The proposed double circuit will require 55m servitudes whereby the towers will be effectively carrying two 400kV voltages but on one servitude, which supports effective optimisation of the land utilisation.

16.4 RECOMMENDATIONS

Baagi Environmental Consultancy as an Independent Environmental Practitioner for the proposed double circuit 400kV line between Arnot and Gumeni Substation recommend the authorisation of the Alternative 1 (refer to **Figure 40**) with the following conditions:

- Compilation of a dedicated contruction and operation EMP be requested and the document must at least include the following:
  - Compilation of a construction and operation EMP should be compulsory for the successful contractor;
  - Landowners' special conditions; and
  - Defined communication channels between Eskom, the contractor and affected land owners;
- The decommissioning EMP must be made available to affected landowners as well as other interested parties for review prior submission to department for approval.
- Compensation for temporary loss of agricultural productivity during construction, including the loss of crops, fruit trees and grazing.
- Appointment of an independent and suitably experienced Environment Control Officer to ensure compliance with the mitigation measures and/or management actions.
- Appointment an independent and qualified botanist to ensure that all construction activities including access roads, working areas and tower assembly sites comply with the mitigation measures and/or management actions as specified in the Flora Specialist Report.
- Avoidance and/minimisation visual impacts on tourism-related cultural heritage sites.
- Avoidance of sensitive birding habitats and, where the need is indicated, the use of bird flappers and bird guards on conductors and towers respectively.
- Development of a Fire Safety and Response Plan to deal with accidental fires and to address training requirements and reporting procedures.
- That the construction personnel must undergo safety and awareness training on wild animals, including rescue and poaching.
- Where possible, use must be made of existing access roads.
- 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 hours. No construction should take place at night.
- All bush clearing activities should be considered in terms of slope (steepness) and soil type (such as duplex soils).

- All waste material must be collected at designated temporary waste disposal areas and transported to a licensed municipal site disposal site. Waste must not be stored on-site for longer the maximum, legal stipulated time.
- Construction activity-related noise and lighting should be kept to a minimum.
- All existing large trees that fall outside the construction area must be retained. These will assist to soften the forms of structures and to obscure views to them.
- 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.
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18. REFERENCES

Acer Environmental Management Consultants, 2009. Proposed 765kV Majuba-Venus substation and associated structures. Draft Environmental Impact Report. Mpumalanga Province, Free State Province and KZN Province

Albert Luthuli Local Municipality. 2010. Integrated Development Plan: 2011–2016

Baagi Environmental Consultancy 2011. Proposed 400kV line (120km)from Ariadne-Venus substation and extention and upgrade of both substation. Final Environmental Impact Assessment Report. Kwazulu Natal Province

Baagi Environmental Consultancy 2009. Proposed 400kV line from Glockner-Kookfontein Substation and upgrade of both substation. Final Environmental Impact Assessment Report. Gauteng Province

Baagi Environmental. 2012. Final Scoping Report for the proposed construction of the Arnot-Gumeni double circuit 400 kV Transmission Line and the upgrade of Gumeni Substation, Mpumalanga Province

Baagi Environmental. 2012. Issues and Response Report for the proposed construction of the Arnot-Gumeni double circuit 400 kV Transmission Line and the upgrade of Gumeni Substation, Mpumalanga Province

Baagi Environmental. 2012. Final Scoping Report for the proposed construction of the Arnot-Gumeni double circuit 400 kV Transmission Line and the upgrade of Gumeni Substation, Mpumalanga Province

Baagi Environmental. 2012. Issues and Response Report for the proposed construction of the Arnot-Gumeni double circuit 400 kV Transmission Line and the upgrade of Gumeni Substation, Mpumalanga Province

Emakhazeni Local Municipality. 2011. Integrated Development Plan 2012-2013.

Emakhazeni Local Municipality. 2010. Integrated Development Plan: 2011-2016

Gert Sibande District Municipality. 2011. Integrated Development Plan:2012-2016

Nkangala District Municipality. 2011. Integrated Development Plan: 2012–2013

Soderstrom, E.J. 1981. Social Impact Assessment: Experimental Methods and Approaches.

Steve Tshwete Local Municipality. 2007. Integrated Development Plan: 2008-2009

Steve Tshwete Local Municipality. 2006. Local Economic Development Plan

SRK Consulting Engineers and Scientist, 2008. Proposed Petroline Petroleum Pipeline that is between Matola Harbour (Mozambique) and Kendal (Mpumalanga, South Africa). Final Environmental Impact Report. Mpumalanga Province RSA and Mozambique

Strategic Environmental Focus, 2008. Proposed Hendrina-Prairie-Marathon transmission lines. Draft Environmental Impact Report. Mpumalanga Province

APPENDIX A: PROJECT TEAM CV'S

APPENDIX B: APPLICATION FORM OF ENVIRONMENTAL AUTHORISATION

APPENDIX C: ACCEPTANCE LETTER OF SCOPING AND PLAN OF STUDY FOR EIA

APPENDIX D: ISSUES AND RESPONSE REPORT

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APPENDIX F: SPECIALIST REPORTS

APPENDIX 1: FLORA ASSESSMENT

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APPENDIX G: ALIGNMENT SELECTION CRITERIA