DRAFT ENVIRONMENTAL IMPACT REPORT

FOR THE

PROPOSED CONSTRUCTION OF THE NZHELELE-TRIANGLE 2x500kV TRANSMISSION POWER LINES, LIMPOPO PROVINCE

DEA EIA REF No: 14/12/16/3/3/2/629

MARCH 2016

Prepared for:

ESKOM HOLDINGS SOC LIMITED
P O BOX 1091
Johannesburg
2000
RSA

Compiled by:

BAAGI ENVIRONMENTAL CONSULTANCY
Postnet Suite 412, P Bag X4
Menlo Park
0102
RSA

Document Control

Degree of Confidentiality	Client Confidentiality
Title	Draft Environmental Impact Report for the proposed construction of Nzhelele-Triangle Substation 2x500kV transmission line, Limpopo Province.
Date of Issue	04 March 2016
No. of Pages	257
Consultant details: **BAAGI ENVIRONMENTAL CONSULTANCY** Postnet Suite 412, Private Bag x4 Menlo Park 0102 RSA Tel: 012 993 0756/7 Fax: 012 993 0743 Email: tinashe@baagi.co.za 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: Nawah@eskom.co.za
Compiled by	Mr. Tinashe Maramba
Peer reviewed by	Mr. Lordwick Makhura and Mr. Angelo Daniels
External reviewed by	
Approved by	
Report Number	03/2016
Keywords	EIA, EIR, PPP,DSR, Specialist, I&APs
Issue Number	01
Copy Number	Ver. 01

Please submit your comments on this Draft EIR to
Mr. Sean Hutcheons
Nzhelele-Triangle Project Public Participation Team
Baagi Environmental Consultancy cc
Postnet Suite 412, Private Bag x4
Menlo Park
0102
RSA
Tel: 012 993 0756/7
Fax: 012 993 0743 Email: public@baagi.co.za
The due date for comments on Draft EIR is the 14th of June 2016

The Draft EIR will be made available for public scrutiny and comment from 20 April 2016 to 14 June 2016 at the following locations (yet to be confirmed):

Place	Address	Contact Details	Contact Person

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

DAY & DATE	TIME	PLACE

EXECUTIVE SUMMARY

INTRODUCTION

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 Limpopo Province.

In response to the imported power allocation in the Integrated Resource Plan (IRP) of the Government (gazetted May 2011) and the establishment of the Southern Africa Energy (SAE) unit in Eskom to facilitate the investment in generation and transmission outside of South Africa, there is an urgent need to identify critical transmission corridors to ensure power transfer into South Africa from our neighbouring countries. A high level report was compiled, describing the potential transmission corridors between South Africa, Botswana, Zimbabwe and Mozambique.

There was report on a follow-up on the Grid Planning Report GP 12/69 "Strategic Transmission Corridors between South Africa and Zimbabwe to enable Regional Trading". The focus of the report was to provide the discussion on the technical impacts and benefits of three different corridor expansions, by means of technical analysis.The study area incorporates the Eskom Northern Grid, BPC network, ZESA network and EdM northern network. By strengthening the ZESA internal network, the power transfer can improve by 173 MW. When comparing the three corridors, the corridor via Nzhelele and Chibata will provide the highest additional transfer, i.e. 516 MW after the internal ZESA network is strengthened. The second best improvement is the Nzhelele corridor via Bindura providing additional 351 MW (501 MW). Strengthening the existing corridor 1 provides an improvement of 22 MW.

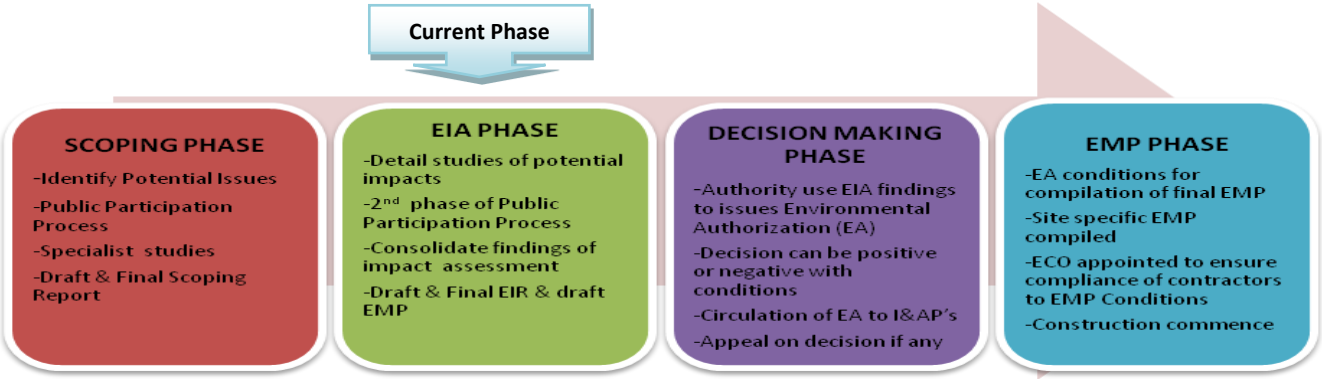
The proposed Nzhelele-Triangle 2X500kV transmission power lines project entails the following activities:

- Construction of two 500kV power lines to be operated at 400kV from Nzhelele Substation to Triangle Substation. However, the line from Nzhelele Substation will terminate at the border of South Africa and Zimbabwe where it will connect with the line from Triangle Substation in Zimbabwe. Zimbabwe Electricity Supply Authority (ZESA) is responsible for constructing the power line further towards Triangle Substation.

ENVIRONMENTAL IMPACT ASSSEMENT PROCESS

The Environmental Impact Assessment (EIA) process consists of various phases, the current phase is the EIA 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 phases that are relevant to the proposed project:



PROJECT NEED AND DESCRIPTION

In response to the imported power allocation in the Integrated Resource Plan (IRP) of the Government (gazetted May 2011) and the establishment of the Southern Africa Energy (SAE) unit in Eskom to facilitate the investment in generation and transmission outside of South Africa, there is an urgent need to identify critical transmission corridors to ensure power transfer into South Africa from our neighbouring countries. A high level report was compiled, describing the potential transmission corridors between South Africa, Botswana, Zimbabwe and Mozambique.

The report was a follow-up on the Grid Planning Report GP 12/69 "Strategic Transmission Corridors between South Africa and Zimbabwe to enable Regional Trading". The focus of this report will be the discussion on the technical impacts and benefits of three different corridor expansions, by means of technical analysis.The study area incorporates the Eskom Northern Grid, BPC network, ZESA network and EdM northern network. By strengthening the ZESA internal network, the power transfer can improve by 173 MW. When comparing the three corridors, the corridor via Nzhelele and Chibata will provide the highest additional transfer, i.e. 516 MW after the internal ZESA network is strengthened. The second best improvement is the Nzhelele corridor via Bindura providing additional 351 MW (501 MW). Strengthening the existing corridor 1 provides an improvement of 22 MW.

The base network results in very similar power transfer limitations. The BPC network is utilised more when generation is injected from the North than the East. From a technical point of view (before specialist assessment) the worst performing corridor is Corridor 1 which is very dependent on the location of future generation. Corridor 2 outperforms Corridor 1 during this contingency scenario. It supports northern generation very well, but does not do equally well with generation from the east. Both Corridor 2 routes perform very similar for generation from either location. Preference would lean towards Corridor 2B (via Chibata) due to higher transfer limits for east generation and minimal difference for north generation.

LEGAL FRAMEWORK APPLICABLE TO THE PROPOSED PROJECT

The above-mentioned proposed project is a listed activity in terms of the 2010 Environmental Impact Assessment Regulations, promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998, NEMA). 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 proposed Construction of two 500kV power lines to be operated at 400kV from Nzhelele Substation to Triangle Substation falls within an array of required legislation (National, Provincial and Local Governmental spheres) to which the Eskom must adhere. Key legislation that is applicable to the proposed project includes but is not limited to:

- Section 2 of Chapter 1 of the NEMA, which provides details of the environmental management principles that should be adhered to during the entire project.
- The National Water Act (Act 36 of 1998, NWA) is the main legislative piece that controls both private and public water use within South Africa, and is relevant to any water uses stipulated in Section 21. The proposed project will require a Water Use License in terms of this Act.
- The Heritage Resources Act (Act 25 of 1999, NHRA) is concerned with the protection of the archaeological or paleontological sites or meteorites, and requires a permit of the destruction or disturbance thereof. Permits may be required in terms of this Act.
- The National Environmental Management: Biodiversity Act (Act 10 of 2004) 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. Permits may be required in terms of this Act.

- Finally, the National Environmental Management: Waste Act (Act 59 of 2008) is the Act that aims to consolidate waste management within South Africa, and will be applicable to any waste related aspect of the proposed project.

PUBLIC PARTICIPATION PROCESS

A Public Participation Process (PPP) is required in an EIA process as per chapter 6 section54 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 purpose of the Draft Scoping Report (DSR) is to give I&AP's the opportunity to comment on the report for inclusion in the Final Scoping Report. I&APs will have 40 calendar days to comment on the Draft Scoping Report.

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).

ALTERNATIVES

It is best practice in environmental management to consider as many alternatives as possible until 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, play a key role in considering and selecting viable alternatives. The following were considered to be the project alternatives:

- Technology Alternative:
  - Overhead power lines vs. underground power lines
- Alignment Alternatives:
  - **Alternative Alignments (Alternative 1 to Alternative 2) (Grey and Red)**

    Alternative alignments 1 to 2with their sub alignment alternatives 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:

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

- Accessibility.

➢ **Alternative 1 (Grey Corridor)**

The proposed Alternative 1 is approximately 51.5km in lengths and it runs northwards along the N1 Highway whereby it deflects westwards at the Sand River. From here it runs northwards along the western side of the Musina Nature Reserve towards Beitbridge.

➢ **Alternative 2a (Red + Orange Corridor)**

The proposed Alternative 2a is approximately 57.5 km runs eastwards towards the R508 from where it deviates westwards and following the R508 towards Musina. From here it continues northwards to the Limpopo River.

➢ **Alternative 2b (Red + Yellow Corridor)**

The proposed Alternative 2B is approximately 52 km runs north-eastwards to the R508 and continues northwards and west of the Nzhelele River towards the Limpopo River.

❖ Source of Energy Alternative: Renewable Energy
❖ No-Go Alternative

The Draft EIR provides authorities and I&APs the opportunity to determine the potential impacts that have been flagged during the Scoping Phase, as well as to indicate how these impacts will be addressed during the Impact Assessment Phase based on the Plan of Study for EIA. The comments received on the Draft Scoping Report will be used in the preparation of the Draft and Final EIR.
The specialists were involved at the scoping level and were asked to provide input based on their respective disciplines. Comprehensive specialist studies will be undertaken during the Impact Assessment Phase.

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:

<u>Flora Assessment</u>

None of the 71 threatened Red Data of Limpopo Province were recorded. A single provincially protected plant was recorded, the Adansonia *digitata* (Baobab). Four nationally protected trees for which a permit is required are present:

❖ *Boscia albitrunca* is the most common protected tree in the area, and was present in all of the plots surveyed, it occurs at an average density of 18 individuals per hectare.
❖ *Combretum imberbe* is the most localised protected species due to its association with water courses.

- *Sclerocarya birrea* subsp. *caffra* is the second most abundant and occurred in more than 50% of the plots sampled; it is present at an average density of 11 individuals per hectare.
- *Adansonia digitata* is more localised than *Sclerocarya birrea* subsp *caffra*, but less than *Combretum imberbe*, it occurs at an average density of 4 individuals per hectare.

The report vetted the alternative routes based on terrain ruggedness, number of watercourses intersected and the Limopopo Conservation Plan. Centred on this school of thought, the Flora Report found route 2b to be the least sensitive and most preferred.

Fauna Assessment and Avi–Fauna Assessment

The Avifuana and Fauna report, set to identify mportant habitat types in the syudy area tha would support fauna and avi fauna. The habitat types were classed as fllows:

- *Sandstone & granite ridges* – important foraging habitat for vulnerable Verreaux's Eagle and vulnerable Lanner Falcon;
- *Alluvial floodplains & riverine woodland* – endangered Pel's Fishing Owl (Maremani), vulnerable White-backed Night-heron (Maremani) and endangered Saddle-billed Stork (Sand River) – all taxa with low densities in South Africa;
- *Artificial dams* – waterbirds and threatened stork taxa;
- *Waterholes for game* – often visited by vultures and scavengers (Maremani)
- *Fallow land*- foraging habitat for vulnerable Secretarybird, near threatened Abdim's Stork and White Stork
- *Large canopy trees (Baobab)* – often breeding platforms for iconic birds of prey.

According to the report, the least favoured route was 2b, with the mst preferd being 2a due to the lesser number of river crossings offered by the route, the least number of habitat types traversed by the route, correspondence to an area with low RD reporting rates OR low occurrence of cranes and the already existing presence of transmission servitudes

Wetlands Assessment

In terms of the wetland assessment, the most favourable route is a close match between the Red - Orange Corridor (Alternative 2a) and Red - Yellow Corridor (Alternative 2b). The Grey Corridor (Alternative Route 1) was deemed the least favourable due to the high density off drainage lines that run parallel to the corridor. Overall, after assessing the number of Watercourse polygon crossings and the combined centre line intersection lengths through delineated watercourse polygons, the Red - Orange Corridor (Alternative 2a) was regarded as the most favourable route from a watercourse consideration.

Visual Impact Assessment

The potential visual impact was determined by extracting the visual sensitivity values at each pylon position (assumed) and interpolating them over an area that was covered by a 3 km buffer and combining these with the view shed and the reduced visibility over distance. A comparison of the provided alternatives was given, after having taken the afore mentioned parameters into consideration, Alternative Route 1 was considered as the preferred route from a visual impact point of view.

Heritage Impact Assessment

As postulated by the Heritage Impact Assessment Report, the developer should consider Alternative 1 and Alternative 1B as the preferred alternatives for the proposed development. Alternative 2 and Alternative 2A are the second preferred Alternatives to the project in that they have less likelihood of impacting on archaeological resources. In both Alternative 1B and Alternative 2A two heritage resources were identified, however, these heritage resources can easily be mitigated by means of avoidance during the construction phase of the project.

Social Impact Assessment

This report suggests that the core considerations for each of the proposed corridors do not pose as fatal flaws. Alternative 2 and Alternative 2A are the most preferred because of the space available for the power-line and the Eco-Industrial Park to exist together, therefore bringing the most benefit to the area. Alternative route 2 and 2B is the least preferred because of its value to the collective area in terms of conservation and preservation of the natural habitat which can have value to the local society in future generations.

Soil and Agricultural Potential Assessment

On the basis of the survey results a specific alignment is not favoured as the impacts would be very similar throughout. From an infrastructure and further land impact perspective in terms of access roads Alternative 1 is preferred as it follows existing road infrastructure along most of the route.

Geological Overview

This assessment came up with a rating matrix that employed the analysis of Engineering geology, Mining, Flooding Potential, Unstable Slopes, Excavability, and Collapsible Soils. In terms of engineering geological constrain, Alternative 2 & 2B of the provided alternatives is the most suitable after analysing geological sensitivity in terms of rating matrix.

Tourism Overview

The Red (2) - Yellow (2B) corridor is the most preferred, although it would pass through Maremani Nature Reserve which does have a number of tourists that visit it annually, the number is not exorbitant and so is the revenue generated as a result of tourism and estimated visitor numbers are higher for the other corridors than for this corridor. The

second least preferred is the red (2) - orange (2A) corridor as it avoids both Musina Nature Reserve as well as Maremani Nature Reserve and other tourism establishments. The least preferred from a tourism viewpoint is corridor route 1. This is as because of the high number of tourist venues along this route. These venues rely on the environment remaining pristine for the game to thrive. The construction of a powerline would alter the scenery and have detrimental effects on the natural habitat reserved for game.

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 (**Grey 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 power lines was considered as an aspect to arrive at the decision for selecting the preferred corridor.

CONCLUSION

The results of specialist studies were used by the Environmental Assessment Practitioner to create an 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. Following the comment period, comments will be consolidated and this report will be updated for submission to the National Department of Environmental Affairs.

MANWELEDZO

MARANGAPHANḒA

Ṯhoḓea ya muḓagasi ine ya khou aluwa i vhea mutsiko muhulu kha vhukoni ha zwino ha u bveledza na u phaḓaladza muḓagasi nga vha Eskom. Vha Eskom vho ḓiṉekedzela kha u shumisa tshiṱirathedzhi tsha fulufulu tshi re na ndalamo tshine tsha ḓadzisa kha mbekanyamaitele na zwiṱirathedzhi zwa Muvhuso wa Lushaka. Zwo ralo, vha Eskom vha khou ṱoḓou ṱanḓavhudza na u khwinisa themamveledziso u itela u khwinisa u fhulufhedzea ha nḓisedzo ya muḓagasi shangoni, nahone nga maanḓa u ṉetshedzwa hu tshi itelwa nyaluwo ya ṯhoḓea ya muḓagasi ine ya vha hone Vunduni ḽa Limpopo.

Kha u fhindula nyavhelo ya muḓagasi wo ṱunḓiwaho kha Pulane ya Zwiko yo Ṱanganelanaho (IRP) ya Muvhuso (zwo dzheniswa kha gurannḓa ya muvhuso nga Shundunthule 2011) na u thomiwa ha khethekanyo ya Fulufulu ḽa Tshipembe ha Afrika (SAE) kha Eskom u itela u tshimbidza vhubindudzi ha u bveledza na u phaḓaladza muḓagasi nnḓa ha Afrika Tshipembe, hu na ṯhoḓea ya tshihaḓu ya u topola phara dza u phaḓaladza dza ndeme u itela u khwaṯhisedza u fhiriswa ha muḓagasi u tshi ḓa Afrika Tshipembe u bva kha mashango a vhahura vhashu. Ho dzudzanywa muvhigo wa maimo a nṯha, une wa khou ṱalutshedza phara dza u phaḓaladza dzine dza nga konadzea vhukati ha Afrika Tshipembe Botswana, Zimbabwe na Mozambique.

Ho vha na muvhigo wa u sala murahu Muvhigo wa U pulana nga ha Giridi ya GP 12/69 “Phara dza u Phaḓaladza dza Tshiṱirathedzhiki vhukati ha Afrika Tshipembe na Zimbabwe u itela Mbambadzo ya Dzingu”. Muvhigo wo vha wo sedzesa kha u ṉetshedza nyambedzano ya masiandaitwa a zwa thekiniki na mbuelo dza mveledziso dza phara tharu dzo fhambanaho, nga u shumisa tsenguluso ya zwa thekiniki. Vhupo ha ngudo vhu katela Giridi ya Devhula ya Eskom, tserekano ya BPC, tserekano ya ZESA na tserekano ya devhula ya EDM. Nga u khwaṯhisa tserekano ya nga ngomu ya ZESA, u fhiriswa ha muḓagasi hu nga khwinifhala nga 173 MW. Musi hu tshi vhambedzwa phara idzi tharu, phara ine ya fhira nga Nzhelele na Chibata i ḓo ṉetshedza phiriso yo engedzwaho ya nṯhesa, ine ya vha 516 MW nga murahu ha u khwaṯhiswa ha tserekano ya nga ngomu ya ZESA. Khwiniso ya khwinesa ya vhuvhili ndi ya phara ya Nzhelele ine ya khou fhira nga Bindura ine ya khou ṉetshedza muṅwe muḓagasi wa 351 MW (501 MW). U khwaṯhisa phara ya 1 ine ya vha hone zwi ṉetshedza khwiniso ya 22 MW.

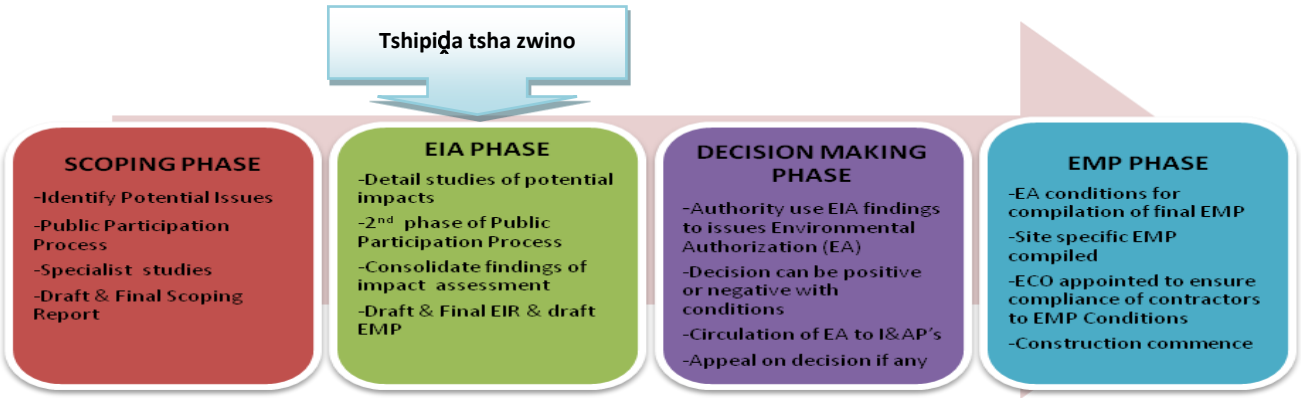
Thandela ya thambo dza u phaḓaladza dza 2 X500kV ngei Nzhelele-Triangle yo dzinginywaho i katela mishumo i tevhelaho:

- U dzheniswa ha thambo mbili dza muḓagasi dza 500kV dzine dza ḓo shumiswa kha thambo dza 400kV u bva Tshiṱitshini tshiṱuku tsha Nzhelele u ya Tshiṱitshini tshiṱuku tsha Triangle. Fhedzi ha, thambo ya u bva Nzhelele i ḓo fhelela mukanoni wa Afrika Tshipembe na Zimbabwe hune ya ḓo ṱumana na thambo ine

ya bva Tshiṱitshini tshiṱuku tsha Triangle ngei Zimbabwe. Vhulaedzwa ha Nḓisedzo ya Muḓagasi ha Zimbabwe (ZESA) vhu na vhuḓifhinduleli ha u dzhenisa thambo dza muḓagasi dzi tshi bvela phanḓa u ṱutshela Tshiṱitshini tshiṱuku tsha Triangle.

MUSHUMO WA TSEDZULUSO YA MASIANDAITWA KHA VHUPO

Mushumo wa Tsedzuluso ya Masiandaitwa kha Vhupo (EIA) wo vhumbiwa nga zwipiḓa zwo fhambanaho, tshipiḓa tsha zwino ndi tsha EIA. Mveledziso ya themamveledziso yo bulwaho afho nṱha yo dzinginywaho ndi mushumo wo dzheniswaho kha mutevhe, u ya nga Ndaulo dza Tsedzuluso ya Masiandaitwa kha Vhupo dza 2010, dza Mulayo wa Ndangulo ya Vhupo wa Lushaka, wa 1998 (Mulayo wa 107 wa 1998). Mishumo yo dzheniswaho kha mutevhe i dzhiiwa sa mishumo ine ha vha na khonadzeo ya uri i ḓo vhanga masiandaitwa mahulwane vhukuma kana a ndeme kha vhupo. Mushumo wo dzheniswaho kha mutevhe wa ndaulo dzo bulwaho afho nṱha u ṱoḓa thendelo ya zwa vhupo u bva kha vhulaedzwa ho fanelaho. Figara i tevhelaho i dodombedza zwipiḓa zwo fhambanaho zwine zwa tshimbilelana na thandela yo dzinginywaho:



TSHIPIḒA TSHA MUVHIGOTHANGELI	**TSHIPIḒA TSHA EIA**	**TSHIPIḒA TSHA U DZHIA TSHEO**	**TSHIPIḒA TSHA EMP**
- U topola mafhungo ane a nga bvelela - Mushumo wa u shela mulenzhe nga Tshitshavha - Ngudo dza	- Ngudo dzo dodombedzwaho dza masiandaitwa ane a nga vha hone - Luṱa lwa vhuvhili lwa	- Vhulaedzwa vhu shumisa mawanwa a EIA kha mafhungo a Thendelo ya zwa Vhupo	- Milayo ya EA ya u dzudzanya EMP ya u khunyeledza - EMP ya vhupo ho tiwaho i a dzudzanywa

vhaḓivhi - Mvetamveto ya Muvhigothangeli na Muvhigothangeli wo khunyeledzwaho	Mushumo wa u shela mulenzhe nga Tshitshavha - Mawanwa o vhuedzanywaho a tsedzuluso ya masiandaitwa - Mvetamveto ya EIR na EIR yo khunyeledzwaho na mvetamveto ya EMP	(EA) - Tsheo i nga vha yavhuḓi kana i si vhe yavhuḓi hu na milayo - U phaḓaladzwa ha EA kha I&AP - Khumbelo ya khaṱhululo ya tsheo arali i hone	- Hu tholiwa ECO u itela u khwaṱhisedza u tevhedzwa ha Milayo ya EMP nga vhorakhoṋṱhiraka - U thoma ha mushumo wa u dzhenisa

ṰHOḒEA NA ṰHALUTSHEDZO YA THANDELA

Kha u fhindula nyavhelo ya muḓagasi wo ṱuṋḓiwaho kha Pulane ya Zwiko yo Ṱanganelanaho (IRP) ya Muvhuso (zwo dzheniswa kha gurannḓa ya muvhuso nga Shundunthule 2011) na u thomiwa ha khethekanyo ya Fulufulu ḽa Tshipembe ha Afrika (SAE) kha Eskom u itela u tshimbidza vhubindudzi ha u bveledza na u phaḓaladza muḓagasi nnḓa ha Afrika Tshipembe, hu na ṱhoḓea ya tshihaḓu ya u topola phara dza u phaḓaladza dza ndeme u itela u khwaṱhisedza u fhiriswa ha muḓagasi u tshi ḓa Afrika Tshipembe u bva kha mashango a vhahura vhashu. Ho dzudzanywa muvhigo wa maimo a nṱha, une wa khou ṱalutshedza phara dza u phaḓaladza dzine dza nga konadzea vhukati ha Afrika Tshipembe Botswana, Zimbabwe na Mozambique.

Ho vha na muvhigo wa u sala murahu Muvhigo wa U pulana nga ha Giridi ya GP 12/69 “Phara dza u Phaḓaladza dza Tshiṱirathedzhiki vhukati ha Afrika Tshipembe na Zimbabwe u itela Mbambadzo ya Dzingu”. Muvhigo wo vha wo sedzesa kha u ṋetshedza nyambedzano ya masiandaitwa a zwa thekiniki na mbuelo dza mveledziso dza phara tharu dzo fhambanaho, nga u shumisa tsenguluso ya zwa thekiniki. Vhupo ha ngudo vhu katela Giridi ya Devhula ya Eskom, tserekano ya BPC, tserekano ya ZESA na tserekano ya devhula ya EDM. Nga u khwaṱhisa tserekano ya nga ngomu ya ZESA, u fhiriswa ha muḓagasi hu nga khwinifhala nga 173 MW. Musi hu tshi vhambedzwa phara idzi tharu, phara ine ya fhira nga Nzhelele na Chibata i ḓo ṋetshedza phiriso yo engedzwaho ya nṱhesa, ine ya vha 516 MW nga murahu ha u khwaṱhiswa ha tserekano ya nga ngomu ya ZESA. Khwiniso ya khwinesa ya vhuvhili ndi ya phara ya Nzhelele ine ya khou fhira nga Bindura ine ya khou ṋetshedza muṅwe muḓagasi wa 351 MW (501 MW). U khwaṱhisa phara ya 1 ine ya vha hone zwi ṋetshedza khwiniso ya 22 MW.

Tserekano ya mutheo na yone i bvelela i na mikano ya u fhirisa ine ya fana na yeneyo. Tserekano ya BPC i shumiseswa nga maanḓa musi u bveledza hu tshi khou itwa u bva Devhula u fhira musi hu tshi khou itwa u bva Vhubvaḓuvha. U ya nga kuvhonele kwa zwa thekiniki (phanḓa ha musi hu tshi itwa tsedzuluso nga vhaḓivhi), phara ine ya si shume zwavhuḓi na luthihi ndi Phara ya 1 ine ya ḓitika nga maanḓa nga vhupo ha u bveledza ha tshifhinga tshiḓaho. Phara ya 2 i shuma zwavhuḓi u fhira Phara ya 1 kha nyimele heyi ya musi zwithu zwo sokou bvelela. I tikedza nga maanḓa u bveledza ha thungo ya devhula, fhedzi a i shumi zwavhuḓi kha u bveledza hu bvaho vhubvaḓuvha. Nḓila dzoṱhe dza Phara ya 2 dzi shuma nga nḓila i fanaho kha u bveledza muḓagasi u bva vhuponi vhuṅwe na vhuṅwe. Hu nga takalelwa u shumiswa Phara ya 2B (i fhiraho nga Chibata) nga mulandu wa mikano ya u fhirisa ine ya vha nṱha kha u bveledza hune ha itwa u bva vhubvaḓuvha na phambano ṱhukhuṱhukhu ya u bveledza ha hune ha itwa u bva devhula.

MUTHEO WA MULAYO UNE WA SHUMA KHA THANDELA YO DZINGINYWAHO

Thandela yo dzinginywaho yo bulwaho afho nṱha ndi mushumo wo dzheniswaho kha mutevhe u ya nga Ndaulo dza Tsedzuluso ya Masiandaitwa kha Vhupo dza 2010, dzo anḓadzwaho nga fhasi ha Mulayo wa Ndangulo ya Vhupo wa Lushaka, wa 1998 (Mulayo wa 107 wa 1998, NEMA). Mishumo yo dzheniswaho kha mutevhe i dzhiiwa sa mishumo ine ha vha na khonadzeo ya uri i ḓo vhanga masiandaitwa mahulwane vhukuma kana a ndeme kha vhupo. Mushumo wo dzheniswaho kha mutevhe wa ndaulo dzo bulwaho afho nṱha u ṱoḓa thendelo ya zwa vhupo u bva kha vhulaedzwa ho fanelaho. U dzheniswa ha thambo mbili dza muḓagasi dza 500kV dzine dza ḓo shumiswa kha thambo dza 400kV u bva Tshiṱitshini tshiṱuku tsha Nzhelele u ya Tshiṱitshini tshiṱuku tsha Triangle hu wela nga ngomu ha tshigwada tsha milayo ine ya ṱoḓea (kha khethekanyo dza Muvhuso wa Lushaka, wa Vundu na Muvhuso Wapo) ine ya fanela u tevhedzwa nga vha Eskom. (Milayo ya ndeme ine ya shumiswa kha thandela yo dzinginywaho i katela heyi fhedzi i songo guma khayo fhedzi:

- Khethekanyo ya 2 ya Ndima ya 1 ya NEMA, ine ya ṋetshedza zwidodombedzwa zwa milayo ya ndangulo ya vhupo ine ya fanela u tevhedzwa u swikela thandela yoṱhe i tshi fhela.

- Mulayo wa Maḓi wa Lushaka (Mulayo wa 36 wa 1998, NWA) ndi tshipiḓa tsha mulayo tsha ndeme tshine tsha langa kushumisele kwa maḓi kwa phuraivethe na kwa nnyi na nnyi Afrika Tshipembe, nahone u tshimbilelana na u shumiswa ha maḓi huṅwe na huṅwe ho bulwaho kha Khethekanyo ya 21. Thandela yo dzinginywaho i ḓo ṱoḓa Thendelo ya u shumisa Maḓi u ya nga Mulayo uyu.

- Mulayo wa Zwiko zwa Vhufa (Mulayo wa 25 wa 1999, NHRA) wo lavhelesaho tsireledzo ya vhupo ha zwa akhiolodzhi kana zwa phaliontholodzhi kana methiorathi,

nahone u ṱoḓa thendelo ya u tshinyadza kana u thithisa arali zwi tshi ḓo vha hone. Thendelo dzi nga ṱoḓea u ya nga Mulayo uyu.

- Mulayo wa Ndangulo ya Vhupo: Zwimela na zwipuka zwo fhambanaho (Mulayo wa 10 wa 2004) u na mbetshelwa ya ndangulo na ndondolo ya zwimela na zwipuka zwo fhambanaho zwa Afrika Tshipembe kha mutheo wa NEMA na tsireledzo ya tshaka na ekhosisiteme dzine dza ṱoḓa tsireledzo ya lushaka. Hu nga ṱoḓea thendelo u ya nga Mulayo uyu.

- Wa u fhedzisela, Mulayo wa Ndangulo ya Vhupo wa Lushaka: Mulayo wa Mashika (Mulayo wa 59 wa 2008) ndi Mulayo une wa ṱoḓa u vhuedzanya ndangulo ya mashika nga ngomu Afrika Tshipembe, nahone u ḓo shuma kha masia oṱhe ane a tshimbilelana na mashika a thandela yo dzinginywaho.

MUSHUMO WA U SHELA MULENZHE NGA TSHITSHAVHA

Mushumo wa u shela mulenzhe nga Tshitshavha (PPP) u a ṱoḓea kha mushumo wa EIA u ya nga ndima ya 6 khethekanyo ya 54 ya R543 ya Mulayo wa Ndangulo ya Vhupo wa Lushaka, wa 1998 (Mulayo wa 107 wa 1998). Nga fhasi ha ndaulo ya EIA, Zwigwada zwine zwa vha na dzangalelo nahone zwi kwameaho (I & AP) zwi fanela u ṋetshedzwa tshikhala tsha u posa mihumbulo nga ha thandela yo dzinginywaho na u khwaṱhisedza zwauri mafhungo oṱhe o swikiswaho nga tshifhinga tsha u posa mihumbulo tsha Tshipiḓa tsha Muvhigothangeli, o rekhodiwa. Ndivho ya Mvetamveto ya Muvhigothangeli (DSR) ndi u ṋe I & AP tshikhala tsha u posa mihumbulo kha muvhigo u itela uri i dzhenisiwe kha Muvhigothangeli wo khunyeledzwaho. Vha I & AP vha ḓo vha na maḓuvha a khaḽenda a 40 a u posa mihumbulo kha Mvetamveto ya Muvhigothangeli.

Zwi tevhelaho zwo itiwa nga tshifhinga tsha tshipiḓa tsha muvhigothangeli tsha mushumo wa u shela mulenzhe nga tshitshavha:

- U ḓivhadzwa ha thandela
- U ṅwaliswa ha I&AP
- Miṱangano ya tshitshavha na Vhashelamulenzhe
- U dzudzanywa ha Muvhigo wa Mbilaelo na Phindulo (IRR).

ZWIṄWE ZWINE ZWA NGA SHUMA

Ndi maitele kwao kha ndangulo ya zwa vhupo u dzhiela nzhele zwiṅwe zwine zwa nga itiwa zwinzhi u ya nga hune zwa konadzea ngaho u swikela hu tshi nangiwa zwiṅwe zwine zwa nga shuma. Nga tshifhinga tsha u topoliwa na u sedzuluswa ha zwiṅwe zwine zwa nga dzhielwa nṱha zwa thandela yo dzinginywaho, thimu ya thandela yo vhumbiwaho nga vhatikedzi, Mushumeli wa Tsedzuluso ya zwa Vhupo (EAP), vhaḓivhi na miraḓo ya tshitshavha, vha shuma mushumo wa ndeme kha u lavhelesa na u nanga zwiṅwe zwine zwa nga shuma. Zwi tevhelaho zwi a lavheleswa sa zwiṅwe zwine zwa nga shuma kha thandela:

- Iṅwe thekhinoḽodzhi:

- Thambo dza muḓagasi dza nga nṱha dzi tshi vhambedzwa na thambo dza muḓagasi dza nga fhasi ha mavu

❖ Kuṅwe kudzudzanyele:

➢ **Kuṅwe kudzudzanyele (Kudzudzanyele kwa 1 na Kudzudzanyele kwa 2) (Museṱha na Mutswuku)**

Kuṅwe kudzudzanyele kwa 1 na 2 na kuṅwe kudzudzanyele kuṱuku kwazwo kwo nangiwa hu tshi khou shumiswa ngona na nḓila dzi fanaho. Kudzudzanyele kwo dzinginywaho kwo nangiwa nga u shumisa zwifanyiso zwa sathelaithi nahone zwo vha zwi tshi ya nga nḓila dzi tevhelaho:

- Vhulapfu ha kudzudzanyele kwo dzinginywaho;
- Thambo dza u phaḓaladza na u fhirisa dzine dza vha hone;
- Tshivhalo tsha "fhethu ho govheaho"kha kudzudzanyele;
- Themamveledziso ine ya vha hone zwa zwino;
- Thophogirafi; na
- U swikelelea.

➢ **Kudzudzanyele kwa 1 (Phara ya Museṱha)**

Kudzudzanyele kwa 1 kwo dzinginywaho ku nga lingana 51.5km nga vhulapfu nahone ku tshimbilela thungo ya devhula u vhambela na Bada khulwane ya N1 hune kwa khonela thungo ya vhukovhela Mulamboni wa Sand. U bva hafha kwa tshimbilela thungo ya devhula kwo vhambela na lurumbu lwa thungo ya vhukovhela lwa Vhugalaphukha ha Musina kwo livha Beitbridge.

➢ **Kudzudzanyele kwa 2a (Phara Tswuku + Tshitopana)**

Kudzudzanyele kwo dzinginywaho ku nga lingana 57.5 km nahone ku khou tshimbilela thungo ya vhubvaḓuvha kwo livha R508 u bva hune kwa khelutshela thungo ya vhukovhela kwa tevhela R508 kwo livha Musina. U bva hafha ku bvela phanḓa ku tshi ya thungo ya devhula u ya Mulamboni wa Limpopo.

➢ **Kudzudzanyele kwa 2b (Phara Tswuku + Ṯaḓa)**

Kudzudzanyele kwa 2b kwo dzinginywaho ku nga lingana 52km nahone ku tshimbilela thungo ya devhula-vhubvaḓuvha u ṱutshela kha R508 kwa bvela phanḓa thungo ya devhula na vhukovhela ha Mulambo wa Nzhelele kwo livha Mulamboni wa Limpopo.

❖ Zwiṅwe zwiko zwa Fulufulu: Fulufulu ḽi Vusuludzwaho

❖ Khonadzeo ya u sa ya

Mvetamveto ya EIR i ṋetshedza vhulaedzwa na vha I & AP tshikhala tsha u wana masiandaitwa ane a nga vha hone e a ḓo topoliwa nga tshifhinga tsha Tshipiḓa tsha Muvhigothangeli, khathihi na u sumbedza uri masiandaitwa enea a ḓo shumaniwa nao hani nga tshifhinga tsha Tshipiḓa tsha Tsedzuluso ya Masiandaitwa zwi tshi ya nga

Pulane ya Ngudo ya EIA. Mihumbulo yo ṱanganedziwaho kha Mvetamveto ya Muvhigothangeli i ḓo shumisiwa kha u lugisela Mvetamveto ya EIR na EIR yo Khunyeledzwaho.
Vhaḓivhi vho vha vhe hone kha vhuimo ha muvhigothangeli nahone vho humbelwa u ṋetshedza mihumbulo zwi tshi ya nga masia avho a vhuḓivhi o fhambanaho. Ngudo ya vhaḓivhi yo dodombedzwaho i ḓo itiwa nga tshifhinga tsha Tshipiḓa tsha Tsedzuluso ya Masiandaitwa.

MAWANWA NA THEMENDELO YA VHAḒIVHI

U bva kha mushumo wa muvhigothangeli wa u thoma na u khwiniswa ha mafhungo na masiandaitwa ane a nga bvelela ane a tshimbilelana na mafhungo enea, ṱhoḓea ya ngudo dza vhaḓivhi dzi re na tshivhalo zwo topoliwa. Mvelelo dza ngudo dza vhaḓivhi dzo pfufhifhadzwa afho fhasi:

<u>Tsedzuluso ya zwimela</u>

A hu na Red Data kha dza 71 dzine dza nga dzhena khomboni dza Vundu ḽa Limpopo dzo rekhodiwaho, Ho rekhodiwa tshimela tshithihi tshine tsha tsireledzwa nga vundu tshine tsha vha Adansonia *digitata* (Muvhuyu). Hu na miri miṋa ine ya tsireledzwa nga lushaka ine ya ṱoḓa thendelo:

- *Boscia albitrunca* ndi wone muri wo tsireledzwaho wo ḓoweleaho kha vhupo hovhu, nahone wo vha u tshi khou wanala kha puloto dzoṱhe dze ha itwa ṱhoḓisiso khadzo, u wanala kha vhukwakwani-tshikati ha miri ya 18 nga egere.
- *Combretum imberbe* ndi lwone lushaka lwapo lu tsireledzwaho nga mulandu wa u baḓekanywa halwo na zwiko zwa maḓi.
- *Sclerocarya birrea* subsp. *caffra* ndi lushaka lwa vhuvhili lwo ḓalesaho nahone u wanala kha puloto dzine dza fhira 50% dzo nanguludzwaho, u wanala kha vhukwakwani-tshikati ha miri ya 11 nga egere.
- *Adansonia digitata* ndi muri wo ḓalesaho u fhira *Sclerocarya birrea* subsp *caffra*, fhedzi u muṱuku kha *Combretum imberbe*, u wanala kha vhukwakwani-tshikati ha miri miṋa (4) nga egere.

Muvhigo wo sedzulusa dziṅwe nḓila zwi tshi ya nga u konḓa ha mavu, tshivhalo tsha milonga ya maḓi yo pfukiwaho khayo na Pulane ya Ndondolo ya Limpopo. Vhukati ha muhumbulo wonoyu, Muvhigo wa Zwimela wo wana uri nḓila ya 2b ndi yone i sa kwameiho nga maanḓa ya dovha ya vha yone ine ya takaleleswa.

<u>Tsedzuluso ya zwipuka na Tsedzuluso ya Avi–Fauna</u>

Muvhigo wa Avifuana na Zwipuka, wo dzudzanyelwa u itela u topola tshaka dza ndeme dza zwithu zwine zwa wanala kha vhupo ha ngudo zwine zwa ḓo tikedza zwipuka na avi fauna. Zwithu zwine zwa wanala hone zwo khethekanywa nga nḓila i tevhelaho:

- *Zwikwara zwa maheṱavha na zwa tshigotswiri (granaithi)*- fhethu ha pfulo ha ndeme ha Magoni a Verreaux na Vhurwanzhivha ha Lanner zwine zwa si kone u ḓipilela;
- *Magovha a khungu na maḓaka a tsini na mulambo*- Magwitha ane a Fasha Khovhe a Pel a re khomboni (Maremani), White-backed Night-heron (Maremani) zwi sa koniho u ḓipilela na Misilisili ya Saddle-billed (Mulamboni wa Sand) zwine zwa vha khomboni– miṱa yoṱhe ine ya vha na vhukwakwani ha fhasi Afrika Tshipembe;
- *Madamu a tshiedza* – zwiṉoni zwa maḓini na muṱa wa maovhelwa une wa vha khomboni;
- *Milonga ya maḓi ya zwipuka* – i anzela u dalelwa nga maanga (Maremani)
- *Vuvhu*- fhethu ha pfulo ha Ṱhame dzine dza si kone u ḓipilela, Maovhelwa a Abdim na Maovhelwa a White ane a vha na khonadzeo ya u vha khomboni
- *Miri ine ya ita dungunudzi ḽihulu (Muvhuyu)* – hu anzela u vha fhethu ha vhualamelo ha zwiṉoṉi zwi ḽaho ṉama zwi ḓivheaho.

U ya nga muvhigo uyu, nḓila ine ya si takaleleswe yo vha i ya 2b, ngeno ine ya takaleleswa i 2a nga mulandu wa tshivhalo tshi re fhasi tsha maḓambuwo ane a wanala kha nḓila yeneyi, tshivhalo tshi re fhasi tsha tshaka dza zwithu zwine zwa dzula henefho zwine zwa pfukwa nga nḓila yeneyo, u livhana na vhupo vhune ha vha na tshiimo tsha u vhiga RD ya fhasi KANA u wanala ha tshivhalo tshiṱuku tsha misilisili na phaḓaladzo ya muḓagasi yo no vhaho hone.

Tsedzuluso ya maroroma

U ya nga tsedzuluso ya maroroma, nḓila ine ya funeswa ine ya vha mbambedzo ya tsinisa vhukati ha Phara Tswuku – Tshitopana (Kudzudzanyele kwa 2a) na Phara Tswuku - Ṱaḓa (Kudzudzanyele kwa 2b). Phara ya Museṱha (Kudzudzanyele kwa 1) yo dzhiiwa sa yone ine i sa funeswi nga mulandu wa vhukwakwani ha nṱhesa ha phaiphi dza muelelo dzine dza tshimbila u vhambela na phara yeneyi. Nga u angaredza, nga murahu ha u sedzulusa tshivhalo tsha maḓambuwo a pholigoni dza Milonga ya maḓi na vhulapfu ha mafhande a nḓila ya vhukati yo ṱanganywaho nga kha pholigoni dza milonga ya maḓi dzo ṱalutshedzwaho, Phara Tswuku - Tshitopana (Kudzudzanyele kwa 2a) yo dzhiiwa sa yone nḓila ine ya funeswa ho lavheleswa milonga ya maḓi.

Tsedzuluso ya Masiandaitwa a Zwithu zwi Vhonwaho

U kwamea ha zwithu zwi vhonwaho hune ha nga vha hone ho tiwa nga u bvisa zwithu zwine zwa tatisa maṱo fhethu hoṱhe hune matanda a ḓo dzheniswa hone (hune ha khou tou humbulelwa) zwa dzheniswa fhethu ho thivhedzwaho nga zwitsiro zwa 3 km na u zwi ṱanganyisa na fhethu ha u vhona na mbonalo yo fhungudzeaho musi zwi kule. Ho ṉetshedzwa mbambedzo ya nḓila dzo ṉetshedzwaho, nga murahu ha u dzhielwa nṱha ha

mafhungo o bulwaho afho nṱha, Iṅwe nḓila ya 1 yo dzhiiwa sa yone nḓila ine ya takalelwa ho lavheleswa mafhungo a zwithu zwi vhonwaho.

Tsedzuluso ya Masiandaitwa kha Vhufa

Sa zwe zwa humbuleliswa zwone nga Muvhigo wa Tsedzuluso ya Masiandaitwa kha Vhufa, mubveledzi u fanela u dzhiela nzhele Kudzudzanyele kwa 1 na Kudzudzanyele kwa 1B sa kwone kudzudzanyele kune kwa takalelwa kha mveledziso yo dzinginywaho. Kudzudzanyele kwa 2 na Kudzudzanyele kwa 2A ndi Kudzudzanyele kwa vhuvhili kune kwa takalelwa kha thandela ngauri hu na tshikhala tshiṱuku tsha uri ku nga kwama zwiko zwa akhiolodzhi. Kha Kudzudzanyele kwa1B na kwa 2A, ho ṱaluswa zwiko zwa vhufa zwivhili, fhedzi ha, hezwi zwiko zwa vhufa zwo leluwa u zwi fhungudza nga u tou zwi tinya nga tshifhinga tsha luṱa lwa u dzhenisa lwa thandela.

Tsedzuluso ya Masiandaitwa kha zwa Matshilisano

Muvhigo hoyu u dzinginya zwauri zwithu zwa ndeme zwine zwa dzhielwa nzhele kha phara iṅwe na iṅwe yo dzinginywaho zwi songo sala zwi tshi vho nga vhukhakhi ho kalulaho. Kudzudzanyele kwa 2 na Kudzudzanyele kwa 2A ndi kwone kune kwa khou takaleleswa nga mulandu wa tshikhala tshine tsha vha hone u itela thambo dza muḓagasi na Eco-Industrial Park uri zwi vhe hone zwoṯhe, ngauralo zwi khou ḓisa mbuelo khulwane kha vhupo. Kudzudzanyele kwa 2 na kwa 2B a ku takaleleswi nga mulandu wa ndeme yakwo kha vhupo nga u angaredza u ya nga ndondolo ya zwithu zwine zwa wanala henefho lwa mupo zwine zwa nga vha zwa ndeme kha zwitshavha zwapo kha mirafho iḓaho.

Tsedzuluso ya Khonadzeo ya Mavu na zwa Vhulimi

Zwi tshi ya nga mvelelo dza ṯhoḓisiso, kudzudzanyele kwo tiwaho a ku khou funiwa sa izwi u masiandaitwa a tshi ḓo fana hoṯhe hoṯhe. U ya nga kuvhonele kwa masiandaitwa kha themamveledziso na mavu zwi tshi ya kha dzibada dza u swikelela, hu khou takalelwa Kudzudzanyele kwa 1 sa izwi ku tshi tevhela themamveledziso ya bada ine ya vha hone zwino fhethu hunzhi ha nḓila yeneyo.

Manweledzo a zwa vhuḓivhamahe

Tsedzuluso iyi yo ḓa na matirikisi ya u ela ye ya shumisa tsenguluso ya Inzhiniarini ya vhuḓivhamahe, Zwa migodi, Khonadzeo ya miḓalo, Zwivhanga zwi songo khwaṯhaho, U gwea khathihi na Mavu ane a mbombomela. U ya nga mutsiko kha inzhiniarini ya vhuḓivhamahe, Kudzudzanyele kwa 2 na kwa 2B kwa kudzudzanyele kwo ṉetshedzwaho ndi kwone kwo fanelaho nga maanḓa nga murahu ha u sengulusa u kwamea ha zwa vhuḓivhamahe u ya nga matirikisi ya u ela.

Manweledzo a zwa Vhuendelamashango

Phara Tswuku (2) - Ṱaḓa (2B) ndi yone ine ya khou takaleleswa, naho i tshi ḓo fhira nga Vhugalaphukha ha Maremani vhune ha si vhe na vhaendelamashango vhanzhi vhane vha vhu dalela nga ṅwaha, tshivhalo a si tshine tsha mangadza zwa ḓi tou fana na

mbuelo ine ya bveledzwa nga mulandu wa zwa vhuendelamashango nahone tshivhalo tsha vhaeni tshine tsha anganyelwa tshi nṱha kha dziṅwe phara u fhira kha phara heyi. Phara ine ya vha ya vhuvhili nga u takalelwa ndi tswuku (2) – tshitopana (2A) sa izwi i tshi tinya Vhugalaphukha ha Musina na ha Maremani na huṅwe fhethu ha zwa vhuendelamashango. Fhethu hune ha si takaleleswe u ya nga kuvhonele kwa zwa vhuendelamashango ndi nḓila ya phara ya 1. Hezwi zwi zwo rali nga mulandu wa tshivhalo tshi re nṱha tsha fhethu ha zwa vhuendelamashango kha nḓila heyi. Vhupo hovhu vhu ḓitika nga zwiko zwa mupo zwo salaho u itela uri phukha dzi kone u aluwa zwavhuḓi. U dzheniswa ha thambo da muḓagasi hu ḓo shandukisa kudzulele kwa zwithu kwa vha na masiandaitwa a si avhuḓi kha zwiko zwa mupo zwo tsireledzelwaho phukha.

MVETAMVETO YA PULANE YA NDANGULO YA VHUPO

EMP i ḓo pfufhifhadza mishumo yoṱhe ine ya fanela u itiwa, hune ya ḓo itiwa hone, vhathu vhane vha vha na vhuḓifhinduleli, masianditwa oṱhe a vhupo kana a zwa matshilisano ane a nga vha hone, maga a u khwinisa, pulane dza u mbuedzedzo, ngona dza u lavhelesa, tshivhalo tsha tshifhinga tsha u lavhelesa na tsumbedzo dza kushumele. EMP i ḓo vha ḽiṅwalo ḽo ḓiimisaho nga ḽoṱhe ḽine ḽa vhofha lwa mulayo, ḽine ḽa ḓo shumiswa u khwaṱhisedza zwauri vha Eskom vha khou tevhedza milayo yoṱhe ya Thendelo dza zwa Vhupo (EA) na Muvhigo wa Masiandaitwa kha Vhupo (EIR).

TSHITATIMENNDE TSHA MASIANDAITWA KHA VHUPO

Vhupo ha ngudo ho pfuma zwimela na zwipuka zwo fhambanaho u ya nga kuvhonele kwa zwimela, zwipuka, na Avi-fauna. Ho topolwa lushaka lwa Red Data lu re na tshivhalo u mona na muṱa wo tiwaho. Lushaka lu vhonalaho lu khomboni nga maanḓa lwa ndondolo ya ndeme vhukuma nga ngomu kha vhupo ha ngudo ndi lushaka lwa misilisili. Vhunzhi ha vhupo vhune ha baḓekanywa na lushaka lwa misilisili ho vha ho ṱalutshedzwa kana ho swaiwa sa vhupo vhune ha kwamea nahone ho itwa ndingedzo dzoṱhe uri phara ine ya khou takalelwa i tinye vhupo hovhu hoṱhe vhune ha kwamea. Vhuṅwe vhupo vhune ha kwamea he ha dzhielwa nzhele ho vha vhu tshi khou ya nga mafhungo a ṱutshelanaho na zwa vhulimi (u shavha u dzhenelela vhukatikati), zwa matshilisano (u shavha mupfuluwo, tshikolo) na huṅwe u kwamea ha themamveledziso. Mishumo ya zwa migodi yo dzhiiwa sa vhuṅwe ha vhupo vhunzhi vhune ha nga kwamea nga mulandu wa u shumiswa ha mavu a vhuponi honoho hune ha vha mishumo ya zwa migodi nga maanḓa.

Hu khou dzhiiwa zwauri u dzheniswa na u shuma ha thambo dza u phaḓaladza muḓagasi zwi ḓo vha na masiandaitwa a si avhuḓi kha vhupo. Fhedzi ha, arali nḓila dza u fhungudza dza nga shumisiwa, vhuhulu ha masiandaitwa vhu ḓo fhungudzea. Nga murahu ha u lavhelesa nga vhuronwane masia a ndeme a vhupo (ane a vha masia a

biofisikhala, zwa matshilisano na zwa ikonomi), phara ine ya khou takalelwa ndi Kudzudzanyele kwa 1 (**Phara ya Museṱha)**. Ho vha hu na phambano ṱhukhuṱhukhu zwi tshi ya kha zwa matshilisano, ikonomi na vhupo vhukati ha kuṅwe kudzudzanyele kwoṱhe kuraru, fhedzi ha, khonadzeo ya zwa thekiniki ya vhupo vhune ha ḓo dzheniswa thambo dza muḓagasi dzo dzinginywaho yo dzhiiwa sa tshiteṅwa u itela u kona u swika kha tsheo ya u nanga phara ine ya takalelwa.

MAGUMO

Mvelelo dza ngudo dza vhaḓivhi dzo shumiswa nga Mushumeli wa Tsedzuluso dza Vhupo u bveledza tsedzuluso yo ṱanganelanaho ya mveledziso yo dzinginywaho. Mvelelo dza ṱhanganelano na tsedzuluso dzo ṅwalwa fhasi kha Mvetamveto heyi ya Muvhigo wa Masiandaitwa kha Vhupo (muvhigo hoyu), we wa iswa tshitshavhani u itela u wana mihumbulo. Nga murahu ha tshifhinga tsha u posa mihumbulo, mihumbulo yeneyo i ḓo vhuyedzanywa ha khwiniswa muvhigo uyu u itela uri u swikiswe kha Muhasho wa zwa Vhupo wa Lushaka.

UITVOERENDE OPSOMMING

INLEIDING

Die stygende aanvraag na elektrisiteit 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 om die betroubaarheid van elektrisiteitvoorsiening aan die land te verbeter, asook om veral voorsiening te maak vir die stygende elektrisiteitsaanvraag in die Limpopo Provinsie.

In antwoord op die ingevoerde kragtoekenning in die regering se Geïntegreerde Hulpbronplan (GHP) (wat in Mei 2011 in die Staatskoerant afgekondig is) en die totstandkoming van die Suider-Afrika Energie (SAE) eenheid binne Eskom om die belegging in opwekking en transmissie buite Suid-Afrika te fasiliteer, is daar ’n dringende noodsaak om kritieke transmissiekorridors te identifiseer om kragtoevoer na Suid-Afrika vanaf ons buurlande te verseker. ’n Hoëvlak verslag is saamgestel wat die moontlike trasmissiekorridors tussen Suid-Afrika, Botswana, Zimbabwe en Mosambiek beskryf.

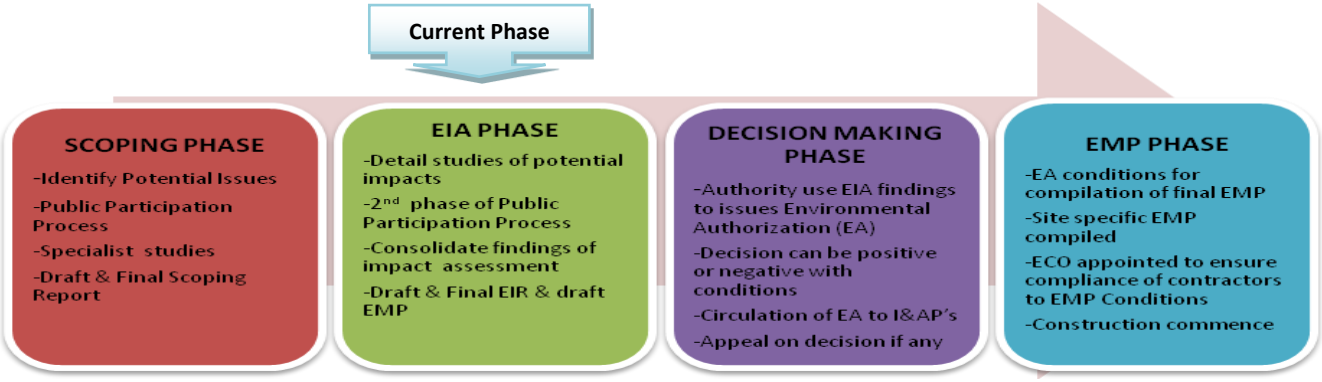
Daar was ’n verslag oor ’n opvolgverslag oor die Kragroosterbeplanningsverslag, GP 12/69, “Strategiese Transmissiekorridors tussen Suid-Afrika en Zimbabwe om Streekshandel moontlik te maak”. Die fokus van dié verslag was om voorsiening te maak vir die bespreking van die tegniese impakte en voordele van die drie verskillende korridoruitbreidings aan die hand van tegniese ontleding. Die studiegebied bestaan uit Eskom se noordelike kragrooster, die BPC-netwerk, die ZESA-netwerk en die EdM noordelike netwerk. Deur die ZESA interne netwerk te versterk, kan kragoordrag met 172 MW verbeter word. As die drie korridors vergelyk word, kan die korridor via Nzhelele en Chibata die hoogste bykomende kragoordrag voorsien, naamlik 516 MW nadat die interne ZESA-netwerk versterk is. Die tweede beste verbetering is die Nzhelele-korridor via Bindura wat ’n bykomende 351 MW (501 MW) lewer. Versterking van die bestaande korridor 1 lewer ’n verbetering van 22 MW.

Die voorgestelde Nzhelele-Triangle 2x 500kV transmissiekraglynprojek behels die volgende aktiwiteite:

- Konstruksie van twee 500kV kraglyne wat teen 400kV vanaf Nzhelele Substasie na Triangle Substasie bedryf sal word. Die lyn vanaf Nxhele Substasie sal egter by die grens van Suid-Afrika en Zimbabwe eindig waar dit sal aansluit by die lyn vanaf die Triangle Substasie in Zimbabwe. Zimbabwe Electricity Supply Authority (ZESA) is verantwoordelik vir die konstruksie van die kraglyn verder in die rigting van Triangle Substasie.

OMGEWINGSIMPAKBEPALINGSPROSES

Die Omgewingsimpakbepalingsproses (OIB) bestaan uit verskeie fases en die huidige fase is die OIB-fase. Bogenoemde voorgestelde infrastruktuurontwikkeling is 'n gelyste aktiwiteit ingevolge die 2012 Omgewingsimpakbepalingsregulasies van die Nasionale Wet op Omgewingsbestuur, 1998 (Wetnr. 107 van 1998). Gelyste aktiwiteite word beskou as aktiwiteite wat die moontlikheid het om omvattende of belangrike impakte op die omgewing te hê. 'n Aktiwiteit wat in die bogenoemde lys verskyn, vereis omgewingsmagtiging van die bevoegde owerheid. Die onderstaande figuur sit die verskeie fases uiteen wat op die voorgestelde projek betrekking het:



Huidige fase

OMVANGBEPALINGS FASE	**OIB-FASE**	**BESLUITNEMINGSFASE**	**OBP-FASE**
- Identifiseer moontlike kwessies - Openbare deelnameproses - Spesialisstudies - Konsep- en Finale Omvangbepalingsverslag	- Gedetailleerde studies van potensiële impak - Tweede fase van openbare deelnameproses - Konsolidering van bevindings van Impakbepaling - Konsep- en Finale OIV en konsep-OBP	- Owerheid gebruik OIA-verslag om Omgewingsmagtiging (OM) uit te reik - Besluit kan positief of negatief met voorwaardes wees - Verspreiding van OA aan B&GP'e - Appèl teen besluit, indien enige	- OA-voorwaardes vir samestelling van finale OBP - Terreinspesifieke OBP saamgestel - ONB aangestel om te verseker dat kontrakteurs aan OBPvoorwaardes voldoen - Konstruksie begin

PROJEKBEHOEFTE EN BESKRYWING

In antwoord op die ingevoerde kragtoekenning in die regering se Geïntegreerde Hulpbronplan (GHP) (wat in Mei 2011 in die Staatskoerant afgekondig is) en die totstandkoming van die Suider-Afrika Energie (SAE) eenheid binne Eskom om die belegging in opwekking en transmissie buite Suid-Afrika te fasiliteer, is daar ’n dringende noodsaak om kritieke transmissiekorridors te identifiseer om kragtoevoer na Suid-Afrika vanaf ons buurlande te verseker. ’n Hoëvlak verslag is saamgestel wat die moontlike trasmissiekorridors tussen Suid-Afrika, Botswana, Zimbabwe en Mosambiek beskryf.

Die verslag was ’n opvolgverslag oor die Kragroosterbeplanningsverslag, GP 12/69, “Strategiese Transmissiekorridors tussen Suid-Afrika en Zimbabwe om Streekshandel moontlik te maak”. Die fokus van die verslag was om voorsiening te maak vir die bespreking van die tegniese impakte en voordele van die drie verskillende korridoruitbreidings aan die hand van tegniese ontleding. Die studiegebied bestaan uit Eskom se noordelike kragrooster, die BPC-netwerk, die ZESA-netwerk en die EdM noordelike netwerk. Deur die ZESA interne netwerk te versterk, kan kragoordrag met 172 MW verbeter word. As die drie korridors vergelyk word, kan die korridor via Nzhelele en Chibata die hoogste bykomende kragoordrag voorsien, naamlik 516 MW nadat die interne ZESA-netwerk versterk is. Die tweede beste verbetering is die Nzhelele-korridor via Bindura wat ’n bykomende 351 MW (501 MW) lewer. Versterking van die bestaande korridor 1 lewer ’n verbetering van 22 MW.

Die basis-netwerk het baie soortgelyke kragoordragbeperkings tot gevolg. Die BPC-netwerk word meer benut wanneer opwekking van die noorde, eerder as van die ooste af, ingevoer word. Uit ’n tegniese oogpunt (voor spesialisassessering) vaar Korridor 1, wat baie afhanklik is van die ligging van toekomstige opwekking, die swakste. Korridor 2 vaar beter as Korridor 1 in hierdie gebeurlikheidscenario, maar vaar nie ewe goed met opwekking van die ooste af nie. Beide Korridor 2-roetes vaar baie soortgelyk vir opwekking vanaf enige van die liggings. Korridor 2B geniet voorkeur (via Chibata) as gevolg van hoër oordragperke vir opwekking van die ooste af en minimale verskil vir opwekking van die noorde af.

REGSRAAMWERK VAN TOEPASSING OP DIE VOORGESTELDE PROJEK

Die bogenoemde voorgestelde projek is ’n gelyste aktiwiteit ingevolge die 2010 Omgewingsimpakbepalings wat kragtens die Wet op Nasionale Omgewingsbestuur, 1998 (Wetnr. 107 van 1998, WNOB) afgekondig is. Gelyste aktiwiteite word beskou as aktiwiteite wat die moontlikheid het om omvattende of belangrike impakte op die omgewing te hê. ’n Aktiwiteit wat in die bogenoemde lys verskyn, vereis omgewingsmagtiging van die bevoegde owerheid. Die voorgestelde konstruksie van twee 500kV kraglyne wat teen 400kV vanaf Nzhelele Substasie na Triangle Substasie bedryf sal word, val binne ’n reeks vereiste wetgewing (nasionale, provinsiale en

plaaslike sfeer) waaraan Eskom moet voldoen. Sleutelwetgewing wat op die voorgestelde projek van toepassing is, sluit die volgende in, maar is nie daartoe beperk nie:

- Artikel 2 van Hoofstuk 1 van die WNOB wat besonderhede verstrek van die omgewingsbestuurbeginsels wat nagekom moet word tydens die algehele projek.
- Die Nasionale Waterwet (Wet 36 van 1998, NWW), is die belangrikste wetgewing wat beide privaat en openbare watergebruik binne Suid-Afrika beheer en dit is van toepassing op enige watergebruik wat in Artikel 21 gestipuleer word. Die voorgestelde projek sal ’n Watergebruiklisensie ingevolge hierdie Wet vereis.
- Die Wet op Erfenishulpbronne (Wet 25 van 1999, WEH) behels die beskerming van argeologiese of paleontologiese terreine of meteoriete en vereis ’n permit vir die vernietiging of versteuring daarvan. Permitte kan ingevolge hierdie Wet vereis word.
- Die Wet op Nasionale Omgewingsbestuur: Biodiversiteit (Wet 10 van 2004) maak voorsiening vir die bestuur en bewaring van Suid-Afrika se biodiversiteit binne die raamwerk van die WNOB en die beskerming van spesies en ekosisteme wat nasionale bewaring regverdig. Permitte kan ingevolge hierdie Wet vereis word.
- Laastens het die Wet op Nasionale Omgewingsbestuur: Afval (Wet 59 van 2008) ten doel het om afvalbestuur binne Suid-Afrika te konsolideer en sal van toepassing wees op enige aspek van die voorgestelde projek wat met enige afval te make het.

OPENBARE DEELNAMEPROSES

’n Openbare Deelnameproses (ODP) word kragtens artikel 54 van R543 van die Nasionale Wet op Omgewingsbestuur, 1998 (Wetnr. 107 van 1998) vereis in ’n OIB-proses Kragtens die OIB-regulasie moet Belangstellende en Geaffekteerde Partye (B&GP’e) die geleentheid gebied word om kommentaar te lewer op die voorgestelde projek en om seker te maak dat alle kwessies wat tydens die kommentaartydperk van die Omvangsbepalingfase geopper is, aangeteken word. Die oogmerk van die Konsep-omvangsbepalingsverslag (KOV) is om B&GP’e die geleentheid te bied om op die verslag kommentaar te lewer vir insluiting in die Finale Omvangbepalingsverslag. B&GP’e word 40 kalenderdae gebied om op die Konsep-omvangsbepalingsverslag kommentaar te lewer.

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).

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, wat bestaan het uit die voorsteller, ’n omgewingsassesseringspraktisyn (OAP), spesialiste en lede van die publiek, ’n sleutelrol gespeel in die oorweging en keuse van uitvoerbare alternatiewe. Die volgende is as projekalternatiewe oorweeg:

- Tegnologie-alternatiewe:
  - Oorhoofse kraglyne teenoor ondergrondse kraglyne
- Belyningsalternatiewe:
  - **Alternatiewe Belynings (Alternatief 1 tot Alternatief 2) (Grys en Rooi)**

    Alternatiewe belynings 1 en 2 met hulle sub-alternatiewe is op grond van dieselfde metode en kriteria gekies. Die voorgestelde belynings is met gebruik van satellietbeelde gekies en berus op die onderstaande kriteria:

    - Lengte van voorgestelde belyning;
    - Bestaande transmissie- en verspreidingslyne;
    - Aantal “buigpunte” in die belyning;
    - Bestaande infrastruktuur;
    - Topografie; en
    - Toeganklikheid.

  - **Alternatief 1 (Grys Korridor)**

    Die voorgestelde Alternatief 1 is ongeveer 51.5km lank en loop noordwaarts langs die N1-hoofweg en swaai by die Sandrivier weswaarts weg. Van hier af loop dit noordwaarts langs die westelike kant van Musina Natuurreservaat in die rigting van Beitbrug.
  - **Alternatief 2a (Rooi + Oranje Korridor)**

    Die voorgestelde Alternatief 2a is ongeveer 57.5 km lank en loop ooswaarts in die rigting van die R508 waar dit weswaarts wegwyk en die R508 in die rigting van Musina volg. Van hier af gaan dit noordwaarts voort na die Limpoporivier.
  - **Alternatief 2b (Rooi + Geel Korridor)**

    Die voorgestelde Alternatief 2B is ongeveer 52 km lank en loop in ’n noord-oostelike rigting na die R508 en gaan noordwaarts wes van die Nzhelele-rivier voort in die rigting van die Limpoporivier.
- Energiebron-alternatief: Hernubare energie
- Onuitvoerbare alternatief

Die Konsep-OIV bied owerhede en B&GP'e die geleentheid om moontlike impakte te bepaal wat tydens die Omvangbepalingsfase uitgewys is, asook om aan te dui hoe hierdie impakte tydens die Impakassesseringsfase aangespreek sal word op grond van die Studieplan vir OIB. Die kommentaar wat op die Konsep-omvangsbepalingsverslag ontvang word, sal gebruik word in die voorbereiding van die Konsep- en Finale OIV.
Die spesialiste was tydens die omvangsbepalingsvlak betrokke en is gevra om insette te lewer op grond van hulle onderskeie studievelde. Omvattende spesialisstudies sal tydens die Impakassesseringsfase onderneem word.

BEVINDINGS EN AANBEVELINGS VAN SPESIALISTE

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

<u>Flora-assessering</u>

Geen van die 71 bedreigde Rooi Data-spesies is aangeteken nie. Een provinsiaal beskermde plant is aangeteken, die *Adansonia digitata* (Kremetart). Vier nasionaal beskermde boomsoorte, waarvoor 'n permit vereis word, is teenwoordig:

- *Boscia albitrunca* is die mees algemene beskermde boomsoort in die gebied en het op al die stukke grond wat ondersoek is, voorgekom; dit kom teen 'n gemiddelde digtheid van 18 individue per hektaar voor.
- *Combretum imberbe* is die meeste gelokaliseerde beskermde spesie as gevolg van sy verwantskap met waterlope.
- *Sclerocarya birrea* subspesie *caffra* kom die tweede meeste voor en was teenwoordig op meer as 50% van die stukke grond waarna gekyk is; dit kom teen 'n gemiddelde digtheid van 11 individue per hektaar voor.
- *Adansonia digitata* is meer gelokaliseer as *Sclerocarya birrea* subspesie *caffra*, maar minder as *Combretum imberbe*, dit kom met 'n gemiddelde digtheid van 4 individue per hektaar voor.

Die verslag het die alternatiewe roetes gekontroleer aan die hand van die ruheid van die terrein, die aantal waterlope wat deurkruis word en die Limpopo Bewaringsplan. Op grond van hierdie denkrigting het die Floraverslag bevind dat roete 2b die minste sensitief en die voorkeurroete is.

<u>Fauna- en Avifauna-assessering</u>

Die Fauna- en Avifauna-verslag het ten doel om belangrike habitatsoorte in die studiegebied te identifiseer wat fauna en avifauna ondersteun. Die habitatsoorte is soos volg geklassifiseer:

- *Sandsteen- & granietriwwe* – belangrike weihabitat vir die kwesbare witkruisarend en die kwesbare swerfvalk;

- *Alluviale vloedvlaktes en rivierbosland* – bedreigde visuil (Maremani), kwesbare witrugnagreier (Maremani) en bedreigde saalbekooievaar (Sandrivier) – almal taksa met lae digthede in Suid-Afrika;
- *Kunsmatige damme* – watervoëls en bedreigde ooievaartaksa;
- *Watergate vir wild* – dikwels besoek deur aasvoëls en aasvreters (Maremani)
- *Braakland* – weihabitat vir kwesbare sekretarisvoël, byna-bedreigde kleinswartooievaar en witooievaar;
- *Groot bome met blaardakke (Kremetart)* – dikwels teelplekke vir ikoniese roofvoëls.

Volgens die verslag is roete 2b die mees ongunstige roete en die voorkeurroete is 2a as gevolg van die kleiner aantal rivierkruisings wat die roete bied, die kleinste aantal habitatsoorte wat die roete deurkruis, ooreenstemming met ’n gebied met ’n gerapporteerde lae koers van landelike ontwikkeling OF lae voorkoms van kraanvoëls en die bestaande teenwoordigheid van transmissieserwitute.

Vleilandassessering

Volgens die vleilandassessering is die Rooi – Oranje Korridor (Alternatief 2a) en Rooi – Geel Korridor (Alternatief 2b) kop aan kop as die voorkeurroete. Die Grys Korridor (Alternatief Roete 1) is as die mees ongunstige beskou weens die hoë digtheid van dreineringslyne wat parallel tot die korridor loop. In die geheel beskou, en nadat die aantal waterloop-veelhoekkruisings en die gekombineerde middellyn-kruispuntlengtes deur gedelinieerde waterloopveelhoeke geassesseer is, is die Rooi – Oranje Korridor (Alternatief 2a) beskou as die gunstigste roete ten opsigte van waterlope.

Visuele impak-assessering

Die moontlike visuele impak is bepaal deur die visuele sensitiwiteitswaardes by elke kragmasposisie (veronderstelde) uit te lig en hulle te interpoleer oor ’n gebied wat deur ’n 3 km buffer gedek is en dit te kombineer met die uitsigverlies en die verminderde sigbaarheid oor afstand. ’n Vergelyking van die verstrekte alternatiewe is voorsien. Nadat die voorgenoemde beperkings in ag geneem is, is Alternatief Roete 1 as die voorkeurroete ten opsigte van visuele impak beskou.

Erfenisimpakassessering

Die Erfenisimpakassesseringsverslag doen aan die hand dat die ontwikkelaar Alternatief 1 en Alternatief 1B as die voorkeuralternatiewe vir die voorgestelde ontwikkeling moet oorweeg. Alternatief 2 en Alternatief 2A is die tweede voorkeur as Alternatiewe vir die projek omdat die waarskynlikheid van impak op argeologiese hulpbronne kleiner is. In beide Alternatief 1B en Alternatief 2A is twee erfenishulpbronne geïdentifiseer. Die impak kan egter maklik versag word deur die erfenishulpbronne tydens die konstruksiefase van die projek te vermy.

Sosiale Impak-assessering

Hierdie verslag stel voor dat die sleuteloorwegings vir elk van die voorgestelde korridors nie onoorkombare gebreke oplewer nie. Alternatief 2 en Alternatief 2A geniet voorrang as gevolg van die ruimte wat beskikbaar is vir die kraglyn en die Eko-Industriële Park om saam te bestaan en dus die beste voordeel vir die gebied te bied. Alternatief roete 2 en 2B is die mees ongunstige weens die waarde van die kollektiewe gebied ten opsigte van bewaring en behoud van die natuurlike habitat wat in die toekoms vir die plaaslike samelewing van waarde kan wees.

Grond- en Landboupotensiaal-assessering

Op grond van die opnameresultate word daar nie voorkeur aan ’n spesifieke belyning verleen nie aangesien die impak deur die bank baie soortgelyk sal wees. Uit die oogpunt van infrastruktuur en verdere grondimpak ten opsigte van toegangspaaie, word Alternatief 1 verkies omdat dit vir die grootste deel van die roete bestaande padinfrastruktuur volg.

Geologiese oorsig

Hierdie assessering het met ’n beoordelingsmatriks vorendag gekom wat gebruik gemaak het van die ontleding van ingenieursgeologie, mynbou, oorstromingspotensiaal, onstandvastige hellings, moontlikheid van uitgrawing en onstabiele grond. Ten opsigte van ingenieursgeologiese beperkings na die ontleding van geologiese sensitiwiteit volgens die beoordelingsmatriks, is Alternatief 2 en 2B van die voorgestelde alternatiewe die mees geskikte opsies.

Toerisme-oorsig

Die Rooi (2) - Geel (2B) korridor geniet voorkeur, alhoewel dit deur die Maremani Natuurreservaat sal loop. Daar is ’n aantal toeriste wat dié reservaat jaarliks besoek, maar die getal is nie baie groot nie en gevolglik is die inkomste wat danksy toerisme en beraamde besoekersgetalle gegenereer word, hoër vir die ander korridors as vir hierdie korridor. Die opsie wat tweede minste voorkeur geniet, is die Rooi (2) – Oranje (2A) korridor omdat dit beide die Musina Natuurreservaat en die Maremani Natuurreservaat vermy. Uit ’n toerisme-oogpunt geniet korridor 1 die minste voorkeur vanweë die hoë getal toerismeplekke langs hierdie roete. Hierdie plekke maak staat daarop dat die omgewing ongeskonde bly sodat wild kan floreer. Die konstruksie van ’n kraglyn sal die natuurskoon verander en ’n nadelige uitwerking hê op die natuurlike habitat wat vir wild opsy gesit is.

KONSEP-OMGEWINGSBESTUURPLAN

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

Ten opsigte van flora, fauna en avifauna 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 voorkeurkorridor 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. Ná noukeurige oorweging van die sleutelaspekte van die omgewing (dit wil sê biofisiese, sosiale en ekonomiese aspekte), is die voorkeurkorridor Alternatief 1 (**Grys Korridor**). Ten opsigte 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 in ag geneem in die keuse van die voorkeurkorridor.

SLOTSOM

Die resultate van die spesialisstudies is deur Omgewingsassesseringspraktisyn ingespan om ’n geïntegreerde assessering van die voorgestelde ontwikkeling te skep. Die uitkomste van die integrasie en assessering word in hierdie Konsep-omgewingsimpakVerslag (hierdie verslag) gedokumenteer, wat in openbare besit bekendgestel is vir kommentaar. Ná die kommentaartydperk sal kommentaar gekonsolideer word en hierdie verslag bygewerk word vir voorlegging aan die Nasionale Departement van Omgewingsake.

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Baagi Environmental Consultancy

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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)
SDF:	Spatial Development Framework
PES:	Presence of Ecological State

TABLE OF CONTENTS BASED ON CHAPTER 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 registered interested and affected parties;	Chapter 7 and Appendix D

June2010 Regulations ,Section 28 Requirements	Section in Draft EIA Report
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 conditions that should be made in respect of that authorisation;	Section 11

June2010 Regulations ,Section 28 Requirements	Section in Draft EIA Report
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 Limpopo and the SADC Region.

In response to the power allocation in the integrated Resource Plan (IRP) of the government (gazetted May 2011) and the establishment of the Southern African Energy (SAE) unit in Eskom to facilitate the investment in generation and transmission outside South Africa, there is an urgent need to identify critical transmission corridors to ensure power transfer into South Africa from our neighbouring countries. In this case, the proposed project concerned will be establishing 2x500kV power lines from Nzhelele (RSA) Substation to Triangle (Zimbabwe) Substation.

The study area covers the jurisdiction of Vhembe District Municipality whereby Musina Local Municipality is the affected municipality as far as the proposed development is concerned. The main places that will be affected are Musina, Nancefield and Mutali.

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: Group Capital 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 Phase

Taking into consideration that environmental management requires an integrated, holistic, multi-disciplinary approach, the input of various specialists was 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 2x500kV power lines between the Nzhelele and Triangle Substations. However, this report will be solely concerned with the search of a suitable corridor that will be from Nzhelele substation to the Musina (RSA)-Beitbridge (ZIM) border. The Zimbabwe Electricity Supply Authority (ZESA) will be responsible for the power lines from Triangle substation in Zimbabwe to the border where it will join with the RSA powerline. 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 within the study area in GIS format (ESRI: shape files). GIS software (ESRI ArcGIS 10.2 program) was used to create a study area map, which indicates the location of the existing. There was no transmission network in the study area, 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 January 2014. 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, Hydrology, Wetland, Social, Visual, Tourism, Heritage, Agriculture and Avifauna). There was a drive through as well as fly over of the study area by the teams. The specialists were involved at the scoping level and were asked to

provide input based on their respective disciplines. The Draft Specialist Reports to date were used in the compilation of this report.

c. Post Site Visit Meeting

Information gathered during the site visit and desktop study was collected in an attempt to understand the study area, and provide an amalgamated view, from the various specialists, of the possible alternative alignments that must be investigated further. The feasibility of the identified corridors from social, economic and environmental points of view as well as taking into consideration the technical viabilities was evaluated.

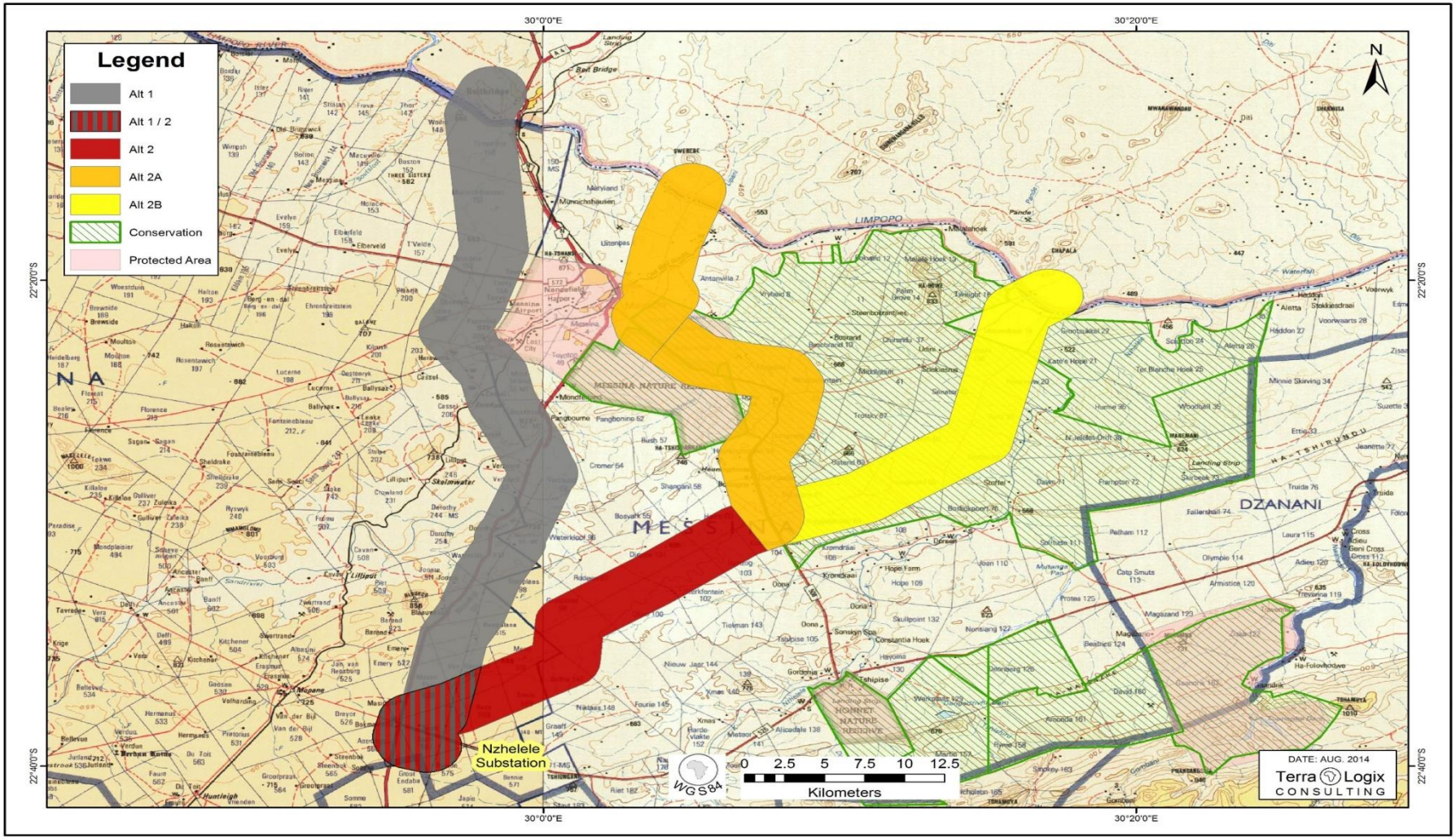

Figure 1: Proposed Project Locality Plan

1.2 PROPONENT

Table 1: Project Proponent Details

PROPONENT DETAILS	
Company Name	Eskom Holdings SOC Limited
Contact Person	Mr Henry Nawah
Postal Address	P O Box 1091, Johannesburg, 2000
Physical Address	Maxwell Drive, Sunning hill Ext 3, Megawatt Park, Sandton
Telephone	011 800 4057
Fax	086 602 9207
Email	nawah@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 Tinashe Maramba
Physical Address	434 Lois Avenue Waterkloof Glen
Postal Address	Postnet Suite 412, P Bag X4, Menlo Park, 0102
Telephone	012 993 0756 x 7
Fax	012 993 0743
Email	makhural@baagi.co.za/tinashe@baagi.co.za

Mr Tinashe Maramba is a qualified Geohydrologist/Hydrologist; he obtained a Bachelor's Degree in Hydrology and Water Resources from the University of Venda in 2010. He is a member of South African Council for Natural Scientific professions (SACNASP) (Provisional). He has 7 years' experience in water and resources management and Geohydrological assessments, attained in Zimbabwe (pre-degree) and environmental management (post-degree).

His South African experience began as a consultant heading the Hydrology/Geohydrology Unit of an Environmental Firm. After developing the division

into a fully-fledged self-sustaining entity, He moved into the role of Environmental Manager at a Pretoria company were he horned his skills in E.I.A Project management, Water Use Applications and Water engineering. Some of the Environmental Projects Mr Maramba has been involved in include:

- Environmental Management Programme (EMPr) Report for the proposed establishment of a Photovoltaic (Solar Panel) Plant On Farm Rietfontein, Erf 1211 In The Phillipstown Area, within the Renosterberg Local Municipality, Northern Cape Province, DEA Reference No: 14/12/16/3/3/2/740, DENC Reference No: NC/Nat/Pix/Ren/Phi/2014
- Scoping Report for the proposed establishment of a Photovoltaic (Solar Panel) Plant on Farm Rietfontein, Erf 1211 in the Phillipstown Area, within the Renosterberg Local Municipality, Northern Cape Province, DEA Reference No: 14/12/16/3/3/2/740, DENC Reference No: NC/Nat/Pix/Ren/Phi/2014
- Basic Assessment and Environmental Management Programme for the Proposed Development of a Weighbridge and associated Infrastructure on Parent Farm Lichtenburg Town And Townlands 27 IP surrounding Erf 1086 to 1093 and Erf 1049 to 1059, along the R503, Lichtenburg Extension 4, in the Ditsobotla Local Municipality, North West Province, DREAD Reference Number: NWP/EIA/79/2014
- Basic Assessment And EMP for the proposed Filling Station Development in Arconhoek with Associated Structures And Infrastructures On Portion 8 Of The Farm Arconhoek 212 KU within the Bushbuckridge Local Municipality, Ehlanzeni District, Mpumalanga Province
- Basic Assessment And EMP for proposed Capacity Upgrade Of Jane Furse Fuel Depot From 23m³ To 480m³ on Remainder of Portion 3 of Farm Vergelegen 819 KS, within the Jurisdiction Of Makhuduthamaga Local Municipality, Under The Sekhukhune District Municipality In Limpopo Province
- Environmental Impact and Scoping Report for the proposed Licensing Of Leandra Landfill Site On Portion 04 Of The Farm Brakfontein 310 IR within the Jurisdiction of Govan Mbeki Local Municipality Under Gert Sibande District Municipality, Mpumalanga Province, Project Ref: 17/4/Wl/Mp307/14/03
- Environmental Management Programme Report for the proposed establishment of a Filling Station on remainder of Portion 29 of Farm Tafelberg 186 HT, Erf 1374, Elukwatini within the Albert Luthuli Local Municipality, Vhembe District Municipality of Mpumalanga Province.
- Basic Assessment Report for the proposed establishment of a Keewave Filling Station On Portion 171 Of The Farm Zeekoelwater 311js in Klipfontein under the jurisdiction of Emalahleni Local Municipality, Nkangala District In Mpumalanga Province, Project Reference Number: 17/2/3n-376

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:

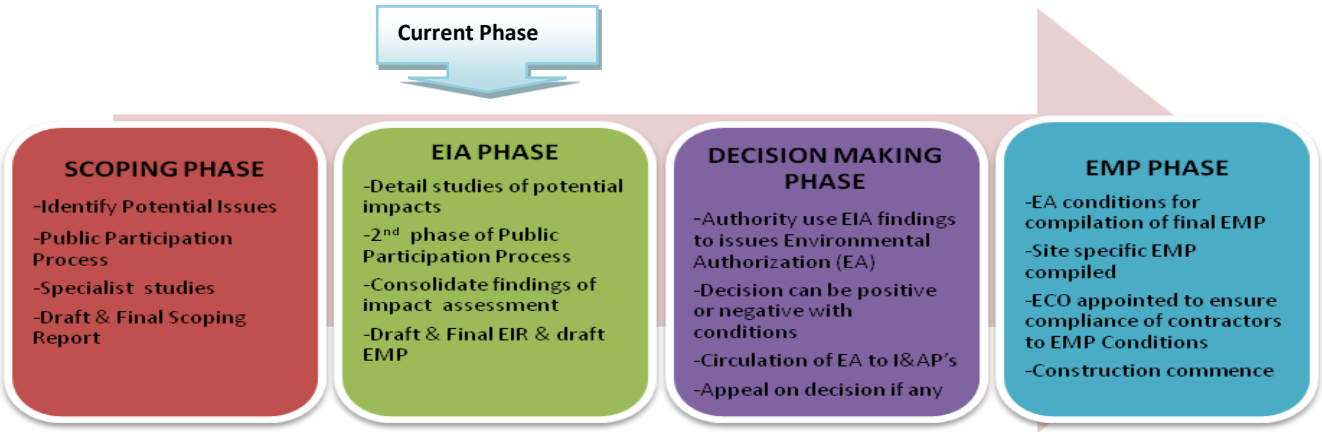

Figure 2: The process Followed for the Environmental Impact Assessment

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 as soon as possible, 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 and the negotiation process of the final route. The EIA study is confined within the boundary of the study area i.e. South Africa; 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 associated with the proposed corridors as a result of the broad width of the corridors. The finer details of the impacts can only be assessed during the EMP phase, whereby there will be a specialist walk down 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 2x500 kV lines has been identified in this draft EIR, the exact positions of the pylons are not yet and the servitude requirements for the 2x500 kV line is 110m (55m wide each). 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 wide 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 Nzhelele-Triangle 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 500kV power lines will be constructed.
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 500kV 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 alterations take place for- (i)linear development activities; or (ii) Agriculture or afforestation where activity 16 in this Schedule will apply.	The condtruction of the transmission lines and Substation will result in the physical alteration of undeveloped, vacant or derelict land.
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;	Construction of roads with a width greater than 4m, outside urban areas, to access construction sites may be necessary.

	(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.	
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.

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 competent authority; (ff) Areas within10 kilometres from national parks or world heritage sites or 5 kilometres from	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.

	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,	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 identified in systematic biodiversity plans adopted by provincial authorities.

	Limpopo, Mpumalanga and Northern Cape: (ii) Outside urban areas, in: (dd) Sensitive areas as identified in an environmental management framework as contemplated in 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:

- Prevent pollution and ecological degradation;
- Promote conservation, and
- 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 –

Any information held by the state; and

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 500kV power line, 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 decommissioning 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 (ANWA) 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:
Taking water from a water resource.
Storing water.
Impending or diverting the flow of water in a watercourse.
Engaging in a stream flow reduction activity.
Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).
Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.
"Disposing of waste in a manner which may detrimentally impact on a water resource.
Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.
Altering the beds, banks, course or characteristics of a watercourse.
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.
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 power lines 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 taking of water from a watercourse for the use during the construction of the pylons

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.

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.

<u>Relevance to Project</u>

A Heritage Resource Permit from SAHRA and LIHRA 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 500kV power line from Nzhelele to the border of SA and Zimbabwe. 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 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 2x500kV power lines may cause the generation of emissions and dust which is governed under the regulations stipulated in the NEMAQA. The generation of high levels of offensive gases and 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:

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

Reduce, re-use, recycle and recover waste;

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

Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;

Prevent any employee or any person under his or her supervision from contravening this Act; and 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 decommissioning activities associated with the construction of the 500kV power line. 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 decommissioning 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.

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 2x500kV power lines and associated infrastructure such as the pylons, may be constructed within protected areas. The construction activities, therefore, will have to be undertaken with consideration to the any standards and regulations stipulated within the NEMPAA.

3.1.9 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 2x500kV power lines 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 2x500kV power

lines and associated infrastructure being constructed within close proximity to any aerodrome.

3.1.10 Occupational Health and Safety Act (Act 185 of 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 inform Eskom on measures and procedures to be incorporated regarding the safety and health of the persons on site.

3.1.11 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 500kV 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.

3.1.12 National Mineral and Petroleum Resources Development Act, 2002 (Act No. 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 2x500kV power lines and associated infrastructure such as pylons may be constructed within mining areas. The NMPRDA regulates the construction of any infrastructure within mining areas and therefore certain requirements, stipulated within the act, will need to be taken into consideration.

3.2 Other Relevant Legislation or Policies Applicable to Eskom

3.2.1 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.

3.2.2 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.

3.2.3 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.

3.2.4 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 Limpopo Province, between Nzhelele and the Zimbabwe international border. The proposed Nzhelele-Triangle Project occurs in the northern parts of the Limpopo Province. The project entails the proposed construction of a 2x500 kV transmission power lines (Built at 500kV & initially operated at 400kV) from the Nzhelele Substation near Musina to the international border of Zimbabwe (approximately 50 km), from where ZESA will take over to link the corridor with the Triangle Substation (approximately 181 km). The proposed project only has reference to the corridor that falls within the ambit of South Africa Based on the length of the proposed transmission lines, two alternative corridors (What about sub-alternatives?) (Each 2km wide and each consisting of two options) have been proposed.

- Alternative 1 (51.5 km) runs northwards along the N1 Highway whereby it deflects westwards at the Sand River. From here it runs northwards along the western side of the Messina Nature Reserve towards Beitbridge;
- Alternative 2A (57.5 km) runs eastwards towards the R508 from where it deviates westwards and following the R508 towards Musina. From here it continues northwards to the Limpopo River; and
- Alternative 2B (52 km) runs north-eastwards to the R508 and continues northwards and west of the Nzhelele River towards the Limpopo River.

The study area affects the following Municipalities' jurisdictions:

- Vhembe District Municipality
- Musina Local Municipality

4.2 PROJECT DESCRIPTION

The proposed Nzhelele-Triangle 2x500kV transmission power lines project entails the following activities:

- Construction of a two 500kV power lines to be operated at 400kV from Nzhelele Substation to Triangle Substation. However, the power lines from Nzhelele will end at the border of SA and Zimbabwe where it will connect with power lines from Triangle in Zimbabwe whereby ZESA is responsible for it.

4.2.1 Technical Specifications for the double circuit 500kV power line:

4.2.1.1 Servitude

The proposed 2x500 kV transmission power lines to be operated at 400kV will require servitude of 55m (refer to Figure 7) in width, i.e. 27.5 m both sides of the centre line and cover a distance of approximately 50km in length. No permanent residence is allowed within the servitude. The servitude is required for the safe operation of the power lines and reliability of electricity supply to consumers. The preliminary/scoping level studies have assessed an entire 3km wide corridor per alignment/corridor alternative. The 3km corridor (You mentioned 2km wide corridor in the study area description) provides sufficient coverage for the assessment of the power line, servitude and associated infrastructure such as access roads.

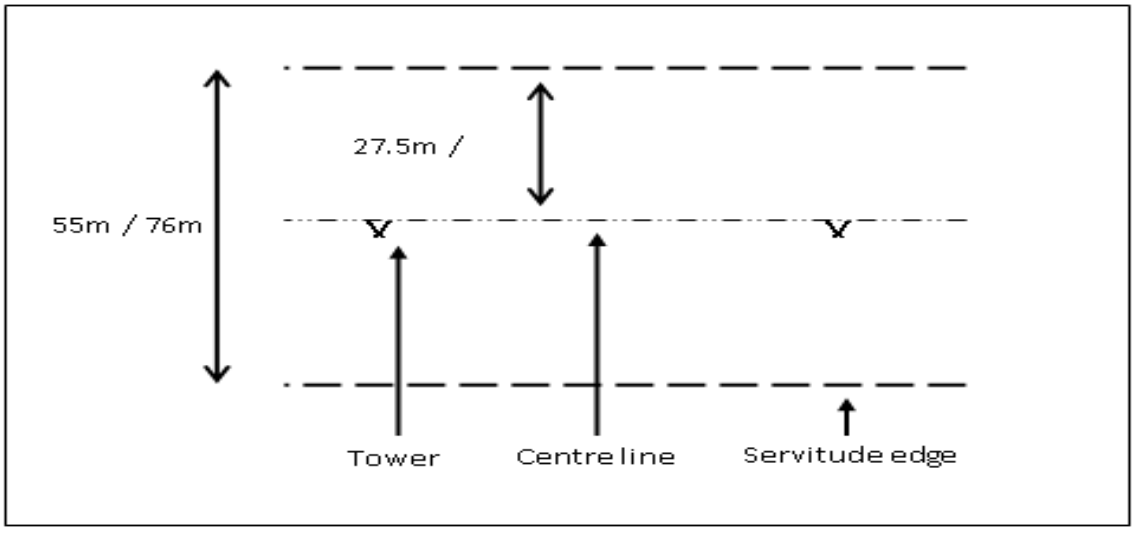

Figure 3: 400kV sevitude illustration (ACER)

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. 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 could be situated within the alignment corridor and will not be more than a hectare in extent. The

construction camp will, when feasible and viable, utilise existing old farm houses instead of erecting new temporary offices.

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. The technical details regarding the associated 500kV line-in-line-out power lines are as follows:

- Single line servitude size is 55m;
- Towers are up to 42m in height;
- Distance between towers is between 350 and 500m, depending on terrain and route angles; and
- Minimum conductor clearance is 8.1m, above ground.

In the case of this project, it is envisaged that following tower types will be considered:

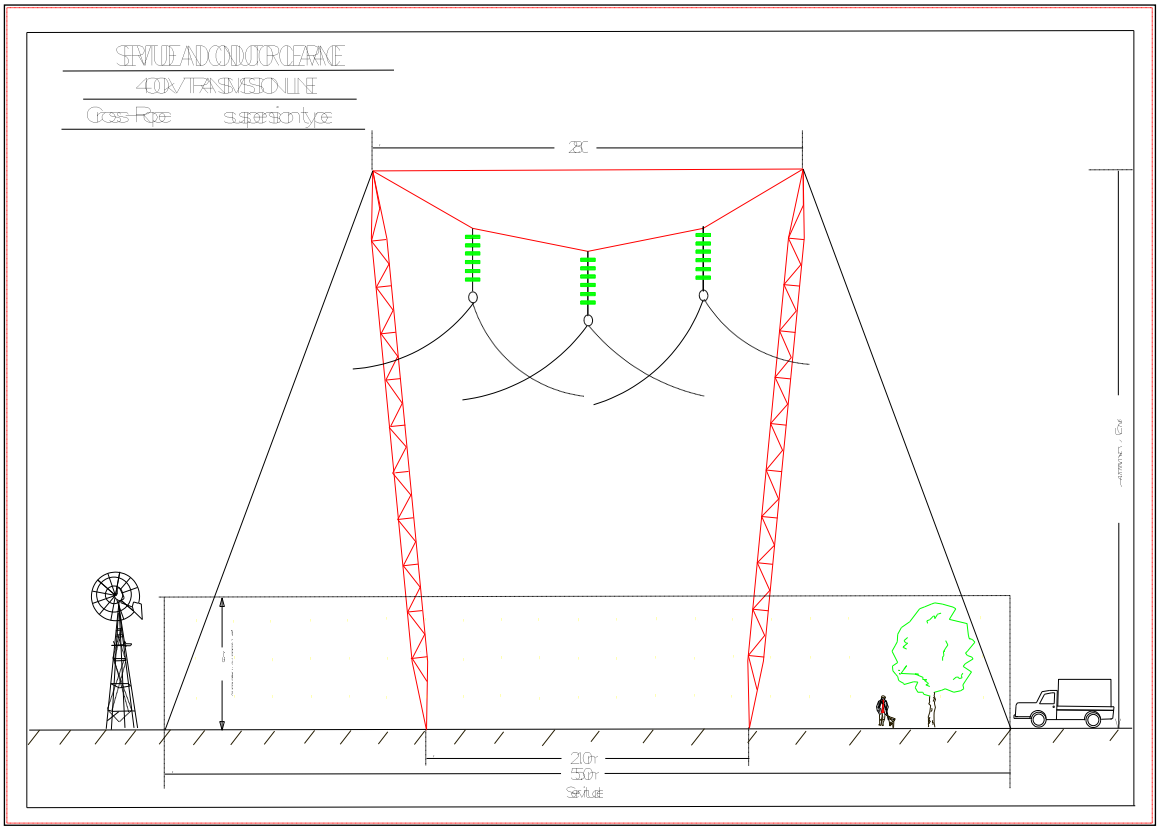

Figure 4: Cross-rope suspension tower

Figure 5: Guyed-V Suspension tower

Figure 6:Self-supporting suspension tower

4.2.1.4 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 and/or septic tank facilities.
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

Access roads will be aligned and constructed within the provisions and specifications of private landowners. This is considered important for three primary reasons:

1. The access road should fulfil multipurpose functions serving the needs of Eskom and the landowners.
2. Landowners are acutely aware of sensitivities on their land, and will be in an excellent position to inform Eskom of optimum alignments.
3. 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; and
- 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.

4.3 Construction, Operation and Decommissioning Activities in Sequence

The actual construction phase for this Transmission power lines will require approximately 24 months to be completed. As mentioned before, 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 cables 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:

4.3.1 Access Negotiations

Negotiations between landowner, contractor and Eskom 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.

4.3.2 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.

4.3.3 Gate Installation

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

4.3.4 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.

4.3.5 Foundation for Steelwork

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

4.3.6 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.

4.3.7 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.

4.3.8 Assembly Team, Punch and Paint

A team will assemble the galvanized steel towers. The tower is assembled whilst it is lying on the ground. 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.

4.3.9 Operation and Maintenance

During operation, Eskom transmission requires access to the servitude to enable maintenance of the transmission power lines. 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 high 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.

4.3.10 Decommissioning

The process of decommissioning any transmission power 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 fall outside the scope of this EIA.

4.4 Use of Services and Resources during Construction

4.4.1 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.

4.4.2 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.

4.4.3 Roads

Existing roads will be utilized as far as possible during the construction and operational periods. 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 being determined during discussions with landowners as part of the negotiation process.

4.4.4 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.

4.4.5 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.

4.4.6 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.

4.4.7 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). There will be an emphasis on job creation during the construction period of this proposed power line.

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.

4.5 Projected Time Frames

In order to stabilize the current situation and meet projected demand, the proposed Nzhelele-Triangle Transmission power lines should be operational by 2018. Construction usually takes up to 24 months, therefore, Eskom wishes to commence with construction early in 2017.

4.6 The need and desirability of the Project

In response to the imported power allocation in the Integrated Resource Plan (IRP) of the Government (gazetted May 2011) and the establishment of the Southern Africa Energy (SAE) unit in Eskom to facilitate the investment in generation and transmission outside of South Africa, there is an urgent need to identify critical transmission corridors to ensure power transfer into South Africa from our neighbouring countries. A high level report was compiled, describing the potential transmission corridors between South Africa, Botswana, Zimbabwe and Mozambique.

The report was a follow-up on the Grid Planning Report GP 12/69 “Strategic Transmission Corridors between South Africa and Zimbabwe to enable Regional Trading”. The focus of this report will be the discussion on the technical impacts and benefits of three different corridor expansions, by means of technical analysis.The study area incorporates the Eskom Northern Grid, BPC network, ZESA network and EdM northern network. By strengthening the ZESA internal network, the power transfer can improve by 173 MW. When comparing the three corridors, the corridor via Nzhelele and Chibata will provide the highest additional transfer, i.e. 516 MW after the internal ZESA network is strengthened. The second best improvement is the Nzhelele corridor via Bindura providing additional 351 MW (501 MW). Strengthening the existing corridor 1 provides an improvement of 22 MW.

The base network results in very similar power transfer limitations. The BPC network is utilised more when generation is injected from the North than the East. The worst performing corridor is Corridor 1 which is very dependent on the location of future generation. Corridor 2 outperforms Corridor 1 during this contingency scenario. It supports northern generation very well, but does not do equally well with generation from the east. Both Corridor 2 routes perform very similar for generation from either location. Preference would lean towards Corridor 2B (via Chibata) due to higher transfer limits for east generation and minimal difference for north generation.
The other contingency that was tested is the outage of the Triangle-Nzhelele 400 kV line. Matimba-Phokoje 400 kV line contingency is however a worse outage than Triangle-Nzhelele 400 kV line for Corridor 2.Results of this contingency are not shown explicitly in this report. Steady state and contingency analysis indicate that Corridor 2B would be the preferred corridor to construct first. This is due to its generally higher increase in power transfers and its better support for additional generation irrespective of its future location.
Corridor 2B has the most technical and other benefits associated with it when compared to other corridors. This corridor is recommended as the preferred investment choice from a strategic perspective. This corridor entails the following substation connections:

- **Nzhelele to Triangle 400 kV line (this report emphasise on this line only)**
- Triangle to Orange Grove 400 kV line with Orange Grove 400/330 kV transformation
- Orange Grove to Chibata 400 kV line with Chibata 400/220 kV transformation
- Chibata to Matambo 400 kV line with Matambo 400/220 kV transformation

It also assumes that the following infrastructure is available and in service:

- Second Songo 330/220 kV transformer
- Nzhelele to Borutho 400 kV line

- Medupi-Witkop 400 kV line
- Both Masa-Selemo 765 kV lines

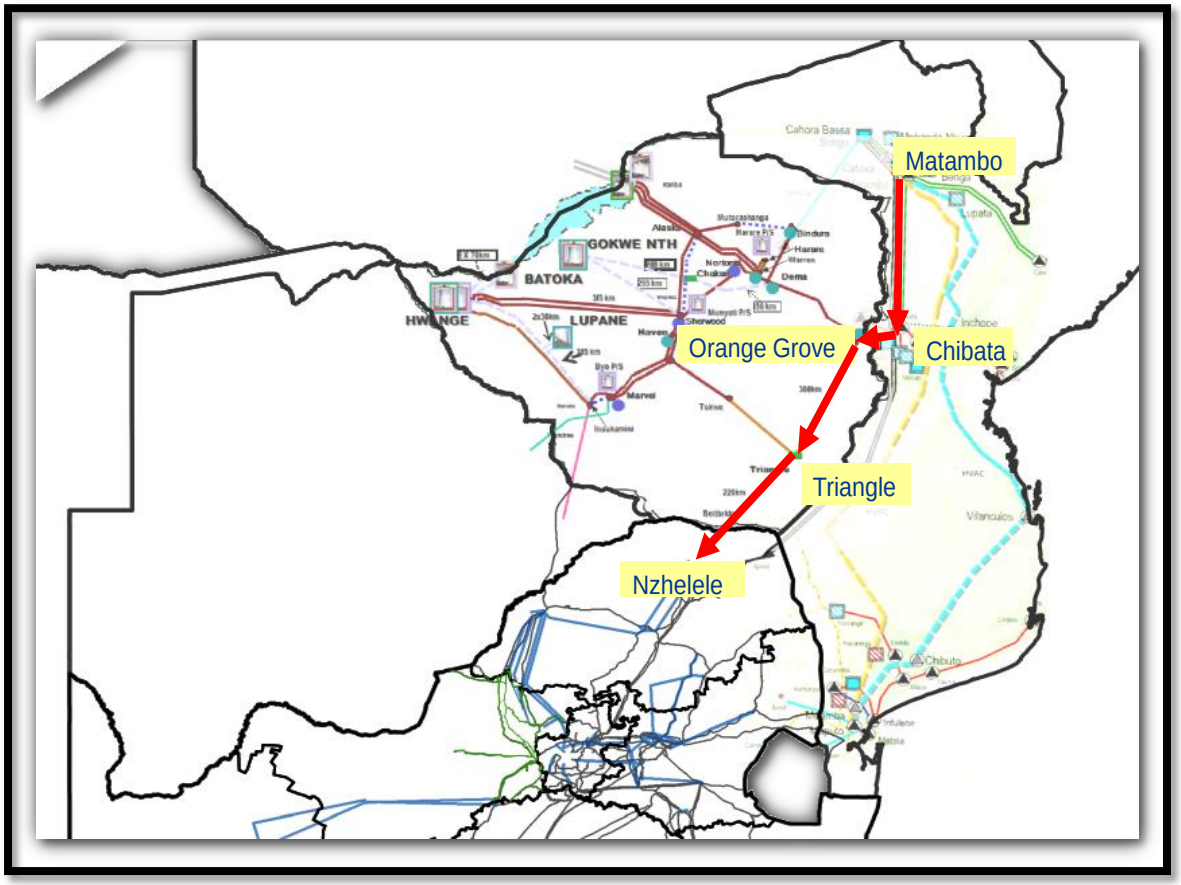

Figure 7: Illustration Represents the Southern African Energy Corridor.

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. The criteria for selecting a suitable or viable alternative will take into consideration environmental constraints and social and economic factors.

5.1 Alternatives Considered

5.1.1 Technology Alternatives

5.1.1.1 Overhead vs. Underground Power Lines Alternative

5.1.1.1.1 Overhead Power line

Overhead power lines can be easily modified to meet customer requirements and maintenance and upgrading can be easily done. The cost of overhead is more feasible compared to the underground line. Thus, overhead is preferred by Eskom because it has the responsibility to provide cost effective and reliable energy resources. Another important factor is that overhead line can generally span and not disturb sensitive features such as cultural resources sites, streams, wetlands, isolated steep slopes, and sensitive species habitat. The other advantage is that overhead lines are constantly cooled by air/wind but underground lines need oil for cooling.

5.1.1.1.2 Underground Power line

It is not economically viable to place a transmission line of this high voltage underground (in this case, a two 500 kV transmission line is proposed) as the cost is estimated at 10 times more than for conventional overhead transmission lines.

In addition to the cost factor, it must be noted that underground transmission lines are oil cooled, requiring sealed conductors significantly larger in diameter than overhead conductors, which are air-cooled. The larger conductors require a larger servitude to keep the conductors apart. Ultimately, a servitude approximating the width of a 10-lane highway may be required for one underground transmission line. Of significance with

this servitude is that the line would need to be buried to a depth of between 1.5 m and 2 m, generating significant spoil that will need to be disposed and the potential pollution to underground water resources in case of oil spills, etc. Underground cables are difficult to maintain, it takes days to find the exact fault with the lines as opposed to overhead lines. Also, once completed, the servitudes would need to be maintained in an open, grassed fashion. Not only is this inappropriate for some parts of the study area, but, importantly for landowners, the servitude area becomes sterile for the purposes of continued agricultural activities.

Taking into consideration the cost implications as well as the technical complexities and environmental impacts incurred by the underground power lines, **this alternative will not be investigated further in this EIA process.**

5.1.2 Alignment Alternatives

All two proposed route (what about sub-alternatives) alignments identified so far for the project have been buffered with a 2km wide corridor, in which the 55m servitude will be incorporated. These two alignments alternatives however, do not represent the final scenarios. 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 500kV power lines from Nzhelele Substation to international border of Zimbabwe. The following sections contain descriptions of the two proposed route corridors which range from 50km to 58km in length.
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 various alignments and consultation with I&APs will be undertaken during the EIA phase of the project.

5.1.2.1 Alignment Selection Criteria

5.1.2.1.1 Alternative Alignments (Alternative 1 to Alternative 2)

Alternative alignments 1 to 2with their sub alignment alternatives 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:

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

- Accessibility.

5.1.2.1.2 Alternative 1 (Grey Corridor)

The proposed Alternative 1A is approximately 51.5km in lengths and it runs northwards along the N1 Highway whereby it deflects westwards at the Sand River. From here it runs northwards along the western side of the Musina Nature Reserve towards Beitbridge. There are agricultural practices occurring on the eastern component of the corridor and in this regard it would be beneficial if the power-lines were positioned along the main road or in the central part of the corridor. However, there is an agricultural establishment in close proximity to the road where tunnels are used and although not large scale, could be avoided by moving the direction of the power-lines toward the centre of the corridor.

Further up the grey corridor there are agricultural practices in the eastern sphere of the corridor. It would therefore be considered valuable if the power lines maintain a position in the centre of the corridor. A component of Nancefield community is positioned within the edges of the corridor, which is a sensitive area from a socio-economic perspective. A purple corridor does affect aerodrome but the status of the aerodrome is not yet confirmed but there is potential impact on those aerodrome. The proposed corridors are located within the Limpopo River Catchment. The important rivers and drainage lines to be crossed by the proposed corridors are few and include the Sand River although numerous seasonal tributaries and drainage lines are to be crossed. Alternative 1A mostly traverse Limpopo Ridge Bushveld.

5.1.2.1.3 Alternative 2a (Red+Orange Corridor)

The proposed Alternative 1 is approximately 57.5 km runs eastwards towards the R508 from where it deviates westwards and following the R508 towards Musina. From here it continues northwards to the Limpopo River. From a tourism value perspective, the future power-lines have the potential to affect the intangible value placed on the reserves used for tourism in the area, such as Musina Nature Reserve and Maremani Nature Reserve. This is as it would affect a tourist's perception of the area and their possible expectation of having no obtrusive man-made infrastructure in reserves. It has the potential to affect the tourism experience. There is however a power-line currently in the Maremani Nature Reserve which is located close to the N1 road.
The extent and diversity of the land cover categories on each respective corridor show that Alternative 2A is *less* transformed when compared to the other corridors. In addition, a large section of Alternative 2A traverses the large Maremani nature reserve. The proposed corridors are located within the Limpopo River Catchment. The important

rivers and drainage lines to be crossed by the proposed corridors are few and include the Sand River although numerous seasonal tributaries and drainage lines are to be crossed. Alternative 2A mostly traverse Musina Mopani Bushveld but it also affects Limpopo Ridge Bushveld. In addition, the high spatial heterogeneity in micro-habitat types presented by these landscape features is more likely to hold a higher floristic richness to the Musina Mopani Bushveld.

5.1.2.1.4 Alternative 2b (Red+Yellow Corridor)

The proposed Alternative 2B is approximately 52 km runs north-eastwards to the R508 and continues northwards and west of the Nzhelele River towards the Limpopo River. From a tourism value perspective, the future power-lines have the potential to affect the intangible value placed on the reserves used for tourism in the area, such as Musina Nature Reserve and Maremani Nature Reserve.

The extent and diversity of the land cover categories on each respective corridor show that Alternative 2B is *less* transformed when compared to the other corridors. Alternative 2B mostly traverse Musina Mopani Bushveld but it also affects Limpopo Ridge Bushveld. In addition, and as is the case with route 2A, the high spatial heterogeneity in micro-habitat types presented by these landscape features are more likely to hold a higher floristic richness to the Musina Mopani Bushveld.

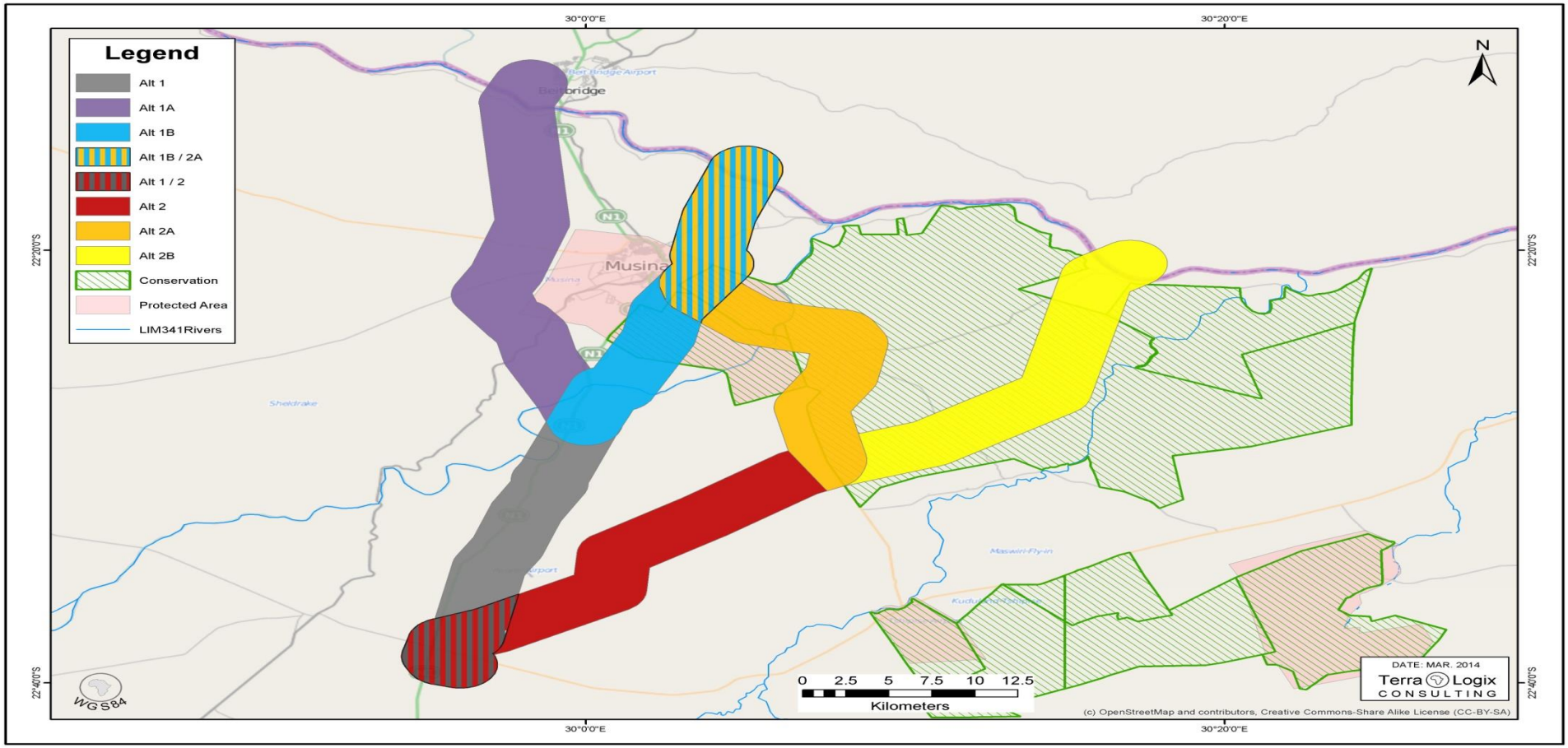

Figure 8: Represents the study with the project alignment alternatives (Alternative Route 1B has since been discarded)

5.1.2.2 Screening Criteria for Rating Alignment Alternatives

Alignment alternatives will be rated based on the main environmental and socio-economic aspects of the study area. The main aspects 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 Limpopo Biodiversity 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.

All the alignment alternatives were investigated within the scoping phase. The ratings will be done from Alternative 1, 2a and 2b. The higher the scoring in terms of rating alternatives, the more unfavourable the alternatives will be whereas the lower the scoring the more favourable the alternative to be taken further into the Impact Assessment Phase of the EIA process. Detailed in **Table 4** are the criteria and ratings selected to determine which alternatives are most suited to take into the Impact Assessment Phase and which ones needs to be discarded.

Weighting keys:

0= No significance
1= Low significance
2= Medium significance
3= High significance

Table 4: Screening of Alignement Alternatives

Environmental and Economic aspects	Alternative 1 (Grey Corridor)	Alternative 1a (Purple Corridor)	Alternative 2 (Red Corridor)	Alternative 2a (Orange Corridor)	Alternative 2b (Yellow Corridor)
1. Opencast & Underground Mining	0	2	0	0	0
2. Agricultural Activities	2	2	1	1	2
3. Footprint (Servitude)	1	1	1	2	2
4. Infrastructure (e.g. Aerodromes, Railways, roads)	1	2	1	2	0
5. Highly Sensitive Habitats	2	1	3	3	2
6. Significant Ecological Corridors (ENPAT)	1	1	1	2	2
7. Wetlands	2	2	2	2	3
8. Cultural and Historical Aspects	1	3	1	1	1
Total Score ratings	**10**	**15**	**10**	**13**	**12**

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.

As detailed in **Table 4**, the initial screening of the alternative has indicated that the potential environmental and socio-economic impacts for **Alternative 1b** is considered to be highly significant and therefore, **Alternative 1b will not be investigated further within the Impact Assessment Phase.**

At this stage, **Alternative 1a, Alternative 2a**and **Alternative 2b will be taken into the Impact Assessment Phase** of the project for further investigation and consideration. Illustrated in **Figure 9**, are the alignment alternatives that are being taken into the Impact Assessment Phase.

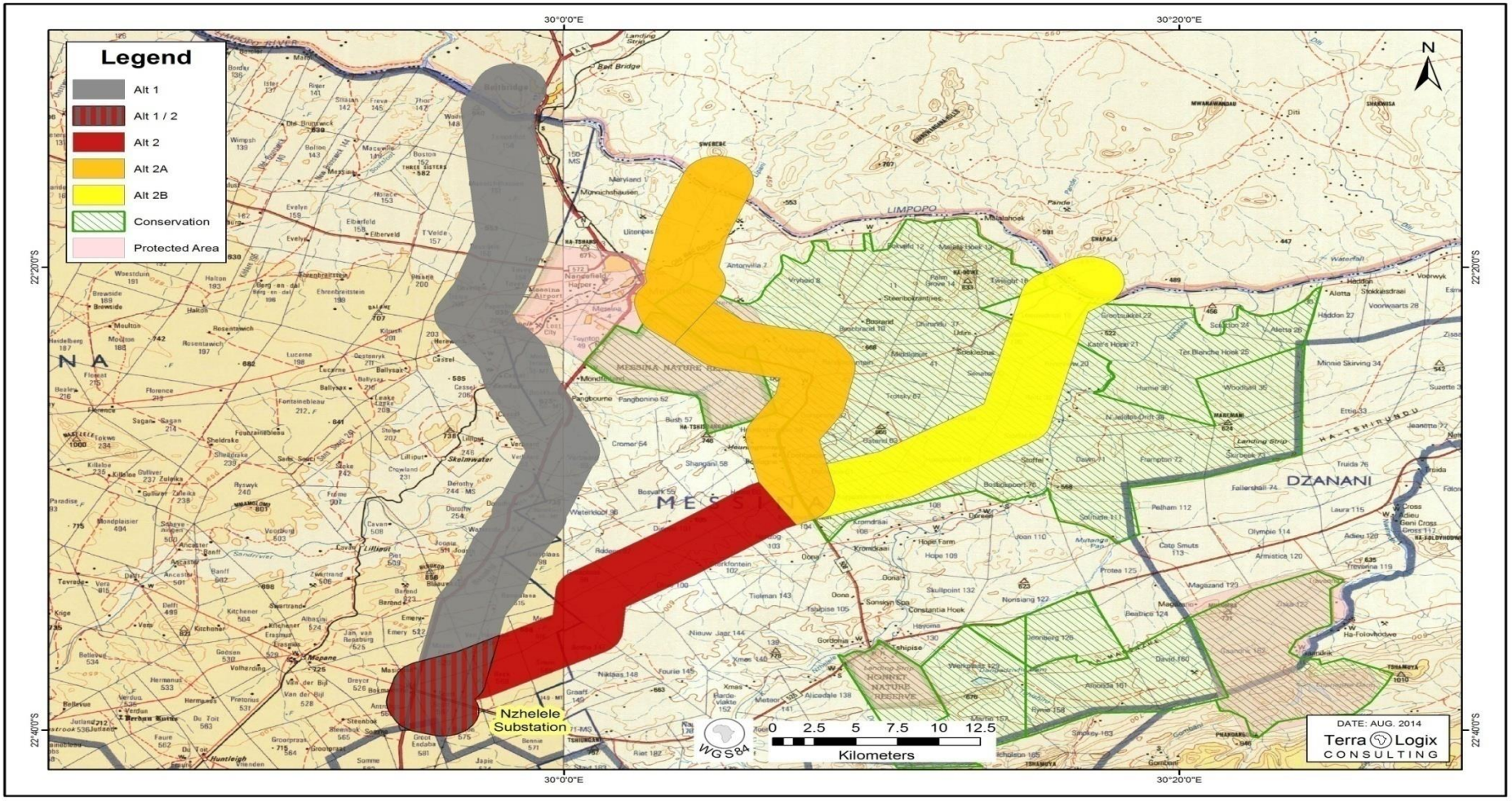

Figure 9: Alignement alternatives to be taken into the impact Assessment Phase.

5.1.3 Source of Energy Alternative: Renewable Energy

Renewable energy is defined as energy that is in constant supply and therefore, cannot run out. Renewable energy sources include wind, solar, water (hydropower), biomass and geothermal. Wind, solar and hydropower are all regarded as clean energy because no water or air pollution is generated during the energy generation process. Most energy in South Africa is generated through the use of coal fired power stations of which the greatest of coal energy is in the Mpumalanga Province.

The study area region has the potential to establish solar power as an alternative to the traditional source of power in South Africa, which is coal. Burning coal is one of the sources of carbon dioxide (CO_2) emitted as end product. Carbon dioxide is one of the greenhouse gases that contribute to the climate change. The amount of electricity received from solar power depends on the amount of sun during the year. Globally, solar power is a significant energy source, producing about 18% of the world's electricity.

The aim of proposed project is primarily in response to the power allocation in the integrated Resource Plan (IRP) of the government (gazetted May 2011) and the establishment of the Southern African Energy (SAE) unit in Eskom to facilitate the investment in generation and transmission outside South Africa, there is an urgent need to identify critical transmission corridors to ensure power transfer into between South Africa and neighbouring Southern African countries (Botswana, Zimbabwe and Mozambique).in this case, the proposed project concerned with establishing 2x500kV power lines from Nzhelele (RSA) Substation to Triangle (Zimbabwe) Substation. Therefore, any alternatives regarding renewable energy would not be appropriate as it will not aid in transmitting electricity from Nzhelele Substation to Triangle Substation or verse versa. **This alternative will not be investigated further during Impact Assessment Phase.**

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 the mandate of the power allocation in the integrated Resource Plan (IRP) of the government (gazetted May 2011) and the establishment of the Southern African Energy (SAE) unit in Eskom to facilitate the investment in generation and transmission outside South Africa. Doing nothing would have a major impact on the future planning on the Integrated Resource Plan within the Southern African Energy unit.

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 Limpopo Province could potentially stunt economic growth both in Limpopo and South Africa in general. Considering the need for a steady supply of electricity in the province and country in general, **this option will still be further considered during Impact Assessment Phase**.

6. DESCRIPTION OF THE RECEIVING ENVIRONMENT OF THE STUDY AREA

6.1 Description of Social Environment

6.1.1 Vhembe District Municipality

Vhembe was originally settled by now-expired tribes of Khoisan peoples. It was later settled by the Venda people (recently migrated from what is now Matabeleland South in Zimbabwe), who constitute a majority of the population of Vhembe today. Venda communities are only found in Vhembe district and as a result, there are no existing Venda communities or villages outside the district. Vhembe means Limpopo River in the Venda language.

6.1.2 Musina Local Municipality

Musina Local Municipality falls within the Vhembe District Municipality, which is made up of four local municipalities, namely Musina, Makhado, Thulamela and Mutale, of which Musina Local Municipality is bounded by Makhado Local Municipality to the South and Mutale local Municipality to the east. Musina is also bounded in the South West by the Local Municipality of Blouberg which falls within the Capricorn District Municipality. Musina Local Municipality is located in the very North of the Limpopo Province, bordering Botswana and Zimbabwe. Musina Local Municipality covers an area of approximately 757 829 ha that extends from the confluence of the Mogalakwena and Limpopo rivers in the West to the confluence of the Nwanedi and Limpopo rivers in the East and from Tshipise and Mopane in the South to Botswana/Zimbabwe borders in the North. The municipal area consists mainly of commercial farms and only 0.08% of the total area is urban in nature.

The spatial structure of the municipality falls within the second order settlement as depicted by the hierarchy as contained in the Spatial Rational and therefore the spatial framework is aligned to the NSDP, ASGISA and the LEGDP. The settlement hierarchy of Musina municipality as per the spatial rationale is as follows:

- Musina (Musina and Nancefield) can be described as a provincial growth point (1st order settlement) due to their relative high level of economic activity and rendering of services to local and surrounding communities.
- Madimbo, Malale, Tshikhudini, Tanda and Domboni can be described as 5th order settlements due to their small populations and the fact that they are only functioning as residential areas with no economic base. The potential of these settlements for future self-sustainable developments is extremely limited.

- Tshipise can be described as a 3rd order settlement (local service point) due to its function in terms of limited service delivery to the surrounding commercial farming areas, tourism attraction and nature conservation.

6.1.2.1 Land Claims and Ownership

The bulk of state land (National and Provincial) apart from a few individual farms is around the town of Musina and make up 8% of land holdings of the municipality. Land owned by the local municipality consists of 27 farms, distributed throughout the municipality and make up 2% of land holdings within the municipality. Private land consists of 786 (59%) within the municipality. The institutional land falls in two large clusters mainly owned by de Beers Consolidated Mines and the South African Development Trust, located around the Venetia diamond mine and the Domboni/Madimbo areas respectively.

Mixed and ownership sites constitutes parent farms that have been subdivided and the subdivisions are owned by the state, privately or by an institution. However, they only constitute some 1% of land ownership within the municipality.

There are 351 land claims lodged on 351 farm subdivisions, covering some 27% of the municipal area. These claims will have a significant impact on spatial developments within the municipality. Twenty one of these claims are on state land, located mainly along the National road and rail routes and adjacent to Mapungubwe.

6.2 Social Profile

6.2.1 Population Figures

The table below indicates that the population of Musina Local municipality from census 2001 was 39 310 and 57 195 from 2007 community survey. It reveals that from 2001 to 2007 the population of Musina has increased by 17 885 people.

Table 5: Population growth trends in Musina Local Municipality

CENSUS 2001	39 310
Community Survey 2007	570195
Population growth	17 885

SOURCE: Census 2001 & Community Survey 2007

6.2.2 Economic Growth and Increased Employment

The main contributors to the economy of Musina municipality are : Agriculture, Forestry and Fishing (35%), Mining (30%), Transport and communication (15%), Manufacturing (11%), Finance and business services (9%), wholesale & retail trade, catering and accommodation (6%), community, social, personal services (6%), government services (5%), construction (5%). The unemployment rate stands at 25% with the highest percentage amongst the youth aged between 15 to 19 years and declining with age. Musina local municipality contributes 11% of GDP to the Vhembe district municipality.

Employment and income indicator	Number	Percentage
Employed	16 197	41.2%
Unemployed	5 384	13.6%
Not economically active	5 073	12.9%
Total 15-65 years	**26 654**	
Income: None-R800	7 983	69.8%
Income: R801-R3 200	2 341	20.8%
Income: R3 200 and above	1 253	10.8%
Total households	11 578	**100%**

Table 6: Employment and income indicators

6.3. Infrastructure

There are various land uses and established facilities within the proposed corridors that will need to be taken into consideration in determining the potential the socio-economic effects.

Four aerodromes have been identified, that have the potential to be impacted on by the proposed 2x500kV power lines, within the study area as well as within close proximity to the study area.. At the moment the status of those airfields are not yet known, however the request of the status of this airfields were made with Civil Aviation Authorities and all the identified airfields were buffered with 3km radius.

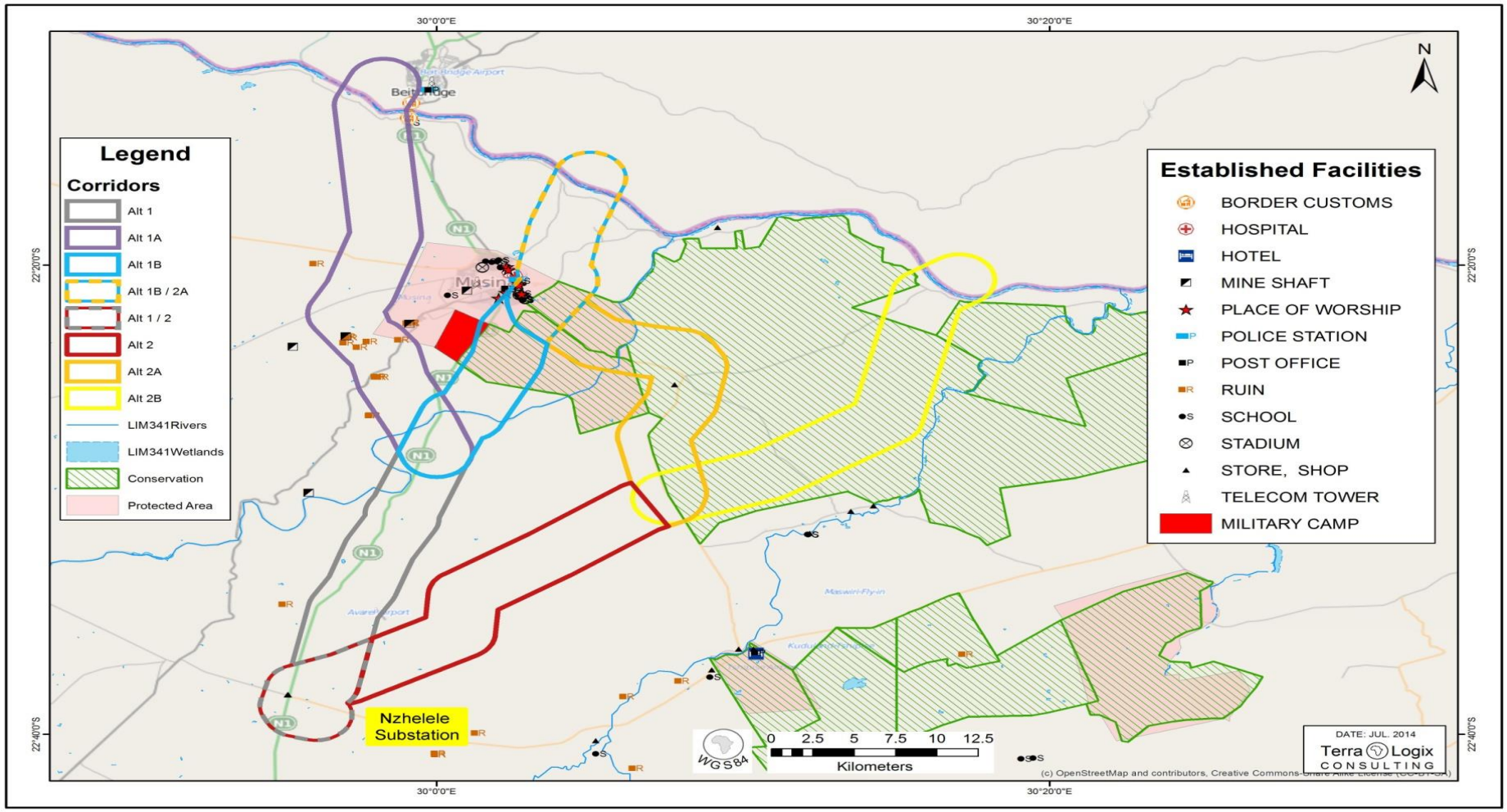

Figure 10: A map representing established faciliities potentiall to be affected by proposed corridors

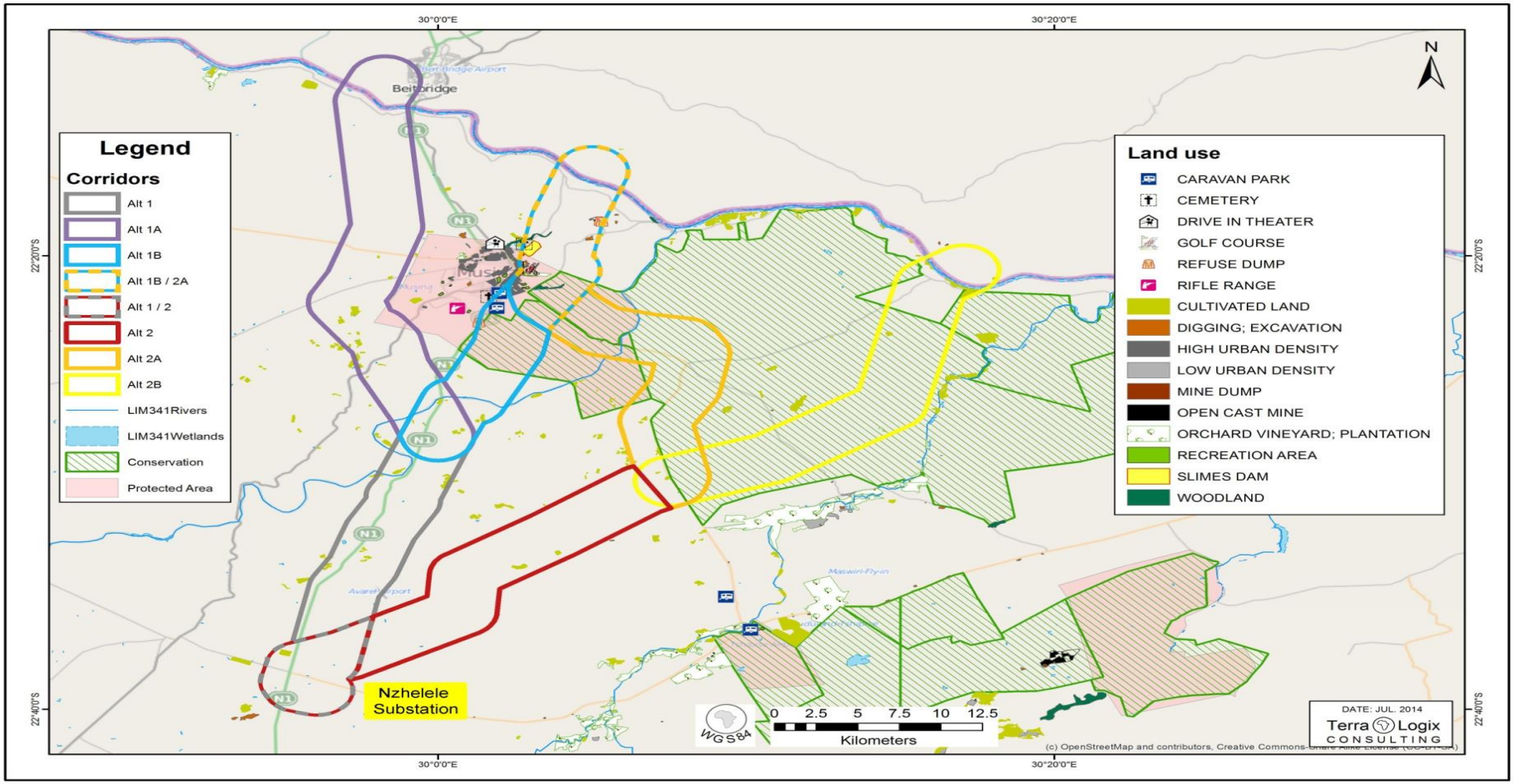

Figure 11: A map represnting land uses potentially to be affected by proposed corridors.

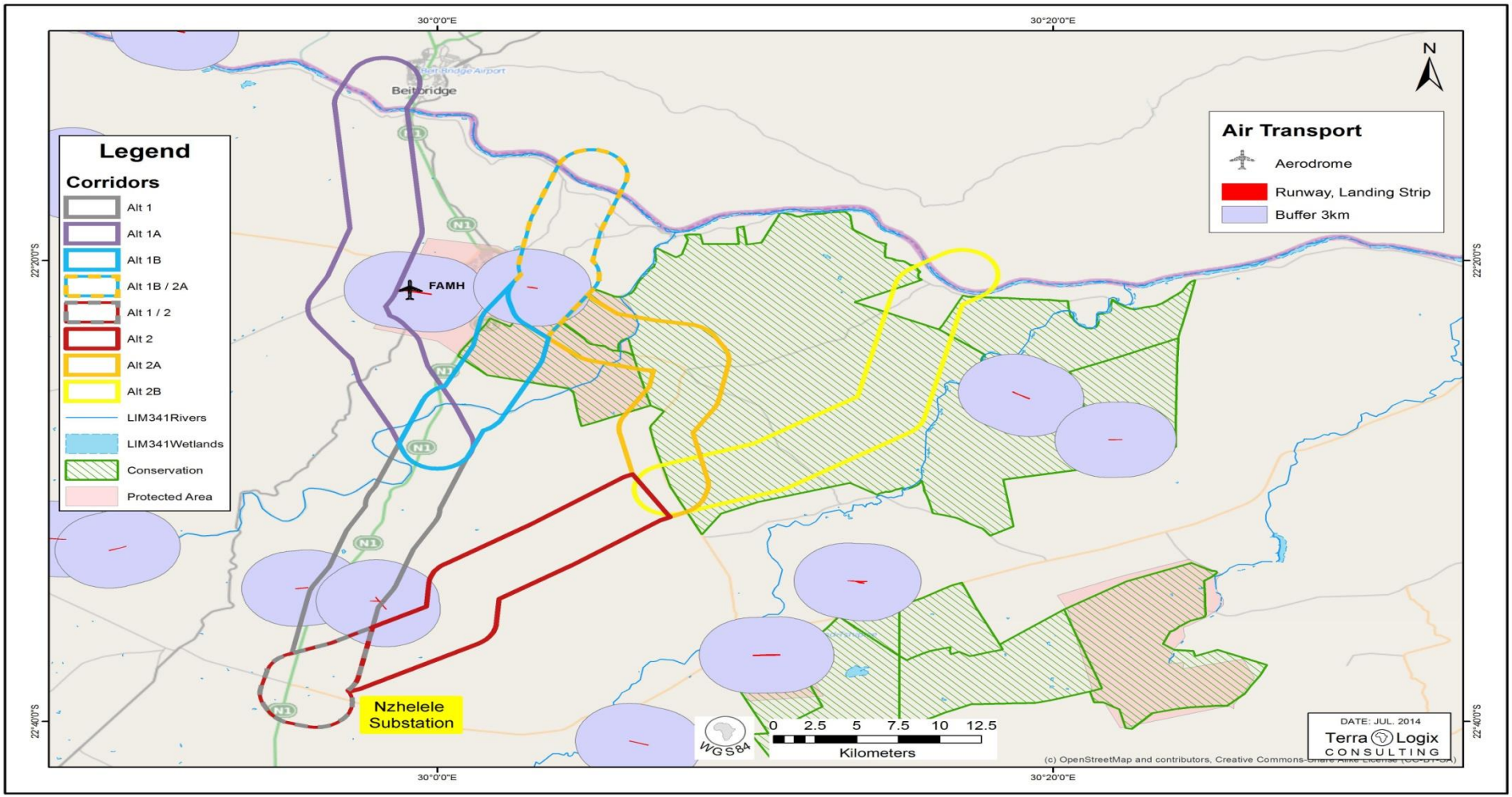

Figure 12: Local Civil Aerodrome Locality Plan

6.3.3 Roads and Railways

The area has a well-developed road network, especially the N1 which stimulates development between the economic hub of the Musina area to the international border of Zimbabwe. Other important secondary corridors include the R508and R572 which connects Musina and other areas such as Tshipise and Alldays. There is railway line exist within the study area, a railway linking Musina with Louis Trichardt (Makhado).

6.4 Tourism Industry

From a tourism value perspective, the future power-lines have the potential to affect the intangible value placed on the reserves used for tourism in the area, such as Musina Nature Reserve and Maremani Nature Reserve. This is as it would affect a tourist's perception of the area and their possible expectation of having no obtrusive man-made infrastructure in reserves. It has the potential to affect the tourism experience.
Musina has a wide range of tourism attraction spots like Vhembe Dongola National Park, Mapungubwe International heritage site De beers game farm, Musina nature reserve, Poppalin
ranch, Ratho crocodile farm, Beit bridge, Limpopo river, Iron ore mine, Musina old copper mine, De beers diamond mine, Spirulina plant, Nwanedi and Tshipise, in the area there are numbers of game farms, conservancies, national parks, nature reserves, and resorts that have been established and developed, and significant initiatives concerning tourism and conservation in or affecting the area are in progress.

The reserves have the following value for tourism:

- Musina Nature Reserve: features as a reserve that is known for the conservation of the baobab tree. It has a Day visitor's area, Educational centre and a tented bush camp.
- Maremani Nature Reserve: The significance of the reserve is in it's the restoration and rehabilitation of animal and plant species as well as its archaeological heritage, such as the rock art. The rock art is representative of the Stone as well as Iron Ages and there are 6 spots that have been set aside for the viewing of the art. They are called "Tombo-la- Thudwa, Yellow Giraffe Shelter, The Work Surface, Shelter of the Moon and Cloud Game Hill".

7. DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

7.1 Climate

The climate patterns within study area (Musina) experiences a hot semi-arid climate with hot temperatures most of the year. Average annual precipitation amounts to

372 mm and is highly concentrated in the summer months from October to April when severe late-afternoon and evening thunderstorms are common. Winter is extremely dry, with almost no precipitation, typically recorded in the driest months from June to August. Clear skies and exceptionally low humidity at this time of the year enable temperatures to plunge close to freezing at night, although frost is fairly uncommon. Droughts frequently occur during the winter months, and infrequently during summers when very little rain falls and drought conditions prevail. These erratic summer droughts are becoming more common as climate change continues. The elevation of this region varies from 750 to 1,400 m and the annual rainfall from 350 mm in the west to 600 mm in parts of the northeast.

7.2 Geology

The Bushveld is one of the most mineral-rich regions of the world. This is due to the Bushveld igneous complex, an extremely rich saucer-shaped geological formation that stretches over more than 50,000 square kilometers. This formation contains most of the world's reserves of minerals such as andalusite, chromium, fluorspar, platinum and vanadium. 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.

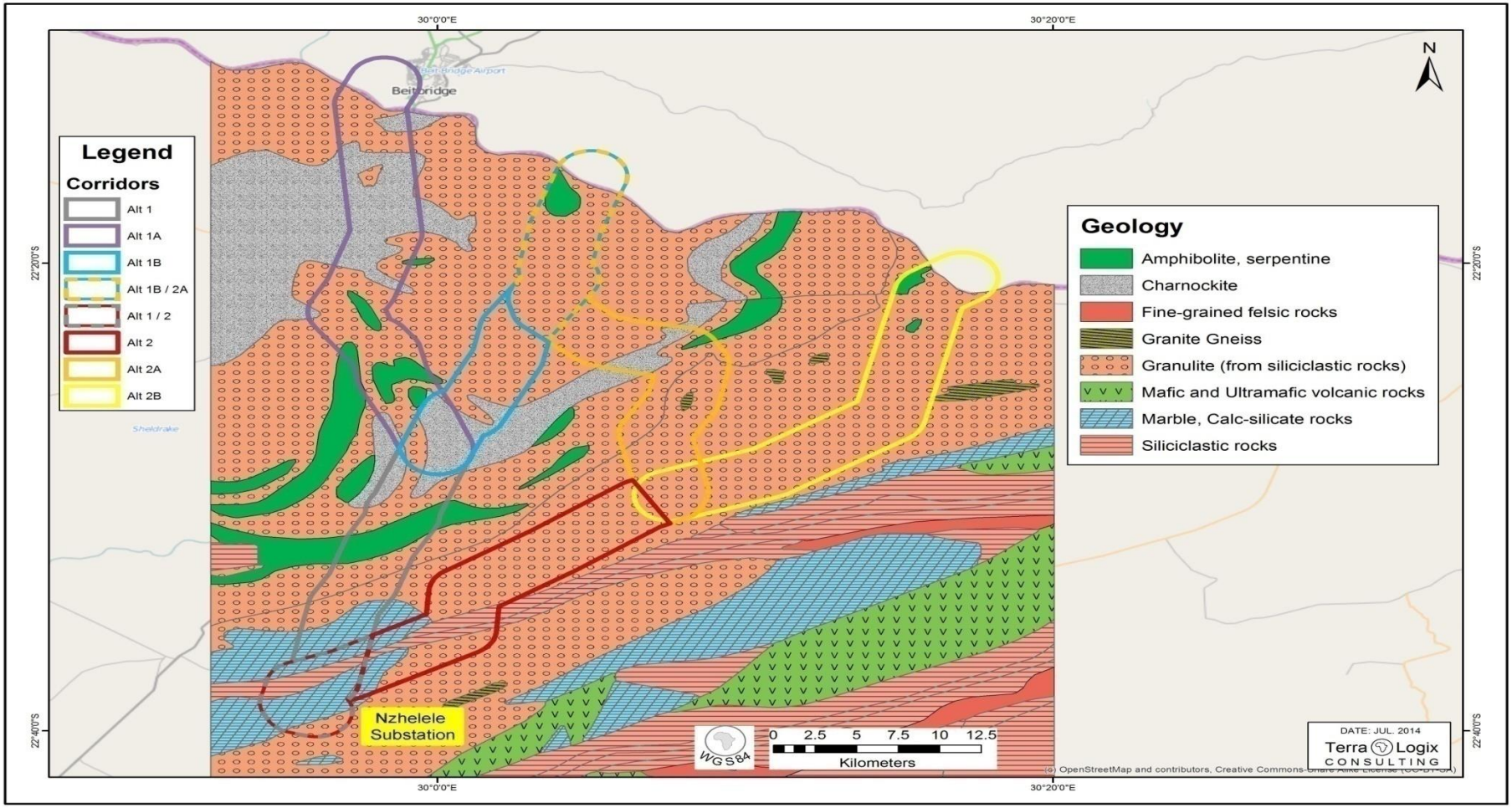

Figure 13: Regional Geological Structures

7.3 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.

7.4Surface Water

The proposed corridors are located within the Limpopo River Catchment and the affected quaternary catchments area. The important rivers and drainage lines to be crossed by the proposed corridors are few and include the Sand River although numerous seasonal tributaries and drainage lines are to be crossed. It is evident that Alternative 2A and Alternative 2B will cross more drainage lines when compared to Alternative 1.

7.5 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 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.

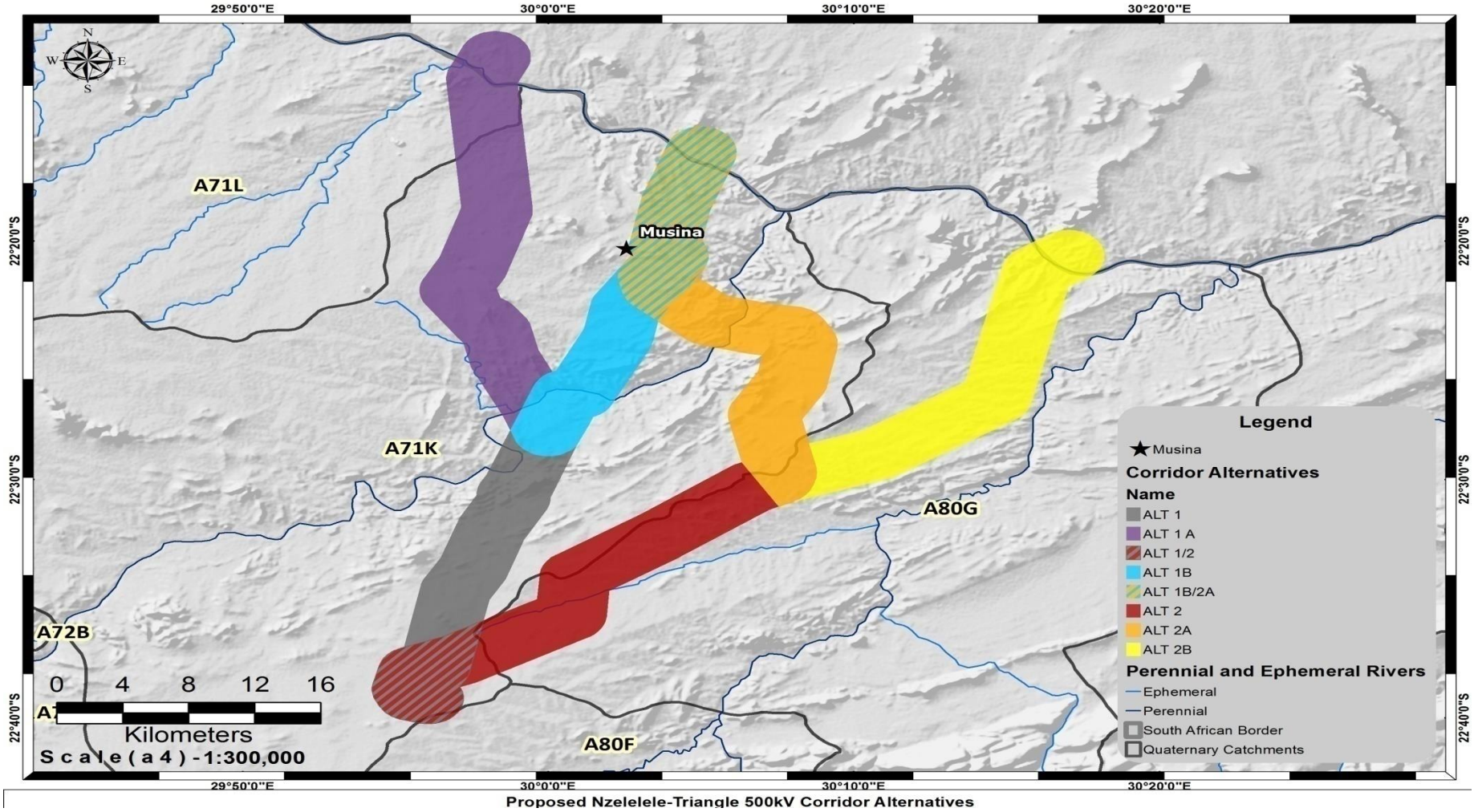

Figure 14: Primary and Quaternary catchment affected by the proposed corridors.

7.6Ecology

7.6.1 Regional Vegetation

The study area corresponds to the Savannah Biome and more particularly to the Mopane Bioregion as defined by Mucina& Rutherford (2006). The proposed corridors comprehend two ecological types known as (a) Musina Mopani Bushveld, and (b) Limpopo Ridge Bushveld

(a) Musina Mopani Bushveld: This vegetation type extends from Baines Drift and Alldays in the west, eastwards and north of the Soutpansberg to Banyini Pan. It is predominantly located on undulating plains that are irregularly interspersed by tributaries of the Limpopo River. On the study area, it forms a moderately open, albeit arid savannah dominated by *Colophospermummopane*, *Terminaliaprunoides*, *Commiphora*species and *Combretumapiculatum*. The field layer is well developed and tends to become more open during the dry season. The herbaceous layer is poor in species richness.

This vegetation type was widespread, least threatened and dominant on the study area.

(b) Limpopo Ridge Bushveld: This bushveld type is associated with low hills and outcrops (mainly Clarens Formation sandstone) scattered within the Mucina Mopani Bushveld. It conforms to a typical and moderately open savannah, dominated by *Kirkiaacuminata* and *Adansoniadigitata,* especially on areas of calcareous soils.

It is evident that both Alternative 1A and 1B traverse a higher percentage of Limpopo Ridge Bushveld compared to Alternative 2. This means that Alternative A is more likely to cross over or be positioned in close proximity to hills and ridges which are often focal habitat for birds of prey and substrate-specialist taxa (e.g. scorpions). In addition, the high spatial heterogeneity in micro-habitat types presented by these landscape features is more likely to hold a higher floristic richness to the Musina Mopani Bushveld.

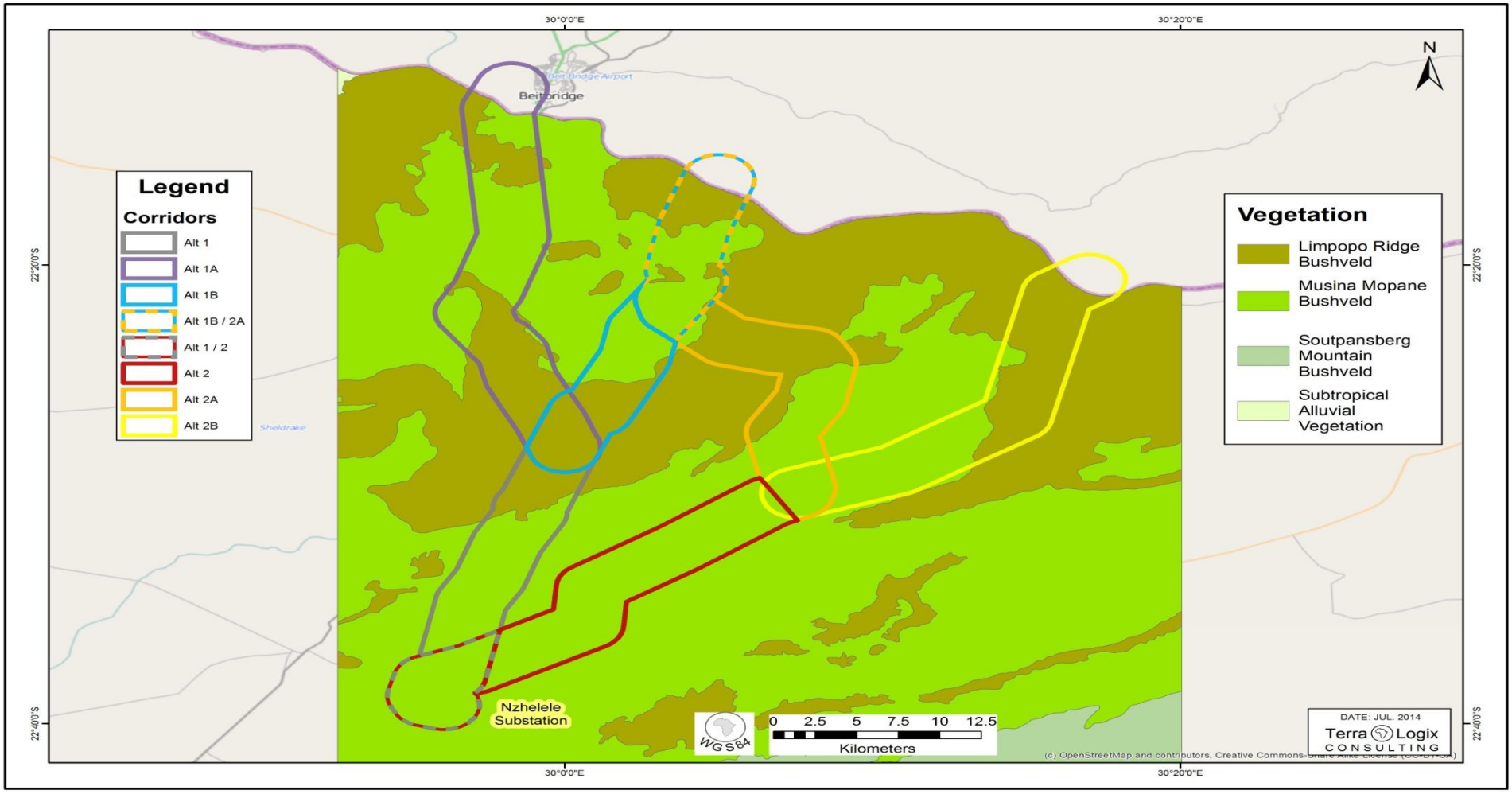

Figure 15: Regional Vegetation Units within the study area.

7.6.2 Vegetation: Species of conservation concern1

The study area consists largely of arid woodland which is widely distributed in the region and often dominated by near-monotonous stands of *Colophospermummopane*. Therefore, the threatened and near-threatened taxa, in contrast to the Grassland Biome, is poorly represented on the study area as evidenced by the low richness of confirmed taxa at a quarter-degree level. However, a preliminary analysis of the typical habitat requirements of these taxa show that moderate to high probabilities of occurrence is expected on the various ridges and hills (broken terrain) and deciduous riverine woodland (along the Limpopo and Sand River) in the area as opposed to the plains. Nevertheless, the direct relationship between these species and areas where slopes are relative steeper has been proven, and a subsequent high level of environmental significance should be attributed to these particular areas. Table 7 lists the conservation important taxa that could occur on the study area, and provides an indication of their potential occurrence.

Table 7: Red Data and Orange Listed plant species

Species	Flowering Season	Habitat	Probability of occurrence	Conservation Status
Orange Listed				
Anselliaafricana	August-October	Hot arid mixed deciduous woodland, especially riverine woodland.	Possible, along tall riverine woodland dominated by *Adansonia, Peltophorum* and *Combretumimberbe*.	Declining
Adeniafruticosa subsp. simplicifolia	September	Low deciduous woodland and thorny bushveld on rocky areas (gneiss, granite and pegmatite).	High, likely to be present in arid woodland on rocky substrate.	Data Deficient
Peristrophecliffordii	May & August –	Deep Kalahari	Could occur in the north along the	Rare

Species	Flowering Season	Habitat	Probability of occurrence	Conservation Status
	October	sand in Mopane bushveld.	Limpopo River.	

It is evident that the northern part of the study area appears to hold the highest probability for these taxa to occur, which corresponds to Alternative 1A, 1B and 2A. *It clearly illustrates the importance of the riverine woodland and bushveld confined to ridges* for these taxa to be present.

7.6.3Fauna

The proposed corridors will traverse through extensive areas of natural woodland and game reserves, especially on the eastern and central section of the study area which provide suitable habitat for a variety of large and charismatic mammal species. Likewise, the perennial rivers provide suitable habitat for a number of near-threatened and data deficient taxa that are wetland-dependant (e.g. shrew taxa of the genus *Crocidura*). However, the area is likely to support a high richness of near-threatened meso- and meta-carnivores on a global and national level (e.g. Leopard *Pantherapardus* and Brown Hyaena*Parahyaenabrunnea*). The objective is not to provide a detailed account on the various animal communities present, but merely to provide an indication of the diversity and potential occurrence of taxa of conservation concern.

Most mammal species are in general highly mobile and therefore able to vacate areas should 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. baboon spiders). 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 8 provides a list of threatened, "near-threatened" and conservation important faunal species with geographic distribution ranges sympatric (overlapping) to the study area. It is evident that a high richness (especially mammal species) is expected to occur. This emphasises the untransformed ecological condition of the various habitat types in the area and the extensive surface areas occupied by these habitat types. Many of these areas coincide with large private game reserves which provide sanctuary for taxa with large body sizes.

Table 8: A list of threatened, "near-threatened" and conservation important faunal species

Scientific Name	Common Name	Global Conservation Status	National Conservation Status	Probability of Occurrence	Habitat
Mammals					
Acinonyxjubatus	Cheetah	Vulnerable	Vulnerable	Potentially restricted to conservation areas on the extreme north and on the eastern parts of the study area.	Open and lightly wooded savannah.
Leptailurusserval	Serval		Near-threatened	High.	Along moist grassland near rivers and dams.
Pantherapardus	Leopard	Near-threatened		High, regarded to be widespread on study area.	Widespread, from open woodland to hills and ridges.
Raphicerussharpei	Sharp's Grysbok		Near-threatened	Could occur, known to occur on western (Alternative 1A) part of the study area.	Dense shrub and woodland areas, especially riverine woodland.

Scientific Name	Common Name	Global Conservation Status	National Conservation Status	Probability of Occurrence	Habitat
Atelerixfrontalis	South African Hedgehog		Near-threatened	Could occur.	A widespread species that prefer dry habitat types and will often utilise urban gardens.
Elephantulusintufi	Bushveld Elephant-shrew		Data Deficient	High, likely to be present.	Sandy soils with low basal cover.
Petrodromustetradactylus	Four-toed Elephant-shrew		Endangered	Low, only known from a single recent observation on the southern part of the study area (2230CA).	Dense forested areas with well-developed understorey and leaf litter - most likely to be present in well-developed riverine woodland.
Hippotragusnigerniger	Sable Antelope		Vulnerable	Probably introduced.	Well wooded savannah, dependant on waterbodies.
Paracynictisselousi	Selous' Mongoose		Data Deficient	Could occur, known to be present in QDS 2230AC.	Savannah within the Limpopo River valley.
Pipistrellusrusticus	Rusty Bat		Near-threatened	High, likely to be present.	Well-developed savannah, mainly riparian woodland.
Mellivoracapensis	Honey Badger		Near-threatened	High, likely to occur.	Catholic, widespread and tolerant to most habitat types.
Crociduracyanea	Reddish-Grey Musk Shrew		Data Deficient	High.	Dry terrain among rocks in dense scrub and grass, in moist places and in hedges.

Scientific Name	Common Name	Global Conservation Status	National Conservation Status	Probability of Occurrence	Habitat
Crocidurahirta	Lesser Red Musk Shrew		Data Deficient	High.	Wide habitat tolerance.
Crociduramariquensis	Swamp Musk Shrew		Data Deficient	High.	Moist habitats, e.g. thick grass along riverbanks, reedbeds and in swamps.
Graphiurusplatyops	Rock Dormouse		Data Deficient	High.	Rocky habitat.
Epomophorusgambianuscrypturus	Gambian Epauletted Fruit Bat		Data Deficient	Could occur.	Riverine woodland with a high density of *Ficus* spp.
Hipposideroscaffer	Sundevall's Leaf-nosed Bat		Data Deficient	Likely to be present.	Forages over savannah, roost in caves.
Rhinolophushildebrandtii	Hildebrandt's Horseshoe Bat		Near-threatened	Could occur, especially in the vicinity of hills and ridges.	Forages over savannah, roost in caves.
Reptiles					
Crocodylusniloticus	Nile Crocodile		Vulnerable	High.	Mainly confined to the Limpopo River.
Homopholismulleri	Muller's Velvet Gecko		Vulnerable	Possible, known from the southern part of the study area.	Holes in *Sclerocaryabirrea, Colophospermummopane* and *Acacia nigrescens*trees in Mopani woodland.
Chirindialangioccidentalis	Soutpansberg Worm Lizard		Vulnerable	Could occur, probably peripheral	Low-lying areas under stones embedded in sandy soils.

Scientific Name	Common Name	Global Conservation Status	National Conservation Status	Probability of Occurrence	Habitat
				to study site.	
Invertebrates					
Thoracistusviridicrus	Green-kneed Seedpod Shieldback		Vulnerable	Status uncertain - only known from six localities in Limpopo pre-1985.	Savannah.
Pterinochilus) lugardi			Protected	Could occur.	Known from the Soutpansberg district near Nwanedzi River.
Augacephalus (=Pterinochilus) junodi	Junodi's Golden Baboon Spider		Protected	High.	Widespread.
Ceratogyrusdarlingi	South African horned baboon spider		Protected	High.	Widespread.

7.6.4 Avi-Fauna

A number of important micro-habitat units are present in the landscape, and it was necessary to elaborate on their importance from an avifaunal perspective (mapping of these units together with detailed descriptions on their spatial position and avifaunal composition will only be dealt with during the EIA phase of this project):

- *Open arid woodland with sparse basal cover* - A large part of the study area is characterised by arid *Colophospermum*- and *Commiphora*-dominated woodland of which the field layer is poorly developed. Therefore, the floristic structure and low presence of human-induced disturbances have facilitated the colonisation and regular foraging of large terrestrial bird species as evidenced by high reporting rates for Kori Bustard (*Ardeotiskori*), Southern Ground Hornbill (*Bucorvusleadbeateri*) and Secretary bird (*Sagittarius serpent Arius*);
- *Limpopo and Sand Rivers* – These include large Shallow River with wide expansive and sandy floodplains. Not only do these linear systems facilitate bird dispersal, thereby linking the study area with other important foraging areas located within the Limpopo River catchment, but it also provide critical important foraging habitat for various threatened and near-threatened stork species and numerous other water bird species. The riparian woodland is also earmarked by prominent canopy constituents (mainly *Ficussycomorus*) which provide additional refuge and roosting habitat for the large bird of prey species;
- *Artificial dams* – these represent artificial dams which provide habitat for a variety of water bird species which benefited from their presence and utilise these bodies of water for breeding and foraging purposes;
- *Arable land and cultivated fields* - These are represented by agricultural land, which provide ephemeral foraging habitat for a number of bird species in particular that of the nationally Secretary bird (*S. serpent Arius*) and other species that are prone to power line collisions such as the White Stork (*Ciconiaciconia*), Abdim's Stork (*C. abdimii*), Spur-winged Goose (*Plectropterusgambensis*) and Egyptian Goose (*Alopochenaegyptiaca*);
- *Isolated ridges and hills* - These landscape features provide ideal nesting and hunting habitat for a range of bird of prey species. Typical species include the Lanner Falcon (*Falco biarmicus*) and the Verreaux's Eagle (*Aquila verreauxii*);
- *Tall canopy trees* - The landscape is characterised by prominent individuals of *Adansoniadigitata*, which also provides ideal nesting and roosting platforms for a diversity of birds of prey species (e.g. Wahlberg's Eagle *Hieraaetuswahlbergi* and White-backed Vulture *Gyps africanus*).

In general, the study area supports a high richness of birds species (mean of 243.6 spp, n=6 QDGs) which is explained by the extensive area of woodland habitat and the

occurrence of tropical riverine habitat along the Sand and Limpopo Rivers. The latter support many species with marginal distribution ranges in South Africa, since the majority reach their southern distribution limits on the study area. The number of bird species recorded for each quarter degree square range from 192 species at Kumkusi (2229BD) to as many as 278 species at Beitbridge (2229BB).

Threatened and Near-threatened Species

The highly seasonal and ephemeral nature of surface water retention in the area, along with the presence of large rivers with extensive sandy floodplains and pools are responsible for the occurrence of many threatened and near-threatened stork species (*c*. five species) in the region. These habitat features, in combination with the open structure of the woodland habitat (which favour large terrestrial bird species such as bustards, ground hornbills and Secretary birds), an abundance of game species (which favours scavengers), the rural practice of ranching in neighbouring Zimbabwe (which favours scavengers of the vulture genera *Terathopius, Gyps* and *Aegyptius*) and the presence of isolated, although prominent landscape features (e.g. ridges which provide optimal hunting habitat for Verreaux's Eagle *Aquila verreauxii* and Lanner Falcon *Falco biarmicus*) have all contributed to the high richness of threatened and near-threatened bird species in the area, especially large birds of prey. Therefore, a total of 19.5 % (133 spp) of all national threatened and near-threatened bird species are present on the study area. In retrospect, the majority of species are also highly prone towards collisions with earth wires, and therefore at risk.

Table 9 summarizes the Red listed species that could potentially occur on the study area. It is evident that the highest reporting rates (according to Harrison *et al*., 1997) were recorded from the southern and waster parts of the study area corresponding to 2229DB (Mopane), 2229BD (Kamkusi) and 2230CA (Thipise). Those areas with high reporting rates were well-utilised by the Kori Bustard (*Ardeotiskori*), followed by the Lapped-faced Vulture (*Aegypiustracheliotos*), Verreaux's Eagle (*Aquila verreauxii*), Southern Ground Hornbill (*Bucorvusleadbeateri*) and Secretary bird (*Sagittarius serpent Arius*).

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 (*Ciconiaciconia*), Woolly-necked Stork (*Ciconiaepiscopus*), African Openbill (*Anastomuslamelligerus*), African Fish-eagle (*Haliaeetusvocifer*), Brown Snake-eagle (*Circaetuscinereus*), Black-chested Snake-eagle (*Circaetuspectoralis*) and a number of water bird species pertaining to the Anatidae (ducks and geese), Phalacrocoracidae (cormorants), Anhingidae (darters), Ardeidae (herons and egrets) as well as Threskiornithidae (ibises).

Table 9: The reporting rates (%) for each Red listed species

QDGC	Global Status	Regional Status	2229BB	2229BD	2229DB	2230AC	2230CA	2230AD
Species			**Beitbridge**	**Kamkusi**	**Mopane**	**Musina**	**Thipise**	**Esmefour**
Great White Pelican (*Pelecanusonocrotalus*)	-	V	3					3
Pink-backed Pelican (*Pelecanusrufescens*)	-	V	6					
White-backed Night-heron (*Gorsachiusleuconotus*)	-	V						3
Yellow-billed Stork (*Mycteria ibis*)	**-**	**EN**		**8**		**2**		**9**
Black Stork (*Ciconianigra*)	**-**	**V**	**3**			**5**		**9**
Abdim's Stork (*Ciconiaabdimii*)	**-**	**NT**	**3**		**14**	**2**	**6**	
Saddle-billed Stork (*Ephippiorhynchussenegalensis*)	**-**	**EN**	**6**					**6**
Marabou Stork (*Leptoptiloscrumeniferus*)	**-**	**NT**	**10**			**2**		
Greater Flamingo (*Phoenicopterusruber*)	-	NT	3					
Lesser Flamingo (*Phoeniconaias minor*)	NT	NT	3					
Secretarybird (*Sagittarius serpentarius*)	**V**	**V**		**8**	**29**	**2**		
African White-backed Vulture (*Gyps africanus*)	EN	EN	3	8	21			3
Cape Vulture (*Gyps coprotheres*)	V	EN		8	21			
White-headed Vulture (*Aegypiusoccipitalis*)	V	EN		8				
Lapped-faced Vulture (*Aegypiustracheliotos*)	V	EN			21			
Verreaux's Eagle (*Aquila verreauxii*)	-	V	6			31	13	
Tawny Eagle (*Aquila rapax*)	-	EN	3		7	7	6	15
Martial Eagle (*Polemaetusbellicosus*)	V	EN	6	8	21	11		6
Bateleur (*Terathopiusecaudatus*)	NT	EN			29	2	6	3

QDGC	Global Status	Regional Status	2229BB	2229BD	2229DB	2230AC	2230CA	2230AD
Species			**Beitbridge**	**Kamkusi**	**Mopane**	**Musina**	**Thipise**	**Esmefour**
Pallid Harrier (*Circus macrourus*)	NT	NT				2	6	
Lanner Falcon (*Falco biarmicus*)	-	V	10		7	7	6	6
Kori Bustard (*Ardeotiskori*)	**NT**	**NT**	**3**	**62**	**50**	**13**	**31**	**15**
Greater Painted Snipe (*Rostratulabenghalensis*)	-	V	6			2		3
Chestnut-banded Plover (*Charadriuspallidus*)	NT	NT	3					
European Roller (*Coraciasgarrulus*)	NT	NT	3	8	29	15	38	15
Southern Ground Hornbill (*Bucorvusleadbeateri*)	**V**	**EN**		**8**	**29**			**12**
Average Reporting Rate			**4.71**	**14.00**	**23.16**	**7.36**	**14.00**	**7.71**
Total Richness			**17**	**9**	**12**	**14**	**8**	**14**

7.7 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.

7.8 Heritage Resources

The Limpopo Province is known to contain archaeological resources dating from Stone Age (Early, Middle & Late Stone Age), Iron Age (Early, Middle & Late Iron Age), the Historical Archaeological Period (the past 500 years covering: Historical, Industrial, Burial Grounds & Graves and Built Environment & Landscape). In this province Rock Art is commonly found in association with the Stone Age archaeology (Late Stone Age) and the historical period. It is also located within a region that contain Archaeozoic, Proterozoic and Phanerozoic geological period rock formations which will influence the palaeontological component of the study. Therefore, the study area will most likely to yield some of the above mentioned archaeological, historical, built environment and landscape features as well as palaeontological resources.

The historical period heritage also includes the farming community heritage such as old towns and associated buildings, graves and many other built environment and landscape features such as dams, reservoirs, water furrows, and farming implements etc. This period is also a period known for some of South Africa's defining events such as the *Imfecane*, the different South African Wars (a.k.a. the Anglo-Boers Wars). The Limpopo, one of the former Transvaal Republic regions and later South African Republic, is well known for some of these events. The totality of the above mentioned heritage resources represent some of the anticipated resources within the broader study area as defined in the study scope terms of reference. Therefore, archaeological, historical and palaeontological records such as journal articles, books and archives about the study area and its immediate surrounding will be studied to give an in-depth archaeological and historical background of the area under consideration. It would therefore be important to access, review and assess heritage databases housed at the following institutions:

- The South African Heritage Resources Agency (SAHRA) - Nation

    - The APM Unit (Archaeological, Palaeontological& Meteorite Unit)
    - Including the SAHRA-Burial Grounds & Grave Unit (should the need arise)
- The Limpopo Provincial Heritage Resources Authority (LIHRA) - Built Environment & Landscape
- The Bernard Price Institute for Palaeontology

8. Public Participation Process: Scoping Phase

Public participation forms an integral part of the full EIA process and the EAP is totally reliant on the Interested and Affected parties (I&AP's) participation 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, and 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.

The Public Participation (PP) team set out an information program during the Scoping Phase of the process to ensure that as many I&APs as possible were well informed about the proposed project as possible in order to form part of the EIA from inception to completion.

During the EIA Phase, the focus was on informing potential I&APs as well as registered I&APs about the project and to ensure that they (and other stakeholders) have ample

opportunity to comment and give input, especially with regard to their preferred alignment. There was no cut-off date for registering as I&APs and new stakeholders are welcomed into the process throughout.

8.1 Developing the I&AP Database

The Public Participation Process in the EIA Phase kicked off with an exercise to ensure that the team had contact details of parties. The initial stages of the process were conducted in January 2014. This was no easy task, but every endeavour was made to create an up to date database of I&APs, including all landowners. In this communication I&APs were invited to send their comments and concerns and to communicate with the PP Team should they have any questions, e.t.c.
The I&AP Database was updated regularly and will be updated regularly throughout the process.

8.2 Notifying potential I&APs of the project and creating the database of I&APs

An initial advertisement advertising the proposed project and the process that was to commence was placed in the Limpopo Mirror and Zoutpansberger of 25 April 2104. This advertisement asked all those who were affected or felt that they were interested to register as I&APs. And in addition the advertising informed the public about the Public Meetings for introduction of the project.

In addition to the advertisements, site notices were placed at places where people gather and across the study area.Landowners were identified through searches on WinDeeds and calling neighbours to obtain contact details of adjacent farms. The Farmers' Unions were also very helpful.
A letter informing landowners of the study was delivered across the study area in April 2014. Some landowners responded to this letter and their comments and additional contact details were included into the I&AP Database.Finally, potential I&APs (such as government departments, municipalities, NGOs, etc.) were pre-identified and placed on the Stakeholder Database.

8.3 Public Meetings

Three meetings were held in total to inform the public as to the project and how they can be involved in the project. The following ways were used to inform I&AFPs of the Public Meetings.

- Newspaper advertisements (the Limpopo Mirror and Zoutpansberger); and
- Notification within the BID.

8.4 Draft Scoping Report Public Comment Period

The Draft Scoping Report (DSR) were made available to the public and I&AP's for review and comment from 15 August 2014 to 30 September 2014.
Notifications will be send out to all registered I&AP's and the public will be notified with advertisements in the Zoutpansberger and Limpopo Mirror News papers of the review period and public meetings.Focus group meetings with stakeholders will take place in the week of 9-11September 2014 and Public meetings will be held in the same week at the following venues:

Table 10: Public Meetings for DSR

Date	Type of Meeting	Venue	Time
9th September 2014	Public Meeting	Sand River Resort – N1	18H00
10th September 2014	Public Meeting	Musina Lodge – Limpopo Avenue	18H00
11th September 2014	Public Meeting	Nancefield Hall – James Chirwa Street	18H00

Hard copies of the Draft Scoping Report will be made available at the following places detailed in **Table 10**.

Table 11: Places were the DSR was made available for review

Place	Address
Nancefield Library	Nancefield Community Centre
Musina Municipality	21 Irwin Street, Musina
Elephant Inn / Sand river resort	Sasol Garage N1 high way
Beitbridge Shell Garage	N1 just before the Beitbridge Border Post
Musina Nature Reserve Office	Off the N1 high way just south of Musina Town
Musina Police Station	Flax Avenue Musina

Comments received on the Draft Scoping Report were included in the Issues and Respond Report. 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.
For more detailed information regarding the Public Participation Process, please refer to the Public Participation Specialist Report under Appendix C of the Final Scoping Report.

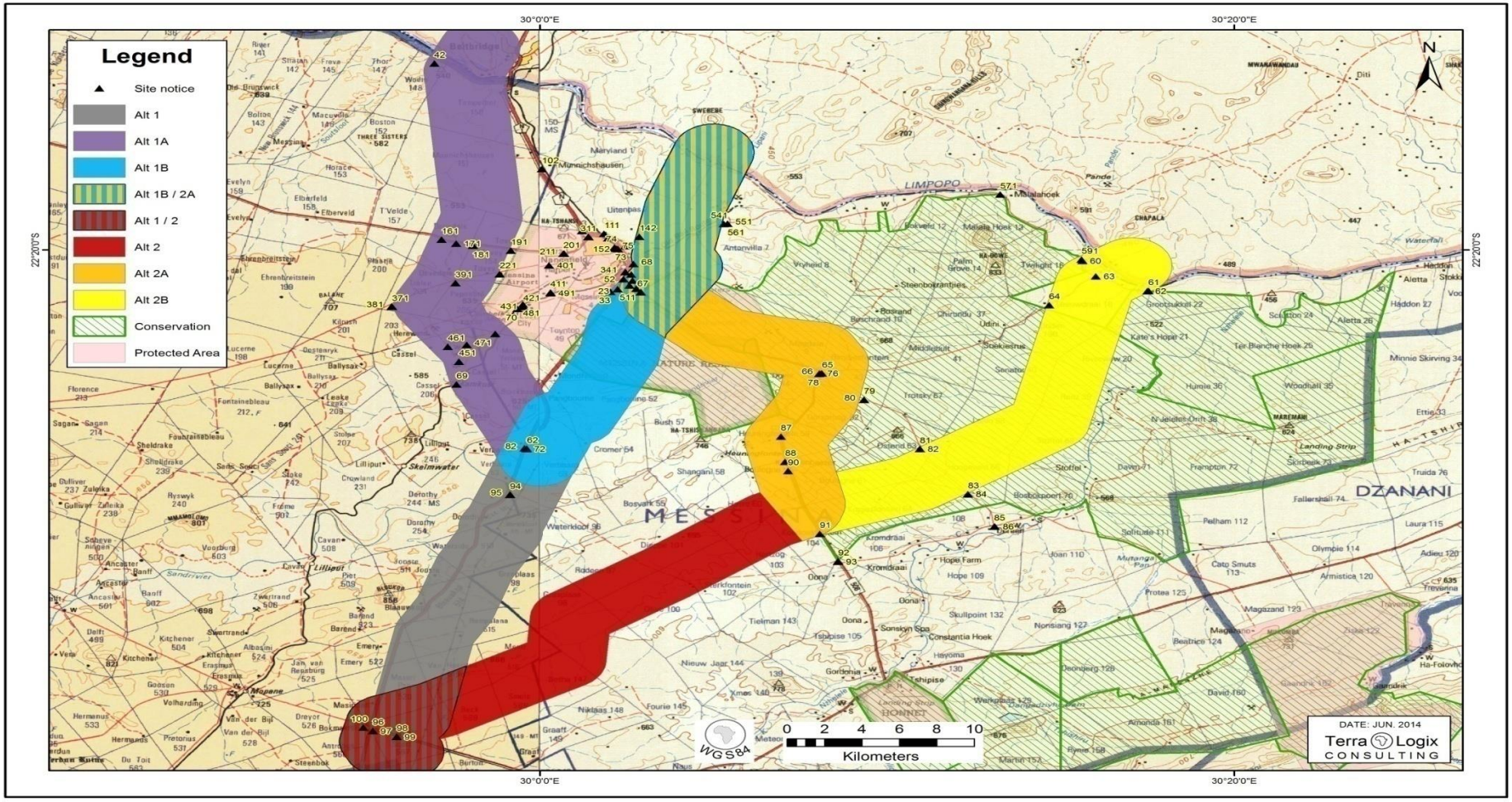

Figure 16: Map representing where the site notices were placed and geo-reference

Draft Scoping Report Public Comment Period

The Draft Scoping Report was placed for public comment, for a period of 40 days, from the 15th of August 2014 to the 30th September 2014.

8.5 Summary of concerns raised during the Scoping Phase

- **Agriculture**
  - Loss of income during construction and operational phase.
- **Air Quality**
  - No issues recorded.
- **Alternatives (including Alignment)**
  - No clear indications of a preferred alignment were identified by the public.
- **Archaeology and Heritage**
  - There are many archaeological sites scattered throughout the area that needs careful consideration.
- **Compensation of servitude**
  - Will landowners be compensated?
  - How will compensation work?
  - Compensation should be an ongoing matter (not a once-off payment as is currently the case).
  - Free electricity should be provided to landowners who have lines on their farms.
- **Construction and Rehabilitation**
  - Suggestions for the EMP.
  - Disruption of normal activities and loss of agricultural potential during construction.
- **Cumulative Impact**
  - There are too many Eskom power lines (between Transmission and Distribution) and future planning for both needs to be shared with the public now already so that they can plan ahead as well.
- **Ecology, Fauna and Flora**
  - Rare, vulnerable and endangered species and large bird species
  - Loss of habitat.
  - Loss of biodiversity.
- **Economy**
  - Loss of income during construction
  - Loss of eco-tourism.
- **Employment**
  - Will local labour be used?
- **Eskom Specific Issues**

  - Maintenance of servitude areas.
  - The cumulative effect of the many power lines.
  - Ensuring that recommendations during the EIA phase are adhered to during construction.
- **General**
  - Issues recorded here were diverse.
- **Geology**
  - No issues were recorded.
- **Ground Water**
  - No issues were recorded
- **Health (Human and Animal, including electro-magnetic fields)**
  - The impact of EMFs on people and animals.
- **Infrastructure**
  - Questions about the types of towers to be used.
- **Land-Use and Planning**
  - Mostly issues around the alignment.
- **Legal**
  - No issues were recorded.
- **Need for the Project**
  - No issues were recorded.
- **Nuisance (including Noise)**
  - No issues were recorded.
- **Offers to assist and requests of Baagi**
  - Various issues were recorded, including new potential I&APs to contact.
- **Process**
  - Time and places for future meetings.
- **Property Values**
  - Notably, I&APs mentioned that it was difficult to sell farms with transmission lines on, especially as the payment is not ongoing – but the nuisance is!
- **Quality of Life / Sense of Place (including Visual Impact)**
  - Some landowners indicated that their farms / homesteads were sensitive to visual intrusions.
- **Safety**
  - Power lines near dwellings are not safe.
- **Security**
  - The fact that Eskom has keys to the locks to farm gates is a security issue.
- **Surface Water**
  - Wetlands need to be studied.
  - Wetlands need to be spanned.

- **Technical Questions**
    - No issues were recorded.
- **Waste Management**
    - No issues were recorded.

The public participation followed to date has culminated in the current Issues and Response Report, see **Appendix D of the Final Scoping Report (FSR)**. The issues raised by all I&APs have been included in this report and have been taken into consideration by the Technical Team. ***For more detailed information regarding the Public Participation Process, please refer to the Public Participation Report under Appendix C.***8. (FSR).

9. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

9.1. BACKGROUND

The EIA Team adopted a robust framework within environmental aspects arising from the influences of the proposed construction of the Nzhelele-Triangle 2x500kV transmission power lines.

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.

9.2. SCOPING

Scoping was undertaken between January April 2014 and August 2014. Primary activities and/or products of scoping are outlined in **Table 12**.

Table 12: 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

9.3 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

The primary product of the Scoping Phase was the Final Scoping Report that was accepted by the DEA on 7th of April 2015. 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.

9.4 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.

9.4.1 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 2x500kV power lines 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 Assessment;
- Heritage Impact Assessment;
- Social Assessment;
- Soil and Agricultural Potential Assessment;
- Tourism Assessment;
- Geotechnical Assessment.

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).

9.4.2 Key Aspects Pertaining to Each Specialist Study

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

9.4.2.1 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.

9.4.2.2 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.

9.4.2.3 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.

9.4.2.4 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.

9.4.2.5 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.

9.4.2.6 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.

9.4.2.7 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.

9.4.2.8 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.

9.4.3 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 13**):

Table 13: 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 14: 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.

10. 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 15**), the results of which are summarized in this chapter. Copies of the specialist reports are provided for in **Appendix F**.

Table 15: Details of Specialist Studies

Specialist Field of Study	Specialist	Organisation
Wetland	Mr. Retief Grobler	Imperata Consulting
HIA	Mr. Morris Sutton	NGT Consulting
Avifauna and Fauna	Mr. Lukas Niemand	Pachnoda Consulting
Flora	Mr. Willem de Frey	EkoInfo CC
Soil and Agricultural Potential	Mr. Johan van der Waals	TerraSoil Consulting
Visual Impact Assessment	Mr. Karsten Drescher	Terralogix Consulting
Social and Tourism Assessments	Ms Chanel Turner	Turnscapes Consulting
Geotech Overview	Mr Karsten Drescher	Terralogix Consulting

10.1 FLORA

FINDINGS

The results aim to evaluate the two aspects indicated in the National Environmental Management Biodiversity Act (No 10 of 2004), namely: ecosystem and species on both a regional (model extent) level and local level (within the alternative corridors) (**Error! Reference source not found.**).

Regional Context

The regional context is defined by the model extent, which represents the landscape associated with the proposed alternative corridors. It covers an area of 251 512 ha (**Error! Reference source not found.**), which represents 25 times the minimum extent (10 000 ha) for an area to be evaluated on a landscape level (Turner *et al.* 2001, Wiens *et al.* 2006).

Ecosystem Diversity

Due the nature of the project, which involves power distribution across international boundaries, the ecosystem diversity is presented from both a global/ continental and national perspective.

Global/ Continental Perspective

From Error! Reference source not found.**17**, it can be observed that three global ecoregions (are associated with the area which the alternative corridors transect namely:

1. Southern Africa bushveld
2. Zambezian and Mopane woodlands
3. Drakensberg montane grasslands, woodlands and forests

The Southern Africa bushveld covers the largest portion, mainly to the south, while the Zambezian and Mopane woodlands covers the northern section and stretches in to Zimbabwe.

The Southern Africa bushveld[1] is described and summarised as follows:
"The Southern African Bushveld is part of the vast savannas that cover much of southern Africa. There is little in the way of endemic flora or fauna, but the charismatic large mammals and rich bird life typical of African savannas are present. The rugged Waterberg Mountains contain the highest levels of species richness and endemism in the region, and are noted for their reptile endemism. Cattle ranching and urban expansion from the nearby Pretoria-Witwatersrand-Vereeniging complex are the major threats to the conservation of this ecoregion. However, ecotourism has become a major land-use activity in the bushveld and has led to the establishment of many small nature reserves and private game parks in the area, which enhance the conservation status of this ecoregion."

This ecoregion is classified as Vulnerable.

"Types and Severity of Threats

The major land-use activities in the Northern Province of South Africa are game and cattle farming. Game farming preserves the natural habitat whereas cattle farming can lead to its degradation. Cattle directly degrade the habitat by grazing and trampling plants and by exposing and compacting the soil, leading to soil erosion. Cattle can also lead to bush encroachment by reducing grass cover and subsequent fire frequency. These processes lead to reduced biodiversity within the area. The predatory and scavenging fauna of the bushveld are perceived as pests by farmers and routinely exterminated. Blackbacked jackals (*Canis*

[1] https://www.worldwildlife.org/ecoregions/at0717

mesomelas), caracals (*Felis caracal*), and vulnerable Cape vultures (*Gyps coprotheres*) (Hilton-Taylor 2000) are common target species. Poisoned carcasses are a popular method of killing these species. Non-target species such as bat-eared foxes (*Otocyon megalotis*), aardwolves (*Proteles cristarus*), and aardvarks (*Orycteropus afer*) are often also killed.

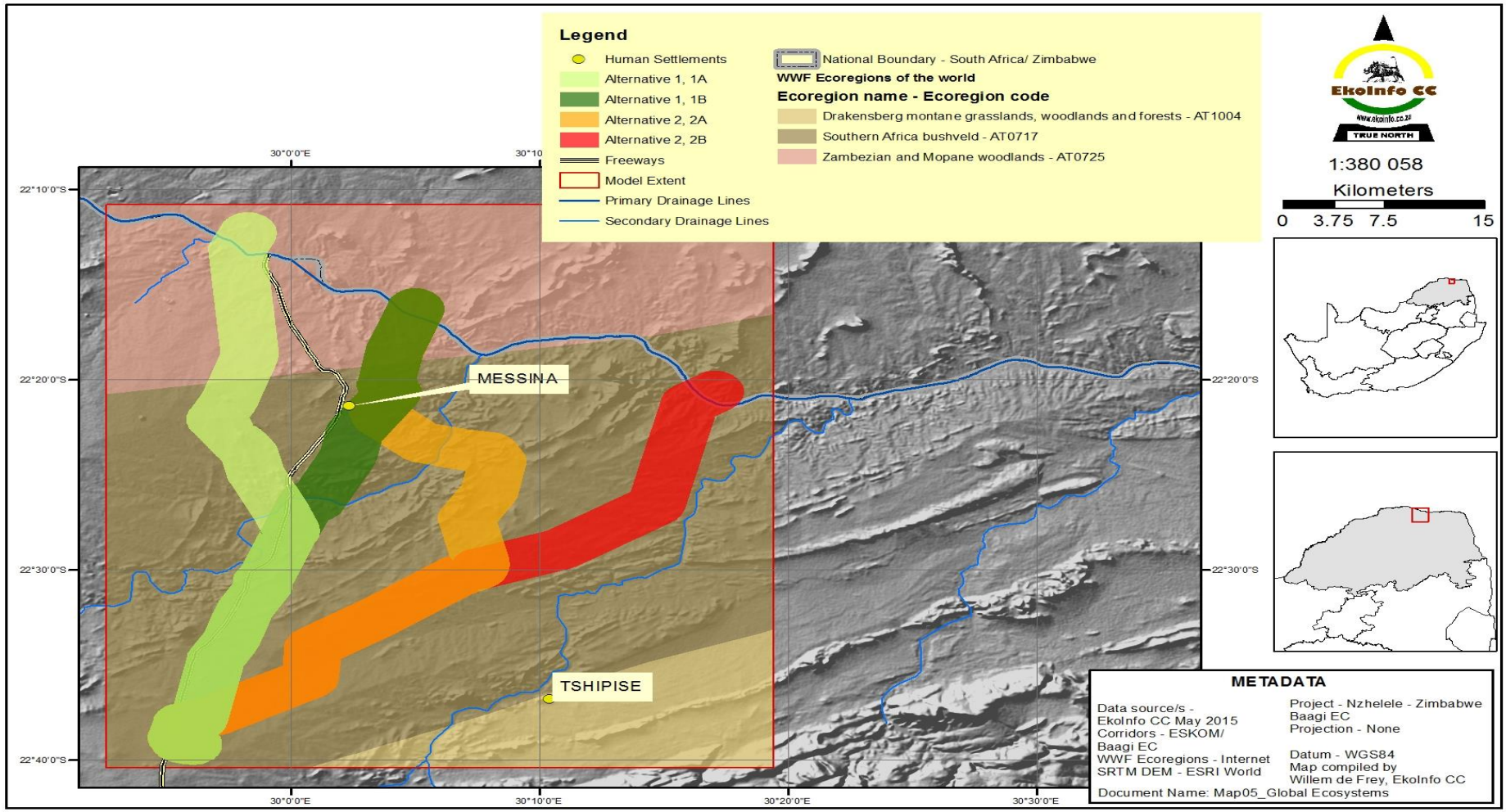

Figure 17: Overview of the global WWF ecoregion units present within the landscape associated with the alternative corridors

Table 16: Overview of the global WWF ecoregions associated with landscape in which the alternative corridors occur

WWF Ecoregions	Surface Area (ha)	% Cover
Drakensberg montane grasslands, woodlands and forests	22 034	9%
Southern Africa bushveld	160 893	64%
Zambezian and Mopane woodlands	68 552	27%
Grand Total	**251 479**	**100%**

There are fewer threats to the north of the ecoregion in Botswana and Zimbabwe, where low-intensity goat and cattle farming create the major impact. The removal of dead wood for firewood may also negatively impact obligate tree-hole nesting birds and small mammals (du Plessis 1995). In large areas of Botswana and Zimbabwe, wildlife contributes significantly to the local economy. Wildlife utilization was originally mostly licensed trophy hunting, but is now increasingly oriented toward non-consumptive recreation and tourism. This trend should improve the conservation status in the north of the ecoregion…"

The Zambezian and Mopane woodlands[2] is described and summarised as follows:
"Zambezian and Mopane Woodlands are dispersed throughout southern Africa, bounded by the Luangwa River in the north and the Pongola River in the south. Mopane tree (*Colophospermum mopane*) woodlands mix with Zambezian woodlands in lower-elevation areas, often along major river valleys. Although the ecoregion, particularly the mopane communities, is considered to be poor in endemics, it supports some of the largest and most significant wildlife populations in Africa, particularly those of the endangered elephant (*Loxodonta africana*) and critically endangered black rhino (*Diceros bicornis*). Important populations of predators are also found in the Zambezian and Mopane Woodlands. The abundance of wildlife can be largely attributed to the high level of protection in the ecoregion, in which more than 45 percent of the habitat is devoted to various forms of state and private conservation. Two cross-border conservation efforts are set to further increase the extent of protected lands in the near future."

This ecoregion is classified as Relatively Stable/Intact.

Types and Severity of Threats

[2] https://www.worldwildlife.org/ecoregions/at0725

The most widespread threat to the ecoregion is poaching and exploitation of wildlife (Stuart et al. 1990). Black rhino and wild dog are species of special concern. Black rhinos are still threatened by demands for rhino horn products and wild dogs are often destroyed by livestock farmers, who perceive them as pests (Stuart et al. 1990). In many areas of the ecoregion, poaching is rife due to poor levels of protection provided by understaffed local authorities, particularly in Zambia and Mozambique (IUCN 1992). However, great efforts have been made in the past few years to rejuvenate and expand many of Mozambique's protected areas (The Peace Parks Foundation 2000a), so an improvement in the quality of wildlife protection is likely.

Land transformation and degradation through agriculture, settlement and livestock grazing poses some threat to the ecoregion, particularly in South Africa and Swaziland, where population densities are as high as 174 persons per km^2 (Els 1996) and large-scale agricultural plans have been introduced (Stalmans and Peel, 1999). In the near future, steadily growing populations (particularly those bordering Kruger National Park) could force the South African government to cede portions of the park and other protected areas to communities demanding space and resources (Els and Bothma 2000). The Zambezi Valley portion of the ecoregion in Mozambique may also be at risk from the steady influx of people and development as stability returns following the civil war. The cattle industry in Botswana threatens wildlife populations, as ranching activities supplant indigenous ungulates, destroy predators, and cattle and veterinary fences impede the movements of migratory mammals (Stuart et al. 1990). Illegal livestock grazing, settlement in protected areas, and uncontrolled bush fires are all threats to the ecoregion in Zambia (IUCN 1992), as well as the overuse of natural resources exacerbated by a declining economy (NESDA 2000). Another concern is the potential habitat destruction caused by uncontrolled elephant populations in some parts of the ecoregion, particularly in Botswana and Zambia (Stuart et al. 1990, IUCN 1992). Culling and translocations are used to regulate elephant populations within protected areas and research into immunocontraception has also been undertaken.

Invasive alien plants are posing an increasing threat to the ecoregion. Current data from the southeastern portion of the ecoregion show that alien plants cover 0.1 to 5 percent of the entire ecoregion in South Africa and Swaziland, with alien cover exceeding more than 20 percent in places (CSIR, undated). Among the more prolific invaders are the shrub and tree species *Lantana camara* and *Melia azederach*, cactii of the genus *Opuntia*, and the water weeds *Salvinia molesta* and *Eichornia crassipes*. Invasive plants are supplanting indigenous vegetation and destroying faunal habitats, as well as altering hydrological and nutrient cycles (CSIR, undated; IUCN 1997/1998).

The most immediate threat to the ecoregion is the present land invasion crisis in Zimbabwe, in which a large percentage of private farms have been occupied since the beginning of 2000. Zimbabwe's private conservation industry has been particularly affected, notably the large Save

Valley and Chiredzi Conservancies in southeastern Zimbabwe near Gonarezhou National Park (Sharman 2000). The land invasions have coincided with a sharp increase in poaching, which have already caused huge losses to wildlife, as well as the application of slash-and-burn farming methods to areas unsuitable for agriculture, particularly in the mopane woodlands and scrub woodlands (Sharman 2000). Community conservation initiatives, such as the CAMPFIRE program, are also reported to have collapsed in the areas where land invasions have occurred (Sharman 2000)."

The Drakensberg montane grassland, woodlands and forest ecoregion is excluded from the discussion as it is located toward the southeast and unlikely to be influenced by the proposed activity.

On a continental scale, a standardised terrestrial ecosystems[3] map of Africa was compiled , of which eight units occur within the landscape associated with the alternative corridors, namely:

1. Zambesian Cryptosepalum Dry Forest
2. Southern African Scarp Forest
3. Limpopo Mopane
4. Zambezi Mopane
5. Wet Miombo
6. Dry Miombo
7. Sub-Escarpment Grassland
8. Lowveld-Limpopo Salt Pan

Of the eight units, the most dominant/ prominent units are the Limpopo Mopane and Zambezi Mopane (Table 17), which cover 82% and 14% respectively of the area.

The Limpopo Mopane unit is described as follows:

"This macrogroup is formed by the savanna communities occurring in the Limpopo province of South Africa and neighboring Zimbabwe, between 300 and 800 m elevation, on undulating to hilly plains with a variety of soils from deep clayey to deep sandy to shallow skeletal types of soils. The mean annual rainfall ranges from 300-550 mm and is strongly seasonal (summer). The vegetation varies from woodland to shrubland to more open savanna. Commonly the dominant species is *Colophospermum mopane*, but other dominants are *Combretum apiculatum*, *Terminalia prunioides*, *Terminalia sericea*, *Grewia flava*, *Acacia tortilis* ssp. *heteracantha*, *Acacia senegal* ssp. *leiorhachis*, *Acacia nigrescens*, *Adansonia digitata*, and *Sclerocarya birrea* ssp. *caffra*."

The Zambezi Mopane unit is described as follows:

[3] http://www.aag.org/cs/africaecosystems

"This type groups mopane-dominated and other open dry types of savanna occurring in the lowlands of southern Eastern Africa, south of the Central African Plateau. The altitudinal range is from 200 to 800 m and the mean annual precipitation is from 400-800 mm with few drier or wetter exceptions; the predominant rainfall regime is that of summer rainfall. The vegetation structure of the communities varies according to the soil types and the moisture availability, with dense and tall woodland types on alluvial soils to stunted shrublands on alkaline soils, and all the grades in between. Dominant species besides the mopane are *Albizia* spp., *Combretum* spp., *Adansonia digitata*, *Diospyros mespiliformis*, *Ficus sycomorus*, *Kigelia africana*, *Lonchocarpus capassa*, *Trichilia emetica*, *Xanthocercis zambesiaca*, and *Xeroderris stuhlmannii* in the north, and further south are *Acacia gerrardii*, *Acacia nigrescens*, *Acacia nilotica*, *Combretum apiculatum*, *Combretum collinum*, *Dichrostachys cinerea*, *Kirkia acuminata*, *Peltophorum africanum*, *Piliostigma thonningii*, *Sclerocarya birrea*, and *Terminalia sericea*."

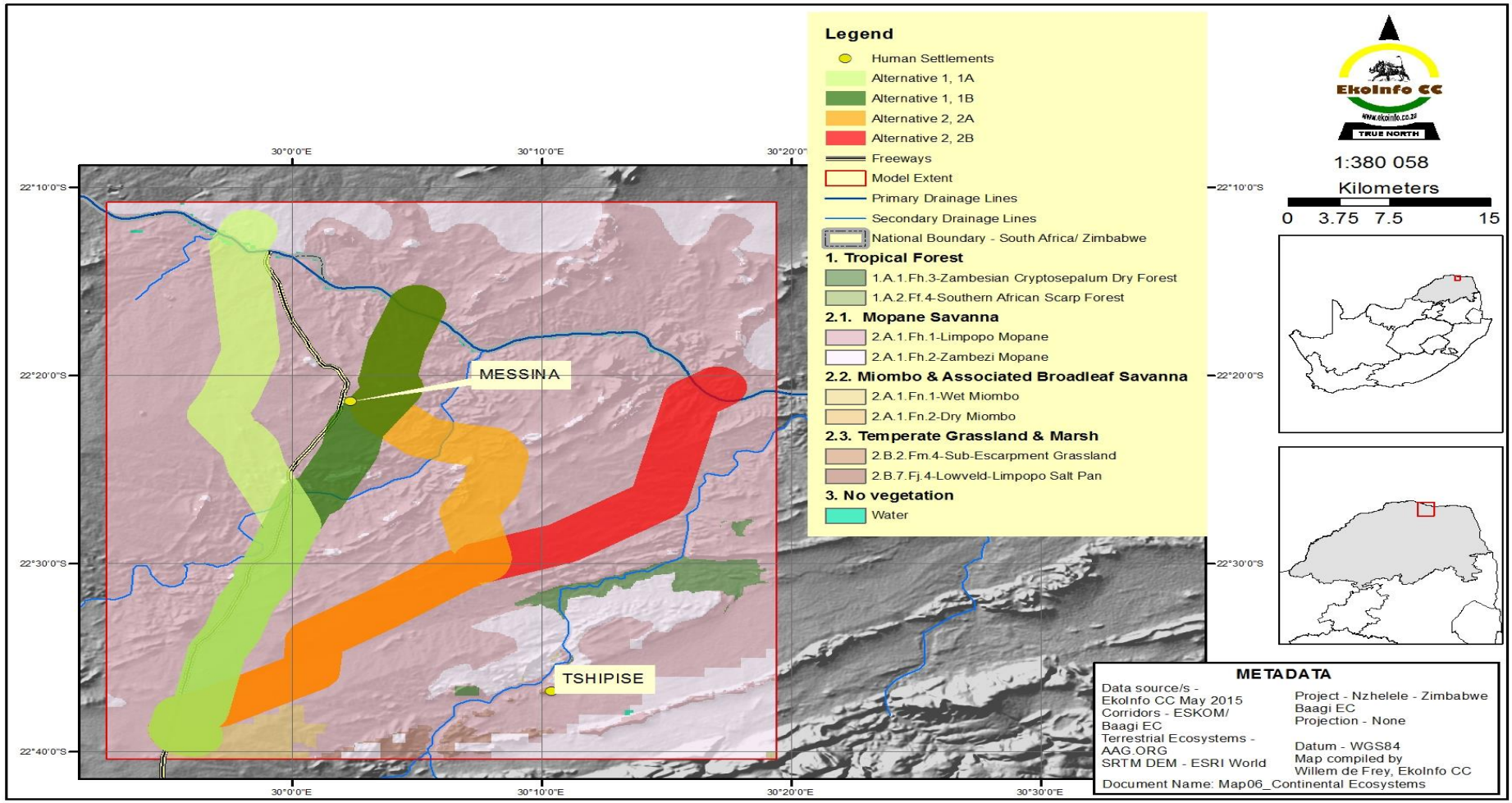

Figure 18: Overview of the standardized continental terrestrial ecosystems present within the landscape associated with the alternative corridors

Table 17: Overview of the hierarchical classification of the standardized continental terrestrial ecosystems present within the landscape associated with the alternative corridors and their extent (percentage cover)

Row Labels	Surface Area (ha)	% of total area
1 Forest to Open Woodland	**3 743**	**1.5%**
1.A Tropical Forest	3 743	1.5%
1.A.1 Tropical Seasonally Dry Forest	3 709	1.5%
1.A.1.Fh Southern African Dry Tropical Forest	3 709	1.5%
Zambesian Cryptosepalum Dry Forest	3 709	1.5%
1.A.2 Tropical Lowland Humid Forest	34	0.0%
1.A.2.Ff Eastern & Southern African Lowland Evergreen & Semi-Evergreen Forest	34	0.0%
Southern African Scarp Forest	34	0.0%
2 Shrubland & Grassland	**245 633**	**98.5%**
2.A Tropical Grassland, Savanna & Shrubland	243 740	97.7%
2.A.1 Tropical Lowland Grassland, Savanna & Shrubland	243 740	97.7%
2.A.1.Fh Mopane Savanna	240 239	96.3%
Limpopo Mopane	205 543	82.4%
Zambezi Mopane	34 696	13.9%
2.A.1.Fn Miombo & Associated Broadleaf Savanna	3 501	1.4%
Dry Miombo	3 471	1.4%
Wet Miombo	31	0.0%
2.B Temperate & Boreal Grassland & Shrubland	**1 893**	**0.8%**
2.B.2 Temperate Grassland, Meadow & Shrubland	10	0.0%
2.B.2.Fm Southern African Montane Grassland	10	0.0%
Sub-Escarpment Grassland	10	0.0%
2.B.7 Salt Marsh	1 882	0.8%
2.B.7.Fj Southern African Salt Pan	1 882	0.8%
Lowveld-Limpopo Salt Pan	1 882	0.8%
Grand Total	**249 376**	

National Perspective

On a national scale, four regional units are present within the landscape associated with the alternative corridors they are:

1. Limpopo Ridge Bushveld
2. Musina Mopane Bushveld
3. Soutpansberg Mountain Bushveld
4. Subtropical Alluvial Vegetation

These four regional vegetation units belong to two biomes, of which the most prominent is the Savanna Biome, which covers 99% (**Table 18**), of the three Savanna regional vegetation units, the Musina Mopane Bushveld covers 62% and the Limpopo Ridge Bushveld covers 37%. Both these two regional vegetation units' conservation status is least threatened. The only threatened regional vegetation unit is the Soutpansberg Mountain Bushveld, which is classified as Vulnerable and occurs in the southeastern corner, and therefore will not be influenced by the proposed corridor alternatives.

The Musina Mopane Bushveld is described as follows (Mucina & Rutherford 2006):
"Vegetation and landscape features undulating to very irregular plains, with some hills. In the western section, open woodland to moderately closed shrubveld dominated by *Colophosperumum mopane* on clayey bottomlands and *Combretum apiculatum* on hills. In the eastern section on basalt, moderately closed to open shrubveld is dominated by *Colophospermum mopane* and *Terminalia prunoides*. On areas with deep sandy soils, moderately open savannah dominated by *Colophospermum mopane*, *T. sericea*, *Grewia flava* and *Combretum apiculatum*. Field layer well developed (especially on the basalt), open during the dry season, the herbaceous layer is poorly developed in areas with dense cover of *Colophospermum mopane* shrubs, for example, north of Alldays bordering the Limpopo floodplain."

The following species were recorded as important taxa within this unit:
Acacia nigrescens, Acacia senegal var. leiorhachis, Acacia tortilis subsp. heteracantha, Acalypha indica var. indica, Acrotome inflata, Adansonia digitata, Aptosimum lineare var. lineare, Aristida adscensionis, Aristida congesta subsp. congesta, Barleria senensis, Becium filamentosum, Boscia albitrunca, Boscia foetida subsp. rehmanniana, Bothriochloa insculpta, Brachiaria deflexa, Cenchrus ciliaris, Colophospermum mopane, Combretum apiculatum subsp. apiculatum, Commiphora glandulosa, Commiphora pyracanthoides, Commiphora tenuipetiolata, Commiphora viminea, Dicoma tomentosa, Digitaria eriantha, Enneapogon cenchroides, Eragrostis lehmanniana var. lehmanniana, Eragrostis pallens, Felicia clavipilosa subsp. transvaalensis, Fingerhuthia africana, Gardenia volkensii subsp. volkensii var. volkensii, Gossypium herbaceum subsp. africanum, Grewia bicolor var. bicolor, Grewia flava, Harpagophytum procumbens subsp. transvaalense, Heliotropium steudneri, Hermannia glanduligera, Hermbstaedtia odorata var. odorata, Heteropogon contortus, Hoodia currorii subsp. lugardii, Maerua parvifolia, Momordica balsamina, Neuracanthus africanus var. africanus, Oxygonum delagoense, Pechuel-Loeschea leubnitziae, Ptycholobium contortum,

Rhigozum zambesiacum, Schmidtia pappophoroides, Sclerocarya birrea subsp. caffra, Seddera suffruticosa, Sesamothamnus lugardii, Sporobolus nitens, Stapelia gettliffei, Stapelia kwebensis, Sterculia rogersii, Stipagrostis hirtigluma subsp. patula, Stipagrostis uniplumis var. uniplumis, Tephrosia polystachya var. polystachya, Terminalia prunioides, Terminalia sericea, Tetrapogon tenellus, Urochloa mosambicensis, Ximenia americana var. microphylla

"Conservation

Least Threatened. Target 19%. Only 2% staturorily conserved mainly in Mapungubwe National Park as well as in Nwanedi and Honnet Nature Reserves. Additionally, about 1% conserved in the Baobab Tree Reserve. Roughly 3% transformed, mainly by cultivation. Erosion is high to moderate."

Table 18: Overview of the biomes and regional vegetation units present within the landscape associated with the alternative corridors

BIOMES And Regional vegetation units	**Conservation Status**		**Grand Total**	**% of total area**
	Least threatened	**Vulnerable**		
AZONAL VEGETATION	**117**		**117**	**0.1%**
Subtropical Alluvial Vegetation	117		117	0.1%
SAVANNA BIOME	**203 195**	**1 336**	**204 531**	**99.9%**
Limpopo Ridge Bushveld	75 449		75 449	36.9%
Musina Mopane Bushveld	127 746		127 746	62.4%
Soutpansberg Mountain Bushveld		1 336	1 336	0.7%
Grand Total	**203 312**	**1 336**	**204 648**	
	99.3%	0.7%		

The Limpopo Ridge Bushveld is described as follows (Mucina & Rutherford 2006):
"Vegetation and landscape features extremely irregular plains with ridges and hills. Moderately open savannah with poorly developed ground layer. Umbrella-shape canopied *Kirkia acuminate* is prominent on some ridge skylines with the often enormous *Adansonia digitata* on shallow calcareous gravel; the shrub *Catophractes alexandri* is dominant on calc-silicate soils. These are particularly striking landscapes with rock walls and passages within areas of sandstone of the Clarens Formation (e.g. within the Mapungubwe National Park)"

The following species were recorded as important taxa within this unit:
Acacia nigrescens, Acacia senegal var. leiorhachis, Acacia tortilis subsp. heteracantha, Adansonia digitata, Aristida adscensionis, Aristida stipitata subsp. stipitata, Barleria affinis, Blepharis diversispina, Boscia albitrunca, Catophractes alexandri, Cissus cornifolia, Colophospermum mopane, Combretum apiculatum subsp. apiculatum, Combretum imberbe,

Commiphora gracilifrondosa, Commiphora mollis, Commiphora pyracanthoides, Commiphora tenuipetiolata, Digitaria eriantha, Enneapogon cenchroides, Ficus abutilifolia, Ficus tettensis, Gardenia resiniflua subsp. resiniflua, Grewia bicolor var. bicolor, Hibiscus calyphyllus, Hibiscus micranthus var. micranthus, Kirkia acuminata, Neuracanthus africanus var. africanus, Panicum maximum, Plinthus rehmannii, Ptycholobium contortum, Schmidtia pappophoroides, Sclerocarya birrea subsp. caffra, Sterculia rogersii, Stipagrostis uniplumis var. uniplumis, Tavaresia barklyi, Terminalia prunioides, Ximenia americana var. microphylla. The following two species are endemic taxa: *Cleome oxyphylla var. oxyphylla, Pavonia dentata*.

"Conservation

Least threatened. Target 19%. Some 18% statutorily conserved, mainly in the Kruger and Mapungubwe National Parks. An additional 2% conserved in the Baobab Tree Reserve (thus together attaining the target). Only about 1% is transformed, mainly for cultivation and mining"

Therefore it is expected that any vegetation surveys within the study area would reflect the presence of these two regional vegetation units, of which neither is threatened.

Species Diversity

SANBI's POSA[4] database lists 4 799 flora species for the province, of which 71 species are classified as threatened (Vulnerable, Endangered, Critical Endangered) (Table 19). Appendix B contains the list of threatened Red Data flora for Limpopo Province as obtained from the POSA website on the 28th of April 2015. These 71 species represents 33 plant families and 52 genera.

Nine topocadastral maps are associated with the corridor alternatives, these nine topocadastral grids contain 742 species or 15% of all the species recorded within Limpopo Province. **No threatened Red Data plants had been recorded within these nine grids.**

In terms of provincially protected flora the following 26 species had been recorded in terms of the Limpopo Environmental Management Act (Act 7 of 2003) within the nine grids associated with the study area: *Adansonia digitata, Adenium multiflorum, Aloe globuligemma, Aloe littoralis, Aloe lutescens, Ansellia africana, Ceropegia ampliata, Combretum vendae, Cyrtorchis praetermissa, Eulophia angolensis, Eulophia hereroensis, Hermbstaedtia capitata, Hibiscus sabiensis, Huernia whitesloaneana, Huernia zebrina, Ochna glauca, Orbea lugardii, Orbea rogersii, Orbea valida, Orbea woodii, Peristrophe cliffordii, Phyllanthus pinnatus, Stapelia*

[4] Plants of Southern Africa - http://posa.sanbi.org/searchspp.php

gettliffei, Stapelia kwebensis, Tavaresia barklyi, Tridactyle tricuspis, Xylopia parviflora (Table 20). **It should be noted in certain cases all the species in the genus or family is protected.**

Three nationally protected flora in terms of the National Environmental Management Biodiversity Act (No 10 of 2004), they are: *Dioscorea sylvatica, Harpagophytum procumbens, Orbea woodii* (Table 21).

Table 19: Overview of the number of threatened Red Data flora species within Limpopo Province

Threatened Red Data flora category	**No of species**	**% of total**
Vulnerable (VU)	40	56%
Endangered (EN)	17	24%
Critical Endangered (CR)	14	20%
Grand Total	71	44%

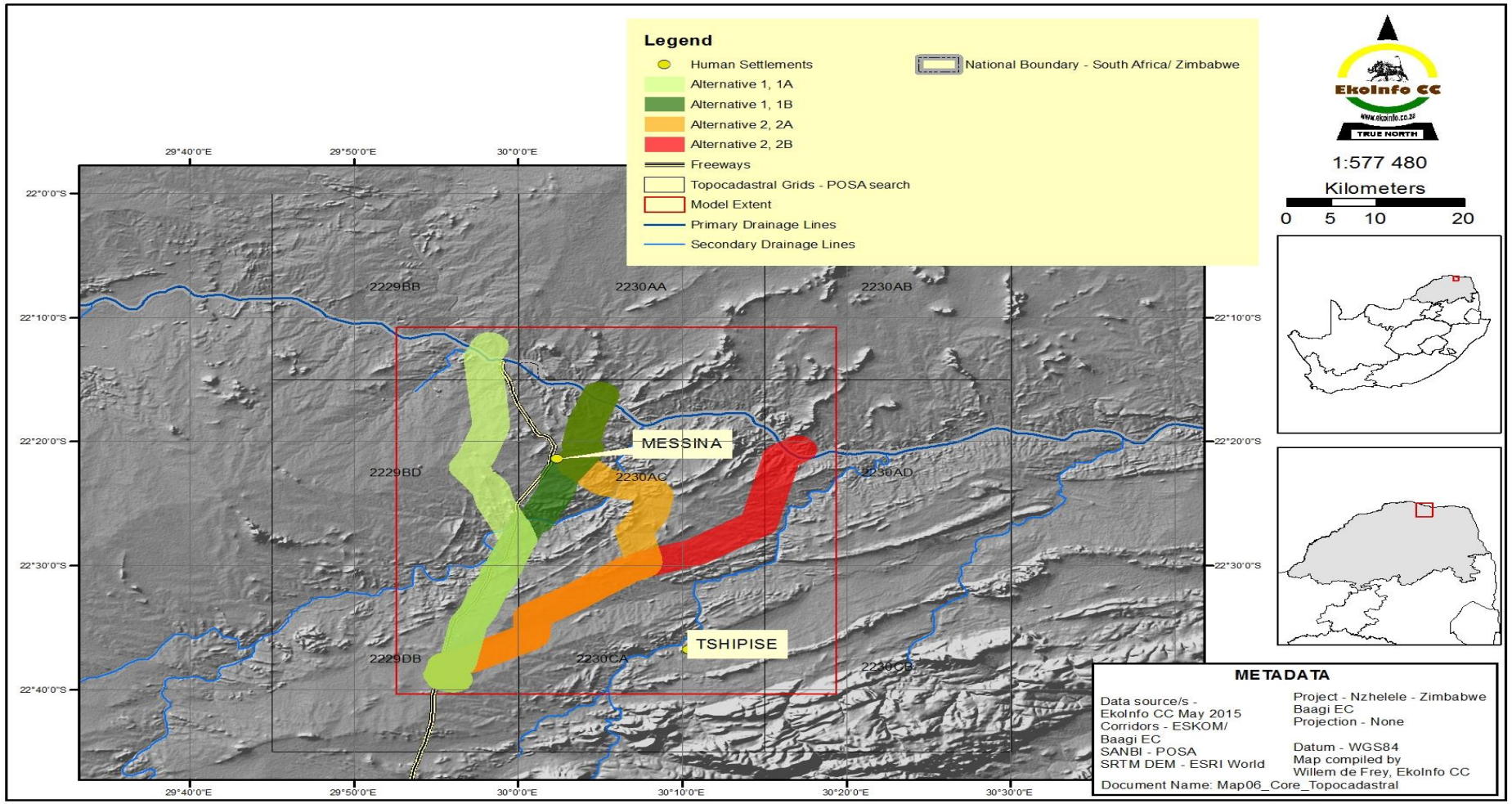

Figure 19: Overview of the nine Topocadastral used in the POSA search

Table 20: Overview of the 26 provincially protected species present within the nine topocadastral grids associated with the corridor alternatives

Botanical Name	Taxon	Protection level
Adansonia digitata		Specific species only
Adenium multiflorum		
Combretum vendae		
Hermbstaedtia capitata		
Hibiscus sabiensis		
Ochna glauca		
Peristrophe cliffordii		
Phyllanthus pinnatus		
Xylopia parviflora		
Aloe globuligemma	Aloe	All species in genus
Aloe littoralis		
Aloe lutescens		
Ceropegia ampliata	Ceropegia	
Huernia whitesloaneana	Huernia	
Huernia zebrine		
Orbea lugardii	Orbea	
Orbea rogersii		
Orbea valida		
Orbea woodii		
Stapelia gettliffei	Stapelia	
Stapelia kwebensis		
Tavaresia barklyi	Tavaresia	
Ansellia africana	Orchidaceae	All species in family
Cyrtorchis praetermissa		
Eulophia angolensis		
Eulophia hereroensis		
Tridactyle tricuspis		

Table 21: Overview of the three nationally protected species in terms of the National Environmental Management Biodiversity Act

Botanical Name	Conservation Status - National

Dioscorea sylvatica	Vulnerable
Harpagophytum procumbens	Protected
Orbea woodii	Vulnerable

Within the nine topocadastral grids associated with the corridor alternatives, the following four trees which are protected in terms of the National Forest Act (No 84 of 1998), were recorded: *Adansonia digitata, Boscia albitrunca, Combretum imberbe* and *Philenoptera violacea*.

Therefore it should be quite evident that there is a very high potential for either provincially or nationally protected flora to occur within the corridor alternatives.

Local Context

This section is based on the results of the actual vegetation surveys using the Braun-Blanquet approach during May 2014.

Ecosystem Diversity

A two-way species indicator analysis (TWINSPAN) of the collected species data (Appendix C) and correlation with the recorded environmental data (Table 22) indicates the presences of two major units. These two major units are representative of the continental and regional vegetation units described within the regional context section, namely cluster one and two (TWINSPAN level 1) is associated with the Limpopo Mopane continental unit or Musina Mopane Bushveld regional vegetation unit and cluster three and four being associated with the Zambezi Mopane continental unit or Limpopo Ridge Bushveld regional vegetation unit.

The vegetation also reflect a grazing gradient (level of utilisation) based on the ruggedness of the terrain,with cluster one and two which is associated with the flat landscape, being more accessible to livestock, whether domestic or game, compared to cluster three and four which are associated with a steeper, more rugged landscape, which is less accessible to livestock. The presence (high constancy and abundance) of the following species in cluster one and two, support this statement: *Dicoma tomentosa* (Appendix C – Species Group A), *Acacia tortilis* (Species Group A), *Aristida congesta* (Species Group B), *Aristida rhiniochloa* (Species Group B), *Tragus berteronianus* (Species Group B), *Acacia erubescens* (Species Group B), *Aristida adscensionis* (Species Group G) and *Dichrostachys cinerea* (Species Group H), all of these species are associated with over utilisation of natural veld (Van Wyk & Van Wyk 1997, Van Oudtshoorn 1991). The following species in Species Group F are in contrast associated with well-managed or responsibly utilised veld: *Digitaria eriantha*, *Tricholaena monachne* and *Panicum maximum* (Van Oudtshoorn 1991)

Based on this information, it is evident that the corridor alternatives transects through vegetation dominated by *Colophospermum mopane* (Appendix C, Species Group H), followed by *Terminalia prunioides*, which confirms the dominance of the Musina Mopane Bushveld in this area.

Species Diversity

Species Richness

During the survey, which involved 15 plots, 95 species (Appendix C) were recorded or 13% of the 742 species recorded within the nine topocadastral grids associated with the study area. On average 26 species were recorded per plot, while the minimum was 16 species and the maximum 37 species (Table 23).

Of the 95 species, 37 species or 39% are forbs, 22 species or 23% are grasses and 36 species or 38% are woody species (trees and shrubs) (Table 24).

Threatened Red Data and Protected Plants

None of the potential 71 threatened Red Data plants listed for Limpopo Province were recorded within the plots surveyed, however this does not imply that some of the species could be present.

Table 22: Overview of the average quantitative environmental attributes associated with the TWINSPAN clusters based on the floristic composition of the data recorded

TWINSPAN	Source	Average values												
		GPS	SRTM DEM	Estimated	SRTM DEM	SRTM DEM	Estimated	Measured	Estimated % cover					SRTM DEM
Level 1	No of Species	Altitude (m)	Altitude (m)	Slope (%)	Slope (°)	Wetness Index	% Clay (A-horizon):	Soil depth (mm)	Gravel	Small stones	Medium stones	Large stones	Rock	Ruggedness Index
100000	8	572	572	1	2	10	4	425	12	6	5	2	0	3
200000	7	512	515	4	3	9	6	457	4	6	5	6	1	5

TWINSPAN	Source	Average values												
		GPS	SRTM DEM	Estimated	SRTM DEM	SRTM DEM	Estimated	Measured	Estimated % cover					SRTM DEM
Level 2	No of Species	Altitude (m)	Altitude (m)	Slope (%)	Slope (°)	Wetness Index	% Clay (A-horizon):	Soil depth (mm)	Gravel	Small stones	Medium stones	Large stones	Rock	Ruggedness Index
110000	1	683	680	1	1	10	4	600	10	0	0	0	0	2
120000	7	556	557	1	2	10	4	400	12	7	6	2	0	3
210000	4	530	533	5	4	9	7	450	6	6	5	4	1	5

220000	3	489	492	3	3	9	6	467	2	5	5	10	2	6

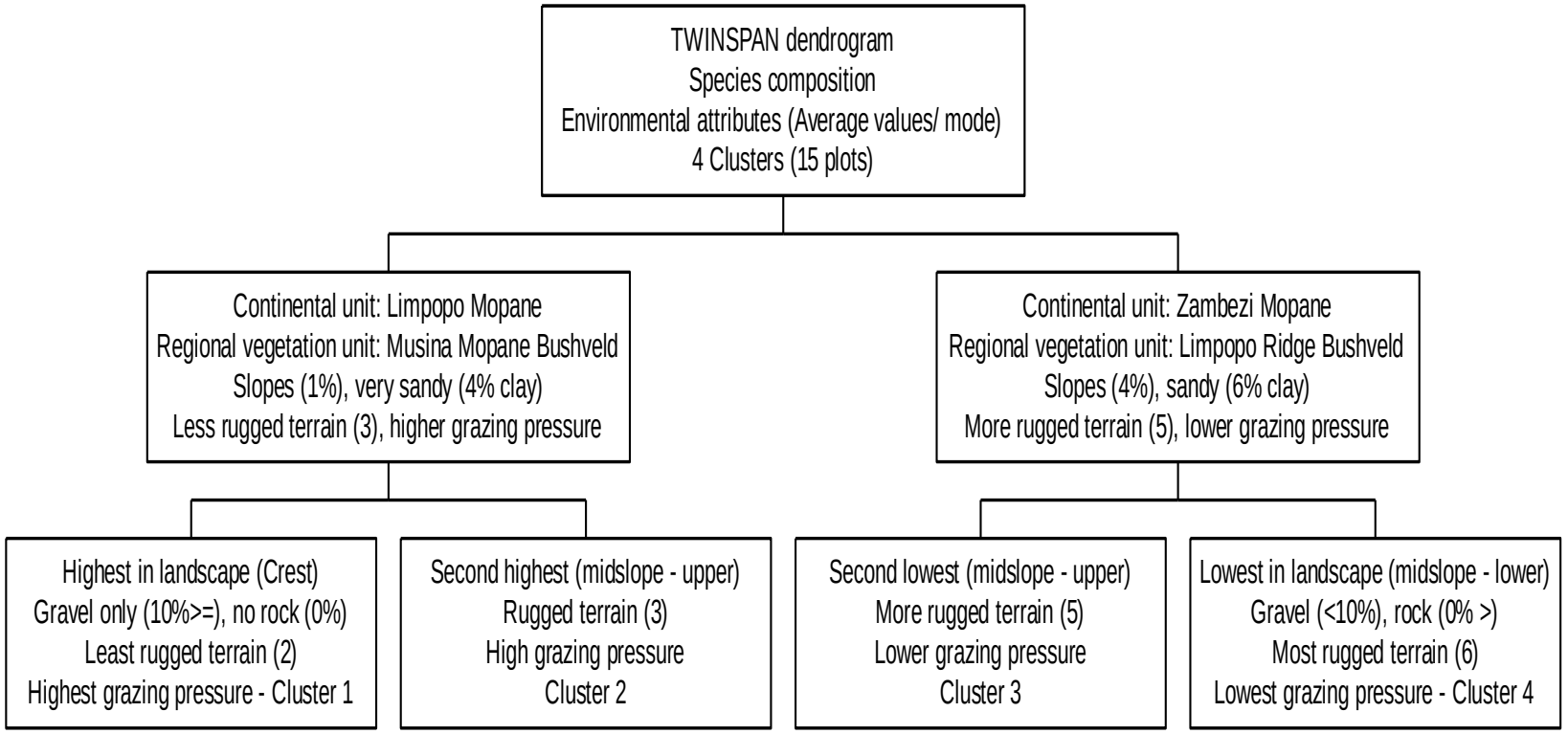

Figure 20: TWINSPAN dendrogram

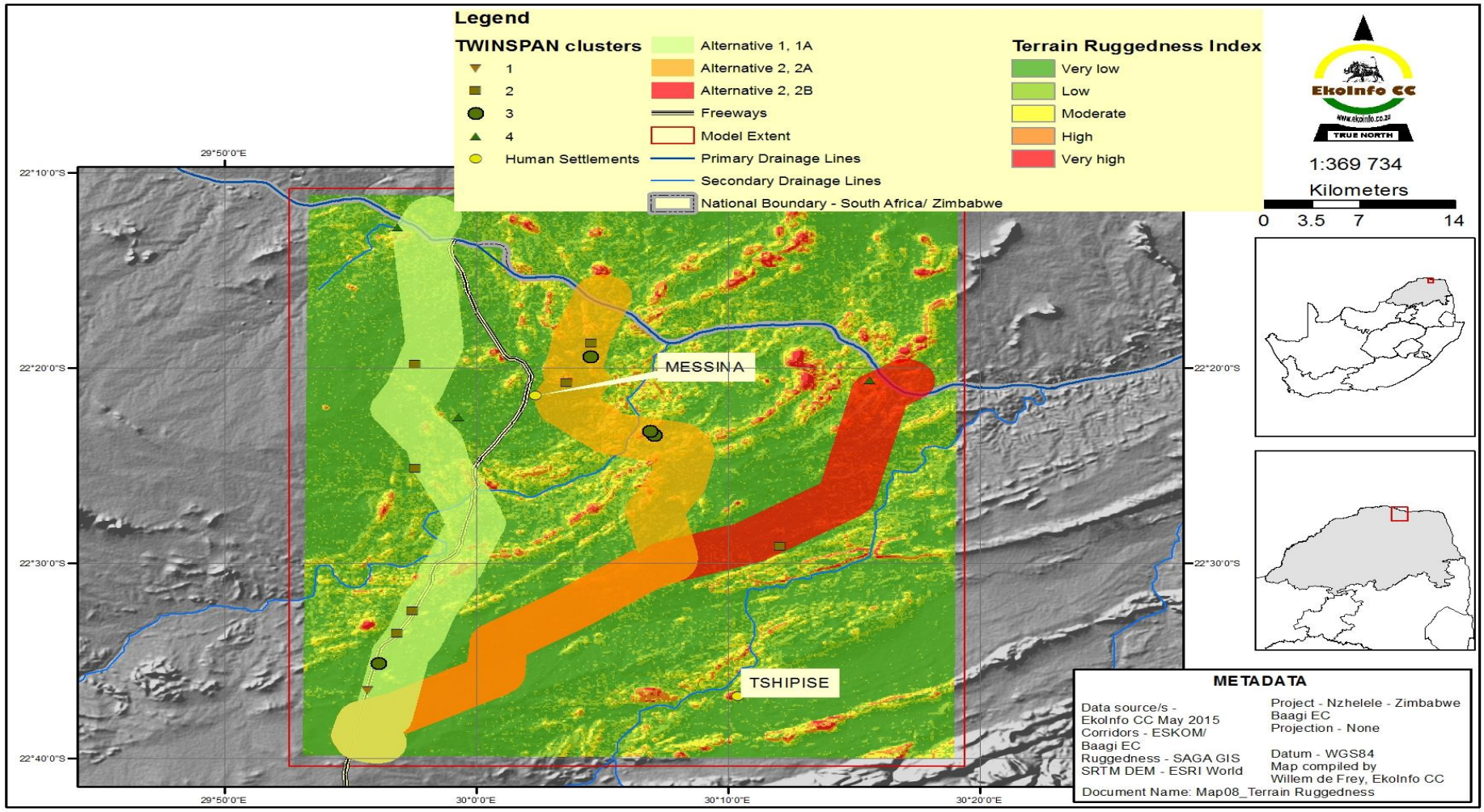

Figure 21: Overview of the level terrain ruggedness within the study aeas, which influences grazing patterns of livestock.

Table 23: Overview of the number of species recorded per sample plot

Plot no	No of species
1	35
2	27
3	26
6	25
10	16
18	20
19	18
20	17
21	28
26	37
27	20
29	27
30	33
31	35
33	21
Minimum	**16**
Average	**26**
Maximum	**37**

Please note the plot number is not the same as the table number.

Table 24: Overview of the major growth forms recorded during the survey

Major Growth Form	No of species	% of total
Forbs	37	39%
Grasses	22	23%
Woodies	36	38%
Grand Total	**95**	**100%**

The only provincially protected plant in terms of the Limpopo Environmental Management Act recorded within the plots surveyed was *Adansonia digitata* (Baobab).

The following nationally protected trees were recorded within the 15 plots surveyed, namely: *Adansonia digitata* (Baobab), *Boscia albitrunca* (Shepard Tree), *Combretum imberbe* (Leadwood), *Sclerocarya birrea* (Marula). From the Braun-Blanquet table (Appendix C), it is evident that *Combretum imberbe* occurs localised, mainly in close proximity to watercourse, while the other three species are common throughout the area, *Adansonia digitata* being more prominent on or in the vicinity of outcrops/ ridges.

It should be noted that a permit is required for the destruction of these species in terms of the National Forest Act.

From the data in Table 25, it is possible to make the following observations with regards to these four nationally protected trees:

1. *Boscia albitrunca* is the most common protected tree in the area, and was present in all of the plots surveyed, it occurs at an average density of 18 individuals per hectare.
2. *Combretum imberbe* is the most localised protected species due to its association with watercourses.
3. *Sclerocarya birrea subsp. caffra* is the second most abundant, and occurred in more than 50% of the plots sampled; it is present at an average density of 11 individuals per hectare.
4. *Adansonia digitata* is more localised than *Sclerocarya birrea* subsp *caffra*, but less than *Combretum imberbe*, it occurs at an average density of four individuals per hectare.
5. Overall it would appear as if there is not enough young individuals (0 – 3 m) within the protected tree populations, with the majority of the individuals being present in the 3 – 6 m class, and only a limited number of very large individuals, the exceptions are *Adansonia digitata* were there is equal numbers of young, middle age and old individuals and *Sclerocarya birrea* subsp. *caffra* where the very large (mature) individuals outnumber the middle age size class. The absence of young individual could be attributed to the over utilisation of the landscape by livestock, especially cattle or the absence of the relevant propagation agents, especially in areas where ecological process had been disrupted.

Medicinal Plants

The following two species with medicinal properties were recorded within the 15 plots surveyed, namely: *Adansonia digitata* and *Sclerocarya birrea subsp. caffra* (Van

Wyk, Van Oudtshoorn & Gericke 2000), both species occur widely throughout the study area.

Alien invasive species

A single declared alien invasive species were recorded within the 15 plots surveyed, namely *Opuntia ficus-indica*, it is a Category 1 species in terms of the Conservation of Agricultural Resources Act (No 43 of 1985) and needs to be eradicated and controlled. The majority of the species belonging to the Cactacea family is considered to be a serious threat to the biodiversity in South Africa and needs to be controlled. In terms of the National Environmental Management Biodiversity Act, this species is classified as Category 1b and must be controlled via an invasive species management programme.

Table 25: Overview of the number of individuals per hectare of nationally protected trees based on seven plots

Nationally protected trees	Plot number								Density per ha – all height classes			% constancy
	5	7	11	15	23	24	32	Grand Total	minimum	average	maximum	
Adansonia digitata		**4**				**4**	**4**	**12**	**4**	**4**	**4**	**43%**
0 - 3 m							4	4				
3 - 6 m		4						4				
6 m +						4		4				
Boscia albitrunca	**12**	**12**	**16**	**28**	**20**	**20**	**20**	**128**	**12**	**18**	**28**	**100%**
0 - 3 m					4	16		20				
3 - 6 m	12	4	16	28	16			76				
6 m +		8				4	20	32				
Combretum imberbe		**16**						**16**	**16**	**16**	**16**	**14%**
3 - 6 m		4						4				
6 m +		12						12				
Sclerocarya birrea subsp. caffra			**4**	**8**		**12**	**20**	**44**	**4**	**11**	**20**	**57%**
3 - 6 m						8	4	12				
6 m +			4	8		4	16	32				
Grand Total	**12**	**32**	**20**	**36**	**20**	**36**	**44**	**200**				

10.2 FAUNA

The proposed corridors will traverse through extensive areas of natural woodland And game reserves, especially on the eastern and central section of the study area which provide suitable habitat for a variety of large and charismatic mammal species. Likewise, the perennial rivers provide suitable habitat for a number of nearthreatened And data deficient taxa that are wetland-dependant (e.g. shrew taxa of the genus *Crocidura*).However, the area is likely to support a high richness of nearthreatened meso- and meta-carnivores on a global and national level (e.g. Leopard *Panthera pardus* and Brown Hyaena *Parahyaena brunnea*). The objective is not to provide a detailed account on the various animal communities present, but merely to provide an indication of the diversity and potential occurrence of taxa of conservation concern. Most mammal species are in general highly mobile and therefore able to vacate areas should 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. baboon spiders). K-selected species are mostly longlived 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.

The table below provides a list of threatened, "near-threatened" and conservation important faunal species with geographic distribution ranges sympatric (overlapping) to the study area. It is evident that a high richness (especially mammal species) is expected to occur. This emphasises the untransformed ecological condition of the various habitat types in the area and the extensive surface areas occupied by these habitat types. Many of these areas coincide with large private game reserves which provide sanctuary for taxa with large body sizes.

Table 25: A list of threatened, "near-threatened" and conservation important faunal species likely to occur on the study area (excluding introduced game, e.g. Lion, buffalo, elephant and rhino). The conservation status of mammal, amphibian, reptile and invertebrate taxa was based on IUCN Red List (2014), Friedman & Daly (2004), Minter *et al*. (2004), Bates *et al.*

Scientific Name	Common Name	Global Conservation Status	National Conservation Status	Probability of Occurrence	Habitat
Mammals					
Acinonyx jubatus	Cheetah	Vulnerable	Vulnerable	Potentially restricted to conservation areas on the extreme north and on the eastern parts of the study area.	Open and lightly wooded savanna.
Leptailurus serval	Serval	Near-threatened	Near-threatened	High.	Along moist grassland near rivers and dams.
Panthera pardus	Leopard		High, regarded to be widespread	High.	Widespread, from open woodland to hills and ridges.

			on study area.		
Raphicerus sharpei	Sharp's Grysbok		Near-threatened	Could occur, known to occur on western (Alternative 1A) part of the study area.	Dense shrub and woodland areas, especially riverine woodland.
Atelerix frontalis	South African Hedgehog		Data Deficient	Could occur.	A widespread species that prefer dry habitat types and will often utilise urban gardens.
Elephantulus intufi	Bushveld Elephant-shrew		Endangered	High, likely to be present.	Sandy soils with low basal cover.
Petrodromus tetradactylus	Four-toed Elephant-shrew		Vulnerable	Low, only known from a single recent observation on the southern part of the study area (2230CA).	Dense forested areas with well-developed understorey and leaf litter - most likely to be present in well-developed riverine woodland.

Hippotragus niger niger	Sable Antelope		Data Deficient	Probably introduced.	Well wooded savanna, dependant on waterbodies.
Paracynictis selousi	Selous' Mongoose		Near-threatened	Could occur, known to be present in QDS 2230AC.	Savanna within the Limpopo River valley.
Pipistrellus rusticus	Rusty Bat		Near-threatened	High, likely to be present.	Well-developed savanna, mainly riparian woodland.
Mellivora capensis			Data Deficient	High, likely to occur.	Catholic, widespread and tolerant to most habitat types.
Crocidura cyanea			Data Deficient	High.	Dry terrain among rocks in dense scrub and grass, in moist places and in hedges.
Crocidura hirta	Lesser Red Musk Shrew		Data Deficient	High.	Wide habitat tolerance.
Crocidura mariquensis	Swamp Musk Shrew		Data Deficient	High.	Moist habitats, e.g. thick grass along riverbanks, reedbeds and in swamps.
Graphiurus platyops	Rock Dormouse		Data Deficient	High.	Rocky habitat.

Epomophorus gambianus crypturus	Gambian Epauletted Fruit Bat		Data Deficient	Could occur.	Riverine woodland with a high density of Ficus spp.
Hipposideros caffer	Sundevall's Leaf-nosed Bat		Data Deficient	Likely to be present.	Forages over savanna, roost in caves.
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat		Near-threatened	Could occur, especially in the vicinity of hills and ridges	Forages over savanna, roost in caves.
Reptiles					
Crocodylus niloticus	Nile Crocodile		Vulnerable	High.	Mainly confined to the Limpopo River.
Homopholis mulleri	Muller's Velvet Gecko		Vulnerable	Possible, known from the southern part of the study area.	Holes in Sclerocarya birrea, Colophospermum mopane and Acacia nigrescens trees in Mopani woodland.
Chirindia langi occidentalis	Soutpansberg Worm Lizard		Could occur, probably peripheral to	Could occur, probably peripheral to study site.	Low-lying areas under stones embedded in sandy soils.

			study site.		
Invertebrates					
Thoracistus viridicrus	Green-kneed Seedpod Shieldback		Vulnerable	Status uncertain - only known from six localities in Limpopo pre-1985.	Savanna.
(Pterinochilus) lugardi			Protected	Could occur.	Known from the Soutpansberg district near Nwanedzi River.
Augacephalus (=Pterinochilus) Junodi's	Junodi's Golden Baboon Spider		Protected	High.	Widespread.
Ceratogyrus darlingi	South African horned baboon spider		Protected	High.	Widespread.

RECOMMENDATIONS

The following literature and databases will be consulted:

- The occurrence and conservation status of mammal taxa will be based on the IUCN Red List (2014) and Friedmann & Daly (2004), while mammalian nomenclature will be based on Skinner & Chimimba (2005) unless otherwise specified; o
- Red Data categories for reptile taxa will be chosen according to Bates *et al.* (2014); and o Red Data categories and listings of amphibian taxa will follow Minter *et al*. (2004) and Measey (2010).
- Red Data categories and listings of butterfly taxa will follow Mecenero *et al.* (2013).
- An inventory of faunal taxa based on faunal activity (mammal spoor, dropping, burrows) will be compiled based on field data recorded from stratified sampling plots distributed at random in different homogenous habitat types (during a site visit). Therefore, the sampling plots will represent a sample of the habitat variation on the study area according to differences in floristic condition, structure and composition, as well as habitat diversity within the landscape.

10.3. AVIFAUNA ASSESSMENT

FINDINGS OF THE AVIFAUNA

Important avifaunal micro-habitat types

A number of important micro-habitat units are present in the landscape, and it was necessary to elaborate on their importance from an avifaunal perspective (mapping of these units together with detailed descriptions on their spatial position and avifaunal composition will only be dealt with during the EIA phase of this project):

- *Open arid woodland with sparse basal cover* - A large part of the study area is Characterised by arid *Colophospermum*- and *Commiphora*-dominated Woodland of which the field layer is poorly developed. Therefore, the floristic Structure and low presence of human-induced disturbances have facilitate. The colonisation and regular foraging of large terrestrial bird species as Evidenced by high reporting rates for Kori Bustard (*Ardeotis kori*), Southern Ground Hornbill (*Bucorvus leadbeateri*) and Secretarybird (*Sagittarius Serpentarius*);

- *Limpopo and Sand Rivers* – These include large Shallow River with wide expansive and sandy floodplains. Not only do these linear systems facilitate bird dispersal, thereby linking the study area with other important foraging areas located within the Limpopo River catchment, but it also provide critical important foraging habitat for various threatened and near-threatened stork species and numerous other waterbird species. The riparian woodland is also earmarked by prominent canopy constituents (mainly *Ficus sycomorus*) which provide additional refuge and roosting habitat for the large bird of prey species;

- *Artificial dams* – these represent artificial dams which provide habitat for a variety of waterbird species which benefited from their presence and utilise these bodies of water for breeding and foraging purposes;

- *Arable land and cultivated fields* - These are represented by agricultural land, which provide ephemeral foraging habitat for a number of bird species in particular that of the nationally Secretarybird (*S. serpentarius*) and other species that are prone to power line collisions such as the White Stork (*Ciconia ciconia*), Abdim's Stork (*C. abdimii*), Spur-winged Goose (*Plectropterus gambensis*) and Egyptian Goose (*Alopochen aegyptiaca*);

- *Isolated ridges and hills* - These landscape features provide ideal nesting and hunting habitat for a range of bird of prey species. Typical species include the Lanner Falcon (*Falco biarmicus*) and the Verreaux's Eagle (*Aquila verreauxii*);

- *Tall canopy trees* - The landscape is characterised by prominent individuals of *Adansonia digitata*, which also provides ideal nesting and roosting platforms for a diversity of birds of prey species (e.g. Wahlberg's Eagle *Hieraaetus wahlbergi* and White-backed Vulture *Gyps africanus*).

Genera Impacts associated with transmission lines

Birds are impacted in three ways by means of transmission lines. It is however a common rule that large and heavy-bodied terrestrial bird species are more at risk of being affected in a negative way when interacting with transmission lines. These include the following:

- *Electrocution*

Electrocution happens when a bird bridges the gap between the live components or a combination of a live and earth component of a power line, thereby creating a

short circuit. This happens when a bird, mainly a species with a fairly large wingspan attempts to perch on a tower or attempts to fly-off a tower. Many of these species include vultures (of the genera *Gyps* and *Aegypius*) as well as other large birds of prey such as the Martial Eagle (*Polemaetus bellicosus*) (Ledger & Annegarn, 1981; Kruger, 1999; Van Rooyen, 2000). These species will attempt to roost and even breed on the tower structures if available nesting platforms are a scarce commodity. Other types of electrocutions happen by means of so-called "bird streamers". This happens when a bird, especially when taking off, excretes and thereby causing a short-circuit through the fluidity excreta (Van Rooyen & Taylor, 1999). This method of electrocution is however a rare phenomena. Other species also likely to be affected include species prone towards roosting on towers such as the Black Stork (*Ciconia nigra*).

However, it is recommended that the "Cross-rope Suspension" tower, a bird-friendly design, be used since it does not provide a suitable roosting or nesting substrate birds, and discourages birds from breeding or roosting on the tower (Vosloo, 2003; Figure 8). However, the use of other towers that do offer perching or nesting habitat, for example the "Self supporting" (which is commonly used at bend points) and "Guyed-Suspension" towers should be limited and fitted with metal bird guards and sleeves to insulate certain phases of the lines (Vosloo, 2003).

The occurrence of tropical riverine habitat along the Sand and Limpopo Rivers. The latter support many species with marginal distribution ranges in South Africa, since the majority reach their southern distribution limits on the study area. The number of bird species recorded for each quarter degree square range from 192 species at Kumkusi (2229BD) to as many as 278 species at Beitbridge (2229BB). Threatened and Near-threatened Species The highly seasonal and ephemeral nature of surface water retention in the area, along with the presence of large rivers with extensive sandy floodplains and pools are responsible for the occurrence of many threatened and near-threatened stork species (*c*. five species) in the region. These habitat features, in combination with the open structure of the woodland habitat (which favour large terrestrial bird species such as bustards, ground hornbills and Secretarybirds), an abundance of game species (which favours scavengers), the rural practice of ranching in neighbouring Zimbabwe (which favours scavengers of the vulture genera *Terathopius, Gyps* and *Aegyptius*) and the presence of isolated, although prominent landscape features (e.g. ridges which provide optimal hunting habitat for Verreaux's Eagle *Aquila verreauxii* and Lanner Falcon *Falco biarmicus*) have all contributed to the high richness of threatened and near-threatened bird species in the area, especially large birds of Prey. Therefore, a total of 19.5 % (133 spp) of all national threatened and nearthreatened bird species are present on the study area. In

retrospect, the majority of species are also highly prone towards collisions with earth wires, and therefore at risk. It is evident that the highest reporting rates (according to Harrison *et al*., 1997) were recorded from the southern and waster parts of the study area corresponding to 2229DB (Mopane), 2229BD (Kamkusi) and 2230CA (Thipise). Those areas with high reporting rates were well utilised by the Kori Bustard (*Ardeotis kori*), followed by the Lapped-faced Vulture (*Aegypius tracheliotos*), Verreaux's Eagle (*Aquila verreauxii*), Southern Ground Hornbill (*Bucorvus leadbeateri*) and Secretarybird (*Sagittarius serpentarius*). Alternative 1A is the most sensitive alignment due to the high reporting rates recorded for conservation important species along this alignment. It is in these areas where proper mitigation actions to reduce collisions or disturbances (through the loss of habitat) are required. 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*), Woolly-necked Stork (*Ciconia episcopus*), African Openbill (*Anastomus lamelligerus*), African Fish-eagle (*Haliaeetus vocifer*), Brown Snake-eagle (*Circaetus cinereus*),Black-chested Snake-eagle (*Circaetus pectoralis*) 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).

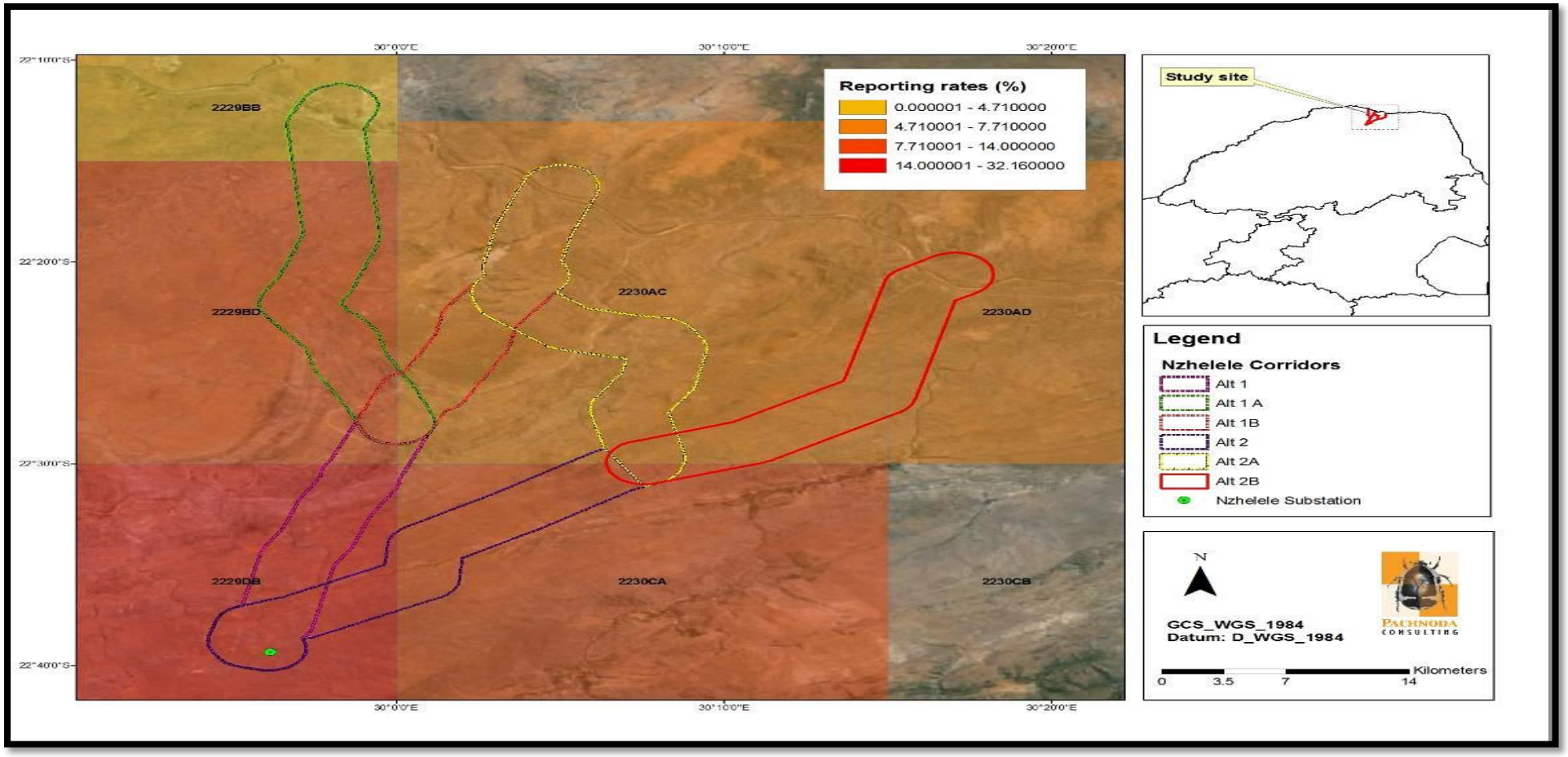

Figure 22: Nzhelele Corridors

Table 26: The reporting rates (%) for each Red listed Species.

QDGC Species	Global Status	Regional Status	2229BB Beitbridge	2229BD Kamkusi	2229DB Mopane	2230AC Musina	2230CA Thipise	2230AD Esmefour
Great White Pelican (*Pelecanus onocrotalus*)	-	V	3					3
Pink-backed Pelican (*Pelecanus rufescens*)	-	V	6					
White-backed Night-heron (*Gorsachius leuconotus*)	-	V						3
Yellow-billed Stork (*Mycteria ibis*)	-	ENV		8				9
Black Stork (*Ciconia nigra*)	-	V	3					9
Abdim's Stork (*Ciconia abdimii*)	-	NT	3		14	6	6	
Saddle-billed Stork	-	EN	6					6

(*Ephippiorhynchus senegalensis*)								
Marabou Stork (*Leptoptilos crumeniferus*)	-	NT	10					
Greater Flamingo (*Phoenicopterus ruber*)	-	V	3					
Lesser Flamingo (Phoeniconaias minor)	NT	NT	3					
Secretarybird (*Sagittarius serpentarius*)	V			8	29			
African White-backed Vulture (*Gyps africanus*)	EN	EN	3	8	21			3
Cape Vulture (Gyps coprotheres)	V	EN		8	21			
White-headed Vulture (*Aegypius occipitalis*)	V	EN		8				
Lapped-faced Vulture	V	EN						

(*Aegypius tracheliotos*)								
Verreaux's Eagle (*Aquila verreauxii*)	-	V	6			13	13	
Tawny Eagle (*Aquila rapax*)	-	EN	3		7	6	6	15
Martial Eagle (*Polemaetus bellicosus*)	NT	EN	6	8	21			6
Bateleur (*Terathopius ecaudatus*)	NT	EN			29	6	6	6
Pallid Harrier (*Circus macrourus*)		NT				6	6	
Lanner Falcon (*Falco biarmicus*)	-	V	10		7	6	6	6
Kori Bustard (*Ardeotis kori*)	NT	NT	3	62	50	31	31	15
Greater Painted Snipe (*Rostratula benghalensis*)	-	V	6					3

Chestnut-banded Plover (*Charadrius pallidus*)	NT	NT	3					
European Roller (*Coracias garrulus*)	NT	NT	3	8	29	38	38	15
Southern Ground Hornbill *(Bucorvus leadbeateri*)	V	EN		8	29			12
Average Reporting Rate			4.71	14.00	23.16	7.36	14.00	7.71
Total Richness			17	9	12	14	8	14

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.

10.4. WETLAND (WATERCOURSE ASSESSMENT STUDY)

FINDINGS

Watercourse Delineation

- Watercourse information from available spatial data sets, such as the 1:50000 topographical maps and the NFEPA River and Wetland data sets are illustrated in the Figures for the 500m corridors around the centre lines of corridor alternatives.
- Information from a desktop assessment per Sub Quaternary Reaches for river sections that overlap with the study area indicate that Corridor Alternative 1 contains the highest number of river reaches (six), with an Ecological Condition (EC) that range from B-C. Corridor Alternative 2 and 2A have three river crossings with an EC that range from B-C, while Corridor Alternative 2 and 2B have two river crossings, both with a B Ecological Condition.
- Based on experience existing spatial datasets under represent the number and extent of watercourses that may be present within a site. Even in arid to semi-arid environments, such as this particular study area. This is due in part to the azonal features of wetlands and related watercourses (Mucina & Rutherford, 2006), and the fact that existing watercourse inventories and datasets data sets are typically created at a national scale, which reduce the level of resolution and detail.
- In order to increase the accuracy regarding the number of watercourses present within the corridor alternatives, centre lines and centre line buffers a on-screen watercourse delineation process was applied to create new data sets that are expected to be of a better quality and more representative compared to existing watercourse datasets.
- Demarcated watercourses were classified into two groups:
    - *Watercourse lines*, which include headwater drainage lines, narrow streams and channels, and narrow riparian systems and channelled valley bottom wetlands. The level of confidence associated with this watercourse category is low to moderate, as some non-watercourse linear features, such as vehicle, game and livestock tracks could also mistakenly have been included as part of the delineation process. Further field verification is therefore necessary during an EMP Walk Down assessment.

- *Watercourse polygons*, which include dams, larger riparian systems, channels, and channelled valley bottom wetlands. Seep, flat and pan wetlands are also included as part of this watercourse category. The level of confidence associated with this watercourse category is moderate and will benefit from field verification during an EMP walk down assessment.

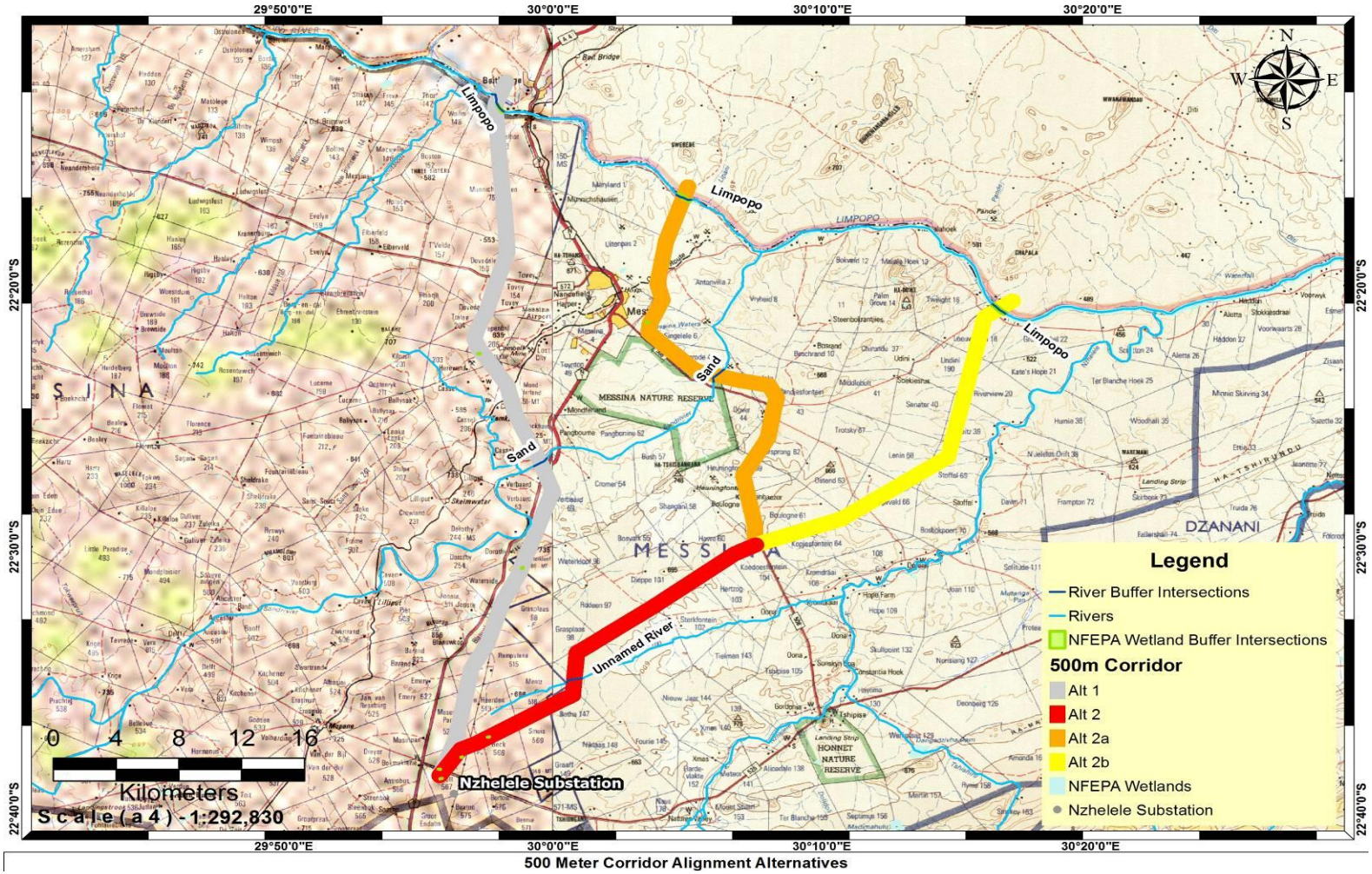

Figure 23: Illustrates Riversan expected wetlands within the study area

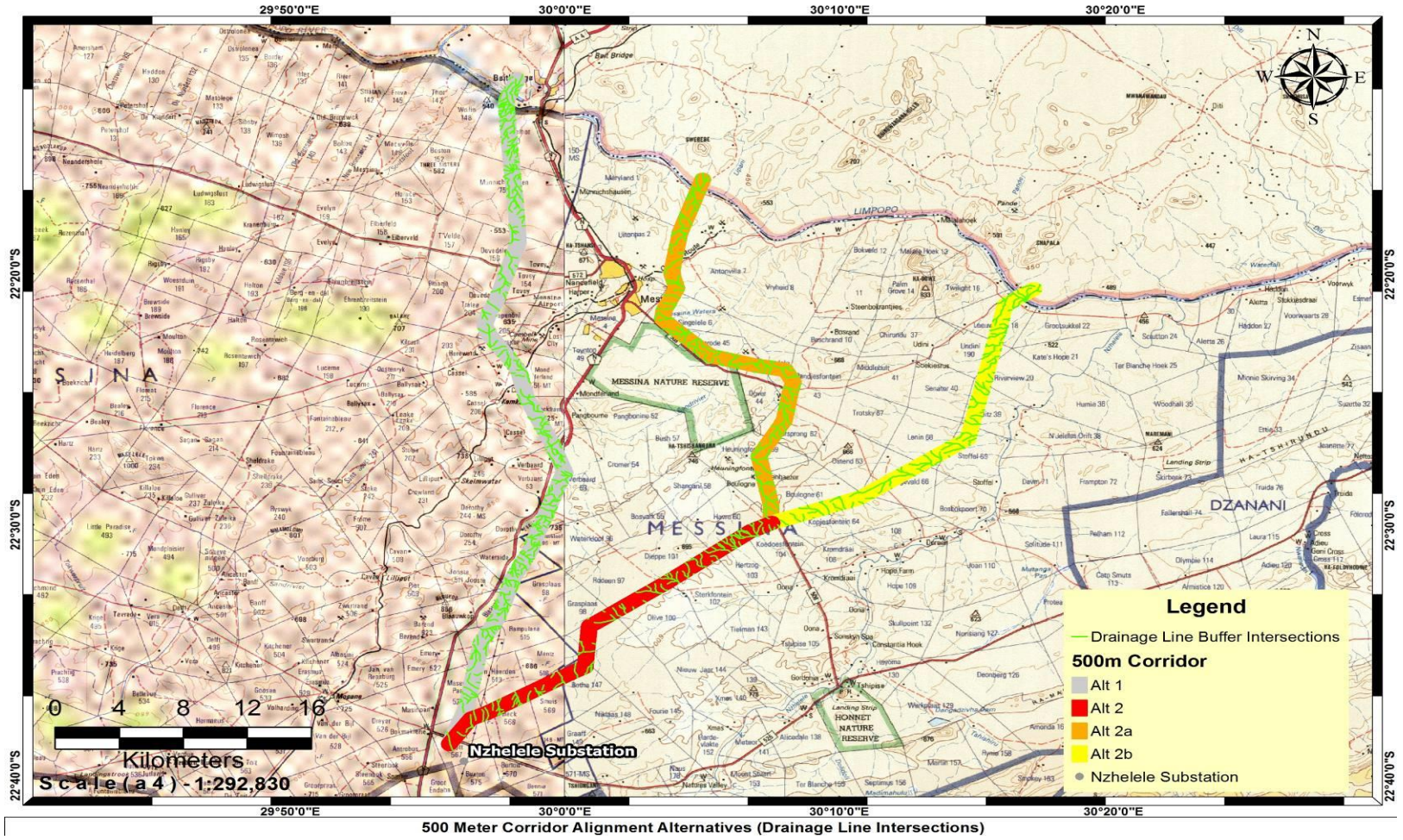

Figure 24: Drainage Buffer Intersections

Table 27: Present Ecological State (PES), Ecological Importance (EI), Ecological Sensitivity (ES) and the combined Ecological Condition (EC).

Corridor name	Number of SQ river reaches in corridor	River name	SQ river reach code	PES category (Median)	Mean EI class	Mean ES class	Stream order	EC (Based on median PES and highest of EI or ES means)	Overlap with
Alt 1	1	Sand	A71K-00019Sand	B	High	Moderate	3	B	Corridor, centre line and 500m centre line buffer
	2	Limpopo	A71K-00019Limpopo	C	High	High	5	B	Corridor, centre line and 500m centre line buffer
	3	Unnamed Sand River tributary	A71K-00029	B	Moderate	Very low	1	C	Only with Corridor 1
	4	Sand	A71K-00031	C	High	Moderate	3	B	Only with Corridor 1
	5	Soutsloot	A71L-00015	A	Moderate	Very low	2	C	Only with Corridor 1
	6	Limpopo	A71L-	C	High	High	5	B	Only with

Corridor name	Number of SQ river reaches in corridor	River name	SQ river reach code	PES category (Median)	Mean EI class	Mean ES class	Stream order	EC (Based on median PES and highest of EI or ES means)	Overlap with
			00006Limpopo						Corridor 1
Alt ½	0	-	-	-	-	-	-	-	No overlap
Alt 2	1	Unnamed Nzhelele River tributary	A80G-00043	B	Moderate	Very low	1	C	Corridor, centre line and 500m centre line buffer
Alt 2A	1	Sand	A71K-00019Sand	B	High	Moderate	3	B	Corridor, centre line and 500m centre line buffer
	2	Limpopo	A71K-00019Limpopo	C	High	High	5	B	Corridor, centre line and 500m centre line buffer
	1	Limpopo	A80G-00026	C	High	High	5	B	Corridor, centre line and 500m centre line buffer

Watercourse Assessments

- Data obtained from existing watercourse-related and road spatial datasets are indicated in tabular format for the centre lines of corridor alternatives and 500m buffers around centre lines. The following can be inferred for each of the three **functional corridor alternatives** as defined in Section 3.1 of the Wetland Report:
    - The combined centre line through and 500m centre line buffer around Alternative 1 and 1/2, overlap with the highest number of drainage lines and contains the longest combined length of drainage lines, as obtained from the 1:50000 topographical data sets.
    - The combined centre line through and 500m centre line buffer around Alternative 1/2, Alt 2 and Alt 2B, overlap with the lowest number of drainage lines and contains the shortest combined length of drainage lines, as obtained from the 1:50000 topographical data sets.
    - The combined 500m centre line buffer around Alternative 1/2,. Alt 2 and Alt 2B contain the highest combined surface area for NFEPA Wetlands. NFEPA Wetlands are however not regarded as representative of wetland within the study area and their presence is therefore associated with a low level of confidence.
- Data obtained from newly delineated (created) Watercourse Line and Polygon datasets are indicated in Table 6-8 f the Wetland Report for the centre lines of corridor alternatives and 500m buffers around centre lines. The following can be inferred for each of the three **functional corridor alternatives** :
    - The combined 4km wide corridor and 500m centre line buffer around Alternative 1 and 1/2, overlap with the highest number of delineated Watercourse polygons, contain the largest combined size of Watercourse polygons, and its centre line intersects with the largest combined length of Watercourse polygons.
    - The combined 4km wide corridor and 500m centre line buffer around Alternative 1/2, Alt 2 and Alt 2B, overlap with the highest number of delineated Watercourse lines and contain the largest combined length. The combined centre line also transects the largest number of Watercourse lines. It is however important to note that the same functional corridor contain a low number (nearly the lowest) of Watercourse polygons in its 4km wide corridor, and the lowest number of Watercourse polygons in its 500m centre line buffer. In addition, it contains the smallest combined surface area size of Watercourse polygons in its 4 km buffer and 500 m centre line buffer.

Lastly and importantly, the centre line of this functional corridor alternative intersects the smallest combined length of Watercourse polygon crossings.

Table 28: Indicates data from available spatial datasheets for 500m buffers round the centre line of corridor alternatives.

Corridor name	No. of drainage lines (1:50000 topomaps)	Combined length of drainage lines (1:50000 topomaps)	No. of rivers (NFEPA River dataset)	Combined length of rivers (NFEPA River dataset)
Alt 1 & Alt ½	268	154 330 m	2	2 602 m
Alt 1/2 & Alt 2	99	57 349 m	1	1 095 m
Alt 2A	110	88 064 m	2	2 216 m
Alt 2B	105	65947 m	1	1 056 m
Alt 1/2, Alt 2 & Alt 2A	209	145 413 m	3	3 311 m
Alt 1/2, Alt 2 & Alt 2B	204	123 296 m	2	2 151 m

Table 29: Indicates data from available spatial datasets for 500m buffers round the centre line of corridor alternatives.

Corridor name	No. of NFEPA wetlands	Combined surface area of NFEPA wetlands	No. of road sections	Combined length of road sections
Alt 1 & Alt ½	5	9.26 ha	124	104 076 m
Alt 1/2 & Alt 2 &	4	1.96 ha	37	22 944 m
Alt 2A	3	11.71 ha	47	50 976 m
Alt 2B	2	21.12 ha	59	39 192 m
Alt 1/2, Alt 2 & Alt 2A	7	13.67 ha	84	73 920 m
Alt 1/2, Alt 2 & Alt 2B	6	23.08 ha	96	62 136 m

Table 30: Indicates data from available spatial data sets for the centre lines of corridor alternatives.

Corridor name	No. of drainage line crossings (1:50000 topomaps)	No. of river crossings (NFEPA)	No. of wetland crossings (NFEPA)	No. of road crossings (1:50000 topomaps)
Alt 1 & Alt ½	88	2	0	66
Alt 1/2 & Alt 2 &	46	1	1	19
Alt 2A	40	2	1	25
Alt 2B	36	1	1	22
Alt 1/2, Alt 2 & Alt 2A	86	3	2	44
Alt 1/2, Alt 2 & Alt 2B	82	2	2	41

Table 31: Indicates data from delineated (created) watercourse Polygon and Watercourse Line data sets for assesses 4km wide corridor alternatives.

Corridor name	No. of Watercourse lines (delineated)	Combined length of Watercourse lines (delineated)	No. of Watercourse polygons (delineated)	Combined Watercourse polygon area (delineated)
Alt 1	238	138 264 m	47	2071.67 ha
Alt ½	22	16 392 m	6	81.29 ha
Alt 1 & Alt ½	260	154 657 m	53	2152.96 ha
Alt 1/2 & Alt 2	80	82 192 m	7	279.97 ha
Alt 2A	147	110 292 m	23	1284.6 ha
Alt 2B	213	157 861 m	25	794.71 ha
Alt 1/2, Alt 2 & Alt 2A	227	192 484 m	30	1564.57 ha
Alt 1/2, Alt 2 & Alt 2B	293	240 053 m	32	1074.68 ha

Table 32: Indicates data from (created) Watercourse Polygon and Watercourse Line data sets.

Corridor name	No. of Watercourse lines (delineated)	Combined length of Watercourse lines (delineated)	No. of Watercourse polygons (delineated)	Combined Watercourse polygon area (delineated)
Alt 1 & Alt ½	85	42 726 m	24	518 ha
Alt 1/2 & Alt 2	34	21 976 m	7	65.93 ha
Alt 2A	46	25 528 m	15	351.88 ha
Alt 2B	58	31 967 m	11	184.69 ha
Alt 1/2, Alt 2 & Alt 2A	80	47 504 m	22	417.81 ha
Alt 1/2, Alt 2 & Alt 2B	92	53 943 m	18	250.62 ha

Table 33: Indicates data from delineated (created) Watercourse Polygon and Watercourse Line data sets alonng the centre line of corridor alternatives.

Corridor name	No. of Watercourse lines (delineated)	Combined length of Watercourse lines (delineated)	No. of Watercourse polygons (delineated)	Combined Watercourse Polygon intersection length (delineated)(
Alt 1 & Alt ½	23	N/A	13	5444 ha
Alt 1/2 & Alt 2	17	N/A	5	597 ha
Alt 2A	12	N/A	12	3965 ha
Alt 2B	14	N/A	9	1700 ha
Alt 1/2, Alt 2 & Alt 2A	29	N/A	17	4561 ha
Alt 1/2, Alt 2 & Alt 2B	31	N/A	14	2297 ha

RECOMMENDATIONS

- All watercourse lines and polygons, which include headwater drainage lines, dams, depressions (pans), other wetlands, and riparian areas are regarded as sensitive 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.
- New Watercourse lines and polygons that were delineated as part of this study and submitted with this report as GIS shapefiles should be used by the Eskom engineers and technical personnel to help find a best fit route alignment in the selected corridor alternative.
- 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 (EMP Walk Down assessment).
- 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.
- 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 (Section 6).

10.5 SOIL AND AGRICULTURAL POTENTIAL

FINDINGS

During the field investigation and high-level reconnaissance soil survey it was found that the land type data provides a very good indication of the soil and landscape variability in the survey area. The summaries of the land types, as provided in section 4.1, therefore apply.

The agricultural potential of the survey area is determined by the soils and the availability of water. In the case of the soils the land types provide a very good indication of the agricultural potential in that all the F land types are of very low potential with extensive grazing and game farming as the only options. In the A land types an aspect such as soil depth plays a role but then water must be available for supplementary irrigation as the rainfall in the area is not enough for dryland crop production. From a climate perspective all the land types are suited to extensive grazing and game farming alone as the rainfall is deemed inadequate for large-scale crop production. In addition, the potential evapotranspiration for the area is high and this further limits the possibility of dryland crop production.

RECOMMENDATIONS

1. The survey area is dominated by shallow and rocky soils with slightly deeper soils occurring in confined locations in the south and west (A land types).

2. The rainfall in the area is variable and relatively low leading to distinct limitations in terms of dryland crop production activities. This is confirmed by the land capability classification for the area that falls into a class VII that indicates that the area is suited to extensive grazing and game farming only.

3. In the A land types pockets of soils occur that are suited to irrigated agricultural uses but water availability is the main restriction when such land uses are considered.

4. The development footprint of a transmission line is such that only small areas of land surface are sterilised and it is therefore practically feasible to limit the impacts through proper pylon placement.

5. On the basis of the survey results a specific alignment is not favoured as the impacts would be very similar throughout. From an infrastructure and further land impact perspective in terms of access roads Alternative 1 is preferred as it follows existing road infrastructure along most of the route.

10.6 VISUAL IMPACT ASSESSMENT

FINDINGS

According to the specialist study, GIS was extensively used as a tool for data collection as **5.1 Viewshed and viewing distance**
Viewshed analyses (proportional viewshed) 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 reduction of visibility with distance (exponential decay) was combined with the viewshed and the results were shown.

10.6.1 Visual Exposure Analysis

Visual exposure analysis uses the digital terrain model (DTM) and derivatives thereof to determine to what extent the topography of the study area exposes or hides human structures. The DTM with 90m pixels was extracted from the SRTM. Visual exposure scores range from -3 to 3; negative values indicate a reduction in visual exposure, positive values an increase in visual exposure.

Landforms
Certain landforms will expose structures more than others. Structures located on top of a ridge will be more visible than structures located in a deep canyon. The DTM and the Topographic Position Index (TPI) as defined by Weiss [1] were used to determine a landform raster dataset. For the analysis, focal statistics with annulus neighbourhoods (ESRI, Arcgis 10) with radii of 150m & 300m and 1860m & 2010m were used.

Slope Position
The visibility of structures positioned on slopes is dependent on where the structures are positioned. Structures on upper slopes and ridges are prone to be more visible than structures in on lower slopes or in valleys. Using the DTM and the TPI analysis with a focal statistics annulus neighbourhood (ESRI, Arcgis 10) with radii of 900m and 1050m, the slope position raster dataset was determined.

Relative elevation
The visibility of a structure at any given position is *inter alia* determined by that position's elevation relative to the elevation of the surrounding topography. If at any given position, most of the immediate surrounding topography has a higher elevation, any structure would be less visible than if most of the immediate

surrounding topography has a lower elevation. For this analysis the mean elevation of a focal statistics circular neighbourhood (ESRI, Arcgis 10.0) with a radius of 1000m was determined and subtracted from the DTM. In the resulting raster dataset, negative values indicate surrounding topography with a higher elevation and positive values indicate surrounding topography with a lower elevation.

10.6.2. Visual Absorption Capacity

Visual absorption capacity (VAC) is a measure of the ability of topographical features to hide introduced structures. It is thus the inverse of the visual exposure analysis. For analytical purposes it is preferred to use the Visual Exposure scores.

10.6.3. Viewer sensitivity

A viewer sensitivity raster dataset was created using the following datasets:

- Topographic data (NGI)
- Conservation (ENPAT)
- Natural Features (ENPAT)
- Formal protected Areas (SANBI)
- Informal protected areas (SANBI)

<u>Recommendations</u>

The most important mitigation measure is planning and design in such that the transmission line is placed is such a manner that the visual intrusion is either avoided or limited as far as possible. Secondarily, it is important that during the construction phase the short term visual disturbance is kept to a minimum that any such disturbance is adequately rehabilitated such that no long term disturbance remains. General mitigation measures include the following:

- Colour/Coating: Using a coating on the steel that is darker than galvanized steel will reduce the visual impact.
- Existing linear features: Placing new linear structures alongside existing linear features will reduce the overall impact.
- Erosion: special attention to erosion control is important as erosion tends to develop long term scars in the landscape.
- Clearing of vegetation: Any clearing of vegetation should be limited to cutting only – no earth moving equipment. Clearing of any vegetation that would provide a screening effect should be avoided. Generally, the overall area has fairly dense vegetation which could be utilised as a very effective shield.
- Access Roads: Use existing roads and tracks as far as possible

- Rehabilitation: Any temporary disturbance should be rehabilitated as soon as possible to reduce the effects of erosion.
-

10.7 HERITAGE IMPACT ASSESSMENT

FINDINGS

From the background information search of the broader Limpopo region, the Limpopo Province is a known to contain some of South Africa's most researched archaeological, rock art, historical and other cultural heritage sites. West of the project area, along the Limpopo River, sites of Mapungubwe and Great Zimbabwe cultures are found.Some of these sites extend to the project foot print on the western end such as Khami. On the eastern end of the project footprint Late Iron Age sites have been found in Meremani Nature. Therefore it can be argued that the project area is located with a rich cultural landscape with a potential of yielding more archaeological, rock art and other heritage resources sites.

Because of the size of the proposed alignments or corridors which cover approximately 4km each in width, not all areas were covered by the survey. For the areas that were not covered by the survey, we conducted Google Earth spotting of the affected areas/environment and used this together with existing database to analyse which of the corridors should be approved in terms of heritage resources management. Interviews with one of the renowned archaeologists working in the area were held by NGT staff with Professor Tom Huffman of the University of the Witwatersrand.

According to Prof Huffman during the interview and assessment of the proposed route and its alternatives, all routes have the potential to yield Iron Age sites. Alternative 1A was identified as having a high possibility of yielding Iron Age sites, as compared to 2B with the least Iron Age possible sites as compared to the other proposed routes such as Alternative 1B and Alternative 2B. This assertion is further supported by the Google Earth spotting of the affected environment and existing maps below. We can see that Alternative 1A has more potential archaeological yield areas as compared to Alternative 2B (small red ink).

Two sites were discovered in Alternative 1B and Alternative 2A; however, these two alternatives are less likely to result to the discovery of more archaeological resources as compared to Alternative 1A and Alternative 2B which also yielded an archaeological site. Alternatives 1 and 2 have not yielded any archaeological resources and no potential yield areas; however, they may still be some

archeological resources that can be discovered once the corridors have been reduced for alignment for the Construction Environmental Management Programme. Based on the above and the associated databases; it is advisable that the developer should omit Alternative 1A from the list of corridors. Alternative 2B has a potential to yield archaeological resources, but less as compared to Alternative 1A. This Alternative is, however, not supported in that it falls within an area in which the University of Pretoria is currently conducting research and is known to contain archaeological sites.

The developer should therefore consider Alternative 1 and Alternative 1B as the preferred alternatives for the proposed development. Alternative 2 and Alternative 2A are the second preferred Alternatives to the project in that they have less likelihood of impacting on archaeological resources. In both Alternative 1B and Alternative 2A two heritage resources were identified, however, these heritage resources can easily be mitigated by means of avoidance during the construction phase of the project. Furthermore, Artonvilla site is a dilapidated mining compound and the Musina cemetery can easily be avoided. Based on the above, the following conclusions and recommendations are made about the project.

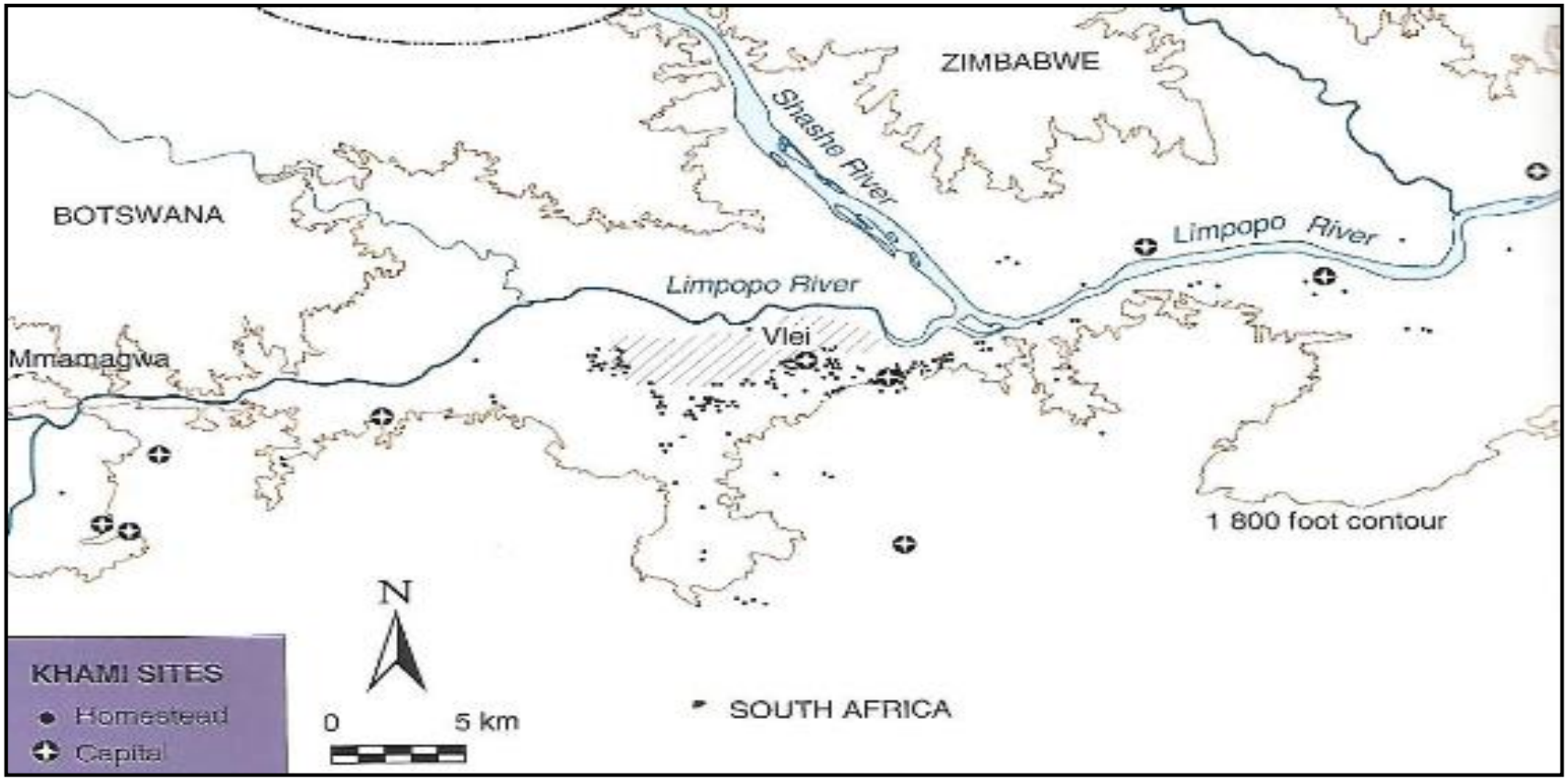

Figure 25: Distribution of Khami (Late Iron Age) sites along the Limpopo River.Note to Khami near our project area

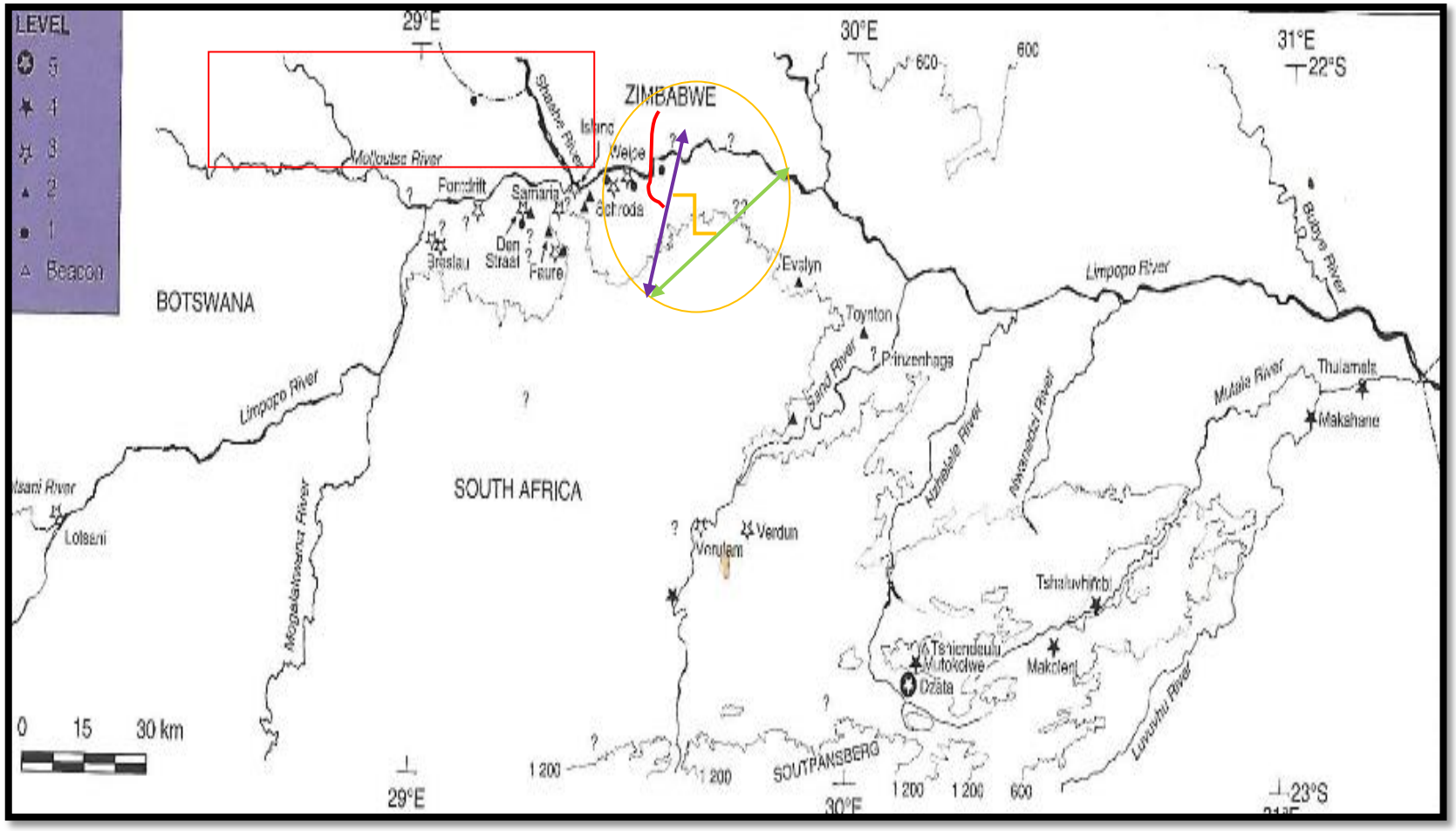

Figure 26: Distribution of known archaelogical sites west of the project footprint.

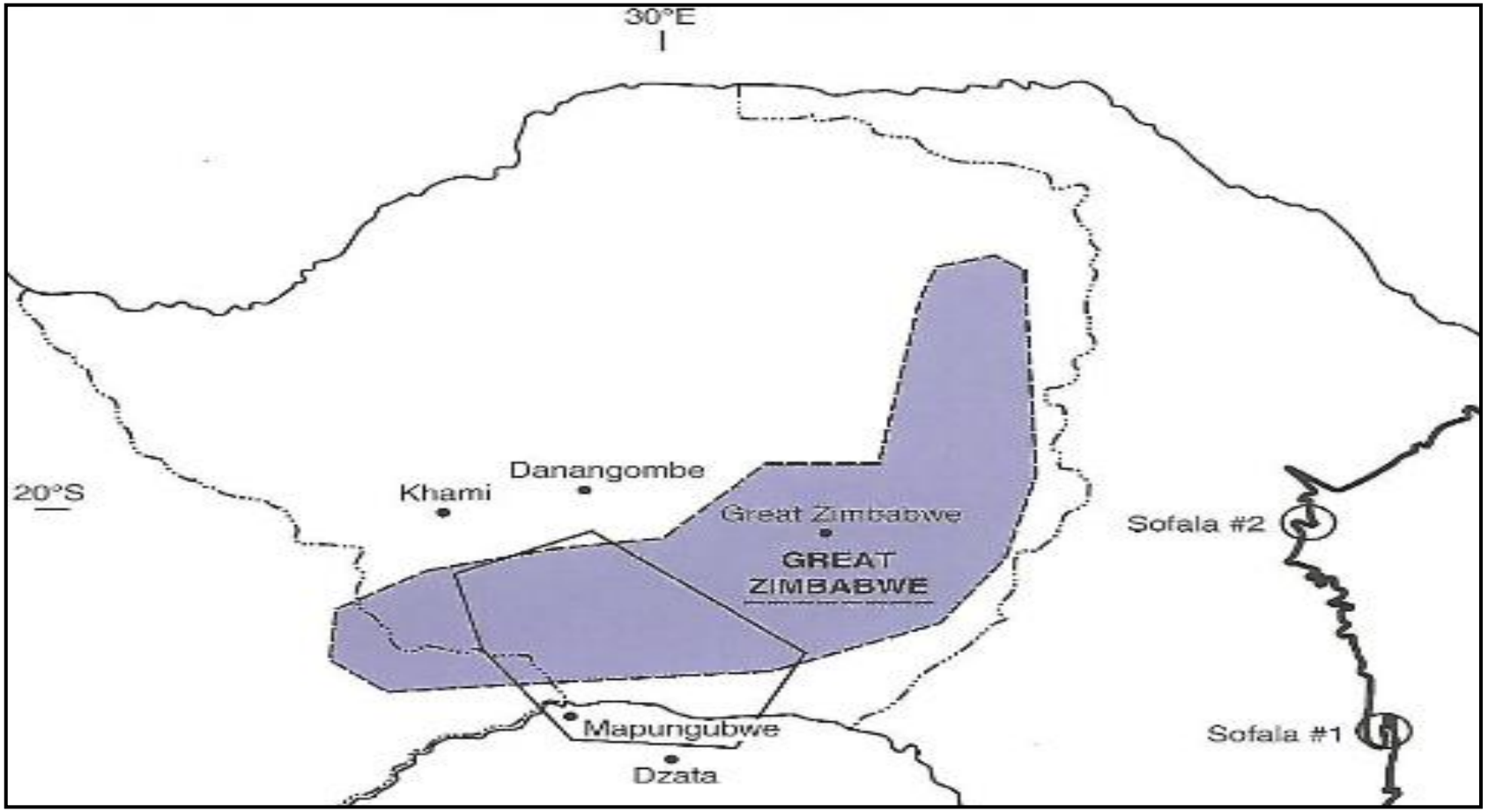

Figure 27: The extent of Mapungubwe as shown in diagnal box.

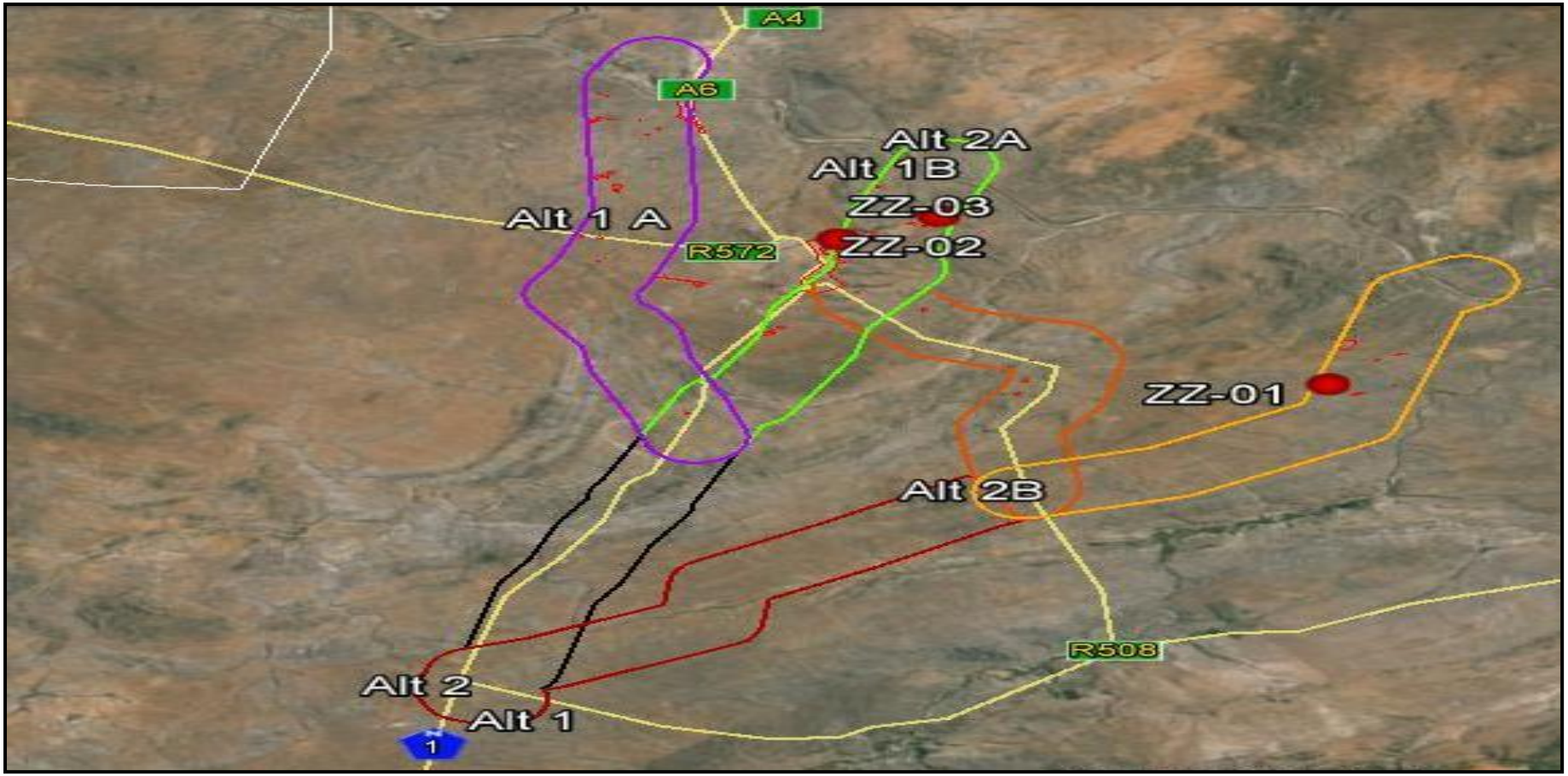

Figure 28: Distribution of the three identified heritage resources and archaelogical potenial yield areasnas shown in small red dot

RECOMMENDATIONS

- It is recommended that SAHRA approves Alterative 1 and Alternative 1B as the preferred alternatives for the proposed development.
- Should Alternative 1 and Alternative 1B not be supported by the developer SAHRA should approve Alternative 2 and Alternative 2B.
- It is recommended to the client that once the EIA process has been completed, a specialist walkdown programme should be developed for the approved Alternative as part of the Construction Environmental Management Programme.
- A heritage consultant or archaeologist should be employed in the specialist walkdown to conduct a Phase 2 HIA for the preferred alternative and assess the location of tower positions in relation to any other heritage resources that would be identified in the walkdown as part of Construction Environmental Management Programme.
- The heritage specialist would then advise both SAHRA and the developer on the mitigation measures for sites that would be impacted and applied for heritage permits for their mitigation in line with the NHRA, No. 25 of 1999.

10.8 SOCIO-ECONOMIC IMPACT ASSESSMENT

FINDINGS

The core considerations for each of the proposed corridors such as the grey, the red, the orange and yellow are ones which do not pose as fatal flaws but are projects or features that would need to be taken into account. In the grey corridor, located close to the border is the intended Limpopo Eco-Industrial Park, which has not yet been built but would still be beneficial to consider such that the two projects could be in harmony with one another. It also features as a part of the orange corridor but less so meaning more space for a power line to be constructed in the designated orange corridor area without affecting the other project. There are no large social considerations for the red corridor. The yellow (2B) corridor cuts through Maremani Nature Reserve which is an area that is used for private conservation.

Following the above it is evident that both the grey (1) and the red (2) and orange (2A) corridors have the Eco –Industrial Park featured on it. However, the red (2) and orange (2A) is most preferred because of the space available for the power-line and the Eco-Industrial Park to exist together, therefore bringing the most benefit to the area. The grey (1) corridor would also intersect with an area that is planned to be

used for conservation in the Eco-Industrial Park, which if cannot be avoided, is still viable. Thus, making it the second most preferred. The yellow (2B) is the least preferred because of its value to the collective area in terms of conservation and preservation of the natural habitat which can have value to the local society in future generations.

Recommendations

•Formulate a communication strategy where the people of the local/ affected area are briefed before construction takes place.
The key information that would need to be shared is as follows:
-The expectant number of employees to the area during the construction phase.
-The location of the construction camp, how large it would be and the duration the construction camp would be around for.
-The number of jobs created for people of the local area (if any) and which companies were appointed in this regard.
-A summary of the Environmental Management Plan (EMP) that would allow for residents to feel that the project will be effectively managed.
-The expectant dates for construction in the respective areas.
This could take the form of a meeting and for people not present could be communicated via email.

•Meeting with relevant people in the Department of Environmental Affairs and Tourism should be consulted to ensure that there is no impact on the status of the Vhembe Biosphere Reserve as a result of the project.

•Recommendations from Pieterse Du Toit & Associates with regard to the Limpopo Eco-Industrial Park Township development, Limpopo Eco-Industrial Park Extension 1, 3000 Ervin Residential Development as well as the Singelele Eco-Estate were received giving respective information about the development and the areas that would be affected by the proposed corridors of the Nzhelele- Triangle Project. Following the recommendations received and considering the national importance of the Nzhlele- Triangle Project as a vehicle for future power, it would be suggested that a meeting take place between Turnscapes Travel and Tourism, Baagi Environmental Consultancy and Pieterse Du Toit & Associates to discuss the harmonisation of the corridors and the proposed developments.
•The position and place of the construction camp should be carefully considered.
•Economic opportunities that can benefit local businesses should be enabled.
•Local businesses should be prioritised in terms of the opportunity for the less skilled positions on the project.

•It would be beneficial to appoint companies that are aligned with the Black Economic Empowerment (BEE) Policy.
•It would be useful for the local companies appointed for there to be a list/registry of other companies in the local setting that could be used for collaboration on the project.
•If it is necessary, a programme to equip local people with the required skills can be enabled.
•Where accommodation establishments will be sought after by employees working on the project, a list of accommodation businesses in the proposed corridors should be put forward to be supported, such to attain some of the benefits of the project

10.9. Tourism Impact Assessment

There are numerous tourism ventures that are game farms and accommodation establishments in the grey corridor (1) and an important focus is on the landscape in this type of nature-based tourism. This can be referred to as the sense of place that places a large role in the perceived attractiveness of the destination and tourism venture in particular. A power- line has the ability to change the sense of place in a negative light in its early stages when it is new to the people and tourists and particularly in its construction phase. This phase can also interfere with the revue generation of the tourism ventures as the trophy hunters in the area might avoid it during that time and sought other destinations after the power –line has been established. Hence, the grey corridor (1) is the least preferred from a tourism viewpoint. The second least preferred is is the red (2) and orange (2A) corridor as it avoids both Musina Nature Reserve as well as Maremani Nature Reserve and other tourism establishments.
The Red (2) and Yellow (2B) corridor is the most preferred as although it would pass through Maremani Nature Reserve which does have a number of tourist that visit it annually although this amount is not exorbitant and the revue generated as a result of tourism and estimated visitor numbers are higher for the other corridors than for this corridor.

<u>Recommendations</u>

- Transparent communication should be facilitated with the respective land-owners and owners of tourism establishments about the possible impacts that would be experienced during the construction phase and the operational phase. This would be such that clear expectations are formulated. It would be useful if elements of management from the Environmental Management Plan be shared such that the community of the affected areas can have confidence that impacts would be effectively managed.

- A schedule of which areas construction will take place in the respective timeframe should be prepared to give the affected land-owners and businesses so that they would be able to prepare in advance for the construction.
- The construction camp should be positioned in an area that is far from key tourism regions.
- Employees employed on the project can choose to support the accommodation establishments that are affected by the project.
- Recommendations suggested by the Social Impact Assessment should be implemented.
- While construction is taking place it would be advisable that it be avoided by tourists in the regions where this is possible.

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 alignement alternatives based on the socio-economic and environemental aspect of the study area

Specialist Study	Alternative 1	Alternative 2 & 2a	Alternative 2 & 2b	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 and endangered flora habitats and conservation priority areas.	Route Alternative 2b is the least sensitive in terms of the vegetation and therefore the preferred route alignment. The second preference is Alternative 2a
Fauna	Transverses the highest percentage of habitat types of high perceived ecological value due to the presence of a riverine environment.	Transverses the least amount of habitat types of high perceived ecological value when compared to the other alternatives due to the route passing through a mostly built up environment	Transverses a moderate percentage of habitat types of high perceived ecological value.	Route Alternative 2a is the least sensitive in terms of the fauna habitats and therefore the preferred route alignment.
Avi-Fauna	Intersects and transverses	The low crane occurrence	Intersects and transverses	Alternative 1 and 2b will have more

Specialist Study	Alternative 1	Alternative 2 & 2a	Alternative 2 & 2b	Summary
	numerous priority crane breeding habitats and wetland types. Also contain important nesting and foraging habitats for crane species.	or nesting localities on farm properties and the presence of a busy highway/transport network alongside the proposed corridor	the highest percentage of priority crane breeding habitats and wetland types. Also contain important nesting and foraging habitats for crane species.	eminent impacts when compared to Alternative 2a. Therefore, Alternative 2a is regarded as the "better" option when compared to the other corridors.
Wetland	The corridor has the highest overlap with Highly Sensitive Aquatic Sub catchments areas and contains the second highest surface area and number of Potential crane breeding watercourses. It also contains the highest number of tributaries that run parallel to the proposed route.	The corridor has the highest surface area of non-linear watercourses (e.g. pan wetlands) and the centre-line has the highest number of crossing lengths greater than 400 m.	The corridor has the highest combined watercourse 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	Alternative 2a is regarded as the most favourable route selection from a watercourse consideration, while Alternative 2b is regarded as second most favourable route. Alternative 1 should not be considered from a watercourse impact aspect.
Heritage (HIA)	Alternative 1 has a potential to impact on more	Alternative 2a two heritage resources were	Alternative 2b is located in area currently being	Alternative 1 is the most preferred route. The second most preferred

Specialist Study	Alternative 1	Alternative 2 & 2a	Alternative 2 & 2b	Summary
	archaeological resources because it is closer to the Mapungubwe cultural landscape. Based on exiting database of known archaeological resources in the region this alternative is also closer to known Khami sites and two Khami Capitals.	identified; however, these heritage resources can easily be mitigated by means of avoidance during the construction phase of the project. Alternative 2A is the second preferred Alternatives to the project in that it has less likelihood of impacting on archaeological resources.	researched by the University of Pretoria and with known archaeological resources.	alternative route is 2a and 2b is not to be considered.
Soil & Agricultural Potential	On the basis of the survey results a specific alignment is not favoured as the impacts would be very similar throughout. From an infrastructure and further land impact perspective in terms of access roads Alternative 1 is preferred as it follows existing road	The corridor contains moderate to low potential agricultural soils.	The corridor contains moderate 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 2 & 2a	Alternative 2 & 2b	Summary
	infrastructure along most of the route.			
Visual (VIA)	Alternative 1 is regarded as having the lowest visual impact in comparison to the other corridors.	Alternative 2a is regarded as having the highest visual impact in comparison to the other corridors.	Alternative 2b is regarded as having a moderate to high visual impact.	The analysis shows that in terms of visual impact, Alternative 1 is the best option.
Geotech	Alternative 1 is regarded as having the highest engineering geological constrains in comparison to the other corridors investigated.	Alternative 2a is regarded as having moderate to high engineering geological constrains.	Alternative 2b 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 2b is the best option.
SIA	The grey (1) corridor would also intersect with an area that is planned to be used for conservation in the Eco-Industrial Park, which if cannot be avoided, is still viable. Thus, making it the second most preferred.	Corridor 2a is most preferred because of the space available for the power-line and the Eco-Industrial Park to exists together, therefore bringing the most benefit to the area.	Corridor 2b is the least preferred because of its value to the collective area in terms of conservation and preservation of the natural habitat which can have value to the local society in future generations.	Both Alternative 1 and Alternative 2a could be followed from a social point of view. However, 2a is most preferred because of its vicinity to the built environment.

Specialist Study	Alternative 1	Alternative 2 & 2a	Alternative 2 & 2b	Summary
Tourism	There are numerous tourism ventures that are game farms and accommodation establishments in the grey corridor (1) and an important focus is on the landscape in this type of nature-based tourism. This can be referred to as the sense of place that places a large role in the perceived attractiveness of the destination and tourism venture in particular. Hence, the grey corridor (1) is the least preferred from a tourism viewpoint.	The second least preferred is corridor 2a as it avoids both Musina Nature Reserve as well as Maremani Nature Reserve and other tourism establishments.	2b corridor is the most preferred as although it would pass through Maremani Nature Reserve which does have a number of tourist that visit it annually although this amount is not exorbitant and the revue generated as a result of tourism and estimated visitor numbers are higher for the other corridors than for this corridor	Alternative 1 and 2a are not preferred due to the potential impact the proposed transmission will have on the tourism of the area. Alternative route 2b is the most preffered route from a tourism point of view.
Technical Viability	Corridor 1 passes transects through a nuber of riverine systems. Thid fact presents the opportunity fr lora and funa to thrive. The corridor also posses the most activity	Alternative route 2b runs closest to Mussina town. As such, it runs close to a built up environment which has exixstng amenities. As such, the	This corridor contains the Maremani Nature Reserve, which is deemed as a non entity as far as Tourism is concerned due to the low numbers of tourists. The	From a technical point of view, Alternative route 1 is the preferred route.

Specialist Study	Alternative 1	Alternative 2 & 2a	Alternative 2 & 2b	Summary
	from a mining point of view, thus presenting the possible threat of undermining. However, from a purely technical point of view, Alternitve route is th most preferred as most of the technical analyses alludes to.	construction of a powerline is deemed to have some impacts on the social and cultural aspects of Mesina town. From a technical point of view, after amassing all the aspect presented by the individual secilaist views, this route is the second most preferred route.	Reserve also does not have as many endangerd floral species as Corridor 1 and 2b.	

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

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

Specialist Study	Alternative 1	Alternative 2&2a	Alternative 2&2b
Flora	X	0	X X
Fauna	X	XX	0
Avi-Fauna	X	XX	0
Wetland	0	XX	X
Heritage (HIA)	XX	X	0
Soil & Agricultural Potential	XX	X	0
Visual (VIA)	XX	0	X
Social	X	XX	0
Tourism	0	X	XX
Technical viability	XX	X	0

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.

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 15. Care should be especially taken during the late winter/ early spring months (June, July, August, and 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

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
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

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
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

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
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	Without management	3	4	1	4	High

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
permanent road crossings and towers in watercourses. Erosion risks are greatest during flooding or high rainfall events	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

Nature of Impact	Management Measures	Duration	Scale	Severity	Probability	Significance
	With management	2	2	1	3	Moderate

11.5 IMPACTS ON AGRICULTURAL POTENTIAL

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 (Agricultural Pontential)

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 41 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

Potential Impacts	Proposed Mitigation measures
	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 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

Potential Impacts	Proposed Mitigation measures
	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 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

Potential Impacts	Proposed Mitigation measures
	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
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.

Potential Impacts	Proposed Mitigation measures
	• 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 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-

Potential Impacts	Proposed Mitigation measures
	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

Potential Impacts	Proposed Mitigation measures
	from the study area to avoid conflict between locals and outsiders with regards to the securing of employment. • 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

Potential Impacts	Proposed Mitigation measures
	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 • 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

Potential Impacts	Proposed Mitigation measures
	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. • 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

Potential Impacts	Proposed Mitigation measures
	• 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 N1 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 Agricultural Activities

There are various agricultural activities occurring within the study area. The cumulative impact of construction the proposed 2x 500kV power lines 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.

12.3 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 2x500kV transmission powerlines 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 500kV line, it is therefore the opinion of the EAP that the activity should be authorised.

In authorising the proposed double circuit 500kV line 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 500kV line 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

The proposed overall onstruction entails a coonection from RSA to Zimbabwe. The Zimbabwe connection is most preferred to be in Beitbridge where Alternative Routes1 and 2a will satisfy. In this regard, Alternative Route 2b is least favoured from a purely technical point of view, as the route veers off to the East of Beitridge.

Froam a specialist assessment school of thought, Route 1 was selected as the preffered alternative. This further makes viable technical sense when coined with the notion presented in the paragraph above.

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 1 is not preferred by wetland, avi-fauna, fauna, soil and agricultural potential while the specialists that prefer it are flora, geotechnical, and visual. Alternative 2a is not preferred by the following specialist socio-economic, soil and agricultural potential while the specialists that prefer alternative 2b 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 500kV line recommends the authorisation of the Alternative 1 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.

Figure 29: Configuration map of the preffered alternative (Grey corridor) *(Awaiting map from GIS specialist that will show only preffered corridor)*

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