FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

THE PROPOSED TABOR WITKOP 400 KILOVOLT TRANSMISSION POWER LINE

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FOR SUBMISSION TO:

Department of Environmental Affairs and Tourism
Private Bag X447
Pretoria
0001

PREPARED FOR:

Eskom Holdings Limited (Transmission Services)

PO Box 1091
Johannesburg
2000

Tel No: 011 800 2621
Fax No: 011 800 3917
Email:
Mamokete.mafumo@Eskom.co.za

COMPILED BY:

Strategic Environmental Focus (Pty) Ltd
PO Box 74785
Lynnwood Ridge 0040
Pretoria

Tel: 012 349 1307
Fax: 012 349 1229
E-mail: sef@sefsa.co.za

EXECUTIVE SUMMARY

INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF), as independent environmental consultants and environmental assessors, was appointed by Eskom Holdings Limited (Transmission Services) to conduct an Environmental Impact Assessment (EIA) for the proposed route of the proposed a planned 400kV Transmission power line between the existing Tabor and Witkop substations, within the Limpopo Province. The area between the existing Witkop and Tabor substations is relatively rural in nature with the establishment of various small holdings and scattered tribal villages whilst the northern region is characterised by game farms and cattle farming. The 400kV Transmission power line located between the Tabor and Witkop substations is aimed at improving the reliability of supply to the area north of Polokwane by eliminating transformation thermal overload at Witkop and Tabor substations and avoiding possible voltage collapse on the Tabor Spencer 275kV network beyond 2011.

PROJECT DESCRIPTION

Eskom Transmission proposes to construct a new 400kV Transmission power line between the existing Tabor and Witkop substations, the length of the proposed power line is 110 kilometres (km). Prior to the construction of a new transmission power line, a number of issues such as servitude acquisition, transmission power line and towers specifications, access roads and construction camps require consideration. This report describes the EIA study undertaken in the process of identifying and securing the servitude for the transmission line, which is the first phase of pre-construction.

The creation of access roads and construction camps form part of the proposed project. Access roads will enable transportation of material, construction teams to the site and for maintenance purposes after construction. Construction camps will be established at strategic positions to provide optimum access. The construction of the transmission line involves teams working in phases. A number of activities are involved, such as surveying; bush-clearing; gate and fencing; foundation-laying; tower erection and stringing.

MOTIVATION

The increase in the platinum and chrome-mining industry in South Africa, specifically the Rustenburg, Brits and Polokwane areas, contributes to the increased power demand. Collectively these areas are known as the platinum basin. Expansions in the platinum basin include the development of a new transmission line and three new substations, namely Dinaledi (Brits), Leseding (Steelpoort) and Marang (Rustenburg) in 2006. Limpopo Province, where new mines are coming into operation, is the

leader with a 10,8 % y/y growth in the first eight months compared with the national average of a 4,8 % y/y increase (www.statssa.co.za, 2006). It is necessary to strengthen the network supply in the Polokwane area in order to improve reliability of supply to the area north of Polokwane by eliminating voltage collapse and facilitating maintenance of the existing lines.

ENVIRONMENTAL AUTHORISATION PROCESS

Three potential corridors were identified within the broader study area. The proposed development of the power line is defined as a 'listed activity' in accordance with the EIA Regulations of 2006 promulgated in terms of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). Listed activities have the potential to detrimentally impact on the environment and therefore require environmental authorisation from the relevant authorising body.

PUBLIC PARTICIPATION PROCESS

The following process was undertaken to facilitate the public participation for the proposed project, which commenced on Thursday, 25th January 2007.

Phase 1

Newspaper advertisements, notifying the public of the EIA process and requesting IAPs to register with and submit their comments to SEF, were placed in the Capricorn Voice (English & Afrikaans) and Northern Review (English & Afrikaans) (2 February 2007) as well as the Daily Sun (Sepedi) (Friday, 26 January 2007). To inform surrounding communities and immediately adjacent landowners of the proposed development, twenty notices were erected at visible and accessible locations and five hundred flyers (English, Sepedi & Afrikaans) were distributed along strategic locations along the proposed alignment (25 & 26 January 2007).

Identified IAPs were directly informed of the proposed development by e-mail, post and fax (26 January 2007). The stakeholder database indicates that 113 people were captured as registered IAPs. The registered IAPs are stakeholders participated in the Public Involvement Process by attending meetings, providing comments in writing and making verbal contact. Government authorities were also captured as registered IAPs. IAPs registered by completing registration forms and forwarding comments by email, fax, post and telephonically. Comments received from IAPs were captured on a stakeholder database, acknowledged by personal letters and forwarded to the relevant environmental specialist for consideration.

Phase 2

Two Focus Group Meetings were scheduled with Authorities, Ward Councillors, businesses, CBO's, NGO's and Tribal Authorities (13 February 2007) at the Matumo Trading Post. However, there were no attendees at either of the focus group meetings. Reasons for the lack of attendance can be attributed to public confusion (as communicated by IAPs) regarding the EIA process followed for the Eskom

Spencer – Tabor proposed power line in conjunction with the EIA process for the Tabor – Witkop line. To ensure stakeholder participation, the Public Participation team visited several of the surrounding Tribal Authority offices and engaged with the Chiefs and their representatives (13 & 14 February 2007). The discussions were participatory and served as focus group discussions.

A Public Information Session, followed by a Public Meeting was held on (14 February 2007) at the Cancer Association in Polokwane. Comments / issues and questions raised at these meetings include, impacts on rail and road; socio-economic impacts; town planning and visual impacts.

Phase 3

An additional Public Open Day and Public Meeting were scheduled for the 30th August 2007 from 14h00 to 15h00 and 15h00 to 16h00, respectively. The Public Sessions were held at the Cancer Association, located on the corner of Dorp and College streets, Polokwane. Meetings with tribal authorities occurred during the morning of the 29th and 30th August 2007. The public raised concerns primarily associated with compensation issues pertaining to the acquisition of the servitude upon finalisation of the alignment.

KEY FINDINGS OF THE EIA

Summary of the key environmental impacts

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Terrestrial & Aquatic Ecology	To limit the loss of protected tree species To identify any no-go areas in terms of the existence of species of conservation importance. To maintain ecological functionality of the wider region as well as hydrological systems The avoidance or management of adverse impacts ensure that the abundance and diversity of all faunal species are maintained through relocation To identify any no-go areas in terms of the existence of rare or threatened species To minimise pollution and soil erosion, which will affect associated hydrological regimes	Potential loss of floral species with medium conservation value Displacement of faunal species and the subsequent loss of faunal habitats Destruction of Granite hills and associated ecological systems Damage to river and wetland systems through sedimentation and pollution Fragmentation of faunal populations	Limit vegetation clearing Strive to undertake majority of the construction during the dry season Utilisation of brush packs to cover exposed land areas Top soil stockpiles should not exceed two metres Accessibility of spill kits for utilisation during accidental spills Strategic placement of pylons in order to avoid rivers / wetlands Utilisation of existing tracks where possible Selection of corridor with minimal impacts i.e. corridor running east of the N1, with the placement of the line in close proximity to the existing Transmission power line Detailed EMP 'walk through', upon finalisation of the preferred corridor, which will allow for minor deviations to minimise the impacts and conserve species of conservation importance

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Avifauna	Through the avoidance or management of adverse impacts ensure that the abundance and diversity of all faunal species are maintained through effective management	Collisions with earth wires Habitat destruction Disturbance of breeding avifauna	Selection of corridor with minimal impacts i.e. corridor running east of the N1. The placement of the line in close proximity to the existing Transmission power line will allow for concentration of the impacts into an area, rendering the lines more visible to avifauna. Minimise collisions through the utilisation of suitable marking devices as per the Eskom Transmission standard in appropriate areas. Monitor and identify 'hot spots' bird collision areas and mitigate appropriately The EMP 'walk through' will identify any active nests that are located in close proximity to the alignment. Active nests will requires specific management in order to mitigate against disturbance

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Heritage and Cultural aspects	To prevent and / or mitigate the negative impacts on heritage and cultural resources.	Disturbance and / or destruction of heritage and cultural resources	Divert the alignment around identified areas of heritage and cultural value. However, the placement of the line along the existing line (east of the N1) will allow for the concentration of impacts on already disturbed heritage and cultural resources (granite hills). Avoid outcrops, bare patches of vegetation and watercourses as these may be associated with heritage and cultural resources. However, the 'walk through' will serve to effectively identify heritage and cultural resources and recommend minor deviations to the alignment, where possible. Through the implementation of an effective EMP, ensure that heritage and cultural resources uncovered during construction and/or operation are reported to the Limpopo Heritage Resources Agency (PHRA) and the correct mitigation measures are implemented.
Visual aspects	To reduce the impact on visual quality due to intrusive line infrastructure and activities	Alteration of landscape character Viewer response	Effective planning of the location of infrastructure to minimise visual impact Avoid elevated areas such as the granite koppies, watercourses and ridges. However, placement along the existing line (east of the N1) will allow for the physical concentration of the power lines in the landscape, which will minimise the cumulative visual impacts. Preferably utilise the compact cross rope or the cross rope suspension tower as these towers are relatively visually permeable and create a relatively low degree of visual obstruction.

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Socio-economic	Ensure that the current socio-economic status quo is improved	*Negative* • Loss of tourism potential of the area • Property values • Visual impact *Positive* • Employment and training opportunities for people in the local community and local contractors • Improvement of infrastructure • Social upliftment and community development programmes • Economic benefits	Selection of the corridor running east of the N1, along the existing line, will not require the relocation of settlements. Implementation of community development programmes upgrading of infrastructure Involve and communicate openly with the affected landowners and users Educate landowners in terms of their rights and responsibilities prior to the construction phase Provide constructive advice on how best to use and maintain the land within the servitude.

CONCLUSIONS & RECOMMENDATIONS

Three alternative corridors were objectively assessed by the relevant specialists. It can be concluded that the most suitable corridor is that which runs east of the N1 along the existing Transmission power line (also referred to as the preferred / proposed corridor). In addition, the public and specialists concur (public meeting held on the 14th February 2007 & specialist integration meeting held on the 30th July 2007) that the route running east of the N1, along the existing power line is preferable. The line will traverse granitic outcrops of ecological and heritage value, however, the existing power line currently presents a form of disturbance to the rocky outcrops and thus it is preferable to concentrate the impacts to a single area in the landscape. However, a detailed 'walk through' by the heritage; avifaunal and ecological specialists will be undertaken in order to ascertain the minor deviations within the proposed servitude as well as provide specific mitigation measures with respect to the actual footprints of the individual pylons and access routes. The detailed mitigation and management measures will be documented in a detailed EMP, which will thereby serve to minimise negative impacts identified during the process.

Provided that the management measures as stipulated in the EMP are implemented during the various phases of the proposed 400kV transmission power line, it is recommended the route running east of the N1, primarily along an existing transmission power line, receives authorisation to proceed in terms of the NEMA.

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LIST OF ABBREVIATIONS

CLF	**C**ommunity **L**iaison **F**orum
DEAT	**D**epartment of **E**nvironmental **A**ffairs and **T**ourism
DWAF	**D**epartment of **W**ater **A**ffairs and **F**orestry
ECO	**E**nvironmental **C**ontrol **O**fficer
EAP	**E**nvironmental **A**ssessment **P**ractitioner
EIA	**E**nvironmental **I**mpact **A**ssessment
EMP	**E**nvironmental **M**anagement **P**lan
ha	**H**ectares
IAP	**I**nterested and **A**ffected **P**arty
IBA	**I**mportant **B**ird **A**rea
IEM	**I**ntegrated **E**nvironmental **M**anagement
kV	**k**ilo**v**olt
LCA	**L**andscape **C**haracter **A**ssessment.
LDO	**L**and **D**evelopment **O**bjective
LDEDET	**L**impopo **D**epartment of **E**conomic **D**evelopment, **E**nvironment and **T**ourism
LT	**L**andscape **T**ype
m/s	**M**eters per **s**econd
MAE	**M**ean **A**nnual **E**vaporation
mamsl	**m**eters **a**bove **m**ean **s**ea **l**evel
MAP	**M**ean **A**nnual **P**recipitation
MAR	**M**ean **A**nnual **R**unoff
MVA	**M**ega **V**olt **A**mpere
NEMA	**N**ational **E**nvironmental **M**anagement **A**ct, 1998 (Act No. 107 of 1998)
NHRA	**N**ational **H**eritage **R**esources **A**ct, 1999 (Act No. 25 of 1999)
NSBA	**N**ational **S**patial **B**iodiversity **A**ssessment
NWA	**N**ational **W**ater **A**ct, 1998 (Act No. 36 of 1998)
PS	**P**lan of **S**tudy
PHRA	**P**rovincial **H**eritage **R**esources **A**gency
RSA	**R**epublic of **S**outh **A**frica
SABAP	**S**outhern **A**frican **B**ird **A**tlas **P**roject
SAHRA	**S**outh **A**frican **H**eritage **R**esources **A**gency
SEF	**S**trategic **E**nvironmental **F**ocus (Pty) Ltd
VAC	**V**isual **A**bsorption **C**apacity
VIA	**V**isual **I**mpact **A**ssessment.
ZVI	**Z**one of **V**isual **I**nfluence

GLOSSARY OF TERMS

Aesthetics

The branch of philosophy concerned with the study of the principles of beauty, especially in art

Alien species

Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity

Alternative alignment / corridors

Refers to the identified alignments within the study area

Anthropogenic

A change induced by human intervention.

Applicant

Any person who applies for an authorisation to undertake a listed activity or to cause such activity in terms of the relevant environmental legislation

Biodiversity

Biodiversity is the variability among living organisms from all sources including *inter alia* terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Biome

A major biotic unit, consisting of plant and animal communities, having similarities in form and environmental conditions, but not including the abiotic portion of the environment

Cluster

A cluster is the existence of a spatial grouping of attractions.

Conservation

The management of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. The wise use of natural resources to prevent loss of ecosystem function and integrity

Corridor

Refers to a specific alignment as numbered on the study area map

Demand Side Management (DSM)

When a utility or local authority that supplies electricity influences the way it is used by customers, this activity is known as Demand Side Management.

Ecology

The study of the inter relationships between organisms and their environments.

Ecosystem services

Activities that help to maintain an ecosystem but are not directly part of energy flows and nutrient cycles. Examples include pollination, dispersal, population regulation, and provision of clean water and the maintenance of liveable climates (carbon sequestration).

Ecosystem

Organisms together with their abiotic environment, forming an interacting system, inhabiting an identifiable space.

Endangered

A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.

Endemic

Occurring in a particular region, and nowhere else.

Environment

NEMA defines “environment” as “the surroundings within which humans exist and that are made up of the land, water and atmosphere of the earth; micro organisms, plant and animal life; any interrelationships among and between them and the physical, chemical aesthetic and cultural properties and conditions that influence human health and well-being’’.

Environmental Control Officer

Independent officer employed by the applicant to ensure the implementation of the Environmental Management Programme (EMP) and manage any further environmental issues that may arise.

Environmental Impact Assessment

An EIA is an assessment of the positive and negative environmental consequences of the development of the proposed project. The primary objective of the EIA section is to aid decision-making by providing factual information on the assessment of the impacts and determining their significance and on which to base valued judgements in choosing one alternative over another.

Footprint Area

Area to be used for the construction of the proposed pylons of the power line, which does not include the total study area.

Forb

A herbaceous plant other than grasses

Habitat

Type of environment in which a plant or animal lives.

Hillslope Units

Configuration of the landform consisting of crest, scarp, midslope, footslope and valley bottom

Horizon contour

A line that encircles a development site and that follows ridgelines where the sky forms the backdrop and no landform is visible as a background. This is essentially the skyline that when followed through the full 360-degree arc as viewed from a representative point on the site defines the visual envelope of the development. This defines the boundary outside which the development would not be visible.

Indigenous

Any species of plant, shrub or tree that occurs naturally in a region

Invasive species

Naturalised alien plants that have the ability to reproduce, often in large numbers. Aggressive invaders can spread and invade large areas

Landscape characterisation/ character

This covers the gathering of information during the desktop study and field survey work relating to the existing elements, features, and extent of the landscape (character). It includes the analysis and evaluation of the above and the supporting illustration and documentary evidence.

Landscape condition

Refers to the state of the landscape of the area making up the site and that of the study area in general. Factors affecting the condition of the landscape can include the level maintenance and management of individual landscape elements such as buildings, woodlands etc and the degree of disturbance of landscape elements by non-characteristics elements such as invasive tree species in a grassland or car wrecks in a field.

Landscape impact

Changes to the physical landscape resulting from the development that include; the removal of existing landscape elements and features, the addition of new elements associated with the development and altering of existing landscape elements or features in such as way as to have a detrimental affect on the value of the landscape.

Landscape unit

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

Magnitude of Impact

Magnitude of impact means the combination of the intensity, duration and extent of an impact occurring.

Niche

The unique environment or set of ecological conditions in which a specific plant or animal species occurs

Proposed servitude

Refers to the proposed final alignment that the transmission line should follow.

Rare species

Species, which have naturally small populations, and species, which have been reduced to small (often unstable) populations by man's activities.

Red Data

A list of species, fauna and flora that require environmental protection. Based on the IUCN definitions.

Restoration

Process of bringing back a derelict or disused site to a properly functioning state; often used to imply the original or similar land use.

Ripping

Deep cultivation of compacted soil using a shanked ripping tool attached to a crawler tractor.

Scarification

Light cultivation of soil surface to improve the seedbeds, prevent lamination between successive soil layers and increase water infiltration.

Sense of place

That distinctive quality that makes a particular place memorable to the visitor, which can be interpreted in terms of the visual character of the landscape. A more emotive sense of place

is that of local identity and attachment for a place "*which begins as undifferentiated space* [and] *becomes place as we get to know it better and endow it with value*" (Tuan 1977)[1].

Sensitive Area

A sensitive area or environment can be described as an area or environment where a unique ecosystem, habitat for plant and animal life, wetlands or conservation activity exists or where there is a high potential for ecotourism.

Sensitive Environments

Sensitive environments are defined as follows in accordance with Section 23 of the Environment Conservation Act, 1989 (Act No. 73 of 1989):

Significant Impact

An impact can be deemed significant if consultation with the relevant authorities and other interested and affected parties, on the context and intensity of its effects, provide reasonable grounds for mitigating measures to be included in the environmental management report. The onus shall be on the applicant to include the relevant authorities and other interested and affected parties in the consultation process. Present and potential future, cumulative and synergistic effects should all be taken into account.

Soil

A mixture of organic and inorganic substances, the composition and structure of the latter is derived from the parent rock material. Soil also contains bacteria, fungi, viruses and micro-arthropods, nematodes and worms.

Soil Compaction

Mechanically increasing the density of the soil, vehicle passage or any other type of loading. Wet soils compact easier than moist or dry soils.

Soil Form

Higher category of the Soil African soil classification system, defined by a unique vertical sequence of diagnostic horizons and/or materials

Species diversity

A measure of the number and relative abundance of species (see biodiversity).

Species richness

The number of species in an area or habitat.

Study area

Refers to the entire study area encompassing all the alternative alignments as indicated on the study area map.

Subsoil

Subsoil means those layers of soil and weathered rock immediately beneath the topsoil that overlay the hard rock formation.

Sub-station

A distribution point within the local and national network from which electrical current is re-routed along different power lines as well as distributed to local and municipal networks.

Sustainable Development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of

[1] Cited in Climate Change and Our 'Sense of Place', http://www.ucsusa.org/greatlakes/glimpactplace.html

"needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs (Brundtland Commission, 1987).

Threatened species

Species, which have naturally small populations, and those, which have been reduced to small (often unstable) populations by man's activities.

Topsoil

Topsoil means the layer of soil covering the earth and which provides a suitable environment for the germination of seed, allows the penetration of water, is a source of micro-organisms, plant nutrients and in some cases seed, and of a depth of 0.5 m or any other depth as may be determined by the Director: Mineral Development for each mining area.

Transmission line

Pylons support the 400kV transmission line consisting of steel support structures (supported by guy wires). Transmission lines are suspended between the supports.

Vertic

Soils high in expanding clay that forms large cracks on drying; self-mixing

Viewer exposure

The extent to which viewers are exposed to views of the landscape in the affected area. Viewer exposure considers the visibility of the site, the viewing conditions, the viewing distance, the number of viewers affected, the activity of the viewers (tourists or workers) and the duration of the views.

Viewer sensitivity

The assessment of the receptivity of viewer groups to the visible landscape elements, visual character and their perception of visual quality and value. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions.

Visual absorption capacity (VAC)

The inherent ability of a landscape to accept change or modification to the landscape character and/or visual character without diminishment of the visual quality or value, or the loss of visual amenity. A high VAC rating implies a high ability to absorb visual impacts while a low VAC implies a low ability to absorb or conceal visual impacts.

Visual amenity

The notable features such as hills or mountains or distinctive vegetation cover such as forests and fields of colour that can be identified in the landscape and described. Also included are recognised views and viewpoints, vistas, areas of scenic beauty and areas that are protected in part for their visual value.

Visual character

This addresses the viewer response to the landscape elements and the relationship between these elements that can be interpreted in terms of aesthetic characteristics such as pattern, scale, diversity, continuity and dominance.

Visual contour

The outer perimeter of the visual envelope determined from the site of the development. The two dimensional representation on plan of the horizon contour.

Visual contrast

The degree to which the physical characteristics of the proposed development differ from that of the landscape elements and the visual character. The characteristics affected typically include:

Visual envelope

The approximate extent within which the development can be seen. The extent is often limited to a distance from the development within which views of the development are expected to be of concern.

Visual impact assessment

A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts.

Visual impact

Changes to the visual character of available views resulting from the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the viewshed experienced by visual receptors and intrusion of foreign elements into the viewshed of landscape features thereby detracting from the visual amenity of the area.

Visual magnitude

Product of the vertical and horizontal angles of an object to describe quantitatively the visual dimension of an object. (Iverson, 1985). The visual magnitude is best described in terms of visual arcs with a one minute arc usually considered as being the minimum resolution detectable by the human eye (equivalent to observing a 29 mm ball at a distance of one hundred metres).

Visual quality

An assessment of the aesthetic excellence of the visual resources of an area. This should not be confused with the value of these resources where an area of low visual quality may still be accorded a high value. Typical indicators used to assess visual quality are vividness, intactness and unity. For more descriptive assessments of visual quality attributes such as variety, coherence, uniqueness, harmony, and pattern can be referred to.

Visual receptors

Includes viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible. The existing visual amenity enjoyed by the viewers can be considered a visual receptor such that changes to the visual amenity would affect the viewers.

Vulnerable

A taxon is ‘Vulnerable’ when it is not ‘Critically Endangered’ or ‘Endangered’ but is facing a high risk of extinction in the wild in the medium-term future.

Zone of visual influence

The extent of the area from which the most elevated structures of the proposed development could be seen and may be considered to be of interest (refer to visual envelope).

1 INTRODUCTION

1.1 BACKGROUND INFORMATION

Strategic Environmental Focus (Pty) Ltd (SEF), as independent environmental consultants and environmental assessors, was appointed by Eskom Holdings Limited (Transmission Services) to conduct an Environmental Impact Assessment (EIA) for the proposed route of the proposed a planned 400kV Transmission power line located between the existing Tabor and Witkop substations, within the Limpopo Province. The study area between the existing Witkop and Tabor substations is relatively rural in nature with the establishment of various small holdings and scattered tribal villages whilst the northern region is characterised by game farms and cattle farming. Three potential corridors, indicated in Figure 1**Error! Reference source not found.**, were identified within the broader study area.

The 400kV Transmission power line is aimed at improving the reliability of supply to the area north of Polokwane by eliminating transformation thermal overload at Witkop and Tabor substations and avoiding possible voltage collapse on the Tabor Spencer 275kV network beyond 2011. The proposed development of the power line is defined as a 'listed activity' in accordance with the EIA Regulations of 2006 promulgated in terms of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). Listed activities have the potential to detrimentally impact on the environment and therefore require environmental authorisation from the relevant authorising body.

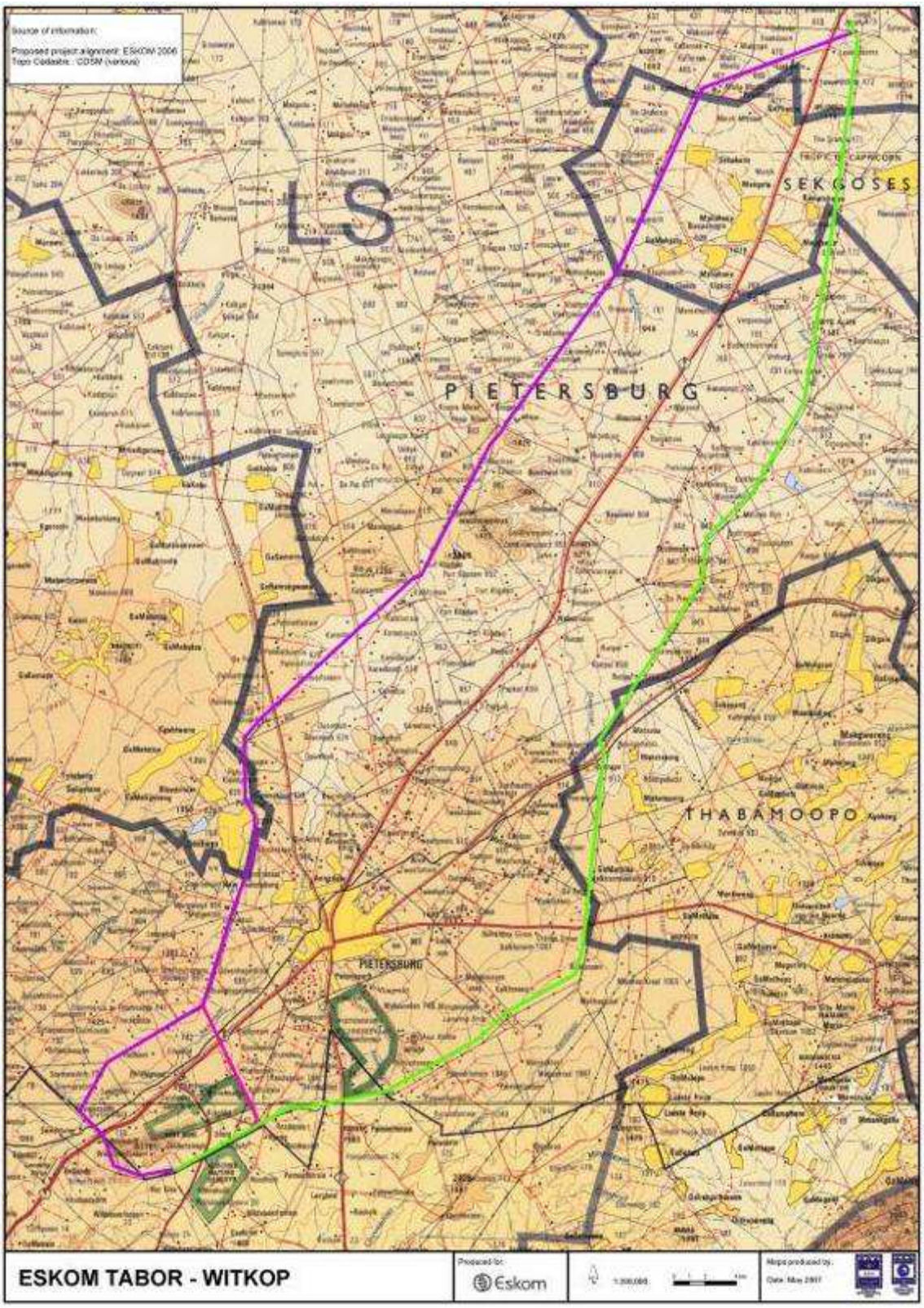


Figure 1: Tabor (north) and Witkop (south) substations and the three proposed corridors indicated by the purple, pink and green lines. The substations occur at the intersection of the purple and green lines

1.2 DETAILS OF THE APPLICANT

The contact details of the project applicant are indicated in Table 1.

Table 1: Applicant's contact details

Name of the Applicant	Postal Address	Relevant Numbers
Eskom Holdings Limited (Transmission Services)	PO Box 1091 Johannesburg 2000	Tel: 011 800 2621 Fax: 011 800 3917 Cell: 082 902 7166
Primary Contact person		
Ms Mamokete Mafumo		

1.3 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Details of the Environmental Assessment Practitioner (EAP) are indicated below.

Table 2: Details of Environmental Assessment Practitioner

Environmental Consultant:	Strategic Environmental Focus (Pty) Ltd		
Contact Person:	Mrs. Deshika Kathawaroo-Lunderstedt		
Postal address:	P.O. Box 74785, Lynnwood Ridge, Pretoria		
Postal code:	0040	E-mail:	deshika@sefsa.co.za
Telephone:	(012) 349 1307	Fax:	(012) 349 1229
Professional affiliation(s)	None		
Expertise of the EAP to carry out the Scoping and EIA Process	Mrs. Kathawaroo-Lunderstedt has the following educational qualifications: MSc (Ecophysiology), University of the Witwatersrand (2005); and BSc (Honours in Botany), University of Cape Town (2000). She has been employed at the following organisations: WSP Walmsley; Synergistics Environmental Services (Pty) Ltd; and SEF (Pty) Ltd. She has over three years of professional experience as an environmental consultant.		

1.4 BRIEF PROJECT DESCRIPTION

The proposed Transmission power line will cover a distance of approximately 110 kilometres (km). At Tabor substation a 500 MVA 400/132kV transformer is proposed. Tabor substation will be upgraded and refurbished to accommodate the additional 400kV Transmission line and 500 MVA 400/132kV transformer.

The Tabor substation is located north of the Tropic of Capricorn (23º22'50"S; 29º47'13"E) while Witkop substation is located south of Polokwane (24º2'28.88"S and 29º21'22.87"E). Eskom and a team of specialists identified three (3) potential corridors. The southern component of the study area around Polokwane comprise

primarily of urban and peri-urban settlements and rural settlements and commercial farms occur south of Tabor substation.

1.5 CURRENT LAND USE

1.5.1 Land use within the study area

An extensive study area consisting of three alternative corridors for the planned Transmission power line was demarcated. The study area, depicted in Figure 2 below, shows various land uses.

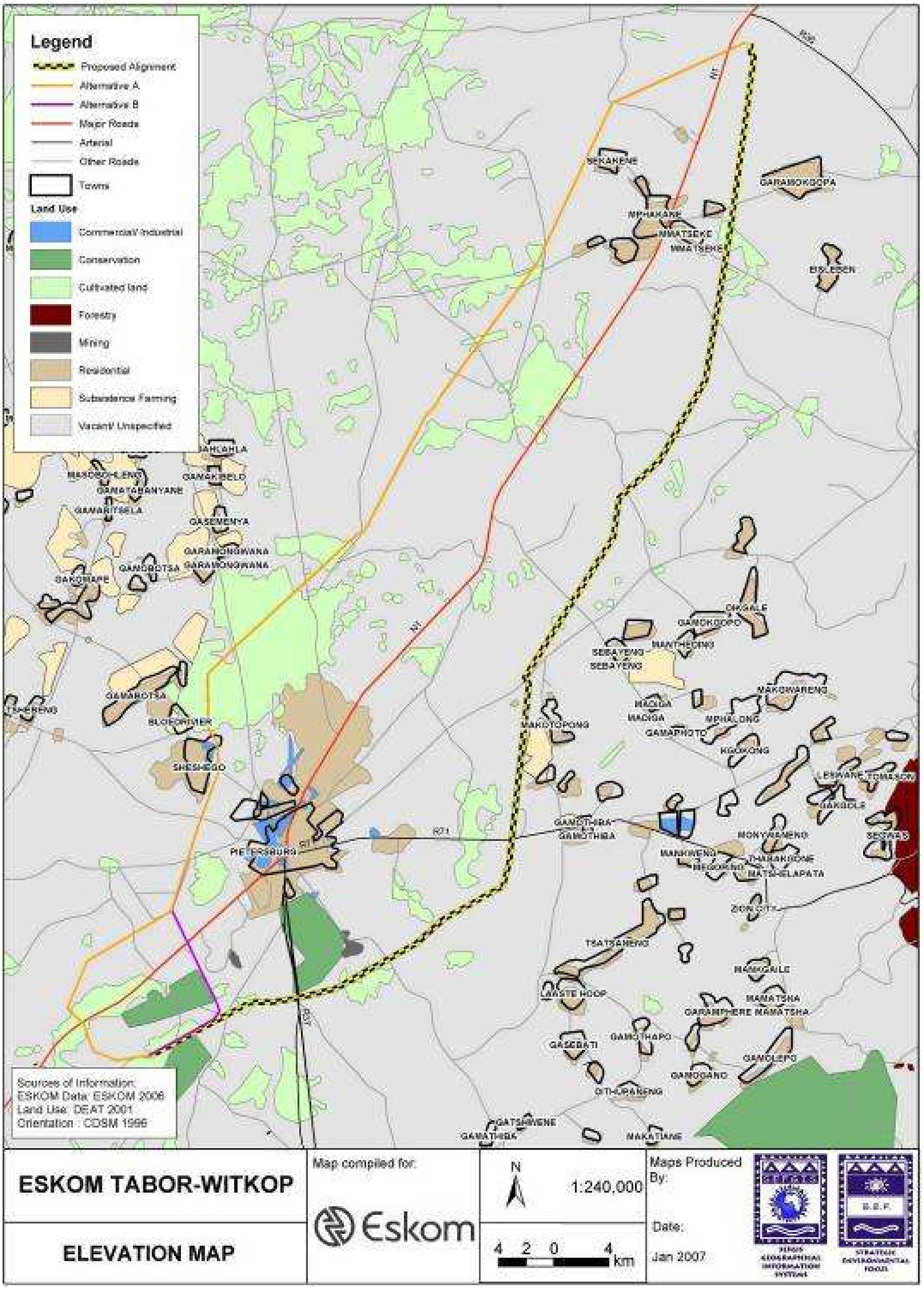


Figure 2: Current land use within the Witkop Tabor 400kV line study area

The southern component of the study area around Polokwane towards Witkop substation comprise primarily of urban and peri-urban settlements. South of Tabor substation rural settlements and commercial farms predominate. The area between Witkop and Tabor substations is relatively rural in nature with various small holdings and scattered tribal villages. The northern region is characterised by game farms and cattle farming, refer to Figure 3 below. The central parts of the study area are flat, characterised by numerous centre pivots[2] as depicted in Figure 4.

The residential and commercial areas in the southern regions of the site, such as Polokwane and Seshego, are depicted in Figure 6. There are some isolated granite outcrops that are generally associated with ecological and heritage and cultural resources. Mining activities also prevail within the study area, as illustrated in Figure 5.

Figure 3: Cattle grazing within the study area

Figure 4: Agricultural circle based on the central pivot point irrigation system

Figure 5: Granite mining within the study area

Figure 6: Urban residential areas located in the southern parts of the study area

[2] Center pivot irrigation is a form of overhead irrigation consisting of several segments of pipe (usually galvanized steel or aluminum) joined together and supported by trusses, mounted on wheeled towers with sprinklers positioned along its length.

1.6 ENVIRONMENTAL AUTHORISATION PROCESS

The proposed development of the power line is defined as a 'listed activity' in accordance with the EIA Regulations of 2006 promulgated in terms of the NEMA. Listed activities have the potential to detrimentally impact on the environment and therefore require environmental authorisation from the relevant authorising body. The environmental authorisation process is diagrammatically depicted in Figure 7.

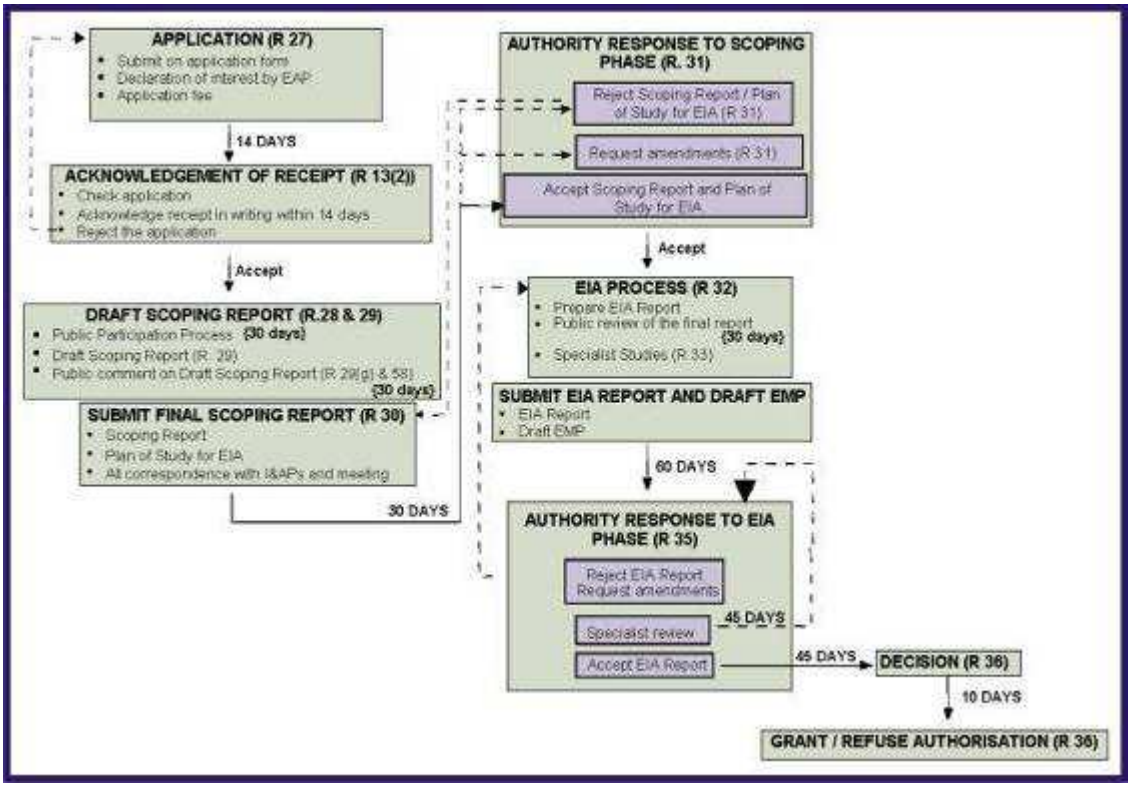


Figure 7: Diagrammatic depiction of the EIA process in terms of Regulation 387 of the NEMA

SEF was appointed by Eskom to manage the environmental authorisation process in terms of the NEMA. The recommending authority for the proposed development is the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) and the competent authority the national Department of Environmental Affairs and Tourism (DEAT).

2 PROJECT DESCRIPTION AND MOTIVATION

2.1 PROJECT DESCRIPTION

Eskom Transmission proposes to construct a new 400kV Transmission power line, approximately 110 km in length, located between the existing Tabor and Witkop substations. The line will run from the existing Tabor substation located just north of the Tropic of Capricorn and east of the N1. The line will run in a southerly direction, past Polokwane and link up with the existing Witkop substation, also located east of the N1. This report represents the EIA study undertaken in the process of identifying and securing the servitude for the transmission line, through the assessment of the environmental impacts within a broad study area encompassing three alternative alignments.

Prior to the construction of a transmission power line a number of issues such as servitude acquisition, transmission power line and towers specifications, access roads and construction camps must be considered. . The components discussed below play a role in the determining the actual limitations of the required servitude for the line.

2.1.1 Access Roads and Construction Camps

The creation of access roads and construction camps form part of the proposed project. Access roads will enable transportation of material, construction teams to the site and facilitate post construction maintenance. Construction camps will be established at strategic positions to provide optimum access to the construction, which will be negotiated with the landowner.

2.1.2 Construction

The construction of the transmission line involves teams working in phases. A summary of the different teams is as follows:

- Surveyors;
- Bush-clearing;
- Gate and fencing;
- Foundation-laying;
- Tower erection; and
- Stringing.

Eskom Transmission ensures that an Environmental Control Officer (ECO) monitors the construction phase. Once the contract is awarded to the contractor, the ECO will contact the landowners to discuss access, the conditions of the area and roads, and the extent of the work that is to take place. The ECO maintains contact with the landowners throughout the construction of the transmission line, monitoring any damage to crops or property. Once construction has been completed, the ECO will

ensure that rehabilitation of the site has been undertaken as stipulated. Landowners will be requested to sign a release form stating their satisfaction with the way in which the land has been rehabilitated.

Earthmoving equipment will be used to establish access roads where necessary. All areas that will be disturbed such as construction camps, access roads and the construction area around the towers will have the stripped topsoil stockpiled for later use.

The foundations are constructed first, followed by the assembly of the towers on the ground, then the erection of the towers and finally the stringing and regulation of the conductors.

2.1.3 Property Ownership

A number of landowners were identified during the scoping process, as property owners who could be affected by the three proposed corridors. Extensive research was undertaken to identify the potentially affected landowners along the alternative routes identified in the EIA Report. This was done by means of a Windeed search and use of updated details of the relevant landowners. The results from this process were then compared with Eskom's existing database of landowners along the existing power line route. The affected landowners were duly notified of the proposed transmission power line in the study area.

2.1.4 Access and Local Context

The Proponent will negotiate with the landowners for servitude to be granted to accommodate the transmission line. The final route of the servitude will be discussed and negotiated with landowners within the corridor proposed by the EIA. Access to the transmission line will be required for the construction and maintenance, thus access roads at agreed points within the servitude will be established if the existing road network is insufficient.

2.1.5 Project Details

2.1.5.1 Construction phase

This phase refers to all construction and construction-related activities that will occur within the servitude area until the project is completed. The first phase will involve the pre-construction activities such as:

- Erection of campsites for the Contractors' workforce;
- Negotiations for access roads to the servitude;
- Bush clearing to facilitate access and construction work for the proposed Transmission power line;
- Establishing of access roads along the servitude; and
- Transportation of equipment, materials and personnel.

The actual construction activities will then follow:

- Building of foundations for the towers;
- Tower assembly and erection;
- Conductor stringing;
- Site de-establishment and clean up;
- Final inspection of the line and taking over from Contractor;
- Rehabilitation of disturbed areas;
- Signing off landowners after all rehabilitation is complete; and
- Releasing the Contractor from site.

Construction camps will be clearly demarcated and areas sited for pylons' installation will be buffered and subsequently fenced so as to keep off animals in the construction area.

2.1.5.2 Operational phase

This phase will commence once all the Transmission assets have been commissioned and energised. All post construction activities, including the operation and maintenance of the proposed development are included here. Such activities will require routine maintenance work using access roads that will be built along the servitude of the Transmission power line.

The servitude also needs to be cleared from time to time to ensure that vegetation does not interfere with the operation of the line. In areas of high erosion potential it may be necessary to repair access roads or carry out activities to prevent erosion. Servitude maintenance therefore goes hand in hand with the use and maintenance of access roads.

2.1.6 Technical Details of the Transmission Line

Details of the planned 400kV Transmission power line, including the architectural and structural information are discussed below.

2.1.6.1 Types of Towers/Pylons

Any one of the following types of towers or pylons (or combinations thereof) may be used on this project:

- Cross rope suspension tower;
- Guyed V suspension tower; and
- Self-supporting suspension tower.

The final tower types chosen will depend on both the technical and environmental constraints as well as landowner requirements. Where necessary a different tower type could be used if it enables Eskom to address a site-specific constraint or issue. The final tower that will be used will be known once the route for the proposed transmission power line has been surveyed and the exact location of the towers is determined.

2.1.7 Design Philosophy

2.1.7.1 Road Access for Construction and Maintenance of the Transmission power line

Road access will be required as part of the servitude along the transmission line for easy access during the construction, and maintenance of the transmission line, which would need to meet specific requirements.

Details regarding the required access roads can only be provided when the preferred corridor is chosen. These will be included in the final EMP for the project (refer to Appendix 4 for reference to a draft EMP).

2.1.7.2 Architectural Design

Table 3: Architectural design features

Tower spacing	300 – 400 m
Tower height avg.	30 - 38 m
Conductor attachment height	Depends on the tower type
Minimum ground clearance	8.1 m
Tower Clearance	5.7 – 7.5
Conductor type	Tern

2.1.7.3 Servitude Required for Proposed Transmission Line

For the purpose of this report servitude should be understood as:

The area demarcated for the transmission line itself, including the areas required for routine maintenance activities that are carried out on it, for instance an access road.

For this project the tree and building restrictions are 27.5 m from the centre of the Transmission power line. The servitude for a 400 kV Transmission power line is 55 m. An area of approximately eight metres will be cleared only if it necessary, and if it is in a valley the area will not be cleared, the contractor may have to use a helicopter for construction and stringing.

The footprint of the pylon/tower depends on the profile of the land, if the pylon/tower is placed on a slope, it is possible that the two stays will fall outside the servitude. This could also happen if the tower has to be raised to cross another power line or telephone line. This issue is covered in the Option form that is signed during negotiations with the landowner.

High voltage power lines such as the proposed Tabor Witkop Transmission power line would require a large clearance area for safety precautions.

Any extra space required outside the servitude shall be negotiated with the relevant landowners and approved by Eskom. All areas marked as no-go areas inside the servitude shall be treated with utmost care and responsibility. Any extra space outside the servitude shall be negotiated with the relevant landowner and approved by Eskom.

2.1.8 Maintenance of the Power Line Infrastructure

2.1.8.1 Removal of vegetation

Eskom has a programme in place to ensure the removal of vegetation around the existing pylons to minimise the risk of fires and collision of the game with the pylons, which will be addressed in the EMP.

2.1.8.2 Anti-climb wires

The installation of the anti-climb wires serve as a deterrent to unauthorised climbing of the pylons rather than an obstruction. It will not prevent a determined individual from climbing over and up the pylon. Thus, the device will become ineffective if the wires are broken or completely missing. In such situations Eskom has programmes where the broken wires are replaced as part of the maintenance on the power line.

2.1.8.3 Corrosion

Corrosion on structures is frequently found where the protective system, be it either galvanizing or a protective organic coating, has weathered, exposing the steel substrate. With routing maintenance, this form of corrosion can be avoided.

Corrosion problems can be avoided by the correct use of materials and their combination with each other. The overall atmospheric conditions expected in a location of an intended structure, and the local environmental effects produced by the erection of structures or installations of equipment should be considered in the selection of appropriate corrosion protection systems.

2.2 MOTIVATION

The demand for power in South Africa is steadily growing. This is as a result of firstly, cold weather conditions through the winter months, as well as increased demand for manufacturing and mining purposes. It was reported on www.statssa.co.za (October 2006) that August was the fourth consecutive month that South Africa consumed more than 20 000 Gigawatt hours of electricity. Prior to 2006, there was only one month, namely July 2004 when the monthly consumption exceeded 20 000 Gigawatt hours. According to Engineering News, the record daily use exceeded 35 000 MW / day twice in June 2007 (www.engineeringnews.co.za).

The increase in the platinum and chrome-mining industry in South Africa, specifically the Rustenburg, Brits and Polokwane areas, also contributes to the increased demand irrespective of weather conditions. Collectively these areas are known as the

platinum basin. Expansions in the platinum basin include the development of a new transmission line and three new substations, namely Dinaledi (Brits), Leseding (Steelpoort) and Marang (Rustenburg) in 2006. Limpopo Province, where new mines are coming into operation, is the leader with a 10,8 % y/y growth in the first eight months compared with the national average of a 4,8 % y/y increase (www.statssa.co.za, 2006).

Furthermore, Polokwane has been identified as a base camp for the Soccer World Cup in 2010. Thus, it is not expected that the demand will decrease or plateau, as the population and economic growth will continue for the foreseeable future. It is worthwhile to note that the demand will, in all likelihood, spike as 2010 approaches as construction activities increase in intensity. Thus, it is necessary to strengthen the network supply in the Polokwane area in order to improve reliability of supply to the area north of Polokwane by eliminating voltage collapse and facilitating maintenance of the existing lines.

The proposed 400kV Transmission power line is aimed at improving the reliability of supply to the area north of Polokwane by eliminating transformation thermal overload at Witkop and Tabor substations and avoiding possible voltage collapse on the Tabor Spencer 275kV network beyond 2011.

3 APPROACH TO THE PROJECT

3.1 LEGAL REQUIREMENTS

The aim of this component of the report is to provide a brief overview of the pertinent policies as well as legal and administrative requirements applicable to the proposed development.

3.1.1 Environmental Impact Assessment Requirements

Constitution of South Africa

The mandate and directives for sustainable and participative local government are embodied in the 1996 Constitution of the Republic of South Africa. Chapter 2 of the Constitution states that everyone has the right to:

(a) an environment that is not harmful to their health or well-being

(b) have the environment protected, through reasonable legislative and other measures that

(i) Prevent pollution and degradation;

(ii) Promote conservation; and

(iii) Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.

National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)

NEMA serves as a framework and provides general principles and guidelines, which must be adhered to. In accordance with NEMA's principles, development must be socially, environmentally and economically sustainable. Sustainable is defined as "A programme to change the process of economic development so that it ensures a basic quality of life for all people, and protects the ecosystems and community systems that make life possible and worthwhile" (DEAT, 1999).

NEMA contains two Key Concepts:

- The concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given, and
- The idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs.

(4) (a) Sustainable development requires the consideration of all relevant factors including the following:

(i) Disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied;

(ii) Pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;

(iii) Disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided or where it cannot be altogether avoided, is minimised and remedied;

(iv) Waste is avoided or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;

(v) Use and exploitation of non-renewable natural resources is responsible, equitable and considers the consequences of the depletion of the resource; and

(vi) Development, use and exploitation of renewable resources and the ecosystems, of which they are part, do not exceed the level or 'critical limits' beyond which their integrity is jeopardised.

The proposed development involves the following listed activities as stipulated in the EIA regulations as promulgated in terms of the NEMA:

Government Notice Regulation 386 of 2006:

According to the list of activities identified in terms of sections 24 and 24d of the NEMA (R 386, 21 April 2006), the proposed development constitutes the following listed activities, which must undergo a Basic Assessment:

7. The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1000 cubic metres at any one location or site.

15. The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long.

Government Notice Regulation 387 of 2006:

1. The construction of facilities or infrastructure, including associated structures or infrastructure, for:

(l) the transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more.

2. Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more

3.1.2 Other Legal Requirements

The following list of legislation applies to the proposed development:

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

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

National Spatial Biodiversity Assessment

The National Spatial Biodiversity Assessment (NSBA): 2004 (2005) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels. The approach used for biodiversity planning is systematic and entails the following three key principles:

- The need to conserve a representative sample of biodiversity pattern, such as species and habitats (the principle of representation);
- The need to conserve the ecological and evolutionary processes that allow biodiversity to persist over time (the principle of persistence); and
- The need to set quantitative biodiversity targets that quantifies the degree of conservation required for each biodiversity feature in order to maintain functioning landscapes and seascapes.

An important feature of this is the concentration on the conservation of the ecosystems as opposed to that of individual species. If the ecosystem is conserved, the individual species will also be included.

National Water Act (NWA), 1998 (Act No. 36 of 1998)

The National Water Act (NWA) guides the management of water in South Africa as a common resource. The Act aims to regulate the use of water and activities, which may impact on water resources through the categorisation of 'listed water uses' encompassing water extraction, flow attenuation within catchments as well as the potential contamination of water resources, where DWAF is the administering body in this regard.

In terms of the proposed development, Section 21 of the National Water Act defines the listed activities for the use of water as follows:

21 (c) impeding or directing the flow of water in a water course
21 (i) altering the bed, banks, course or characteristics of a watercourse

National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The National Heritage Resources Act (NHRA) legislates the necessity for cultural and heritage impact assessment in areas earmarked for development, which exceed 0.5 ha or linear development exceeding 300 metres in length. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA). The item in question for this application is as follows:

38(1) (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length.

National Forest Act, 1998 (Act No. 84 of 1998)

Certain trees are protected in terms of Section 21 of the National Forest Act, 1998 (Act No. 84 of 1998). According to Section 15 of the above-mentioned Act, protected trees cannot be cut, destroyed, damaged or removed without a permit granted by the Minister of the Department of Water Affairs and Forestry (DWAF).

Protected species – Provincial Ordinances

Provincial ordinances were developed to protected particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial Departments of Environmental Affairs, in this case the LDEDET. Refer to the list of protected species in the Ecological Assessment (Appendix 3).

3.2 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

This EIA Report uses the Scoping Report as a basis for the key issues and concerns that were identified. It includes the results of the specialist studies, a full assessment of the impacts, associated mitigation measures and proposed alternatives.

3.2.1 Authority Consultation and Site Visits

Authority consultation plays an integral role in the EIA process. The authorities guide the process through highlighting the necessary legislative requirements and key areas of concern. In terms of the NEMA, the recommending authority for the proposed development is the LDEDET and the competent authority the national DEAT.

Officials from DEAT and the LDEDET, attended two (2) site visits that were held during September 2006 (ground investigations) and on the 11th to the 13th December 2006 (aerial overview), respectively. The site visits were also attended by various specialists, including ecological; visual; air quality; geotechnical; avifaunal; and social specialists; Eskom and the EAP team. The purpose of the site visit was to determine

baseline conditions and facilitate conceptualisation of the proposed project by both the authorities and the project team.

Ground survey - September 2006

A drive through site visit took place on 4th and 5th September 2006. The route was determined by following the existing Transmission power line (where possible), which links the existing Tabor and Witkop substations. Representatives from the LDEDET and the DEAT, Eskom, SEF and a team of specialists were present.

Aerial survey –December 2006

A helicopter site visit took place from 11th to the 13th December 2006 with the afore-mentioned organisations and team members. The alternative routes, as indicated in were aerially inspected by the project team.

During the site visit, an informal meeting was held with the DEAT's representative, to discuss the approach to the proposed project and sensitive aspects associated with the proposed corridors. DEAT suggested that the alternative corridors must be sufficiently investigated during the EIA process in order to prevent procedural delays later on in the process.

3.2.2 Project Registration with DEAT

An Application for Authorisation in terms of the NEMA and the EIA Regulations of 2006 (G.N. 385-387 of 2006) was submitted to DEAT and LDEDET on the 21st September 2006 for the proposed 400kV Transmission line between the Tabor and Witkop substations. On the 6th October 2006, DEAT issued the reference number 12/12/20/857 to the project and granted authorisation to SEF to proceed with the prescribed Scoping Process.

3.2.3 Scoping phase

The scoping phase of the process was structured in order to ensure that it guided the EIA phase of the environmental authorisation process (Refer to Figure 7). The scoping phase aligns the terms of reference for the EIA, identifying all environmental issues, which requiring further investigation.

The Scoping phase fulfilled the following objectives:

- Effectively identify and notify all IAPs of Eskom's intention to construct a new transmission power-line;
- Ensure that all concerns and issues of IAPs are taken into account during the EIA stage of the process;
- Provide sufficient information to all IAPs to ensure that they can effectively participate in the EIA Process;

- Focus the EIA on specific issues, which are important for the decision-makers, thereby reducing the potential for any delays as a result of requests for additional information; and
- Develop the necessary terms of reference for all specialist studies to be undertaken as part of the EIA.

SEF presented the findings of the Final Scoping Report to DEAT on the 12th March 2007. DEAT indicated that they were satisfied with the manner in which the environmental process was conducted to date. DEAT also added that the assessment of the alternatives and the notification of the three alternative routes to the Interested and Affected Parties (IAPs) must be carried out in detail in the EIA phase. This report aims to provide the IAPs with the details of the assessment of the three alternative routes.

The Final Scoping Report and Plan of Study (PS) for the EIA were submitted to DEAT and LDEDET on the 4th April 2007. Due to the misplacement of the document, the report was re-submitted to the department on the 18th May 2007. The PS for EIA and the Final Scoping Report was acknowledged by DEAT on the 21st June 2007. This EIA Report aims to provide DEAT with the approach to the study as set out in the PS for EIA. For all the documentation pertaining to the above, please refer to Appendix 1.

The Draft Scoping Report was made available for public review from Friday, 2 February 2007 to Friday, 2 March 2007. Comments on the Draft Scoping Report were mainly positive. IAPs are of the opinion that the line is long overdue and that it will assist with the capacity problems and current unreliable supply of electricity.

The IAP input was included into the Draft Scoping Report, to form the Final Scoping Report, which was simultaneously submitted to IAPs for their perusal and to the authorities for review. This strategy was discussed with and agreed to by DEAT during a meeting held on the 12th March 2007 (refer to Appendix 1 for minutes of the meeting).

3.2.4 Peer Review of the Scoping Report and EIA Reports

The Scoping Report and EIA Reports were reviewed by David de Waal of Afrosearch. The comments were integrated into Report accordingly and subsequently submitted to the authorities.

3.2.5 EIA Report

The results of the specialist studies, a full assessment of the impacts and the proposed alternatives formed part of the EIA Report. As concluded in a meeting held with Ms Lené Grobbelaar of DEAT on the 12th of March 2007, it was concluded that the alternative corridors identified during the Scoping phase must be investigated

during the EIA phase.

The EIA Report expands on the key issues and concerns identified during the Scoping phase and incorporates the authorities' comments on the Scoping Report. Additional specialist investigations were conducted and included in the EIA Report. The specialist studies assisted with the assessment of anticipated impacts as identified in the Scoping Phase and highlighted the key areas of concern as well as necessary mitigation measures. Mitigation measures were provided for each impact. Where, applicable various alternatives were evaluated. The EAP assessed the impacts using professional judgement and scientific evaluations, where possible.

3.2.6 Specialist Studies

The following specialist studies were conducted:

- Geotechnical Investigation (Nino Welland – Moore Spence Jones (Pty) Ltd);
- Soils and landform (Garry Paterson – Agricultural Research Council);
- Terrestrial ecology (Vaughan Blackman – SEF);
- Avifauna (Jon Smallie – Endangered Wildlife Trust);
- Air Quality Assessment (Demos Dracoulides – DDA Environmental Engineers);
- Heritage Impact Assessment (Johnny van Schalkwyk – National Flagship Institution);
- Visual Impact Assessment (Gerhard Griesel – SEF);
- Social Impact Assessment (Milicent Solomons and Jessica de Beer – SEF).

The specialists employed the following basic methodology:

- Site visits on the ground as well as aerial inspections;
- Sampling, where necessary;
- Desk top studies;
- Assessment of baseline data;
- Assessment of impacts;
- Development of appropriate mitigation measures; and
- Documentation of the findings in the form of reports.

Please refer to Appendix 3, containing the specialist reports for further details with respect to the methodology employed by specialists.

3.3 INVESTIGATION OF BASELINE DATA

The baseline environment (or prevalent environmental status) of the study area represents the current prevailing environmental conditions and existing levels of environmental sensitivity, pollution or degradation prior to the proposed development.

The baseline information is therefore indicative of the current environmental status. Baseline information was gathered through visual inspections of the site and its surroundings, desktop studies as well as detailed specialist investigations.

The baseline description provides an indication of:

- Current environmental conditions;
- Current levels of disturbance / degradation; and
- Environmental and social sensitivity / tolerance to change.

The baseline information serves as a reference point to scientifically measure or professionally judge the future changes to the environment based on impacts associated with the proposed project.

3.3.1 Geotechnical Investigation

Moore Spence Jones (Pty) Ltd (MSJ) were requested to provided a geotechnical comparison of three separate proposed routes for the proposed 400kV transmission power line connecting the towns of Tabor to the north of Polokwane and Witkop to the south of Polokwane in Limpopo Province.

The investigation was intended to be restricted to a desk study of available geological, geotechnical and hydro geological information and subsequent analysis. Thus, the results are intended to be relative and not absolute. However, a helicopter reconnaissance field visit to confirm findings was considered necessary.

Environmental and social issues that may affect the route determination were not considered as part of this report and analysis. The geology was superimposed onto the distribution routes, together with the variation in topographic slope using the categories of gentle (< 2°), moderate (2° to 5°) and steep (> 5°). Each of the alternative routes was then divided into sections of similar constraints such as geology, soil cover, groundwater, excavatability and access.

A number of relevant geotechnical parameters or constraints were selected from an established set of criteria (Partridge, Brink & Wood, 1993) and assigned an importance rating according to the development of the proposed distribution line. The chosen geotechnical constraints were:

- Groundwater;
- Access;
- Foundation condition; and
- Excavatability.

A rating system of 1 (good), 2 (moderate or fair) and 3 (poor) was assigned to each parametric constraint for each route length of similar constraints.

The ratings of each of the sections of a particular route was then sub-totalled and then adjusted for the proportional length of the section compared to the total length of the particular route. The final rating for a particular route was then determined as the sum of these adjusted ratings. The most preferred route is that with the lowest adjusted rating total.

3.3.2 Soils and landform

The ARC-Institute for Soil, Climate and Water was requested by SEF to carry out a desk top study for the soils and agricultural potential along a proposed corridor for a new 400kV Transmission power line in Limpopo Province. The soil information that was used to compile this study, forms part of the map sheets 2428 Nylstroom and 2328 Pietersburg of the national 1:250 000 land type survey (Botha, 1993; Paterson, Plath and Smith, & Ross, 1988).

3.3.3 Terrestrial Ecology

Access roads intersecting the proposed route were driven by vehicle on the 4th to the 7th September 2006 to obtain a terrestrial perspective of the flora and fauna and vegetation units that occur on the proposed route, alternative routes were not driven due to accessibility and time constraints. The proposed route and the proposed alternative routings were later flown by helicopter to gain an aerial perspective of the routes from the 11th to 13th December 2006.

The study area consisted of a 100 m buffer zone on either side of the proposed route for the 400kV line, and a 200 m buffer zone around the substation in order to consider the substation upgrade. A holistic approach was taken with regards to nearby features that fall outside the study area but that may be indirectly affected by the proposed development.

Within the study area the following investigations were conducted:

- With the aid of an orthophoto and available literature, preliminary ecological zones were identified.
- Several line transects were walked within each of the ecological zones to:
  - Determine the compatibility of the data in the study area with the information gathered in the literature review;
  - Determine the degree of alien/exotic plant occurrence;
  - Determine land use patterns;
  - Investigate sensitive habitat and landscape elements more closely; and
  - To search for signs of animal activity.

Due to the secretive nature and nocturnal habit of many of the faunal species and the limited time available for the survey, a literature survey was also performed to identify potential faunal species that may occur in area. The probability of amphibians and mammals occurring on site was estimated using:

- The information gathered during the field survey (actual sightings, spoor, dung, call and available habitat);
- The information gathered during the literature review (habitat descriptions and geographical distributions); and
- Personal knowledge of species occurrence in similar areas.

3.3.4 Avifaunal study

Endangered Wildlife Trust was appointed by SEF to conduct the following:

- Mapping of sensitive sites;
- Describe affected environment and determine status quo in terms of bird communities most likely to be impacted and various bird micro-habitats as well as the species associated with those habitats;
- List the typical impacts expected from the development as well as the expected impact on the bird communities. Impacts will be quantified (if possible) and a full description of predicted impacts (direct and indirect) will be provided;
- Highlight and discuss baseline data through utilisation of best data sources coupled with local knowledge;
- Assessment and evaluation of potential impacts on birds according to the magnitude, spatial scale, timing, duration, reversibility, probability and significance;
- Propose and explain mitigation measures;
- Summarise residual impacts after mitigation; and
- Indicate a monitoring programme.

The study made use of the following data sources:

- Bird distribution data of the Southern African Bird Atlas Project (SABAP – Harrison *et al.*, 1997) obtained from the Avian Demography Unit of the University of Cape Town, in order to ascertain which species occur in the study area. A separate data set was obtained for each quarter degree square within the study area;
- The Important Bird Areas (IBA) project data was consulted to establish if any IBA's are located in the study area (Barnes 1998);
- The conservation status of all bird species occurring in the afore-mentioned quarter degree squares was determined with the use of The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland (Barnes, 2000);
- The power line bird mortality incident database of the Eskom/Endangered Wildlife Trust Strategic Partnership (1996 to present) was consulted to determine which of the species occurring in the study area are typically impacted upon by power lines;
- A classification of the vegetation types in each quarter degree square was obtained from the SABAP (Harrison *et al.*, 1997); and

- The author has extensive knowledge of the bird life in the study area from personal observations and several bird impact assessment studies conducted in similar habitat in Limpopo.

3.3.5 Air Quality

Demos Dracoulides of DDA Environmental Engineers was appointed by SEF to undertake an air quality study. The air quality impact study comprised of two main components, namely, a baseline climate and air quality assessment a simulation of the dispersion potentials of the various atmospheric pollutants.

The route alignment assessment took into consideration the:

- Types and sources of pollution along the route;
- Distance of the power line from the different types and sources of pollution;
- Approximate length of power line estimated to be affected by each type of pollution; and
- Any other information related to pollution, which may affect performance of the line.

A site visit for the Tabor-Witkop power line was undertaken on the 4th and 5th of September 2006. The power line alignment was intercepted utilizing the existing road network and, where available, the service roads along the power lines. The second site visit was conducted on the 12th and 13th of December 2006. During this visit the inspection of the proposed alternatives was conducted by means of a helicopter.

3.3.6 Heritage and Cultural Resources

The National Cultural History Museum[3] was contracted by SEF to review an area in which it is proposed to develop a new 400kV power line. The scope of work consisted of reviewing an area, in accordance with the requirements of Section 38(3) of the National Heritage Resources Act (Act 25 of 1999), to determine the potential of heritage resources that may occur in the area, which included:

- Conducting a desk-top investigation of the area;
- A visit to the proposed development site.

The study comprised of the following:

- A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area;
- The Heritage Sites Database, Environmental Potential Atlas, topocadastral and other maps as well as aerial photographs were consulted;

[3] The National Cultural History Museum is affiliated to the Northern Flagship Institution, which act as parent body for a number of museums, all of which reside under the Department of Arts and Culture.

- The area was divided into blocks by using natural as well as man made boundaries. Each block was surveyed by driving across it in a number of transects; and
- Sites, objects and structures that were identified were documented according to the general minimum standards accepted by the archaeological profession.

3.3.7 Visual

The Visual Impact Assessment (VIA) was undertaken by Gerhard Griesel of SEF during September 2006. The study area was informed by the zone of visual influence (ZVI) of the project and was limited to a 10 km radius around the proposed site.

- The site was visited to establish a photographic record, views and areas of particular visual quality and or -value;
- The project components and activities were described and assessed as potential elements of visual and landscape impacts;
- The receiving environment was described in terms of its prevailing landscape- and visual character;
- Landscape and visual receptors that may be affected by the proposed project were identified and described;
- The sensitivity of the landscape and visual receptors was assessed;
- The severity of the landscape and visual impacts was determined;
- The significance of the visual and landscape impacts was assessed;
- Mitigation measures are proposed to reduce adverse impacts; and
- The findings of the study were documented in the form of the VIA.

3.3.8 Social

The Social Impact Assessment (SIA) was conducted by Milicent Solomons and Jessica de Beer of SEF during 2006 and 2007. The International Association for Impact Assessment (2003) states that SIA includes the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programmes, plans, projects) and any social change processes invoked by these interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment. The Inter-organizational Committee on Principles and Guidelines for Social Impact Assessment (2003:231) defines SIA in terms of efforts to assess, appraise or estimate, in advance, the social consequences likely to follow from proposed actions. For the purpose of this SIA, the following categories were investigated:

- Health and social well-being;
- Quality of the living environment;
- Economic impacts and material well-being;

- Cultural impacts;
- Family and community impacts;
- Institutional, legal, political and equity impacts, and
- Gender impacts.

Relevant criteria for selecting significant social impacts included the following:

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

The following methodology was used:

- Necessary demographic data was obtained from Statistics South Africa;
- A scoping exercise consisting of an initial site visit and information search was conducted to identify and contact stake holders. Stake holders included town councils, community representatives, political leaders, representatives of the mining industry, tourism groups, land owners, parks boards and agricultural groups amongst others;
- The initial site visit was followed up with a longer period of field work to obtain additional information and communicate with key stakeholders;
- Information was obtained via focus groups, formal and informal interviews, participatory rural appraisal, observation, the internet and literature reviews. Minutes and notes were kept of all interviews and focus groups;
- An interview schedule was utilised instead of formal questionnaires. An interview schedule consists of a list of topics to be covered, but it is not as structured as an interview. It provides respondents with freedom to elaborate on their views;
- The SIA focussed on current conditions, providing baseline data. Each category discussed the current state of affairs, but also investigated the possible impacts that are likely to occur in future and recommendations to ameliorate the impacts were made;
- The SIA had a participatory focus. This implies that the SIA focused strongly on including the local community and key stakeholders; and
- The findings of the public participation process fed into the SIA.

3.4 IMPACT ASSESSMENT

The results of the specialist studies were analysed and interpreted in order to assess the potential impacts, which the proposed development may inflict on bio-physical and social systems, devise potential alternatives with respect to selected activities and the development of necessary mitigation measures in order to minimise negative impacts and optimise positive impacts. The specialist recommendations were also incorporated into the proposed mitigation measures. The activities were described in the project description were assessed in terms of direct, indirect as well as cumulative impacts, where possible.

3.4.1 Specialist Impact Identification and Assessment

The specialists specifically differentiated between the environmental impacts associated with the construction, operation and maintenance of the proposed mine. As far as possible, the specialists were required to quantify the suite of potential environmental impacts identified in their studies and assess the significance of the impacts. Each impact was assessed and rated. For the purposes of this scoping process, the term 'assessment' refers to "the process of collecting, organising, analysing, interpreting and communicating data relevant to some decisions" (Stauth *et al*., 1993). The assessment of the data was, where possible, based on accepted scientific techniques, failing which, the specialists made judgements based on their professional expertise and experience.

3.4.2 Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Regulations, published by the DEAT (April 1998) in terms of the NEMA.

An explanation of the impact assessment criteria is defined below.

3.4.2.1 Extent

The physical and spatial scale of the impact is classified as:

a) Footprint

The impacted area extends only as far as the activity, such as footprint occurring within the total site area.

b) Site

The impact could affect the whole, or a significant portion of the site.

c) Regional

The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.

d) National

The impact could have an effect that expands throughout the country (South Africa).

e) International

Where the impact has international ramifications that extend beyond the boundaries of South Africa

3.4.2.2 Duration

The lifetime of the impact, that is measured in relation to the lifetime of the proposed development.

a) Short term

The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.

b) Short to Medium term

The impact will be relevant through to the end of a construction phase (1.5 years)

c) Medium term

The impact will last up to the end of the development phases, where after it will be entirely negated.

d) Long term

The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.

e) Permanent

This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

3.4.2.3 Intensity

The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as:

a) Low

The impact alters the affected environment in such a way that the natural processes or functions are not affected.

b) Medium

The affected environment is altered, but functions and processes continue, albeit in a modified way.

c) High

Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

3.4.2.4 Probability

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:

a) Improbable

The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).

b) Possible

The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.

c) Likely

There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.

d) Highly Likely

It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.

e) Definite

The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

3.4.3 Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

3.4.3.1 Determination of Significance – Without Mitigation

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

a) No significance

The impact is not substantial and does not require any mitigation action.

b) Low

The impact is of little importance, but may require limited mitigation.

c) Medium

The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.

d) High

The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

3.4.3.2 Determination of Significance – With Mitigation and Without Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

a) No significance

The impact will be mitigated to the point where it is regarded as insubstantial.

b) Low

The impact will be mitigated to the point where it is of limited importance.

c) Low to medium

The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.

d) Medium

Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.

e) Medium to high

The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.

f) High

The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it was necessary to re-evaluate the impact. The significance of the impact after the mitigation measures are taken into consideration.

3.5 LIMITATIONS & ASSUMPTIONS

The EIA is multi disciplinary process, which was informed by the applicant, engineers and specialists. It is therefore necessary to assume that the information provided by the project team is accurate and true.

3.5.1 Information Pertaining to the Infrastructure

The EIA Report accounts for the environmental impacts associated with the study area as defined by the proposed Tabor Witkop Transmission power line.

3.5.2 Geotechnical Investigation

The analysis was limited to a desk top study of available information and a limited fly-over reconnaissance survey. The ground conditions described in this report refer specifically to those determined from a desk top study, purely for route selection purposes from a geotechnical perspective and therefore should not replace a comprehensive site investigation. It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere and thus detailed geotechnical assessments.

3.5.3 Ecological Study

In order to obtain a comprehensive understanding of the dynamics of communities and the status of endemic, rare or threatened species in an area, vegetation and faunal studies should ideally be replicated over several seasons and over a number of years. However, due to time constraints such long term studies are not feasible. Consequently, the results are based on data and observations made during a four day ground survey and two day fly-over, a literature review and experience gained by the author through the investigation of other areas similar to the study area in question.

3.5.4 Avifauna

This study made the assumption that the above sources of information are reliable. However, the following factors may potentially detract from the accuracy of the predicted results:

- The SABAP data covers the period 1986-1997, which means that some of the data is currently over a decade old. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate;
- Other sources of error in the SABAP database (for a full discussion of potential inaccuracies in ASAB data, see Harrison *et al.*, 1997); and
- Predictions in this study are based on experience of these and similar species in different parts of South Africa. Bird interactions with power lines cannot be reduced to formulas that will hold true under all circumstances; at most impacts can be predicted with a fair amount of confidence based on field experience.

3.5.5 Soils and Landform Study

The information contained in the land type survey is of a reconnaissance nature (1:250 000 scale) and, can therefore only represent the dominant soils within a specific land type. It is to be expected that areas of different soils will occur, but due to the nature and scale of the survey, detailed soil maps cannot be assimilated using

the results of this study.

3.5.6 Heritage Impact Study

The following played an important role in determining the potential in the area:

- Minimal information was available;
- Dense vegetation encountered during the survey period, made it difficult to identify sites, as well as to establish their extent (size);
- Inaccessible areas, for example game ranches and some farms; and
- Insufficient oral traditions are available for the rural areas to have insight into the existence of possible heritage sites.

3.5.7 Visual Impact Assessment

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town and SEFGIS (2007) respectively;
- Observations made and photographs taken during site visits;
- Technical information received from Eskom Transmission;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

This assessment was undertaken during the conceptual stage of the project and is based on information available at the time.

- An exact commencement date for the construction phase is unknown. Construction is expected to commence as soon as public participation is complete and approval is received from the relevant authorities;
- The exact location, size and number of construction camps and material lay-down yards are not yet specified at this stage of the project. It is anticipated that construction camps will be set up on farms at central locations along the preferred alignment. The construction camps will consist of temporary structures such as tents or temporary buildings. Ablution facilities will also be associated with the construction camps and are expected to be portable toilets and temporary shower facilities;
- The exact alignment of the proposed transmission lines and position of the pylons are not yet determined and the alternatives only specify proposed corridors. The visibility results have been generated from the anticipated alignment and may deviate from the route for the final approved alignment. The differences are considered omissible;
- The study area is an exceptionally large area and an in depth site investigation is not feasible, considering the timeframes and budget allocated for the assessment. The assessment is based on information gathered from a desktop

study and confirmed during the site investigation. The route of travel was considered to be representative of the majority of the study area and provided enough detail to complete the assessment with reasonable accuracy; and

- This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. Viewer sensitivity is determined by means of a commonly used rating system.

3.5.8 Social Impact Assessment

The following assumptions and limitations are relevant to the Social Impact Assessment (SIA):

- Only key persons in the community were approached for further discussion. Additional information was obtained using existing data and via telephonic and on-site interviews;
- The fieldwork for the study was conducted in late 2006;
- It is assumed that local employment will be a priority for all operations;
- It is assumed that apart from temporary disruption, most communal grazing areas will be fully accessible after construction;
- It is assumed that the 2001 Census data is not entirely accurate, but it gives a broad reflection of the social environment, and
- It is assumed that the information obtained during the public participation process was accurate and also informed the study.

3.5.9 Mapping

All mapping was completed using ArcGis 8.3. Most work was completed using GeoWgs84 (Geographic WGS84). However, where calculations were required, a projection of TM27Wgs84 (Transverse Mercator Lo 27, WGS84) was used.

4 ALTERNATIVES

4.1 INTRODUCTION

The consideration of alternatives is a critical component of the EIA process, where an appropriate range of alternatives require consideration whilst achieving the desired objective of the proposed project (DEAT, 2004). The IEM procedure stipulates that an environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, DEAT requires that a number of possible proposals or alternatives, for accomplishing the same objective, should be considered. It is noteworthy that DEAT considers the failure to consider alternatives adequately to be "…symptomatic of a biased process that is intent on defending a project proposal" (DEAT, 2004). The alternatives considered in this report include the following:

- Route / corridors;
- Structural;
- Strategic;
- Scheduling; and the
- No development option.

4.2 ROUTES / CORRIDORS

A detailed corridor / route alternative analysis was undertaken for the development as far as possible within the obvious parameters of the supply and demand. Alignment selection or the consideration of alternative alignments starts by gathering information from topographical maps, land use maps, planning documents, geology, soil maps, satellite images, local knowledge and site visits to the area. The first option is the straight line between the substations, which inevitably is the cheapest option.

Based on the findings of the specialist's studies, sensitive areas such as cities, town, game farms, national parks and reserves, rivers, ridges, must be taken into consideration and the proposed alignment may require deviations. The following recommendations were made:

- Access for construction and maintenance must always be considered;
- The proposed power line must be kept as far away from dwellings and must not pass in front thereof;
- The power line structures must not encroach on wetlands and as far as possible avoid ridges;
- Practical issues must be considered, such as valley crossings, side slope, erosion, irrigation schemes, mountainous terrain, access routes for construction vehicles,
- Low-lying areas should be considered as far as possible; Avoidance of positioning the power line in such a manner that it disrupts the sky line; and

- Considering the above-mentioned criteria, the proponent considered three possible routes within the study area, i.e. proposed corridor, and alternatives A and B. For the different alignments, please refer to **Error! Reference source not found.**1. Three alternative alignments identified are discussed in the EIA Report, based on the specialist findings and input from the affected landowners along the alignments. The preferred alternative will be that which inflicts minimal environmental impacts.

4.2.1 Reference terminology

It should be noted that all three alternative corridors were subjected to an objective and detailed comparative assessment during the EIA process, by both the specialist team as well as the EAP. The reason that alternative 1 is termed 'proposed' was purely because the initial project description entailed a single alignment only. Thus, upon commencement of the project (August 2006), there was only one alignment, referred to as the 'preferred' alignment. Subsequently, alternative corridors (December 2006), were identified by Eskom and a team of specialists and these alternatives were termed alternatives A and B. Thus, the reference terminology was kept consistent purely to prevent confusion amongst the public and specialists regarding the various alignments and is therefore by no means indicative of a biased process.

4.2.2 Proposed Alternative (Parallel to the Existing Power Line, East of the N1)

The proposed alternative will begin at the Tabor substation in a southerly direction along the existing Tabor-Witkop servitude, on the eastern side of the N1 highway. After crossing the R71 the line will continue in a south-westerly direction and pass in close proximity to the southern boundaries of the Polokwane and Kuschke Game Reserves to reach the Witkop substation. This option / route is sometimes also referred to as the existing route (E) because the route runs parallel to existing power line connecting the existing Tabor and Witkop substations (Figure 1).

4.2.3 Alternative A (West of the N1)

Alternative A will begin at the Tabor substation, cross the N1 highway and run along a decommissioned power line servitude on the western side of the N1. East of Kuschke Game Reserve it will again cross the N1 and run in an easterly direction to join the Witkop substation from its western side (Figure 1).

4.2.4 Alternative B (Crosses the N1 North of Kuschke Nature Reserve)

Alternative B will utilise the same corridor as Alternative A until south of Polokwane, where it will cross the N1 and run along the eastern side of Kuschke Game Reserve. Thereafter, it will join the servitude of the Proposed Alternative until it reaches the Witkop substation from an easterly direction (Figure 1).

4.3 STRUCTURAL DESIGN

A number of pylon structures were considered for the proposed Transmission power line as listed below:

- Cross rope suspension tower;
- Guyed suspension tower; and
- Self-supporting suspension tower.

It is assumed that cross-rope suspension towers such will be used for the majority of the line. However, the final tower that will be used will only be determined once the design studies have been finalised. The tower is approximately 45 m high. The average span between towers will be about 450 m. Self-supporting strain towers will be used at bend points and any other points that require additional strength along the line.

It is recommended that the cross-rope suspension tower is used wherever possible, due to the:

- Small footprint of the tower;
- Limited excavation required;
- Small visual impact;
- The design has no inherent electrocution risk for large birds because the clearances between live parts and live and earthed components exceed the wingspan of any bird; and
- The design of the suspension towers is such that bird streamers are unlikely to be a source of faulting on the line. Birds tend to perch on the highest points first, in this instance the earth peaks. The perching space above the conductors is uncomfortable and restricted. This type of tower has never had suspected bird streamer faulting (Eskom Transmission Engineering pers.comm).

4.4 STRATEGIC UTILISATION OF ENERGY

4.4.1 Demand Side Management

Demand Side Management (DSM) can generally be defined as the activities performed by the electricity supply utility, which are designed to produce the desired changes in the load shape through influencing customer usage of electricity and to reduce overall demand by more efficient use. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity.

By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. Some of the basic tools are the price signals (such as time of use tariffs) given by the utility and direct load management. This option is practised to a certain extent, but is currently not considered feasible for expansion in this particular region.

4.4.2 Construct 275kV and 400kV Transmission power lines in the Witkop - Tabor - Spencer network

This option will sufficiently reinforce the present network, as it will result in the formation of a ring feed between Witkop, Tabor and Tabor substations from Polokwane. The planned 275kV and 400kV lines together with the substation upgrades will ensure that there is adequate supply to the Witkop Tabor Spencer network. This is the option most favoured by Eskom Transmission. This alternative is the most economical action that can be implemented in the short to medium term. The need for increased capacity and the need for optimising existing infrastructure would be met.

The advantages with this option are the following:

- It overcomes the voltage collapse problems;
- It will create a more flexible network since it forms an interconnection between the loads fed from Tabor and Witkop substations. This will improve the overall reliability of the system, which will be of benefit to both Eskom and to all electricity users in the area;
- It improves the reliability of supply to the Polokwane by encouraging economic growth; and
- It will be less costly than any other options that were considered.

Based on the current land use and development in the Polokwane area, the area available for the construction of major Transmission power lines with a servitude of 55 m is limited. New routes must, however, be secured to ensure servitudes for the expansion of the network and meet the forecast increase in demand.

The need for increased capacity and the need for optimising existing infrastructure will be met in this way, and this option is put forward by Eskom Transmission as the most feasible option.

4.5 NO DEVELOPMENT

The DEAT stresses that the no development option should be considered in cases where the proposed development will have a significant negative impact that cannot be effectively or satisfactorily mitigated.

If the Tabor Witkop 400kV line is not constructed, Eskom will be unable to meet load demand requirements or maintain existing reliability and quality of supply. This is despite the fact that Eskom Transmission has taken all measures to date to ensure that the existing Transmission system is utilised to its full capacity. In addition, it will not be possible to meet the expected load demand if the predicted increase in electricity demand occurs in the Limpopo Region.

The no development option will result in a zero environmental impact in this area. However, the implications of not implementing the project appear to be significant

with respect to economic and social components of sustainable development. Therefore this option is not be viable.

By the lack of action, Eskom Transmission will not ensure firm supply into the Polokwane area, which would result in the existing load shedding causing major disruptions of power supply to different areas at various times. This can have a major impact on the economy of the region, as no real economic growth can take place. This option is therefore ruled out because it would neither supply the projected demand for electricity nor optimise the existing infrastructure.

Considering that the power line will be constructed adjacent to an existing power line and its associated servitude, no environmental impact associated with this activity cannot be effectively mitigated. The no-development alternative can, therefore, be justifiably dismissed as an alternative. If further information becomes available, which indicates otherwise, and then this will warrant reconsideration.

5 DESCRIPTION OF THE BASELINE ENVIRONMENT

5.1 CLIMATE

Meteorological data was obtained from the air quality study. Precipitation data was obtained for the stations of Hans Merensky and Louis Trichardt for the years 2002 to 2006. As can be seen, the easterly wind direction is the most predominant one, reaching 9 % at Tzaneen station (Figure 8) and 20 % at Mara station (Figure 9). The wind speeds are predominantly low and calm wind conditions have a high occurrence rate for both stations, i.e. 36 % and 63 % for the Tzaneen and Mara stations, respectively. These types of wind patterns are not conducive to large distance transportation of dust and air pollutants from the emitting sources. The precipitation in the general area is depicted for the Hans Merensky (Figure 10) and Louis Trichardt stations (Figure 11). April to September precipitation is very low.

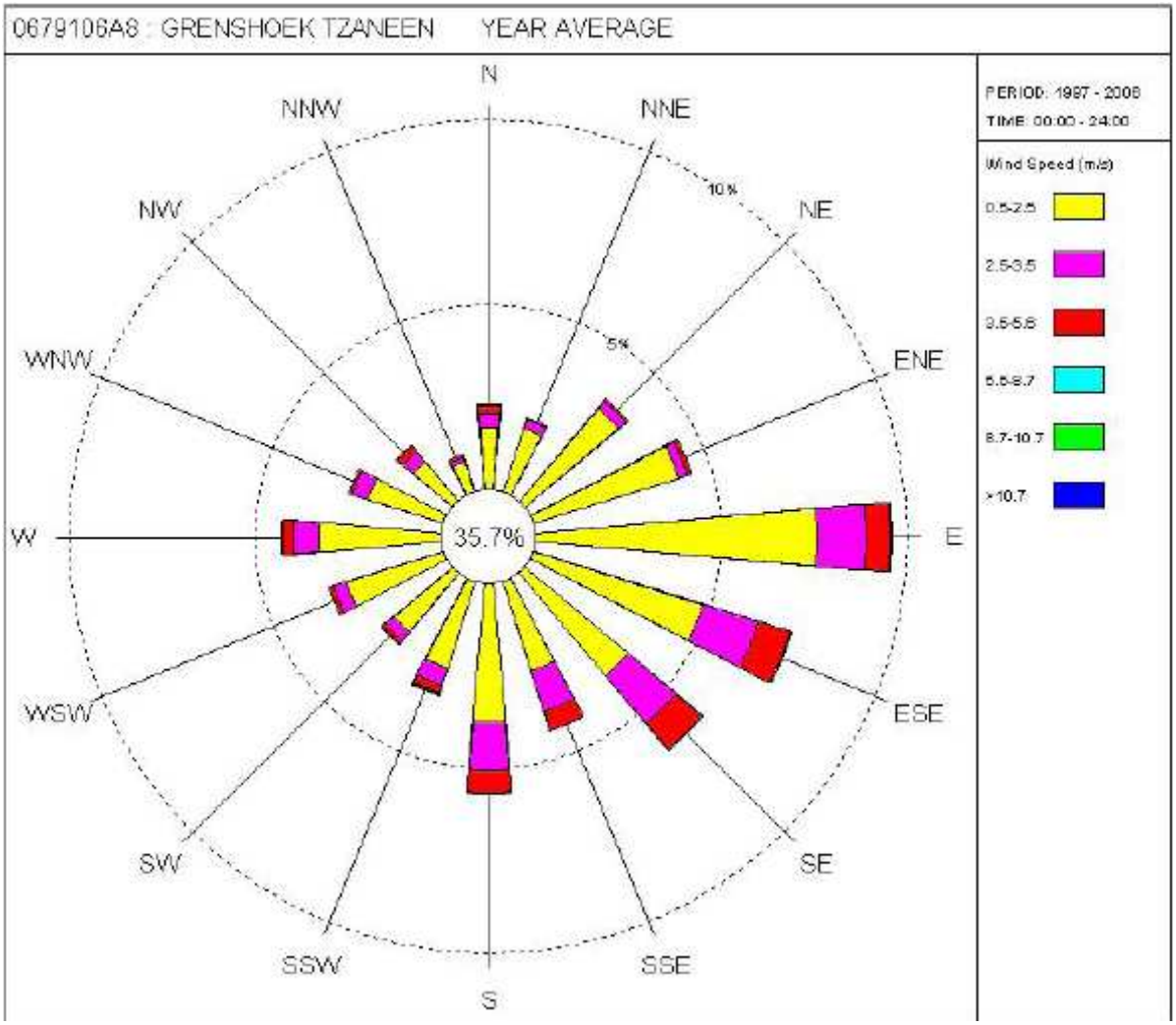


Figure 8: Wind Rose for Grenshoek Tzaneen Weather Station

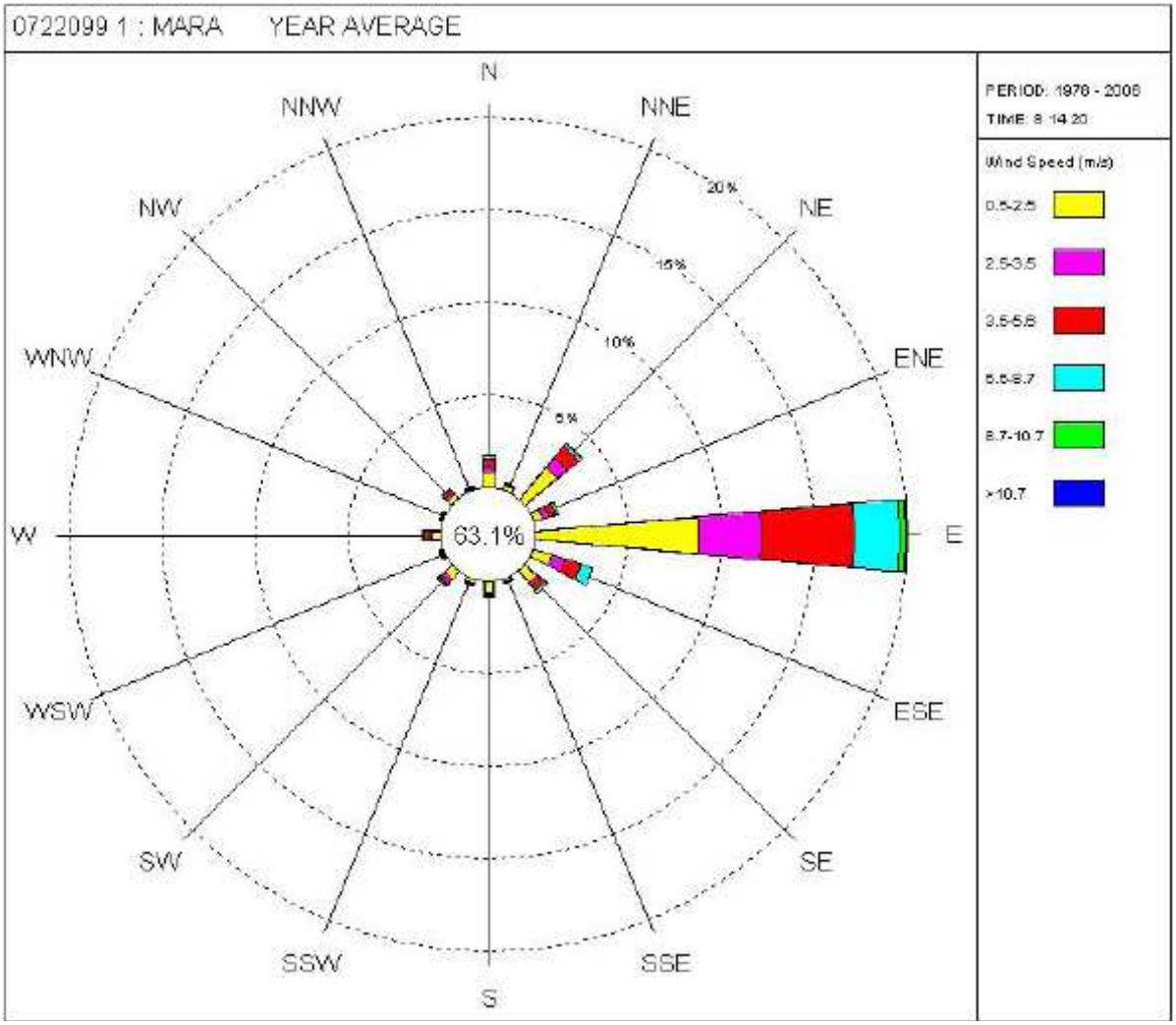


Figure 9: Wind Rose for Mara Weather Station

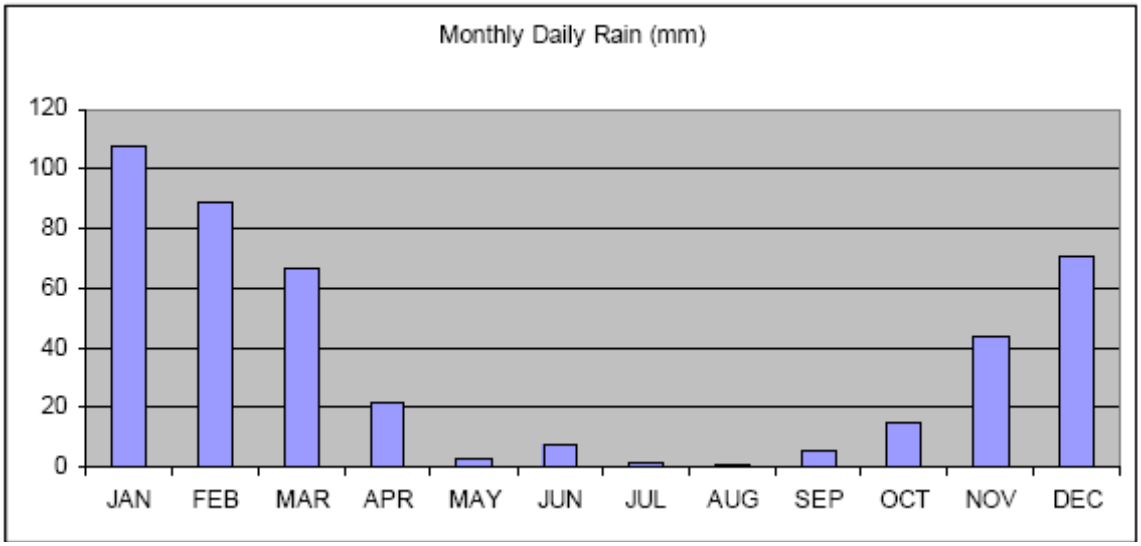


Figure 10: Precipitation for Hans Merensky Weather Station

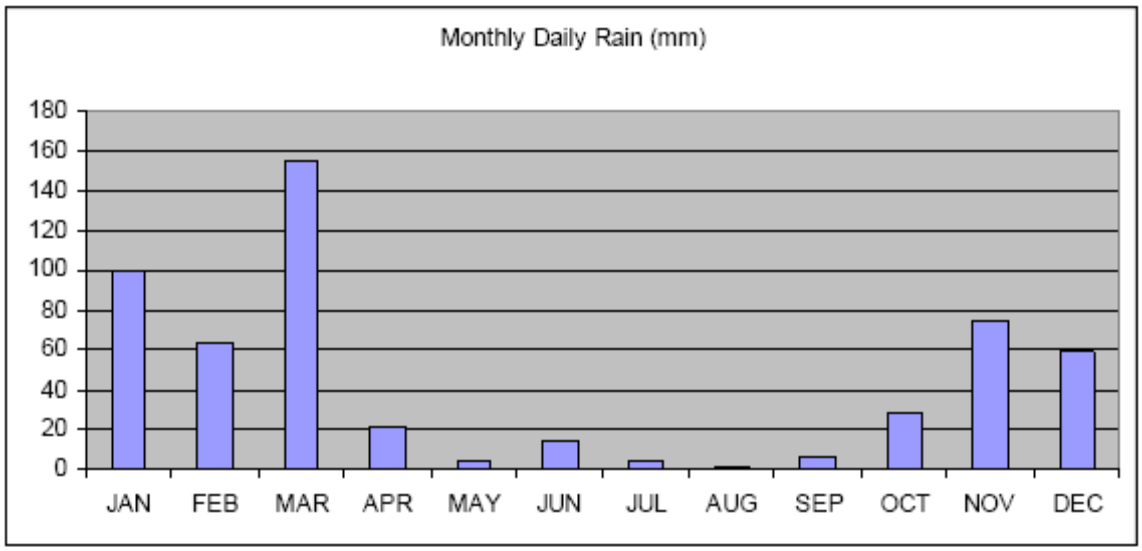


Figure 11: Precipitation for Louis Trichardt Weather Station

5.2 TOPOGRAPHY

The northern parts of the study area are characterised by numerous scattered granite outcrops within a generally flat topography, while the southern parts of the study area are characterised by gentle slopes.

5.3 GEOLOGY

According to the published 1:250 000 scale geological maps covering the proposed route (2328 Pietersburg [Polokwane] and 2428 Nylstroom [Modimolle]); the majority of the route is underlain by Houtplaats Gneiss and Shale. Refer to Figure 12.

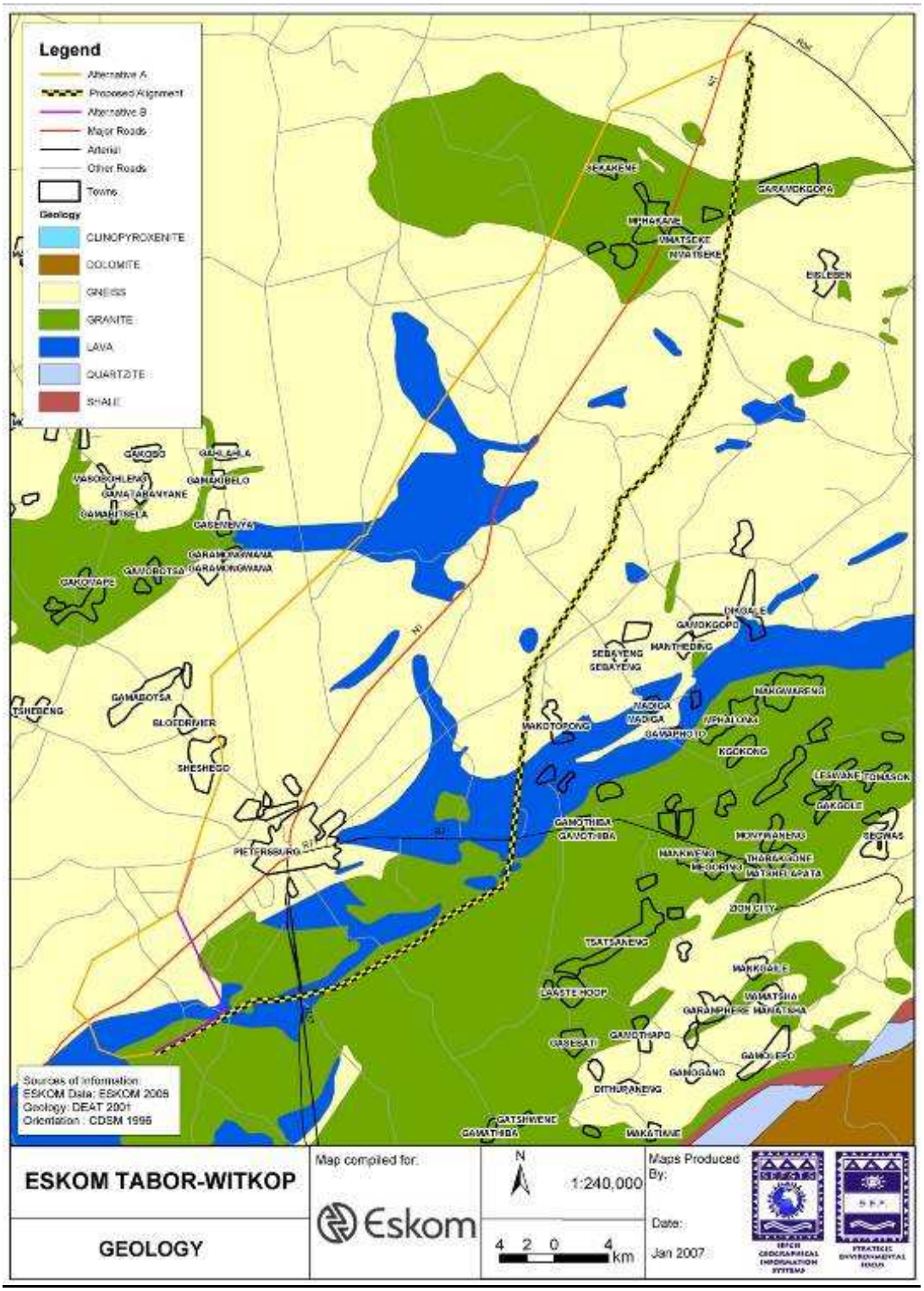


Figure 12: Geological Formations of the study area (DEAT, 2001)

5.4 HYDROLOGY

Non-perennial tributaries of perennial rivers drain the study area within three (3) quaternary catchment areas, namely:

- A71C;
- A71B; and
- A71A.

The perennial Sand River crosses the proposed and alternative alignment twice in the northern section of the study area while the perennial Blood River runs approximately three (3) km east of the southern section of the proposed alternative and then splits into two tributaries one on the east and the other to the west of the line, (Chief Directorate: Surveys & Mapping 1996: Hydrology. Cape Town: CDSM).

5.5 SOILS AND LANDFORM ASSESSMENT

The main characteristics of each of the land types are given in below. The soils were classified according to MacVicar *et al.* (1977) with the dominant agricultural potential class within each land type indicated in bold type.

The route(s) affected by each land type are also shown, namely Alternative A (A), Alternative B (B) or the existing route (E).

Table 4: Soil properties per land type

Land type	Dominant soils	Sub-dominant soils	Slopes (%)	Agricultural Potential (%)	Route(s)
Ab91	Hu24/25/26; 300-1200 mm; LmSa-SaClLm 41 %	Gs&Ms; 100-400 mm; LmSa-SaLm 22 % Es&Va; 600-1000 mm; SaClLm 11 %	1-10	H: 11.1; M: 51.8 L: 37.1	A B
Ae225	Hu&Cv36/37; 400-1200 mm; SaClLm-Cl 68 %	Sd21/Va31; 600-1200; SaCl-Cl 11 %	2-10	H: 7.0; M: 85.0; L: 8.0	A; B; E
Ae229	Hu26/36; 300-1200 mm; SaClLm 45 %	Gs&Ms; 100-300 mm; LmSa-SaLm 35 % Rock 15 %	2-15	H: 1.0; M: 46.5 L: 52.5	B E
Ae336	Hu34/35; 400-800 mm; Sa-LmSa 51 %	Rock & shallow soils 25 %	2-1	H: 11.0; M: 64.5 L: 24.5	A; B; E
Bc48	Hu&Bv36; 400-1200 mm; SaLm-SaClLm 27 %	Rock & shallow soils 29 % Cv&Av36; 400-1200 mm; SaLm-SaClLm 15 %	1-5	H: 3.6; M: 61.0 L: 35.4	E
Bc49	Cv&Av34-36; 400-1100 mm; SaLm-SaClLm 49 %	Rock & shallow soils 7 %	1-8	H: 0; M: 45.7 L: 54.3	A; B; E
Bc56	Rock & shallow soils 24 %	Hu34/35/36; 600-1200 mm; SaLm-SaClLm 22 % Cv34/35/36; 600-1200mm; SaLm-SaClLm 21 %	1-4	H: 6.0; M: 67.5 L: 26.5	E
Bd39	Rock & shallow soils 26 %	Av36/37; 600-900 mm; SaClLm-SaCl 23 % Cf31; 300-600 mm; LmSa-SaLm 18 %	1-5	H: 3.8; M: 38.8 L: 57.4	B E
Bd51	Cv&Av34-36; 400-1100 mm; SaLm-SaClLm 41 %	Hu&Bv34-36; 400-1200 mm; SaLm-SaClLm 27 %	0-2	H: 0; M: 74.4 L: 25.6	A B
Bd52	Rock & shallow soils 47 %	Cv26/36; 400-700 mm; SaLm-Lm 17 % Hu26/36; 600-1000 mm; SaLm-Lm 13 %	1-3	H: 5.8; M: 50.6 L: 43.6	A; B; E
Dc52	Hu&Cv26; 400-1000 mm; SaLm-SaClLm 26 %	Rock & shallow soils 20 %	1-10	H: 0; M: 68.7 L: 31.3	E
Fa537	Hu&Cv36; 400-800 mm; SaLm-Lm 36 %	Gs15-17/Ms10; 100-300 mm; LmSa-SaLm 26 % Rock 15 %	5-20	H: 0; M: 51.7 L: 48.3	A; B; E
Fa538	Hu&Cv36; 400-800 mm; SaLm-Lm 32 %	Gs14/17/Ms10; 100-300 mm; LmSa-SaLm 22 % Rock 19 %	5-10	H: 9.9; M: 45.9 L: 46.2	E
Fa759	Gs15-18&Ms; 50-300 mm; LmSa-SaLm 44 %	Hu&Cv34/35; 300-500 mm; SaLm 24 %; Rock 18 %	10-20	H: 0; M: 14.0; L: 86.0	B; E
Ia132	Oa47/Ik10/Bo30; >1200 mm; ClLm-Cl 34 %	Oa35/36& Du10; >1200 mm; SaClLm 32 %	1-3	H: 44.0; M: 52.0 L: 4.0	A; B; E
Ia133	Oa47/Ik10/Bo31; >1200 mm; ClLm-Cl 34 %	Oa35/36& Du10; >1200 mm; SaClLm 32 %	1-3	H: 44.0; M: 52.0 L: 4.0	A; B; E

Land type	Dominant soils	Sub-dominant soils	Slopes (%)	Agricultural Potential (%)	Route(s)
Ia134	Oa36/Du10; 600-1200 mm; SaClLm 32 %	Oa27/Va41; >900 mm; SaCl-ClLm 27 %	1-5	H: 59.0; M: 30.0 L: 11.0	A; B; E

The column in the above table that refers to 'Agricultural Potential', which is calculated based on the dry land potential. The dry land potential refers to the soil characteristic without any climatic parameters. The corridor runs through a mostly dry area (annual rainfall less than 500 mm), where dry land production is problematic. In South of the study area, around Polokwane only, the annual average rainfall exceed 540 mm.

Based on the information provided in Table 4, most of the study area comprises structureless, red and yellow soils of medium texture and moderate depth. No extensive areas of excessively steep, rocky topography and/or shallow soils occur, although within most of the land types, smaller zones with these characteristics are found in places.

5.6 TERRESTRIAL ECOLOGY

Information gathered during the two site visits and a desktop study revealed three different vegetation units prevalent within the study area. The alignment for the proposed alternative falls within the Mixed Bushveld vegetation unit, whilst alternative alignments A & B fall within the Mixed and Sweet Bushveld vegetation units (Figure 14).

Low & Rebelo (1996) identifies the *Savannah Biome* within the study area. The ecologist identified sensitive vegetation units as well as Red Data plant and / or species of conservation importance occurring within the study area (Figure 19).

As part of the investigation of the sensitive ecological zones, the specialist study included a faunal investigation, assessing the current state of the environment as well as the possible impacts that may emanate from the proposed project. The faunal investigation identified Red Data amphibians, reptiles and mammals and / or species of conservation importance may occur in the region.

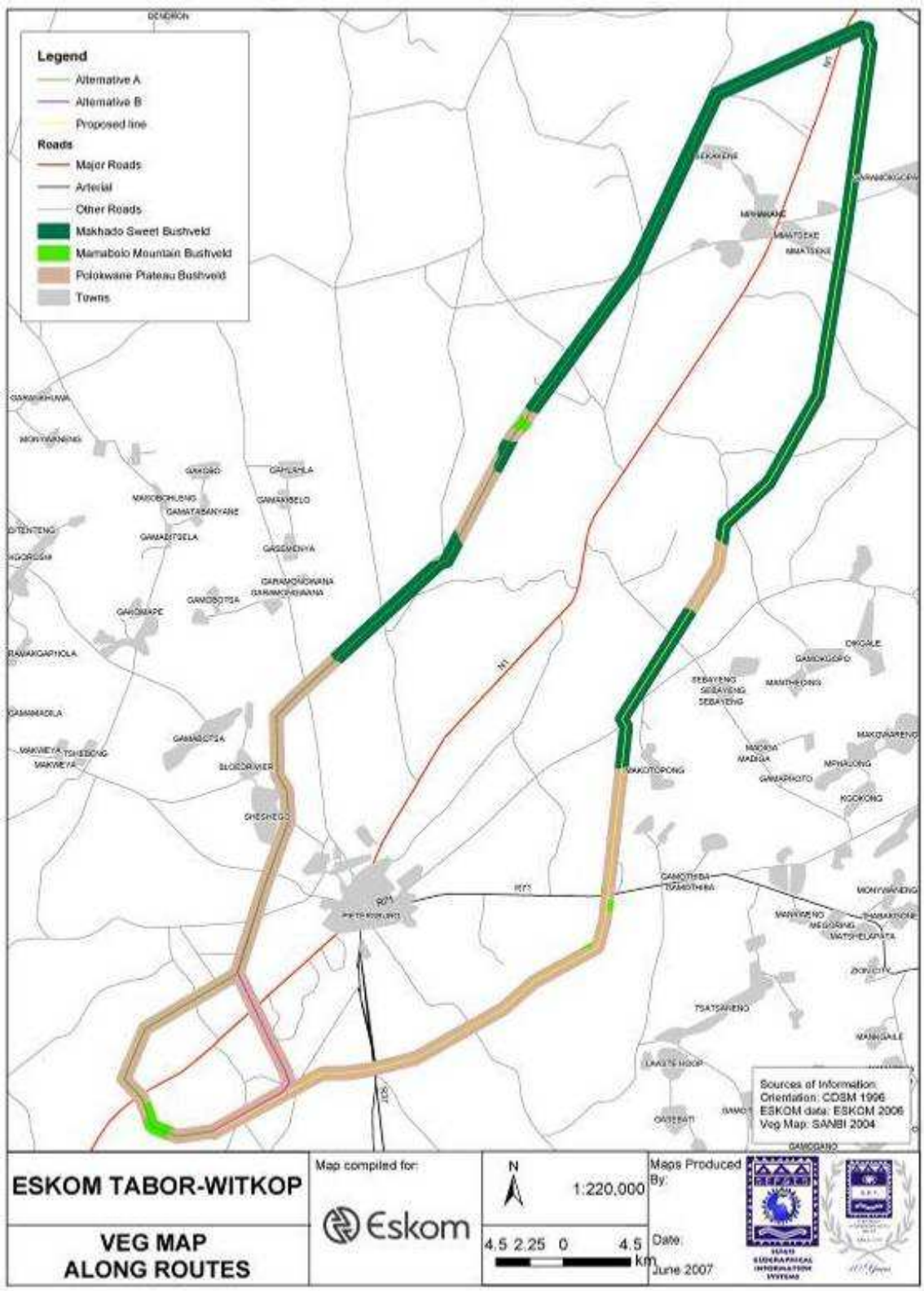


Figure 13: Broad-scale vegetation map of the alternative routes / corridors

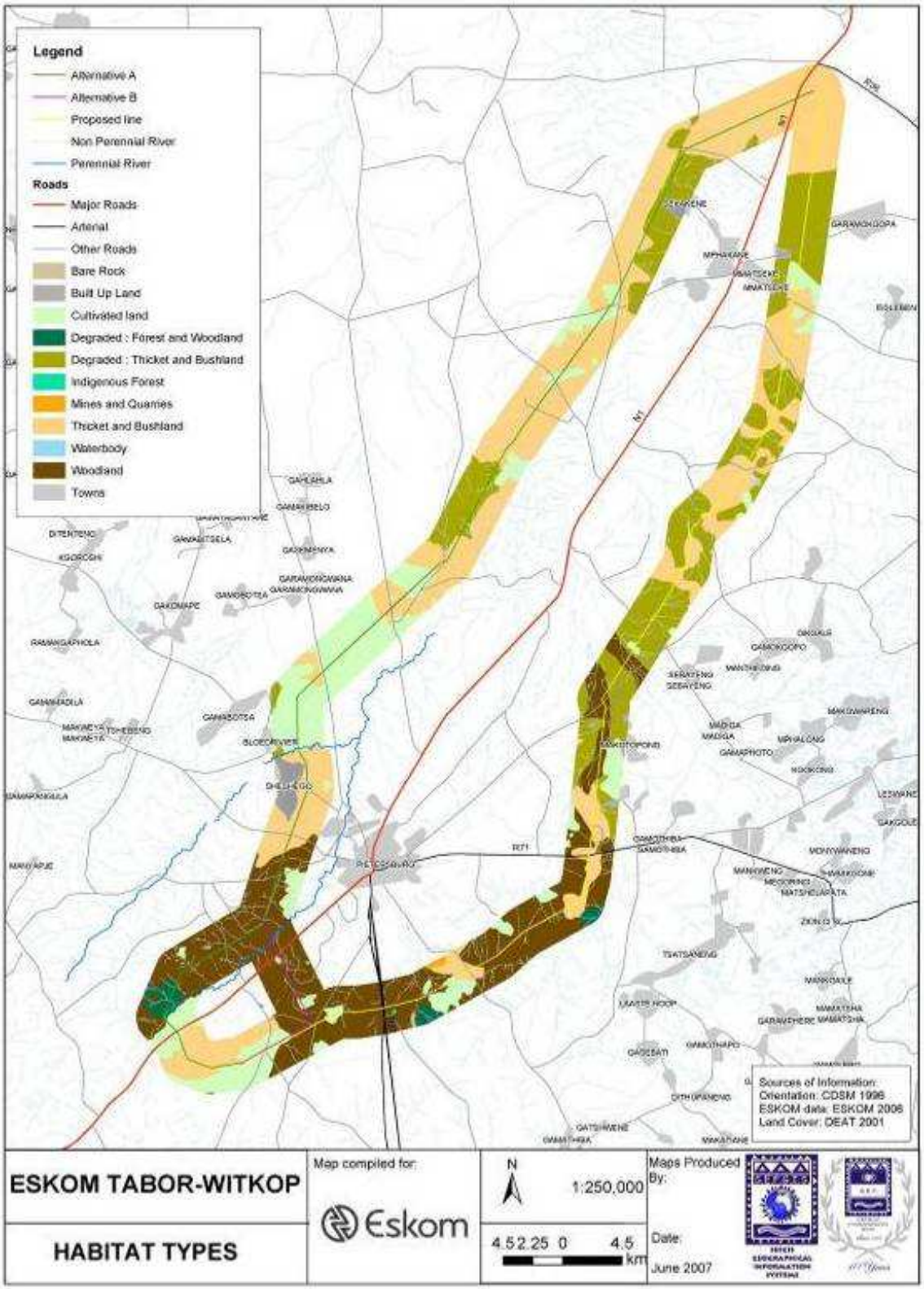


Figure 14: The habitat units associated with the alternative routes / corridors

5.6.1 Flora

5.6.1.1 Makhado Sweet Bushveld

Makhado Sweet Bushveld occurs in the western area of the Soutpansberg, around Blouberg and up to the Limpopo. As a result of the relatively low rainfall, grasses are sparse and trees do not grow tall. The vegetation is varied with a mixture of *Colospermum mopane*, *Combretum imberbe*, *Acacia nigrescens*, *Boscia albitrunca* and *Sesamothamnus lugardii*. In these areas a strong Kalahari element is seen in the protruding red sands.

The woody element includes *Combretum apiculatum, Commiphora pyracanthoides, Acacia tortilis* and various *Grewia* species. The herbaceous layer includes the gramenoid species; *Eragrostis rigidior, Panicum maximum, P. coloratum* and *Urochloa mosambicensis* and various forbs species.

This vegetation type is poorly conserved with approximately 1 % that has been statutorily conserved, some 27 % transformed by cultivation with some urban and built up areas also occurring (SANBI & DEAT, 2004).

Figure 15: Images of the typical vegetation associated with this vegetation unit along the proposed alignments.

5.6.1.2 Polokwane Plateau Bushveld

Also known as the Pietersburg Plateau False Grassland, this habitat is characterised by open savannah dominated by *Themeda* grass and scattered *Acacia tortilis* and *Acacia rehmanniana* trees. As the name suggests it is perched on an elevated plateau at an average height of 1300 m above sea level. Much of this habitat has been altered as a result of agricultural activities and the most pristine examples can be found in and surrounding the Polokwane Nature Reserve. Less than 2.7 % has been statutorily conserved mainly in the Percy Fyfe and Kuschke Nature Reserves. Some 17 % is transformed, which includes 10 % through cultivation and 6 % through urbanisation occurring predominantly in the East and North West.

Where watercourses and drainage lines run through the Polokwane Plateau, the vegetation becomes much taller forming dense *Acacia karoo/Rhus pyroides* riverine thickets. Other interesting geographical features scattered over the plateau include white Quartz veins, Granite outcrops and barren saline patches.

Figure 16: Polokwane Plateau Bushveld: very open savannah with low *Acacia tortilis* trees.

5.6.1.3 Mamabolo Mountain Bushveld

This vegetation type lies between the Polokwane Plateau and the mountain habitats of the Strydpoort, Wolkberg and Drakensberg ranges and tends to be isolated to the granitic koppies within this region. The first major intersection between the proposed alignment and this vegetation type occurs along the southern portion of the proposed alignment, approximately where the proposed alignment crosses the R71.

This vegetation type is an extension of the Polokwane Plateau Bushveld but has a greater botanical diversity and is therefore important to consider. Mamabolo Mountain Bushveld is made up of a combination of dense shrubby thickets and small trees of both Acacia and broad-leaved species. Tall Mountain Aloes, *Aloe marlothii* are conspicuous as are the characteristic granite boulders and koppies, which give this habitat its uniqueness. These outcrops support a great variety of plant life including *Euphorbia cooperi*, and various *Ficus, Combretum* and *Acacia* species. The thickets consist mainly of *Acacia gerrardii*, *Dombeya rotundifolia, Cussonia natalensis, Pappea capensis* and several *Euclea* species. Mamabolo Mountain Bushveld is considered to be poorly protected with only 8 % falling within recognised

conservation areas. However, a large percentage (roughly 94 %) still remains fairly intact, and is therefore considered to be least threatened (SANBI & DEAT, 2004).

The lands between these rocky granitic outcroppings are heavily farmed and thus fragment the continuity that these have with the surrounding vegetation. Therefore contiguous segments of this vegetation type are particularly important to maintain. Also apparent on these vegetation units was strong evidence of historical human habitation in the form of old kraals, which became clearly apparent from the air when the site was flown by helicopter and should be the subject of a heritage investigation.

Figure 17: Vegetation along the proposed alignment representative of the Mamabolo Mountain Bushveld vegetation units as mapped by Mucina and Rutherford (2006).

5.6.1.4 Agricultural Lands

Sections of the study area also have been cleared of vegetation for agricultural purposes. These areas predominantly support hardy pioneer or exotic plant species. Common species included *Argemone subfusiformis, Asparagus sp., Bidens pilosa, Solanum sp., Cynodon dactylon, Pogonarthria squarrossa, Cereus jamacaru* and *Opuntia ficus-indica*.

Based on the removal of vegetation in this ecological zone, the plant species diversity is very low. Figure 18 indicates open agricultural land, which forms a large portion of the southern area of the site.

Figure 18: Agricultural lands

5.6.1.5 Red Data and Protected Plants

A total of 67 plant species are listed as Red Data according to the interim TSP Red Data list of August 2006 for the Limpopo Province. Of these 67 species, two are 'Extinct', two are 'Extinct in the Wild', seven are 'Critically Endangered', six are 'Endangered', 28 are 'Vulnerable' and 22 are 'Near-threatened'.

No Red Data plants species that are on the TSP Red Data list were observed within the study area, nor was any suitable habitat for these species observed. It should, however, be noted that their presence cannot be totally dismissed.

5.6.1.6 Declared Weeds and Invader Plants

Concern is growing over the way in which alien/exotic plants are invading large areas within South Africa. Invasive species are a major threat to the ecological functioning of natural systems as well as the productive use of the land, and should ideally be removed if they are not serving an ecological function. Seven alien plants species were observed during the field survey, they are listed in the table below.

Table 5: List of some alien plants species observed within the study area

Scientific Name	Common Name
Acacia mearnsii	Black Wattle
Eucalyptus sp.	
Opuntia ficus-indica	Sweet Prickly Pear
Argemone subfusiformi	Mexican Poppy
Bidens pilosa	Common Black-jack
Solanum sp.	
Cereus jamacaru	Queen of the Night

5.6.2 Terrestrial Fauna

5.6.2.1 Amphibians

The study area is very dry with few major rivers and wetlands in the proposed alignment. It is anticipated that with mitigation, crossings of these habitats will not impact significantly on their hydrology and thus on the amphibian communities within these habitats.

Due to the largely terrestrial nature of the proposed alignments, the study area will predominantly support the more terrestrial amphibian species (e.g. *Bufo garmani* and *Bufo gutturalis*). A total of 14 amphibian species could possibly occur within the study area. However, it is estimated that approximately 12 species will have a high probability of occurrence. No amphibians were observed, and it is not expected that any Red Data species will occur within the study area.

5.6.2.2 Reptiles

Limpopo supports 148 species of reptiles, 92 of which may occur in the area of the proposed alignment or its alternatives and are associated with bushveld or savannah

habitat. Eighteen reptile species of conservation importance occur in Limpopo, the majority of which occur in the Sekhukhuniland, Drakensberg Escarpment and the Soutspansberg centres of endemism. None of these are likely to occur along the proposed alignment or its alternatives.

5.6.2.3 Mammals

Based on the habitat availability, it is estimated that a total of 105 species could potentially inhabit the study area. Of these, it is estimated that approximately 60 species have a high probability of actually occurring within the study area. The larger mammalian species that occur within the study area are correlated with the game farming areas to the north of Polokwane, corresponding to the Tabor portion of the proposed alignment. Many of these species have been reintroduced to these areas and therefore may fall outside of their natural distribution ranges. The proposed alignment or its alternatives are not expected to significantly affect the existing status quo of mammalian species of conservation concern that may occur within the study area.

5.6.3 Ecological Sensitivity

At a landscape level various koppies, rivers, wetlands and drainage lines intersect with the proposed and alternative alignments. In the vicinity of Makhado, game farming and cattle farming is the preferred land use. Closer to Polokwane human settlement and subsistence agriculture predominate. As a result of the varied land uses and landscape features, various portions of the proposed and alternative alignments attract different sensitivity ratings.

The northern portion of the proposed and alternative alignment is in the most natural state attracting a higher significance as these areas contain higher abundances of wildlife and are more connected ecologically and therefore have a higher ecological function. Where the alignment intersects with important and widely acknowledged sensitive landscape features such as koppies, rivers, wetlands and drainage lines, the significance of the ecological impacts on these increases to the point that major mitigation actions such as re-routing the alignment, design modification or increasing the standard spans may be required.

5.6.3.1 Koppies

The proposed alignments as well as the alternatives traverse several koppies or rocky outcrops, these coincide with the Mamabolo Mountain Bushveld vegetation units as described above and may contain unique niches that support niche-adapted floral and faunal species as well as structures of heritage value. The proposed alignment intersects a rocky outcrop at the convergence of the R71 and the existing servitude, approximately 14 km east of Polokwane.

It is suggested that where possible, the alignments bypass these features and do not cross them. This may, however, not be possible close to the Witkop substation where several lines, including the proposed line, converge.

5.6.3.2 Rivers and Wetlands

The proposed and alternative alignments cross several rivers and drainage lines. These areas are considered very sensitive because of their well established ecological value as suppliers of ecological goods and services and inherent value in ecological processes. Riverine areas can be spanned by the power lines with very little ecological impact on the provision that none of the infrastructure associated with the power lines is placed within the riparian zone. Wetlands, however, are more difficult as a result of their size and should be avoided altogether. Where they cannot be avoided they should be spanned at their narrowest width, such that the spans traverse the wetland with very few, if any, supports occurring in the wetland zone. All of the alignments cross wetlands, alternative alignments A and B cross a large wetland approximately nine kilometres North West of Polokwane and the preferred proposed alignment crosses a large wetland approximately 21 km North East of Polokwane.

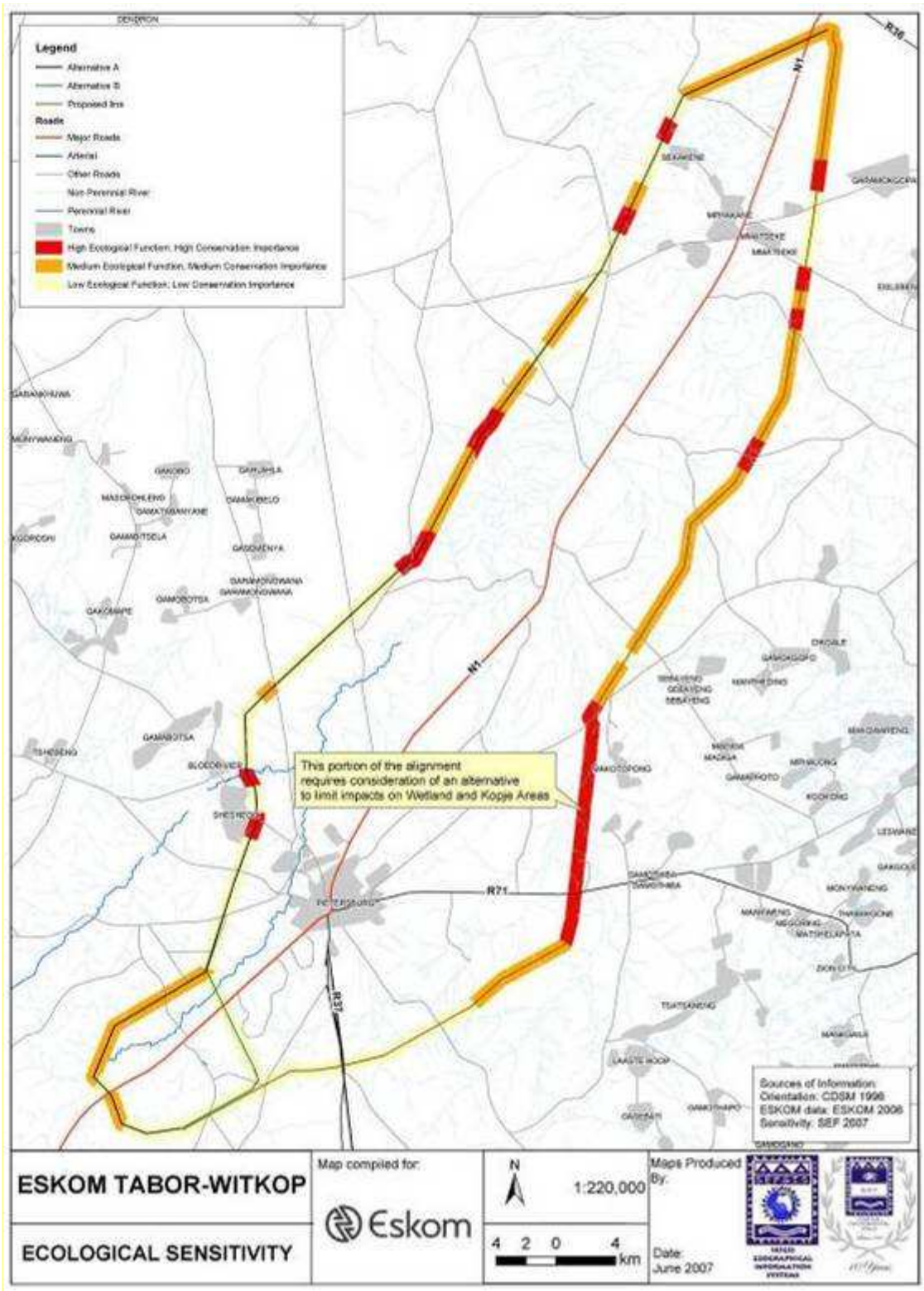


Figure 19: Ecological sensitivity associated with the proposed corridors / routes

5.7 AVIFAUNA

It is widely accepted within ornithological circles that vegetation structure, rather than the actual plant species, influences bird species distribution and abundance (in Harrison *et al.,* 1997). Therefore, the vegetation description below does not focus on lists of plant species, but rather on factors which are relevant to bird distribution. The description makes extensive use of the work of Harrison *et al.* (1997). In addition to the vegetation description, some of the micro habitats available to birds in the study area are described below.

Woodland (mixed bushveld): The woodland biome is identified as having a grassy under storey and a distinct woody upper story of trees and tall shrubs. Tree cover can range from sparse to almost closed canopy. Moist woodland comprises predominantly broadleaved, winter deciduous woodland. Soil types are varied but are generally nutrient poor. The woodland biome contains a large variety of bird species (it is the most species-rich community in southern Africa) but is generally less important from a Red Data bird perspective, as very few bird species are restricted to this biome. The woodland or savannah biome is particularly rich in large raptors such as White-backed Vulture, Cape Vulture, Martial Eagle, Tawny Eagle, and Lappet-faced Vulture. Apart from Red Data species, it also serves as the stronghold of several non-Red Data raptor species, such as the Brown Snake Eagle, Black-chested Snake Eagle (Black-breasted Snake Eagle), and a multitude of medium-sized raptors for example the migratory Steppe Buzzard, African Harrier Hawk (Gymnogene), Wahlberg's Eagle and African Hawk Eagle. The savannah biome, and specifically Moist Woodland, is well represented in the study area, particularly in the north.

Sour grassland: Sour grassland generally occurs in the higher rainfall areas on leached soils. Vegetation is short and dense, and nutrients are withdrawn from the leaves during the winter months. Many grassland bird species show a preference for sour grassland over sweet or mixed. These include many Red Data species, clearly confirming the status of grassland in South Africa as one of the least conserved or most transformed biome, as many of the bird species that depend on grassland habitat are threatened. Very little sour grassland exists along the proposed alignment and it consists mainly of relatively isolated patches in the woodland. Red Data species likely to make use of the grassland areas include Bald Ibis, African Grass Owl, African Marsh Harrier, Blue Crane, Short clawed Lark and the Melodious Lark. Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of vegetation types above, it is even more important to examine the micro habitats available to birds. These are generally evident at a much smaller spatial scale than the vegetation types, and are determined by a host of factors such as vegetation type, topography, land use and man made infrastructure.

Wetlands: Wetlands are characterized by slow flowing water and tall emergent vegetation, and provide habitat for many water birds. The conservation status of many of the bird species that are dependent on wetlands reflects the critical status of wetland nationally, with many having already been destroyed. Wetlands are extremely important habitat for a number of bird species, such as the African Marsh Harrier in this study. Small tongues of wetland are encountered at various points in the study area.

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

Rivers: The study area contains a number of seasonal rivers. The rivers are particularly important for stork species such as Black Stork and Yellow-billed Stork and a variety of other water birds. The riparian habitat along the river may provide refuge for shy species such as the White-backed Night Heron.

Arable lands: Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects, which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. Small patches of arable land do exist along the alignment, mostly along the rivers; many of them are irrigated by centre pivot irrigation. The agricultural activities are important for birds such as Secretary birds (fallow fields), and White and Abdim's Stork (irrigation).

Table 6 below lists the Red Data species that were recorded in the eight quarter degree squares that cover the study area during the Bird Atlas Period (Harrison *et al.*, 1997). A total of 25 Red Data species were recorded. One "Endangered", Twelve "Vulnerable" and 12 "Near Threatened" species were recorded. In addition, the White Stork and Abdim's Stork are included here as although they are not classified as Red Data, they are protected internationally under the Bonn Convention on Migratory Species. It is important to note that these species could have been recorded anywhere within each quarter degree square, not necessarily within the exact study area for the proposed line. It is also important to note that the number of cards Table 6 varies considerably between the squares. This is essentially the number of times that squares were counted. The variability between squares means that comparison of the birds occurring in the different squares and their report rates needs to be done with caution. The species below can be separated into (i) larger species, which are

capable of interacting directly with power lines through mechanisms such as collision with earth wires, and electrocution and (ii) smaller species, which are only likely to be impacted on by the proposed lines indirectly through disturbance and habitat loss. The larger species can also be impacted on by disturbance and habitat destruction. These larger species, which interact directly with the proposed corridors, are shaded below.

Table 6: Report rates for Red Data species in the quarter degree squares covering the study area (Harrison *et al.,* 1997)

Species	Conservation status	2329 BD	2329 BC	2329 CB	2329 DA	2329 DB	2329 CD	2329 DC	2429 AB
Number of cards submitted		39	12	22	26	11	162	68	35
Saddle-billed Stork	E	-	-	-	4	-	1	-	-
Blue Crane	V	-	-	-	-	-	1	-	3
Bald Ibis	V	-	-	14	-	-	19	28	11
Lesser Kestrel	V	-	-	14	8	9	2	24	9
White-bellied Korhaan	V	-	-	9	-	9	5	12	
African Grass Owl	V	-	-	9	-	-	-	4	3
African Marsh Harrier	V	3	-	-	4	-	-	-	-
Bateleur	V	3	-	-	-	-	-	-	-
Tawny Eagle	V	-	-	5	4	-	-	-	-
Martial Eagle	V	3	8	-	4	-	1	1	9
White-backed Vulture	V	31	8	14	8	-	-	-	3
Cape Vulture	V	10	25	64	23	-	15	49	9
Lappet-faced Vulture	V	-	-	-	4	-	-	-	-
Half-Collared Kingfisher	NT	-	-	-	-	-	1	-	-
Pallid Harrier	NT	-	-	5	4	-	-	-	-
Red-billed Oxpecker	NT	21	-	-	-	-	-	-	-
Short-clawed Lark	NT	3	8	5	4	-	14	41	6
Lanner Falcon	NT	3	17	45	4	9	5	18	3
Secretary bird	NT	38	8	23	62	-	14	31	14
Black Stork	NT	13	17	5	4	9	4	1	14
Yellow-billed Stork	NT	-	-	-	8	-	8	9	3
Pygmy Goose	NT	-	-	-	-	-	-	3	-
Marabou Stork	NT	-	-	5	-	-	-	-	-
Melodious Lark	NT	-	-	-	-	-	-	-	3
Lesser Flamingo	NT	-	-	-	-	-	1	-	-
Painted Snipe	NT	-	-	-	4	-	1	-	-
White Stork	BONN	26	-	18	4	9	8	19	9
Abdim's Stork	BONN	-	-	18	4	9	12	15	6

E – Endangered
V – Vulnerable
NT – Near threatened
Bonn – Protected internationally under the Bonn Convention on Migratory Species

5.8 AIR QUALITY

Air pollution is a major criterion for the design of Transmission power line insulators. Pollution has a negative effect on the insulation system of power lines and substations, which could result in the shutdown of the power line. Deposition of atmospheric pollutants onto the insulators produces a conductive film on the surface,

which causes the surface leakage current to increase, eventually resulting in flashover / local arcing on insulators.

Flashovers[4] occur mainly on Transmission power lines when, in combination with condensation, light rain or fog, ash or the accumulation of dust result in arcing[5] across insulators as well as dips and spikes in power supplies. Arcing weakens the insulators and repeated arcing can result in shutdown of the power line.

The following activities may contribute to the emission of dust particles and other atmospheric pollutants:

- A quarry identified along the existing power line alignment, located in close proximity to the Polokwane metropolitan. Quarrying and associated activities may result in the emission of particulate matter into the atmosphere;
- Dust entrained by vehicles travelling along dirt roads; and
- Industrial activities.

Based on information obtained during the site visit (on the 4th & 5th September 2006 and the 11th until the 13th of December 2006), the power lines and insulators appear to be in good condition and relatively free from negative effects of ambient air pollution.

5.9 HERITAGE AND CULTURAL RESOURCES

Heritage sites are fixed features in the environment. Any impact upon these features is permanent and non-reversible. Resources that cannot be avoided and that are directly impacted by the development can be excavated / recorded and a management plan can be developed for future action, with the consent of the SAHRA. Those sites that are not impacted on can be written into the management plan and can therefore be avoided and/or preserved (Natural Cultural History Museum, 2007).

Various possible heritage sites were identified during the two site visits (Figure 20). Plate 1 depicts some heritage sites infringed upon by an existing power line. These sites were prevalent along the routes, particularly associated with the occurrence of granite outcrops.

[4] A disruptive discharge through air or over the surface of solid insulation, between parts of different potential or polarity, produced by the application of voltage wherein the breakdown path becomes sufficiently ionised to produce an electrical arc

[5] A luminous discharge caused by an electric current flowing across a gap in an electrical circuit

Plate 1: Aerial perception of some heritage structures infringed upon by the existing Transmission power line

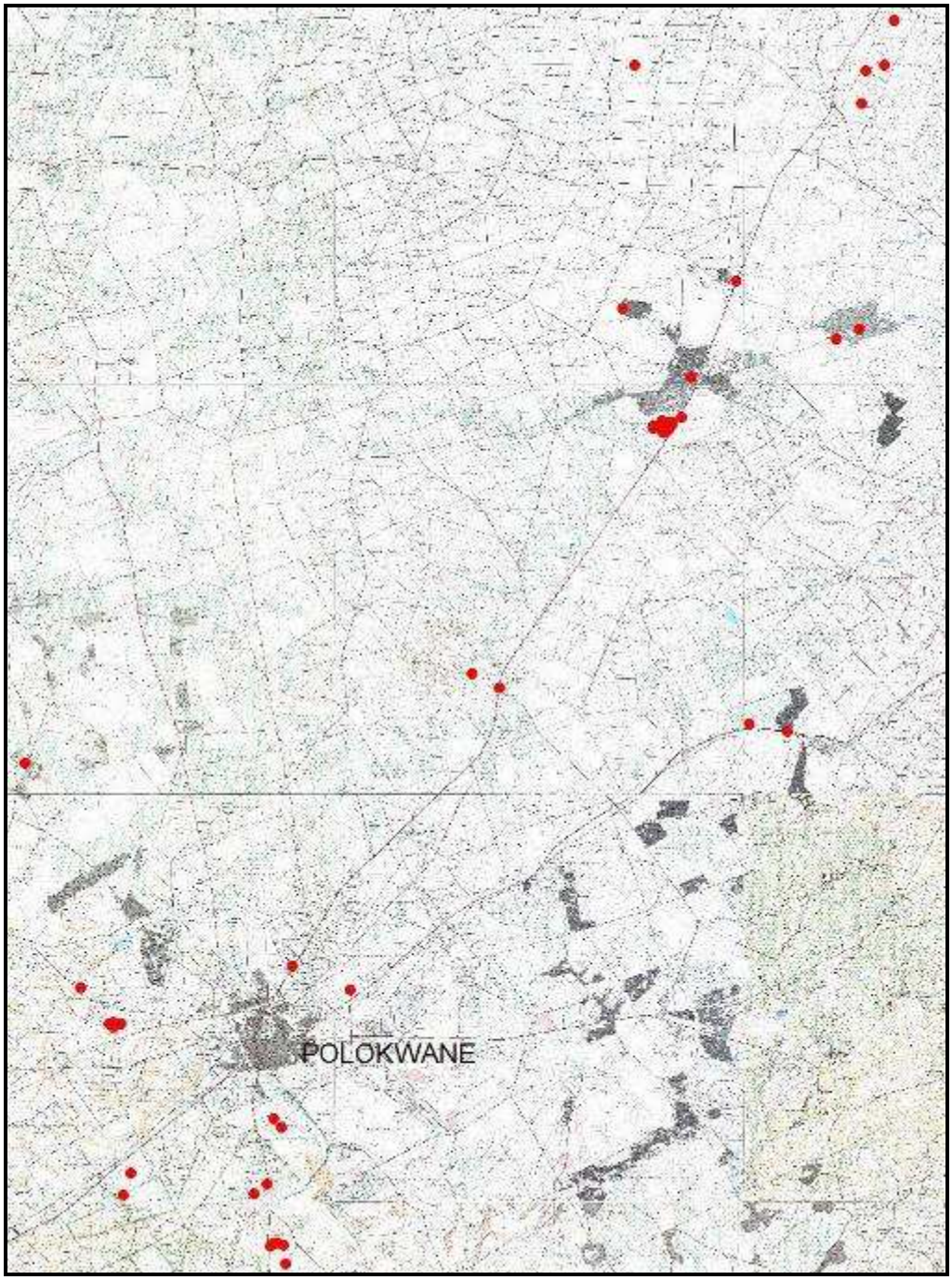


Figure 20: Known sites of cultural significance

5.10 VISUAL

The study area consists of vacant and uninterrupted land as well as cultivated, residential, subsistence farming, and game farms. Extensive game faming is located more to the northern side of the study area and agricultural activities to the south. Subsistence farming activities are more intense further south and east of the study area. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements.

The landscape character changes through the study area. The study area is divided into distinct landscape types, which are areas within the study area that are relatively homogenous in character (Swanwick, 2002). Landscape types are distinguished by differences in topographical features, vegetation communities and patterns, land use and human settlement patterns (Refer to Figure 21).

The following broad scale landscape types have been delineated in the study area (Figure 21). The assessment is done on a macro-scale and discusses the predominant landscape conditions and visual characteristics found in a particular landscape type. Each landscape type is given a descriptive name, which relates to the vegetation type, topography and/or land use of the region (Adapted from Van Riet *et al*., 1997):

- Capricorn Agricultural (Figure 22);
- Capricorn Residential (Figure 22);
- Capricorn Sweet Bushveld (Figure 23);
- Capricorn Mixed Bushveld (Figure 23); and
- Capricorn Conservation (Figure 23).

Capricorn Agricultural

Capricorn Agricultural is the combination of all the agricultural farms that are scattered throughout the study area. The agricultural practices vary from formalised commercial farms to subsistence farming. The concentration of these agricultural farms varies in the study area. There is a lower concentration of the agricultural farms in the northern part of the study area. These agricultural farms form pockets of developed and some degraded areas in the surrounding uniform bushveld character. The southern part of the study area has a higher concentration of farms. These farms are surrounded more by informal settlements and degraded land.

Capricorn Residential

Capricorn Residential consists of both formal and informal settlements. Polokwane is located in the southern part of the study area and represents the formal settlements. The informal settlements are dispersed mostly in the southern and eastern parts of the study area. Approximately 8 % of households live in proclaimed towns while 73 % live in rural villages, with the remainder resident on farms and in informal settlements.

The southern part of the study area comprises out of large tracts of arable land, which are being used for intensive and extensive agricultural activity.

Capricorn Sweet Bushveld

Capricorn Sweet Bushveld vegetation structure is mostly short and shrubby. Sandy areas are dominated by trees. In some areas granite outcrops where exposed. The height of these outcrops varied from a few metres to 20 m in height. The majority of these outcrops were relatively far away from the footprint of the proposed development.

Capricorn Mixed Bushveld

Capricorn Mixed Bushveld vegetation varies from a dense, short bushveld to a rather open tree savannah. This Landscape type supports a relatively high diversity of plant species (in comparison to the other landscape types) as it contains aspects of sweet and sour veld. Many of the trees within this landscape type have been cut down, presumably for firewood, building of structures and for wooden crafts. Similarly, the grass layer has been heavily utilised for grazing. Although this ecological zone appears quite 'hammered', it still supports many indigenous species. Informal settlements are scattered through this area and create highly eroded and bare soil patches due to over grazing.

Capricorn Conservation

Capricorn Conservation consists of two conservation areas with the study area. These conservation areas are:

- Kuschke nature reserve; and
- Polokwane nature reserve.

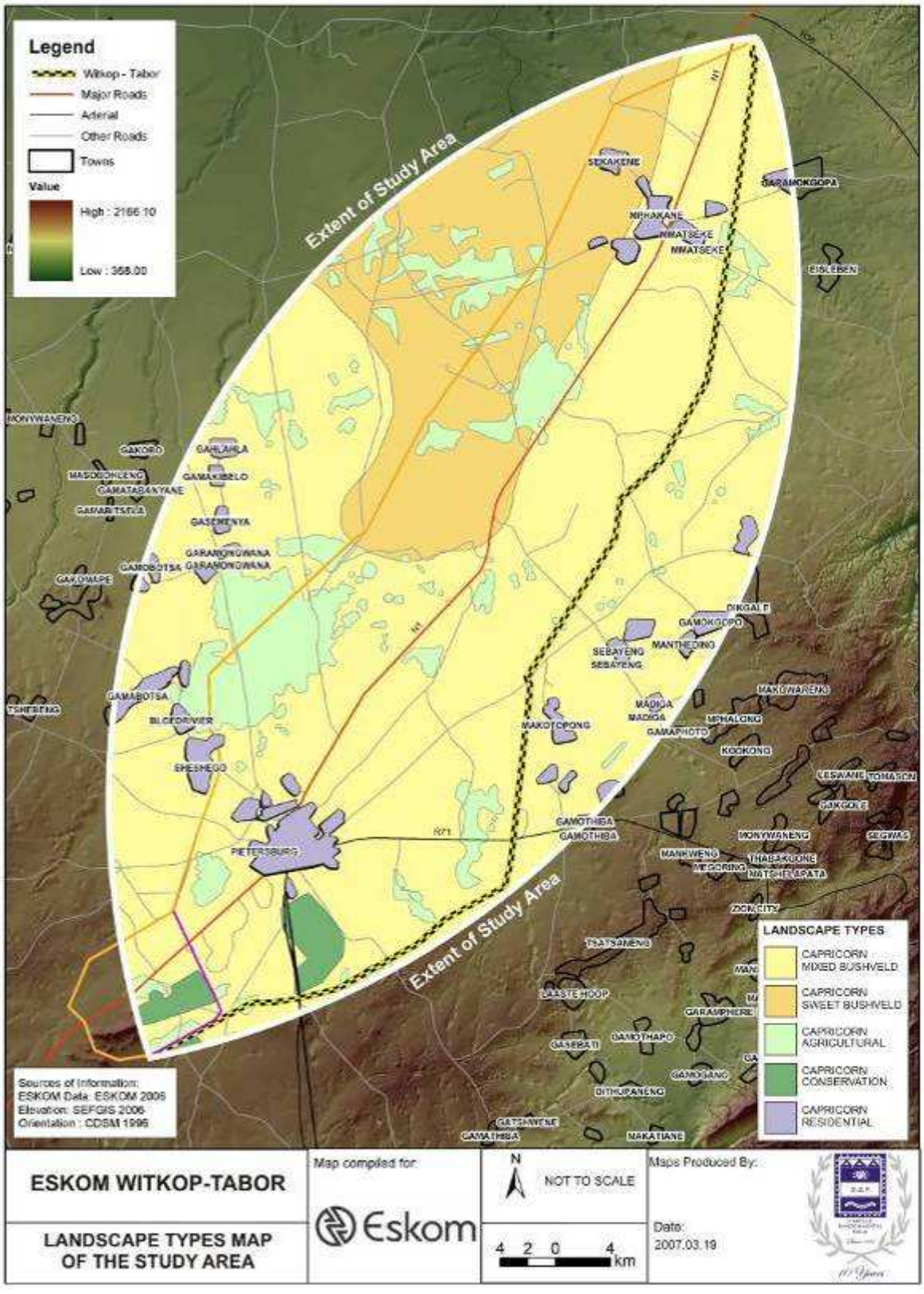


Figure 21: Landscape types occurring within the study area

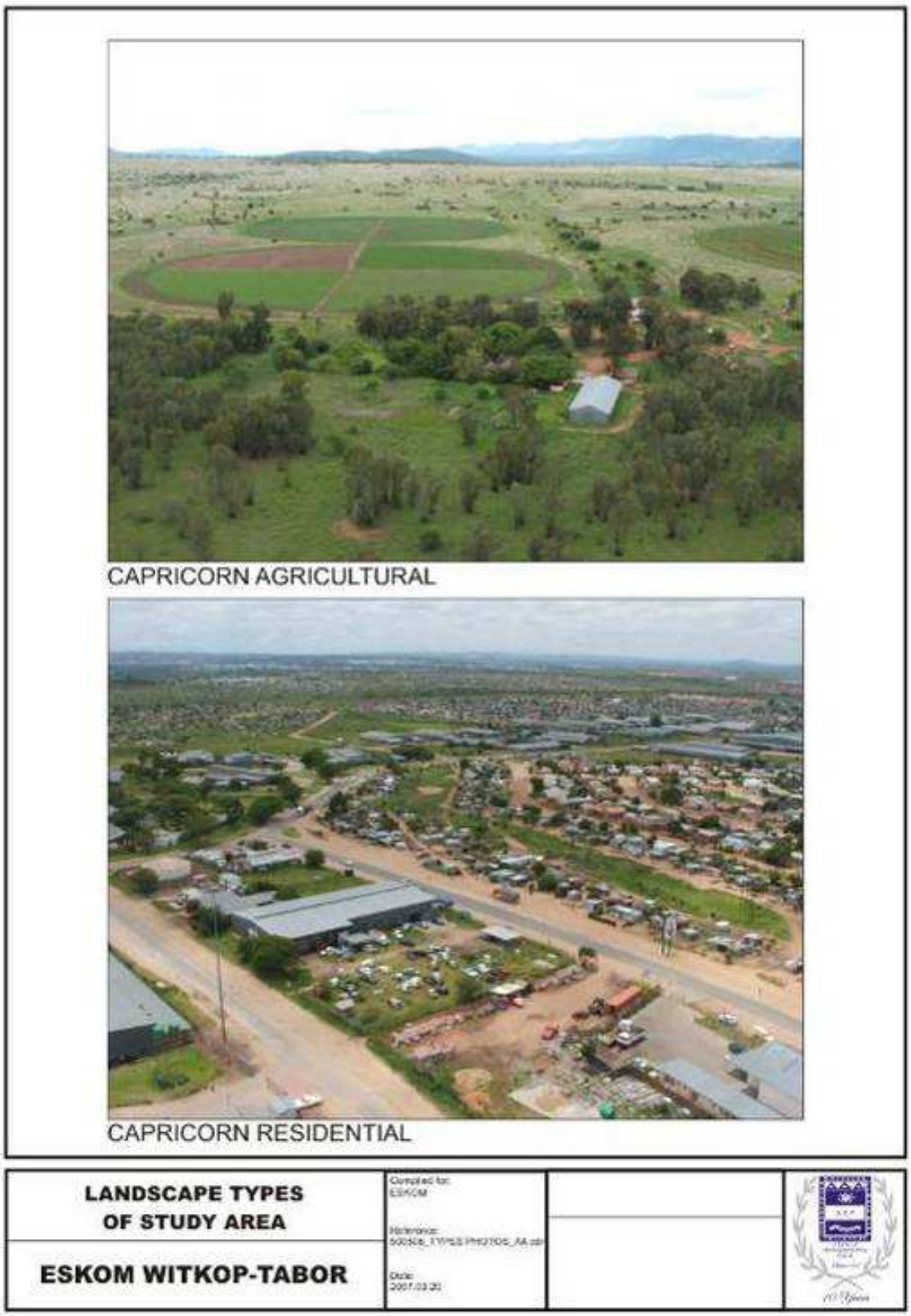


Figure 22: Landscape types of study area: Residential & Agricultural

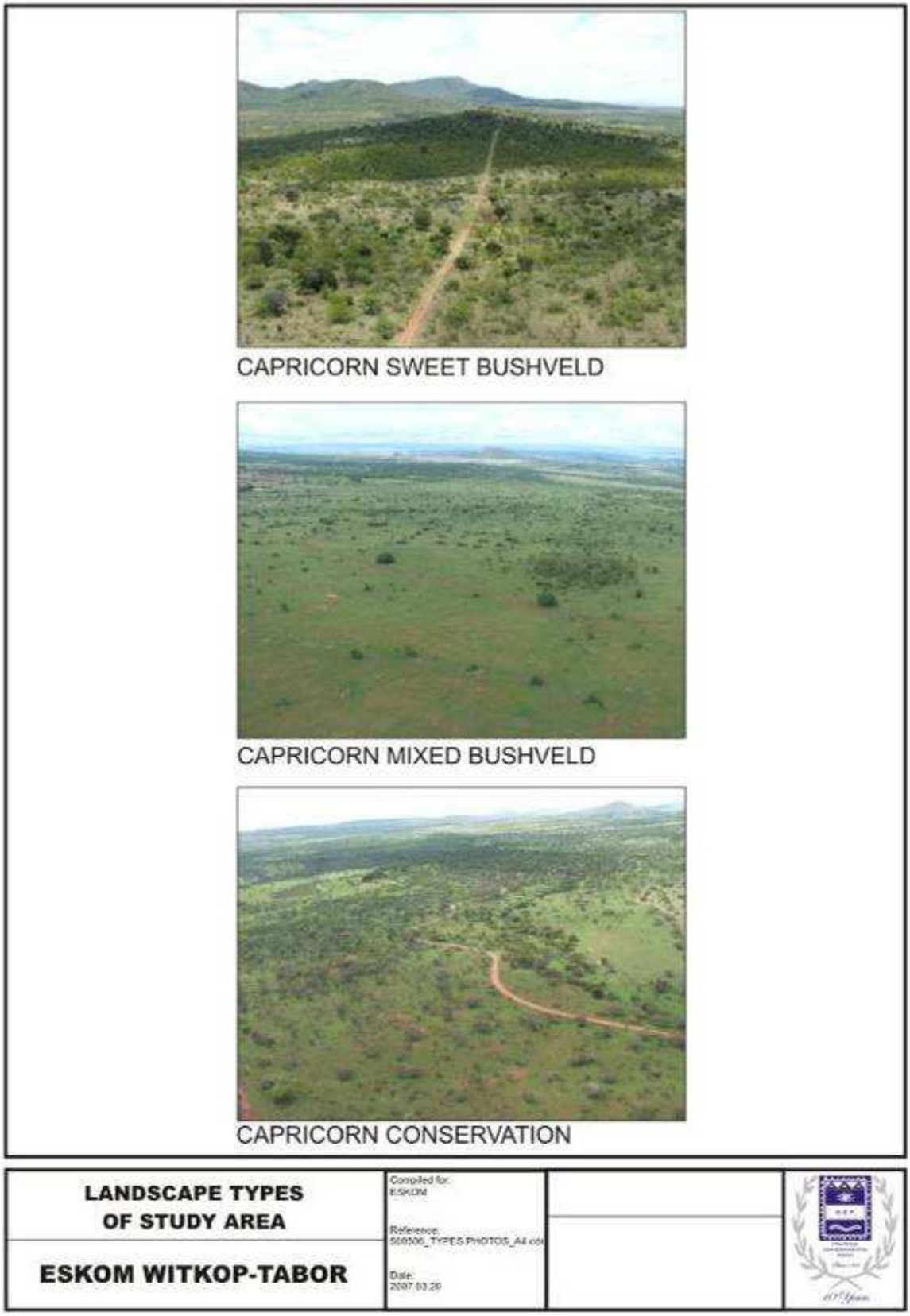


Figure 23: Landscape types of study area: Bushveld (sweet & mixed) and conservation

5.11 SOCIO-ECONOMIC

Figure 2 depicts the spatial distribution of the various land uses. These areas include both informal and formal residential areas. The formal residential areas (Table 7) form part of various towns situated along the proposed and alternative alignments.

Table 7: List of towns located in close proximity to the potential corridors

Proposed alignment	Alternative alignment A	Alternative alignment B
Ramatsowe 1.3 km W Makotopong 2.3 km E Ga Nothiba 2 km E	Sekakane 19 km E Ga-Makgato 2.9 km E Blood River 2.4 km W	Sekakane 1.9 km E Ga-Makgato 2.9 km E Blood River 2.4 km W

There are numerous tourism attractions in the area, comprised primarily of game farms that facilitate game viewing and hunting. The tropic of Capricorn serves as a tourism node, situated in the northern part of the study area. Figure 24 indicates the area of influence from a tourism point of view and Figure 25 represents the populations of the affected municipalities within the study area.

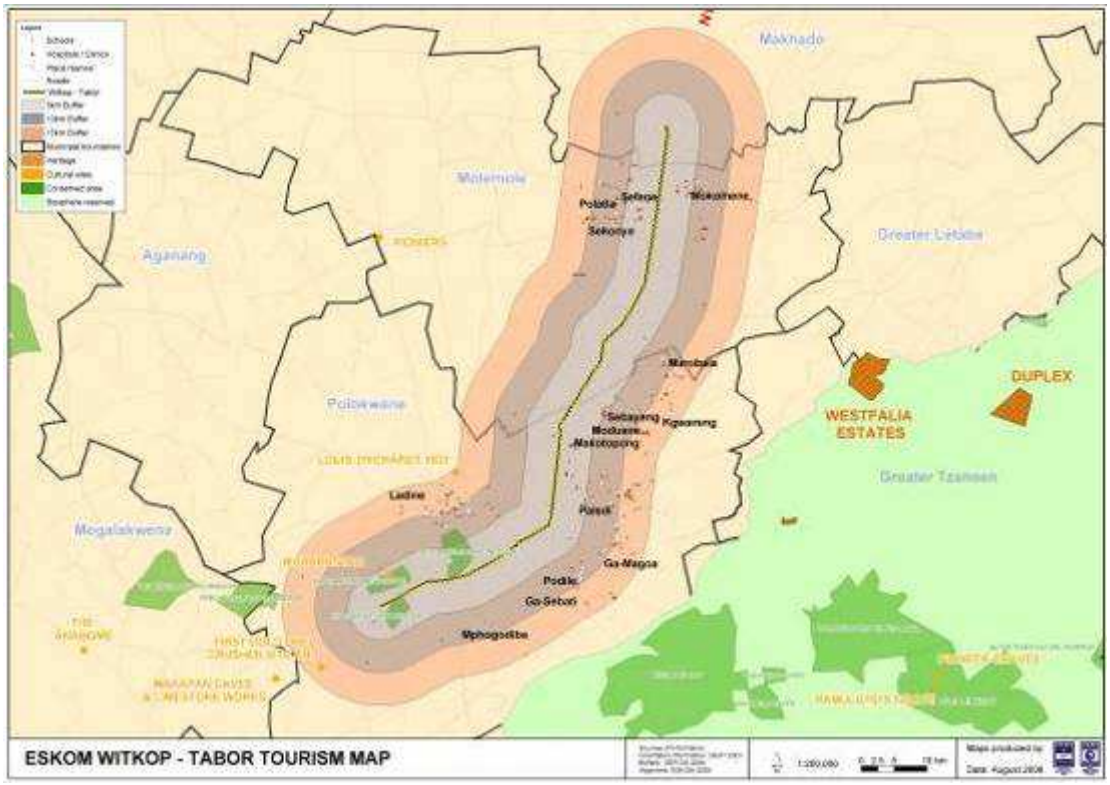


Figure 24: A visual presentation of the tourism areas of influence (DEAT, 2005)

For the purpose of this report, the social and tourism assessments will be combined since there are significant overlaps within these study areas.

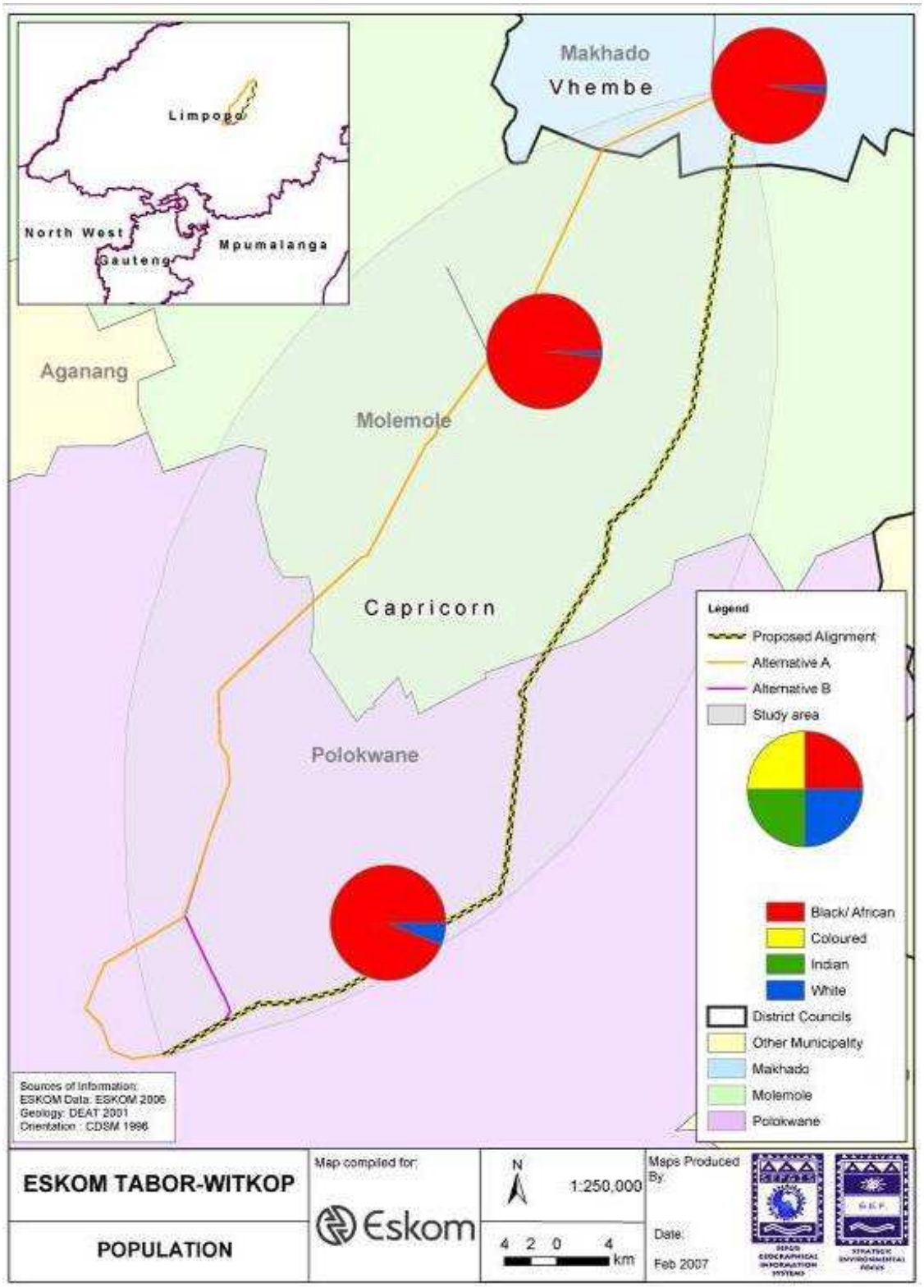


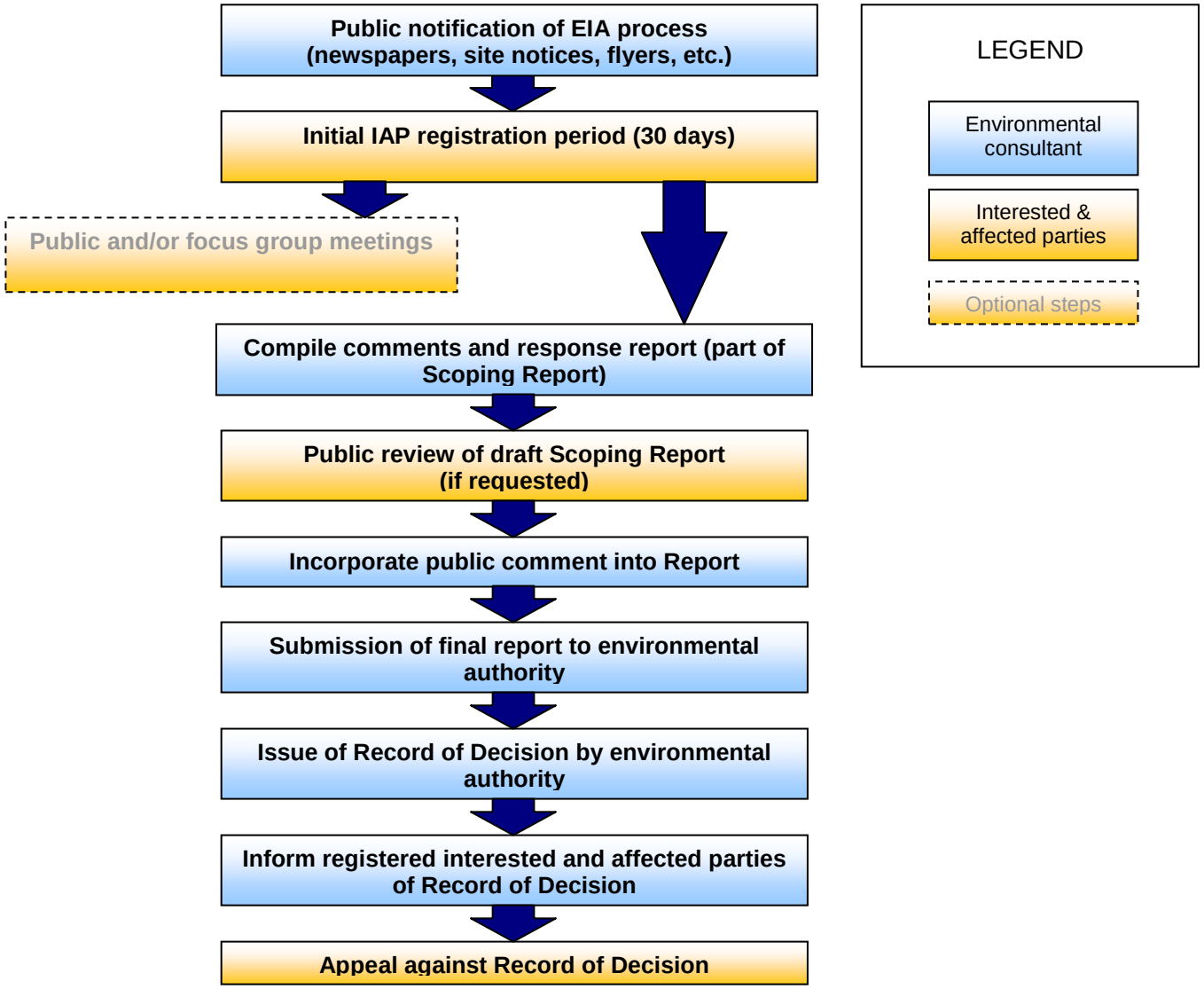
Figure 25: Populations of the affected municipalities within the study area

6 PUBLIC PARTICIPATION

6.1 PUBLIC PARTICIPATION PROCESS

Public participation is the involvement of all parties who potentially have an interest in a development or project, or may be affected by it. The principal objective of public participation in an EIA process, in particular this Scoping and EIA, is to inform and enrich decision-making.

GENERIC PUBLIC PARTICIPATION PROCESS SHOWING STEPS WHERE INTERESTED AND AFFECTED PARTIES CAN BE INVOLVED



6.2 PROCESS FOLLOWED TO DATE

The following process was undertaken to facilitate the public participation for the proposed project, which commenced on Thursday, 25th January 2007.

6.2.1 Newspaper advertisement

Advertisements, notifying the public of the EIA process and requesting IAPs to register with and submit their comments to SEF, were placed in the Capricorn Voice (English & Afrikaans) and Northern Review (English & Afrikaans) on Friday, 2nd February 2007, as well as the Daily Sun (Sepedi) on Friday, 26th January 2007. A copy of the advertisement is attached in Appendix 2.

6.2.2 Site notices

To inform surrounding communities and immediately adjacent landowners of the proposed development, twenty notices were erected at visible and accessible locations within the study area on Thursday, 25th January and Friday, 26th January 2007. Photographic evidence of the site notices is included in Appendix 2. Site notices (English (6), Afrikaans (6) and Sepedi (8)) were erected at the following venues:

Afrikaans (6):

- Kuschke Nature Reserve;
- Soekmekaar Municipality;
- Polokwane Municipality (Corner of Landros Maré and Bodenstein Streets); and
- Along the proposed alternatives at strategic places.

English (6):

- Polokwane Nature Reserve;
- Public Library in Polokwane City – Library Gardens;
- Matumo Trading Post;
- Soekmekaar Police Station; and
- Along the proposed alternatives at strategic places

Sepedi (8):

- Bandelierskop Police Station;
- Botlokwa Satellite Police Station;
- Soekmekaar – Shop at the Petrol Station;
- Sheshego Police Station;
- Sheshego Public Library - Community Hall on Tokyo Sexwale Street; and
- Along the proposed alternatives at strategic places.

6.2.3 Direct notification of identified IAPs

Identified IAPs, including key stakeholders representing the following sectors, were directly informed of the proposed development by e-mail, post and fax on Friday, the 26th January 2007.

- Provincial Authorities;
- Local Authorities;
- Service providers;
- Non-governmental organisations;
- Ward Councillors;
- Tribal Authorities;
- Community based organisations;
- Businesses; and
- Adjacent landowners.

6.2.4 Registered IAP Database

The stakeholder database indicates that 113 people have been captured as registered IAPs. The registered IAPs are stakeholders that have participated in the Public Involvement Process by attending meetings, providing comments in writing and making verbal contact. The comments and responses are outlined in Table 8 Government authorities have also been captured as registered IAPs. Refer to Appendix 2 for a list of the registered IAPs.

6.2.5 Flyers

Five hundred flyers in total, of which 2/3 were in English and Sepedi and 1/3 in Afrikaans and Sepedi, were distributed at strategic locations along the proposed alignment on Thursday, 25th January and Friday, 26th January 2007, to notify and inform as many IAPs as possible of the proposed project (Appendix 2).

6.2.6 Concerns raised by IAPs

IAPs registered by completing registration forms and forwarding comments by email, fax, post and telephonically. Comments received from IAPs were captured on a stakeholder database, acknowledged by personal letters and forwarded to the relevant environmental specialist for consideration.

6.2.7 Focus Group Meetings

Two Focus Group Meetings were scheduled with Authorities, Ward Councillors, businesses, CBO's, NGO's and Tribal Authorities on Tuesday, the 13th February 2007 at the Matumo Trading Post. Invitations to these meetings were sent out on the 2nd February 2007 (Refer to Appendix 2).

6.2.8 Public Information Sessions and Public Meetings

A Public Information Session, followed by a Public Meeting was held on Wednesday, the 14th February 2007 at the Cancer Association in Polokwane. The minutes of the meeting are included in Appendix 2. Comments / issues and questions raised at these meetings, are in addition, captured in the Comments and Response Report below. Main comments / issues raised and discussed at the meeting include:

- Impact on rail and road;
- Socio-economic impacts;
- Town planning; and
- Visual impacts.

6.2.9 Public Review of the Draft EIA Report

The draft EIA Report was made available for public review from Tuesday, the 7th August 2007 to Friday, the 7th September 2007 on both SEF and Eskom's websites as well as at the following venues.

- Polokwane Public Library;
- Motuma Trading Post;
- Polokwane LED Office; and
- Botlokwa Satellite Police Station.

6.2.10 Tribal Authority Consultation and Public Meeting

An additional Public Open Day and Public Meeting were convened on Thursday, the 30th August 2007 from 14h00 to 15h00 and 15h00 to 16h00, respectively. The Public Meeting was held at the Cancer Association, located on the corner of Dorp and College streets, Polokwane. The purpose of the meeting was to report on the main findings of the EIA and proposed mitigation measures, as well as to provide IAPs with the opportunity to raise queries and / or comments on the EIA.

Furthermore, meetings with tribal authorities were convened on the 29th and 30th August 2007 with the following Tribal Authorities:

- Ga Mothapo Tribal Authority;
- Ga Mothiba Tribal Authority;
- Ga Ramokgopa Tribal Authority;
- Ga Machaka Tribal Authority;
- Ga Makgatho Tribal Authority;
- Dikgale Tribal Authority; and
- Ga Molepo Tribal Authority.

These meetings reported on the main findings of the EIA and proposed mitigation measures, as well as provided them with the opportunity to raise queries and / or comments on the EIA. Tribal Authority consultation was done in the form of questionnaires. For the purpose of gathering valid and reliable information, the constructed questionnaire was composed of both closed (structured) and open-ended (unstructured) questions.

Open ended questions were used as they allow respondents to answer in their own frame of reference, entirely uninfluenced by any specific alternatives suggested by the interviewer. Open-ended questions invite free responses and the data collected transcends factual material by the inclusion of hidden motivations underlying attitudes, interests, preferences and decisions. Thus, open-ended questions tend to lead to the salient issues to respondents.

It was concluded that the tribal authorities have no objections to the project. In fact, many expressed their support of the proposed transmission power line. However, tribal authorities expressed concerns relating to the construction phase of the proposed transmission power line. They requested for prior communication with the construction contractor and for the establishment of a co-operative relationship.

Enquiries related to the negotiation and compensation of the servitude were also raised and addressed by Pieter Steenkamp, the Eskom negotiator.

An example of the questionnaire and the detailed analysis of the information obtained are included in the Appendix 2.

6.3 LIMITATIONS

There were no attendees at either of the focus group meetings scheduled for Tuesday, 13th February 2007. Reasons for this can be ascribed to public confusion (as communicated by IAPs) regarding the EIA process followed for the Eskom Spencer Tabor proposed power line in conjunction with the EIA process for the Tabor Witkop line.

To ensure stakeholder participation, the Public Participation team visited several of the surrounding Tribal Authority offices and engaged with the Chiefs and their representatives, on the afternoon of Tuesday, 13th February 2007 and early morning of Wednesday, 14th February 2007. The discussions were participatory and served as focus group discussions.

These limitations were sufficiently addressed by additional consultation with tribal authorities, as mentioned in section 6.2.10.

6.4 COMMENT AND RESPONSE REPORT

Registered IAPs, concerns raised, as well as responses to these concerns, are detailed in the Comment and Response (Table 8).

Table 8: Comment and response report

Issues / comment raised by:	Date	Means of communication	Issue / comment (verbatim)	Response
Comments during initial Stakeholder Engagement				
Project information				
Ms Jacqueline Makgoba (Councillor - Mangkweng)	2/14/2007	Public Meeting	What type of structures will be used?	A variety of structures will be used and the exact types are still to be determined.
			Would it matter if the proposed alignment is close to buildings?	Yes it would because no structure or building is allowed within the servitude.
Ms Moora Mailula (Councillor - Dikgale)	2/14/2007	Public Meeting	There is a lot of unemployment in Dikgale.	The comment was regarded during the Social Impact Assessment (SIA). Refer to Appendix 3.
Fauna				
Mr Billy Human (Landowner)	2/14/2007	Public Meeting	His property is located west of the second alternative. There is an existing line running close to his property and there is a piggery west of it. He wanted to know whether that line is still in use, because there are vultures that fly into the line. These vultures are then eaten by the pigs.	There is a 66kV line that runs close to Bloodriver from Pietersburg to Mosjesj and it is in operation.
Visual				
Mr T Goosen (Owner of farms Spitshoek, Brakfontein and Vlakfontein)	3/1/2007	Fax	From an aviation point of view, concentrated power lines are easier to record and identify for safety precautions.	The comment was regarded during the SIA (Appendix 3) and Technical assessment (Section 7.8) of the proposed line.

Road and Rail				
Mr Kobus Hannekom (Spoornet)	2/14/2007	Public Meeting	There are diesel locomotives that run north of Polokwane, and there are rail crossings over Eskom's access roads. Spoornet must therefore be consulted, as they would like to avoid this with the new alignment. There are also electrical trains that run west of Polokwane and these will run under the proposed alignment. This should be discussed with Eskom's technical team.	One of the alternatives is an existing line. Eskom Distribution (Mr Peter Sekhuto) acknowledges that the proposed alternative on the east (the existing line) crosses Spoornet's assets several times and the other alternatives will prove to be problematic.
Town planning				
Mr Willie Human (Landowner)	2/14/2007	Public Meeting	Are there any plans for expansion in terms of the villages along the Moletshi road from Seshego? There is already land that has been divided into plots and the proposed alignment will impact on it.	The impacts of all the various alternatives were assessed as part of the SIA (Appendix 3).
Mr Peter Sekhuto (Eskom Distribution)	2/14/2007	Public Meeting	The alternative on the Eastern side, close to the R81 will cross an area where there is a lot of development planned, such as security villages. The municipality must ensure that the development does not take place under the lines (within 55 m)	The Municipality was not present to address this issue. However, these developments should be related to the 500 m area that constitutes the study area.
Services				
Mr Maribana Raesibe (Polokwane Municipality)	2/14/2007	Public Meeting	Eskom knows that when the lightning strikes, the 66kV line, next to the Moletshi road, does not work. The question is, will the 400kV line improve that?	The 66kV line has given Eskom Distribution (Mr Peter Sekhuto) problems in the past and it goes down mostly during night time, as it supplies other areas such as Potgietersrus. The 400kV line will not solve this problem, as it only takes electricity from Tabor to Witkop and dumps it there. Distribution of the electricity is then reliant on the distribution lines.

Socio - Economic				
Mr Billy Human (Landowner)	2/14/2007	Public Meeting	If the electricity is increased to 400kV, how will the community be affected?	The potential impact may be a reduction in power cuts and improved electricity supply. The results of the SIA can be found in Appendix 3.
Mr Mokopane Matsaung (Polokwane Municipality)	2/14/2007	Public Meeting	There are already two existing power lines and if this one is constructed there will be three. One of the alternatives will cut across some agricultural holdings that are used for agriculture and grazing. A power line does not only need a small access road, the lines are wide and they have an impact on the existing holdings in terms of the space that they require.	The SIA (Appendix 3) considers land use and the impact that the proposed line will have on landowners. During negotiations, Eskom acquires the right of way for that land, but farmers are still able to use that land for grazing or agricultural related uses.
Mr Richard Chinzevende (Eskom Transmission)	2/14/2007	Public Meeting	The existing alignment is preferred as they foresee problems with the other alternatives, in terms of the communities that are located in close proximity. There are three problems specifically: 1. Exiting the Witkop substation, the lines will have to cross several lines that supply the town and the smelter nearby. 2. It is planned to take a line from Witkop to strengthen the supply to Polokwane. 3. There is a 66kV line that runs to the West of Polokwane. If the 400kV line is to cross that line, it would proof to be problematic.	When higher voltage lines cross lower voltage lines, it causes “flashovers”, and the number of failures that a 66kV line will have, will increase, particularly when lightning strikes the higher voltage lines. The maintenance on the lines will become more difficult, and the relationship with the farmers and landowners will suffer as a result. Eskom will also have to re-negotiate access points for them with the landowners.
Bio-physical				
Mr T Goosen (Owner of farms Spitshoek, Brakfontein and Vlakfontein)	3/1/2007	Fax	A power line, previously crossing the individual properties, was decommissioned and demolished, which left behind an ecological and unacceptable polluted situation, apart from many other problems caused during its operation.	The new EIA regulations (Section 3.1) are there to prevent the situation from re-occurring.

Mr L Perkins (Polokwane Conservation Forum)	2/28/2007	Email	The Polokwane Conservation Forum recommends that the proposed 400kV Witkop-Tabor power line follows the route of the existing 275kV power line. However, please note the existence of the very rare and endangered plant, *Euphorbia groenewaldii*, on the farm Melkboomfontein. This plant MUST be identified during the Scoping and EIA phases, so that the populations can be avoided.	The comment was taken into consideration and the exact delineation of the affected populations can only occur during the 'walk through', which will form part of the detailed EMP phase. The detailed investigations will allow for minor deviations along the route in order to minimise negative impacts.
Mr L Perkins (Polokwane Conservation Forum)	2/28/2007	Email	If the alternative route is chosen, west of Polokwane, the Polokwane Conservation Forum recommends Alternative A, so that there is minimal disturbance to Kuschke Nature Reserve. Please also note that there is a vulture colony west of Polokwane, which must also be avoided. This colony must be identified during the EIA and avoided.	The comment was regarded during the alternative analysis (Section 4) and Avifaunal assessment (Appendix 3) of the proposed line and the preferred alignment was indicated as that running east of the N1.
General				
Mr T Goosen (Owner of farms Spitshoek, Brakfontein and Vlakfontein)	3/1/2007	Fax	We are against Alternative B and support Alternative A as the more practical choice, and in the context of power supply and maintenance, it would be the most suitable choice.	The comment was regarded during the alternative assessment (Section 4) of the proposed line and is in accordance with the preferred route as identified during the EIA process.
Mr D Matsheletja	1/29/2007	Post	Indicated interest in participating with the implementation of the power equipment.	The details of the IAP were forwarded to Eskom.
Verbatim Comments on Draft Scoping Report				
Mr/Ms J Hare		Comment sheet on Draft Scoping Report (DSR)	Due to the shortage of electricity on busy holidays, we (the community) will be happy if in Botlokwa, around the N1 from Polokwane, you empower our line.	The comments were regarded during the SIA (Appendix 3) and Motivation (Section 2.2) for the proposed line.
Mr/Ms MH Tladi		Comment sheet on DSR	Since we have been experiencing shortage of electricity we would be very happy if the installation from Tabor to Polokwane become a reality.	

Mr MW Ramaphalela		Comment sheet on DSR	I welcome the installation of a power line along the N1 Road. The strong power line will serve to upgrade our electricity that is always off.	The comments were regarded during the SIA (Appendix 3) and Motivation (Section 2.2) for the proposed line.
Mr Kgoale		Comment sheet on DSR	I encourage the stronger, everlasting electricity that will not drop down.	
Mr RC Pheeha		Comment sheet on DSR	Yes, build us this power line.	
Mr/MS Tseitsi Masubelele		Comment sheet on DSR	It would be very important for us to get that kind of help, because presently, the electricity is not enough to supply our community.	
Mr Simon Aamese		Comment sheet on DSR	Long overdue.	
Mr/Ms P Rapukuo		Comment sheet on DSR	We need it fast.	
Mr Mohlopi Pheeha		Comment sheet on DSR	We have suffered too long a time because of the shortages of power cuts. This can bring a sigh of relief to the whole community.	
Mr MZ Kgamakga		Comment sheet on DSR	It is a good idea if we can put it into practice. I have lost a lot of electrical equipment due to power failure and was never compensated.	
Mr WM Nkooma		Comment sheet on DSR	It will be largely accepted	
Mr NL Rangata		Comment sheet on DSR	I hope that the line will minimise the frequent power failures around Matoks.	
Mr Chris Mashabela		Comment sheet on DSR	This is long overdue. Our businesses are suffering, and we loose a lot of money due to this weak electricity.	
Mr TG Chepape		Comment sheet on DSR	At long last Eskom is taking us serious.	
Mr Gilbert Mangokaona		Comment sheet on DSR	There is a poor supply of electricity and it should be intensified.	
Mr Solomon Mohale		Comment sheet on DSR	Start tomorrow, lets have better electricity.	
Comments on Draft Scoping Report				
Project Information				
Mr Michael Mothiba, Mothiba Traditional	8/30/2007	Public Meeting	Where is the Mothiba community located in terms of the proposed Transmission Power Line?	The exact location of affected portions, belonging to the Mothiba Tribal Authority could not be determined, but confirmation of this will be

Authority				forwarded to Mr Mothiba.
Mr Jacob Ramokoni, Mothiba Traditional Authority	8/30/2007	Public Meeting	During the construction of the initial power line, the community members were compensated.	During the construction phase, Eskom reimburses the landowners for any damage to crops.
Socio-Economic				
Mr. Michael Mothiba, Mothiba Traditional Authority	8/30/2007	Public Meeting	How will the proposed Transmission Power Line affect the Mothiba community, and what will the distance be?	The exact location of affected portions, belonging to the Mothiba Tribal Authority could not be determined, but confirmation of this will be forwarded to Mr Mothiba.
			How will the proposed Transmission Power Line affect the Mothiba Tribal Authority?	These impacts have been addressed by the SIA (Appendix 3).
Mr. E Mulatji, Mothiba Traditional Authority	8/30/2007	Public Meeting	Once it has been determined who will be affected at Mabelfontein the Tribal Authority will be in communication with those affected parties.	Community members that are likely to be affected must be made aware of the project to prevent them from being caught by surprise when the authorisation is issued.
General				
Mr. Michael Mothiba, Mothiba Traditional Authority	8/30/2007	Public Meeting	The Mothiba Tribal Authority provides the residents with Permission to Occupy (PTO).	Comment noted. The negotiator from Eskom will communicate with the owner of the title deed.

6.5 PUBLIC REVIEW OF THE SCOPING REPORT

The DSR was made available for public review from Friday, the 2nd February 2007 to Friday, the 2nd March 2007. The DSR was made available at the following public locations:

- Polokwane Public Library;
- Motuma Trading Post;
- Polokwane LED office;
- Seshego Community Library; and
- Botlokwa Satellite Police Station.

Comments on the Draft Scoping Report were mainly positive. IAPs are of the opinion that the line is long overdue and that it will assist with the capacity problems and current unreliable supply of electricity.

6.6 PUBLIC REVIEW OF THE EIA REPORT

The Draft EIA Report was made available for public review from Tuesday, the 7th August 2007 to Friday, the 7th September 2007. The Draft EIA Report was made available at the following public locations:

- Polokwane Public Library;
- Motuma Trading Post;
- Polokwane LED office;
- Seshego Community Library; and
- Botlokwa Satellite Police Station.

Other than the comments obtained from the Public Meetings and Tribal Authority consultations, which pertained primarily to compensation issues, no further comments were received on the Draft EIA Report.

6.7 CONCLUSION

The most significant concerns raised by IAPs included the following:

- Impacts on rail and road;
- Fauna and flora;
- Visual impacts;
- Issues related to compensation;
- Impacts related to the construction phase, and
- Socio-economic impacts.

IAPs who responded and who are most likely to be affected by the proposed development are:

- Local and Provincial Authorities;
- Adjacent Landowners;
- Service providers;
- Non-governmental organisations;
- Tribal Authorities, and
- Ward Councillors.

7 DETAILED ENVIRONMENTAL IMPACT ASSESSMENT

7.1 GEOLOGY

The Geotechnical Report was compiled by Moore Spence Jones (Pty) Ltd (Refer to Appendix 3). The geology along the three corridors proposed is underlain in major portions by igneous and metamorphic rocks (metapelite, granite, amphibolite and gneiss) as indicated in (Figure 12).

7.1.1 Geotechnical Constraints Attributed to Bedrock Geology

Metapelite and Amphobolite

The fine-grained metamorphosed sediments underlie localised areas of the central portion of the area where the alignments cross and in the eastern extremity and normally weather to deep, expansive residual soils. However, inspection of open trenches during the brief reconnaissance site visit showed relatively shallow bedrock overlain by colluvial soils.

Hard excavation or even blasting may be required to achieve foundation and a key-in depth of two metres or more. Groundwater is expected to be shallow to deep and the ground slopes gentle and thus access will not be a constraint, except in the central cross-over area where topographic gradients can be a constraint.

The northern and central portions of the northern option (proposed) will be affected by this geology.

Granite and Gneiss

All three routes will be affected by this lithology. Access will not be a constraint but foundations may require limited blasting to achieve required key-in depth.

Diabase

The southern and northern sections of the routes will be affected by this lithology. Blasting or boulder excavation to achieve foundation key-in depths will almost certainly be required.

7.1.2 Geotechnical Constraints Attributed to Soil Cover

Transported Aeolian Sand

The soil fabric is expected to be potentially collapsible and subject to creep movements. The topography is gentle and the groundwater deep. Slope stability should not be a problem as foundation excavation into the bedrock will not be excessive.

Foundations can be placed through the aeolian cover onto the underlying bedrock.

Alluvium

Thin to moderately thick alluvial soils should be expected in the river and stream sections. Moderately expansive conditions producing ground heaves are expected with perched water tables and occasional flooding of the area.

Foundation for the pylons in these areas will require over-excavation to the residual soils or bedrock, temporary shoring of the side-walls and possible de-watering and flood protection of the excavations. Mass concrete bases will be required to resist any lateral erosion forces and scour due to stream flow.

Access and maintenance roads will require sub-grade treatment, road-bed elevation and possibly culvert protection. A more practical solution would be to plan the pylon locations to span these areas where possible. The northern and southern alignments will be affected by this soil type in isolated and limited areas. The southern (alternative B) alignment and a localised section of the northern route (proposed) will be affected by this soil type.

Residual Soils

The majority of the routes will be affected by this soil type, but the thickness of this soil layer is not thought to be significant. Residual soils above the meta-pelite are expected to be insignificant and moderately expansive. Groundwater is expected to be deep and the ground slope gentle. Access and maintenance roads should not encounter any problems. Foundations for the pylons can generally be taken to a two metre depth with no untoward problems.

Groundwater and Seepage

The groundwater generally occurs at a depth of 10 to 25 m below surface. Between two and more than 10 million m^3/annum is abstracted within the project area for irrigation purposes. The groundwater quality is suitable for most uses as indicated by an Electrical Conductivity value of 70 to 300 mS/m. Underground precautionary measures for concrete or reinforcing are not envisaged. A perched groundwater should also be expected at the interface of the surficial soils and the underlying bedrock.

7.2 SOIL AND LANDFORM

7.2.1 Loss of topsoil and soil with agricultural potential

Source of the impacts:

Construction of the transmission line along any one of the three identified corridors

Description of the impacts:

Loss of agricultural potential soil

The main effect of the construction of a power line would be the loss of agricultural potential due to soil disturbance. However, the localized nature of the pylons, as well as the lack of high potential soils in the area, renders this impact of low significance for all three corridors.

Water and wind induced soil erosion

Disturbances to the upper soil horizons, removal of plant cover, increased gradient can result in exposure of especially dispersive B-horizons, which can induce soil erosion.

Stockpiles exceeding two (2) metres in height/depth

The depth of the stockpile and the length of time it is stored affects the quality of the soil at replacement and thereby presents the greatest risk to future rehabilitation. The natural process of soil development can take hundreds of years. Stockpiled topsoil becomes highly degraded the moment this structure is disturbed. Research indicates that the most damage occurs when topsoil is initially stripped from the ground.

Table 9 explains the effects that can be expected to result from the stripping of soil as well as the incorrect stockpiling of soil.

Soil compaction

Soil compaction occurs when soil particles are pressed together, thereby reducing pore spaces between the soil particles. According to DeJongh-Hughes, Moncrief, Voorhees and Swan (2001) up to 80 % of soil compaction occurs with the first pass of a vehicle. Furthermore, axle loads exceeding 10 tons per axle – as is the case for the majority of earthmoving equipment and batching plant – can result in soil compaction in excess of 50 cm depths (DeJongh-Hughes *et al.*, 2001).

Mixing of the subsoil and the topsoil layers

Earthworks will involve the removal and storage of the topsoil and in certain cases the subsoil layers. The combination of the top and subsoil layers despite its radically different physical and chemical properties will create difficulty with the rehabilitation of the vegetation. The subsoil layers lack the organic and microbial organisms necessary to sustain plants. Thus, all efforts must be made to separate the top and subsoils.

Table 9: Impacts on soil resulting from stripping / stockpiling

Action	Impact	Reference
Stripping soil	• Increased bulk density • Decreased water holding capacity • Chemical changes • Reduced nutrient cycling • Reduced microbial activity • Loss of viable plant remnants and seeds	Strohmayer (1999)
Topsoil stripping	• Varying moisture levels within the stockpile, which limits soil microbial respiration, causing reduced microbial community	Strohmayer (1999)
	• Remediation of damage may require extended periods of time • Damaged sites that return to relatively healthy status may not return to their pristine states	Sims (1990)
Stockpiles > 2 m deep	• Accumulation of ammonium • Formation of anaerobic conditions at pile base, resulting in the following: Increased microbial competition Major drop in microbial community Decreased nutrient cycling Decrease in carbon • Decrease in viability of buried seeds • Absence of propagules	Harris and Birch (1989)
	• Moisture problems created by saturation and desiccation • Limiting soil microbial respiration, causing loss in microbial community	Strohmayer (1999)
Stockpiling	• Immediate drop in carbon levels by as much as 30 %	Visser *et al*., (1984)
	• Cessation of nutrient input, resulting in a loss of organic material	Jordon (1998)
	• Marked drop in earthworm populations	Johnson *et al*., (1991)
Compaction / waterlogging	• Establishment of anaerobic conditions, and • Subsequent loss of aerobic microbial communities	Sims (1990)

Pollution

Pollution may potentially result from the operation activity in the form of litter and fuel spills. During construction earth-moving vehicles, generators, batching plant or other machinery are brought onto site. These machines may leak fuel / oil and diesel. This fuel / oil will then infiltrate into the soils of the area impacting on the surrounding environment. Inevitably, with people working on site, litter is generated.

Table 10: Impacts on Soils and Land form

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction Phase	Loss of agricultural potential (three corridors)	Negative – permanent loss of agricultural potential.	Local	Permanent	Low	Probable	Low	Low
Operational Phase	Maintenance activities during the operation of the line (three corridors)	Negative - compaction (as for the construction phase)	Local	Short-term	Low	Highly probable	Mediu m	Low

WM = With Mitigation WOM = Without Mitigation

7.2.2 Mitigation Measures

- The removal of plant material must be kept to a minimum.
- All attempts must be made to avoid exposure of dispersive soils.
- Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in the area have ceased.
- Ground exposure should be minimised in terms of the surface area and duration, wherever possible.
- Construction that requires the clearing of large areas of vegetation and excavation should ideally occur during the dry season only.
- Construction during the rainy season (November to March) should be closely monitored and controlled.
- The run-off from the exposed ground should be controlled with the careful placement of flow-retarding barriers.
- The soil that is excavated during construction should be stock-piled in layers and protected by berms to prevent erosion.
- The placement of the flow retarding barriers must occur in consultation with the ECO and as part of an overall storm water management system during the construction phase.
- Rehabilitation of the erosion channels and gullies.
- Without compromising the sensitive water balance of the area, dust suppression must take place.
- Re-establishment of plant cover on disturbed areas must take place as soon as possible once activities in that area have ceased.
- Sufficient brush packs must be re-established on areas of exposed soil.
- The service track must be maintained on a regular basis.

- Areas where erosion is taking place must be restored.
- Berms must be constructed in the roads to prevent erosion especially in areas close to streams and riverbanks.
- Contractors must drive on existing tracks as far as possible to prevent the formation of unnecessary tracks.
- The removal of vegetation at the construction camps should be avoided, and should it occur, these areas need to be re-vegetation with local species.
- Similarly disturbed areas around pylon structures should also be re-vegetated.
- All possible efforts must be made by the contractors to strip topsoil to a maximum depth of 150 mm.
- Topsoil stockpiles must be kept as small as possible in order to prevent compaction and the formation of anaerobic conditions.
- Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired.
- Topsoil must not be handled when the moisture content exceeds 12 %.
- Topsoil stockpiles must be kept separate from subsoils.
- Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any storm water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate.
- The topsoil should be replaced as soon as possible on to the backfilled areas, thereby allowing for the re-growth of the seed bank contained within the topsoil.
- Stockpiles susceptible to wind erosion are to be covered during windy periods.
- Refuelling must take place in well demarcated areas and over suitable drip trays to prevent soil pollution.
- Spill kits to clean up accidental spills from earthmoving machinery must be well-marked and available on site.
- Workers must undergo induction to ensure that they are prepared for rapid clean-up procedures.

7.3 SURFACE WATER AND AQUATIC ECOLOGY

7.3.1 Disruption to hydrological systems and water resources

Source of the impact:

Construction of the transmission line within sensitive hydrological and surfaces water resources located along the identified corridors

Description of the impact:

Construction Phase

Erosion of stream banks, floodplains and pans

Access of construction vehicles and construction personnel onto the stream banks, floodplains and pans can result in the onset of erosion. The clearance of vegetation will reduce the capacity of the land surface to retard the flow of surface water, thus decreasing infiltration, and increasing both the quantity and velocity of surface water runoff and erosion. Human activities, which disturb the soil structure, such as the compaction of soil along footpaths and vehicle tracks, as well as the disturbance of soil structure, can result in increased susceptibility to erosion. Roads and pathways created during the construction phase have the potential to become preferred drainage lines, resulting in gully erosion.

Sedimentation of streams and rivers

Clearance of existing vegetation will expose the upper layers of the soil horizon to soil erosion. The transport of eroded soil into the surface water resources will impact on water quality. The movement of construction vehicles and personnel can also result in the onset of erosion and associated sedimentation of streams and rivers. The stockpiling of excavated earth and construction materials can result in contamination of runoff, through erosion of stockpiles.

The addition of this particulate matter to a water-stressed system will result in decreased flow rates (choking of streams), decreased *extent* of flow and increased turbidity. This will occur over and above the limited flow extent due to the high evapo-transpiration and the high turbidity already expected due to the intensity of rainfall events in the area.

Faunal disturbance

During the construction phase, the habitat of the majority of fauna that frequents the construction sites could be damaged or destroyed. Accordingly, these animals can be expected to migrate from the area. As the construction activities will be of relatively short duration and of limited extent, most animals will be able to migrate back. The riparian zone is an important corridor for the movement of wildlife, and thus the construction activities may temporarily impact on the movement of certain faunal species along the riverine corridor. The construction related activities that will result in a deterioration of the water quality, will ultimately influence aquatic species such as macro-invertebrates, fish, amphibians and birds. This impact would, however, be limited in terms of duration. The construction activities, if not properly

managed, can potentially result in a change in the streambed characteristics through sedimentation, litter and construction rubble, which will ultimately result in the disappearance of certain faunal components like fish and macro-invertebrates that require specific habitat conditions.

Floral disturbance (riparian zone, floodplains)

The clearing of vegetation for construction purposes can have a limited impact resulting from the limited area affected by the tower's footprint. However, a small footprint in a sensitive area, for example in a pristine riparian zone can have a major impact on the flora on a local scale. The movement of vehicles through the riparian zone and / or floodplains of rivers and on the perimeter of, or through pans, can also result in floral disturbance. Such disturbance can result in the onset of erosion and facilitate alien plant invasion.

Surface water pollution

Hydrocarbons-based fuels or lubricants spilled from construction vehicles, construction materials that are not properly stockpiled, and litter deposited by construction workers may be washed into the surface water bodies. Should appropriate toilet facilities not be provided for construction workers at the construction crew camps, the potential exists for surface water resources and surrounds to be contaminated by raw sewerage?

Disturbance of hydrological regime on a micro scale in floodplains and riparian zones

The presence of construction vehicles, personnel and material in floodplains and riparian zones, can result in a local change in flow patterns. Human activities, which disturb the soil structure, such as the compaction of soil along footpaths and vehicular tracks and the disturbance of soil structure through the movement of soil, can also result in a change in the micro scale hydrology.

Operational Phase

Erosion of stream banks and floodplains

The presence of the transmission power line and associated towers would not result in a substantial increase in erosion during the operational phase.

Sedimentation of streams and rivers

The presence of the transmission line and associated towers would not result in a substantial increase in sedimentation of surface water resources. Sedimentation may, however, be associated with maintenance activities.

Floral disturbance (riparian zone and floodplains)

The presence of the transmission line will result in disturbance to the flora found within the riparian zone and floodplains. Clearing of the servitude to prevent fire hazard, will result in floral disturbance. This will, however, be limited to the footprint area of the servitude. Access roads to the servitude may also need to pass through wetland areas and / or the riparian zone, which will also result in floral disturbance.

Surface water pollution

Maintenance activities may result in limited surface water pollution. The source of this pollution could be oil and fuel spills from maintenance vehicles, construction material i.e. solvents, paint, concrete. In addition activities by the work force (i.e. ablution, washing and littering) in the riparian zone and / or floodplains may also result in pollution.

Disturbance of hydrological regime (micro scale) in floodplains and riparian zone

The presence of the towers in the floodplain and riparian zone could result in a change in the hydrological regime found within these wetlands. This could result in limited flooding, erosion and changes in the drainage patterns of these wetlands.

Table 11: Hydrological impacts

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction and Operation Phases	Movement of vehicles, workforce and construction of towers within sensitive aquatic habitats	Negative – Erosion of stream banks and floodplains	Local	Short-term	Medium	Probable	Medium	Low - Medium
		Negative – Sedimentation of streams and rivers	Regional	Short-term	Medium	Probable	Low - medium	Low
		Micro-scale changes in hydrological regime during construction	Local	Medium-term	Medium	Probable	Low	Low
		Negative – Faunal disturbance within the riparian zone and floodplains	Local	Short-term	Medium	Highly Probable	Low - medium	Low - medium
	Uncontrolled activities of the construction crew	Negative - Floral disturbance within the riparian zone and floodplains	Local	Short-term	Medium	Probable	Low - medium	Low - medium
	Oil and fuel spills from construction vehicles. Accidental deposition of construction material (i.e. concrete, solvents, paints etc.) into sensitive aquatic habitats during construction's activities	Negative - Surface water pollution	Regional	Short-term	Medium	Probable	Low - medium	Low - medium
	Maintenance of towers within sensitive environments	Negative – Permanent disturbance of hydrological regime (micro scale) in floodplains and riparian zones.	Local	Permanent	Medium	Probable	Medium	Low - Medium

WM = With Mitigation WOM = Without Mitigation

7.3.2 Mitigation Measures

Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place where soil may be exposed to high levels of erosion as a result of steep slopes and soil structure.

- If a freak storm displace the temporary earth embankments or other erosion control structures, a visual inspection of the channel must be made and any damage be recorded. Any damage and loss of soil resulting from a storm is to be remedied immediately. In the event that the embankment walls collapse as a result of construction / engineering flaw, the contractor must fund the remediation process.
- Stormwater at the construction crew camps must be managed in order to reduce the silt loads in the aquatic system. Measures must be implemented to distribute storm water as evenly as possible to avoid point sources of erosion.
- Construction on steep slopes and in soft or erosive material will require erosion control measures and correct grassing methods.
- All construction areas should be suitably top soiled and vegetated as soon as possible after construction.
- Disturbed surfaces to be rehabilitated must be ripped, and the area must be backfilled with topsoil or overburden.

Sedimentation of streams and rivers

- To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area.
- All topsoil must be removed and stockpiled on the site.
- The temporary storage of topsoil, inert spoil, fill should be above the 20 year flood line or at least 20 m from the top of the bank of watercourses, whichever is the maximum or as agreed with the ECO.
- Stockpiles should not be higher than two metres to avoid compaction, and single handling is recommended.
- Dust suppression is necessary for stockpiles older than a month – with preferably water or a biodegradable chemical binding agent.

Faunal disturbance

- The Contractor shall ensure that all works are undertaken in a manner, which minimises the impact on the local fauna (including aquatic fauna) and shall apply the following specifications with respect to fauna management and protection:
- Under no circumstances shall any animals (wildlife and domestic animals) be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.
- The Contractor shall ensure that the work site is kept clean and tidy and free from rubbish, which can result in the interference with aquatic animals.

- The Contractor shall advise his workers of the penalties associated with the needless destruction of wildlife, as set out in the Animals Protection Act (Act No. 71 of 1962) Sec. 2 (fine R2 000 and/or 12 months imprisonment).

Floral disturbance (riparian zone and floodplains)

- Construction crew camps should not be located within the riparian zone, floodplains of rivers and streams.
- Any wetland and buffer areas should be rehabilitated after construction has been finalised.
- Clearance of indigenous vegetation in the floodplains, riparian zones and other wetlands must be kept to a minimum.
- Areas of vegetation that must be protected must be demarcated and cordoned off during construction, preferably using a temporary fence.
- No indigenous vegetation may be collected, or used for firewood.
- Large trees to be retained or transplanted must be marked and protected against damage by construction activities. Wattle trees and other alien invasive trees should be removed where possible.
- The following provisions shall apply with respect to the protection of areas of indigenous vegetation on or adjacent to the construction sites:

    1. No indigenous tree or shrub on or adjacent to the construction site shall be felled, cut or pruned without the prior written approval of the Consulting Engineer or ECO and a permit from DWAF.

    2. No indigenous tree or shrub on or adjacent to the site shall be felled or pruned until it has been clearly marked for this purpose by the ECO. The method of marking will be specified by the Consulting Engineer or the ECO, and the Contractor will be informed in writing.

Surface water pollution

- Construction vehicles are to be maintained in good working order, to reduce the probability of leakage of fuels and lubricants.
- A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas.
- 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, bitumen.
- Sufficient care must be taken when handling these materials to prevent pollution.
- Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils.
- Oil residue shall be treated with oil absorbent such as Drizit or similar and this material removed to an approved waste site.

- Concrete must be mixed on mixing trays only, not on exposed soil.
- Concrete shall be mixed only in areas, which have been specially demarcated for this purpose.
- All concrete that is spilled outside these areas shall be promptly removed by the Contractor and taken to an approved dumpsite.
- After all the concrete mixing is complete all waste concrete shall be removed from the batching area and disposed of at an approved dumpsite.
- Stormwater shall not be allowed to flow through the batching area. Cement sediment shall be removed from time to time and disposed of in a manner as instructed by the Consulting Engineer.
- All construction materials liable to spillage are to be stored in appropriate structures with impermeable flooring.
- Portable septic toilets must be provided and maintained for construction crews. Maintenance must include the removal without sewerage spillage.
- Under no circumstances may ablutions occur outside of the provided facilities.
- At all times care should be taken not to contaminate surface water resources.
- No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. Any discharge points need to be approved by the relevant authority.
- In the case of pollution of any surface or groundwater, the Regional Representative of the DWAF must be informed immediately.
- Where construction in close proximity to sewer lines is unavoidable then excavations must be done by hand while at all times ensuring that the soil beneath the sewer lines is not destabilised
- Backfill must be compacted to form a stabilised and durable blanket; and the current load above the sewer lines must at no time be exceeded

Disturbance of hydrological regime (micro scale) in floodplains and riparian zone

- Only a single access road should be used to the construction area.
- The movement of construction vehicles at the construction site should be limited to a specific area.
- Access into the riparian zone and floodplains of rivers should be prevented as far as possible. Where access into these areas is required a preferred corridor should be determined. No deviation from these corridors should be allowed.
- Once the construction of the towers has been completed and the site cleared of building materials and waste, the ECO must inspect the site and give approval that it is ready for rehabilitation.
- Areas to be rehabilitated should be agreed upon by the ECO, contractor and proponent.

Operational Phase

Similar measures as proposed for the construction phase must be enforced.

7.4 TERRESTRIAL ECOLOGY

7.4.1 Loss of and disturbance to flora and fauna

Source of the impacts:

The following activities will contribute to the loss of vegetation of low ecological function and low conservation importance:

- Upgrades of substations;
- Construction of pylons and access routes/service roads within the majority of the area;
- The clearing of vegetation / habitat for the construction camps, temporary access roads; and
- The construction of the line and maintaining the servitude will result in the loss of connectivity and fragmentation of natural habitat for fauna.

Description of the impacts:

Construction

Loss of vegetation

The loss of vegetation that is categorised as 'high ecological function' and 'medium conservation importance', and in areas where the vegetation component is largely indigenous, occurring along the length of all three corridors. This will occur when pylons and access routes/service roads are constructed within this ecological zone.

Destruction of vegetation associated with granitic outcrops

Construction of pylons and access routes/service roads within the first section of the proposed alignment and close to Witkop substation will result in the destruction of vegetation associated with granite outcrops.

There is several granite outcrops scattered along the proposed alignment corridor. The majority of these are relatively far away from the proposed alignment. However, depending on the exact alignment of the route, there may be a possibility that one or two outcrops are affected. Thus should the final alignment of the 400kV line run over a granite outcrop, the construction of pylons and service roads within the outcrop will have a negative impact on faunal species that inhabit the area.

Operation

Loss of connectivity and fragmentation of natural habitats

During the operational phase of a power line, vegetation is cleared in the servitude of the alignment. This has the effect of creating unnatural open space through the vegetation and the matrix of the landscape. Due to this cleared open space, some species that habitually seek out cover for movement may be prevented from moving across this open space due to the fear of predation. Furthermore the power lines give an ideal perch to avian predators to utilise in seeking out prey further reducing the success of negotiating the open space for small prey species.

Fragmentation of habitat will lead to the loss of migration corridors, in turn resulting in degeneration of the affected population's genetic make-up (genome). This results in a subsequent loss of genetic variability between meta-populations occurring within the study site. Pockets of fragmented natural habitats hinder the growth and development of populations.

Noise disturbance to fauna

The construction and operation of the proposed line goes hand-in-hand with elevated ambient noise levels and the eventual loss of suitable habitat. Other possible disturbances include killing and snaring of faunal species by the construction crew. These disturbances are likely to only be of a short term nature, and once construction is finished, fauna will re-colonise the area.

Electromagnetic fields emanating from the transmission line

The electromagnetic fields emitted from the transmission lines may result in some form of faunal disturbance, i.e. invertebrates, birds and mammals (refer to Terrestrial Ecology Study) may be affected by the strong electro-magnetic field which surround the lines. In the majority of situations, the faunal species will simply move into the large expanses of nearby similar vegetation. However, the problem arises in situation where the line crosses over a granite outcrop. Granite outcrops are relative small and offer unique habitats for faunal species such as invertebrates, and these species cannot simply move into the nearby vegetation, as this nearby vegetation will not offer the same niches.

Table 12: Impacts on vegetation

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
	Loss of vegetation that is of high Ecological Function and medium Conservation Importance	Middle section of proposed alignment	Local	Long Term	Medium	Probable	Medium	Medium
	Loss of vegetation that is of low Ecological Function and low Conservation Importance	Along large sections of the route Substation upgrade areas	Local	Short Term	Low	Probable	Low	Low
	Destruction of granite outcrops.	First section of the proposed alignment and areas close to Witkop substation	Local	Long Term	Medium	Probable	Medium	Medium
	Damage to river and wetland systems	At river and wetland crossings along the route	Local	Short term	Medium	Probable	Medium	None
	Habitat fragmentation due to the cutting and maintaining of the servitude	Entire length of the alignment.	Local	Long Term	Medium	Highly Probable	Medium	Low
	Faunal disturbance from electro magnetic field near the line	Entire alignment	Local	Long Term	Medium	Probable	Medium	Medium
	Erosion	Entire route Areas of substation upgrade	Local	Short term	Low	Probably	Medium	Low

WM = With Mitigation WOM = Without Mitigation

7.4.2 Mitigation Measures

- Vegetation under the power lines should not be cleared within the servitude but be left in its natural form and pattern. This will ensure a continuum in the landscape matrix helping to reduce secondary impacts such as habitat fragmentation.
- Minimise the footprint of transformation.
- In order to minimise the impact, all disturbed areas must be rehabilitated as soon as possible in order to limit erosion.
- All disturbed areas are rehabilitated as soon as possible in order to limit erosion.

- This effect can be mitigated by leaving woody vegetation that does not have a predicted impact on the integrity of the power lines intact.
- Another possibility may be to thin out the woody vegetation occurring within the servitude but not eliminating it completely.
- The extent of the proposed line should be demarcated on site layout plans, and no construction personnel or vehicles may leave the demarcated area.
- All those working on site must be educated about the conservation importance of the fauna and flora occurring on site.
- The ECO must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site.
- The environmental induction should occur in the appropriate languages for the workers who may require translation.

7.5 AVIFAUNA

7.5.1 Disturbance to avifauna

Source of the impact:

Construction activities along any one of the three corridors, involving servitude clearing and construction of access roads and activities of the crew at the construction camps

Description of the impact:

Bird mortality as a result of collisions with the earth wire of the transmission line, habitat destruction and disturbance and impact of birds on quality of supply. The size and prominence of electrical infrastructure, renders the power lines an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are electrocution of birds (and other animals) and birds colliding with power lines. Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, (Van Rooyen & Taylor 1999) and disturbance and habitat destruction during construction and maintenance activities.

Below follows a short discussion of the issues that arise between birds and power line infrastructure:

Collision with Earth Wire

Power lines are a major cause of avian mortality among power line sensitive species, especially Red Data species. Furthermore, the cumulative effects of power lines and other sources of unnatural mortality might only manifest itself decades later, when it might be too late to reverse the trend. It is therefore imperative to reduce any form of unnatural mortality in these species, regardless of how insignificant it might seem at the present moment in time.

Collisions are the biggest single threat posed by transmission lines to birds in southern Africa. Most of the heavily affected species are Red Data species. Of the top five most affected species namely the Blue Crane, White Stork, Greater Flamingo, Ludwig's Bustard and Cape Vulture, three are present in this study area – Blue Crane, White Stork and Cape Vulture. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. This will impact upon:

- Assorted non Red Data species associated with water sources such as dams and rivers;
- Black, Yellow-billed & Saddle-billed Stork, particularly along watercourses;
- Blue Crane in open grassland areas & arable lands;
- White-bellied Korhaans in open woodland areas;
- Secretarybird in open woodland areas; and
- White Stork & Abdim's Stork, particularly in arable lands, wetlands, grassland.

Disturbance and habitat destruction

During the construction phase and maintenance of power lines and substations, some habitat destruction and transformation inevitably occurs. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line, which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat.

Similarly, the above-mentioned construction and maintenance activities impact on bird through disturbance, particularly during breeding activities. This could lead to breeding failure if the disturbance happens during a critical part of the breeding season.

During the construction phase and maintenance of power lines and substations, some habitat destruction and transformation inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line, which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat. Red-billed Oxpeckers and assorted non-Red Data and Red Data raptors will be especially affected by this if breeding trees are cut for the servitude. The following birds will be disturbed, particularly during the construction phase:

- Several non Red Data eagles such as Black Eagle & Steppe Eagle, while breeding; and
- Secretarybird, Lanner Falcon, Bateleur, Tawny Eagle, Martial Eagle, White-backed & Lappet-faced Vulture if breeding nearby.

Impact of Birds on Quality of Supply

Through the following mechanisms birds are able to cause electrical faults on power lines thereby impacting on the quality of electrical supply. In the case of a bird streamer induced fault, the fault is caused by the bird releasing a “streamer” of faeces which can constitute an air gap intrusion between the conductor and the earthed structure. The fault appears to flash across the air gap and does not follow an insulator creepage path as observed on pollution faults (Refer to Taylor 1999 for an exhaustive analysis of the propagation characteristics of the bird streamer mechanism).

Bird pollution is a form of pre-deposit pollution. A flashover occurs when an insulator string gets coated with pollutant, which compromises the insulation properties of the string. When the pollutant is wetted, the coating becomes conductive, insulation breakdown occurs and a flashover results. Bird nests may also cause faults through nest material protruding and constituting an air gap intrusion. Crows in particular often incorporate wire and other conductive material into their nests. When nests cause flashovers, the nesting material may catch fire. This in turn can lead to equipment damage or a general veld fires. Apart from the cost of replacing damaged equipment, the resultant veld fires can lead to claims for damages from landowners.

Construction Phase

Although the most severe impacts are the likelihood of electrocutions, collisions, as well as habitat destruction and disturbance, the particular design of the transmission line also has a bearing on the inherent risks for birds. Refer to the Avifaunal Assessment (Appendix 3) for a detailed assessment of the potential impacts of pylon design from a bird interaction perspective.

Operational Phase

The earth wire is the biggest risk, since it is much thinner and could be unseen by a bird in flight. Electrical faults caused by bird excreta deposited on electricity infrastructure show that birds could also have negative impacts on transmission lines.

Bird transmission line interactions can either be direct interactions, in which the bird comes into physical contact with the transmission line infrastructure, or indirect interactions, in which the transmission line infrastructure in some way impacts on the bird without coming into direct contact with it. Typically, direct interactions take the form of birds colliding with or being electrocuted on the infrastructure, or using it for nesting, roosting or perching. Indirect interaction is disturbance or habitat destruction as a result of activities relating to the construction or maintenance of the transmission line. In spite of the fact that the above-mentioned activities do not necessarily kill birds, they may impact negatively on birds.

Direct interaction occurs in the form of collision of birds with the earth wire of the proposed line, while indirect interaction takes the form of habitat destruction and disturbance.

It should be noted that Tawny and Martial Eagles, as well as various non Red Data and smaller raptors species may also nest on the self support towers, which constitutes a positive impact on the species concerned.

Table 13: Impacts on Bird Life

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction Phase	Clearing of servitude, construction of access roads, construction camps etc.	Negative destruction of habitat	Local	Short-term	Medium	Probable	Medium	Low
	Construction activities in the contractor camps	Negative – disturbance of sensitive species by the contraction crew	Local	Short-term	Medium	Probable	Medium	Low
Operational Phase	Operation of the transmission line	Negative – mortality of birds, due to collision with earth wire	Local	Permanent	High	Probable	High	Medium
	Maintenance of the transmission line servitude, access roads	Negative – destruction of habitat by the maintenance crew	Local	Short-term	Low	Probable	Low	Low
	Maintenance of the transmission line servitude, access roads	Negative – disturbance of sensitive species by the maintenance crew	Local	Short-term	Low	Probable	Medium	Low
	Impact of birds on quality of electrical supply	Negative – electrical faults on power lines	Local	Short-term	High	Probable	High	Medium

WM = With Mitigation WOM = Without Mitigation

7.5.2 Mitigation Measures

Construction Phase

Habitat destruction

Destruction of grassland during construction and operation should be kept to a minimum.

No destruction of Wetlands and Rivers during construction and operation should be allowed. In particular no vehicles should be allowed to drive through or across wetlands or rivers and streams.

Disturbance

The activities of the construction and operations staff must be restricted to the servitude and immediate surrounds. Under no circumstances must birds be exposed to more disturbance than is inevitably brought about by construction and operations

activities. Potential trapping and hunting of wild birds by construction crews is strictly forbidden.

It is highly recommended that as part of the EMP, a 'tower to tower' walk through assessment of the chosen line must be undertaken. The avifaunal walk through will identify any species breeding close to the alignment if possible, and earmark areas that require special management.

Operational Phase

Collisions

All sections of line crossing or close (within one span) to wetlands, dams and rivers should be marked with a suitable marking device on the earth wires as per the Eskom Transmission standard.

All sections of line passing over or close to irrigated arable lands should be marked with a suitable marking device on the earth wires as per the Eskom Transmission standard.

It is not considered practical to recommend marking all line through open areas to mitigate for Korhaan and Secretary bird collisions, as this would be a large proportion of the line, and the risk does not warrant it. Instead it is recommended that the routine line patrols by Eskom staff be used to detect any bird collisions. If any collision "hot spots" are identified, these can be mitigated reactively.

It is recommended that as part of the EMP, the avifaunal specialists conduct a 'tower to tower' walk through assessment of the proposed line. This will identify exact spans of line to be marked as well as any other sensitive areas.

Impacts of birds on quality of supply

- Bird Guards should be installed on all self support towers, on all three phases, as per the Eskom Transmission standard. Once operational, the faulting levels on the lines should be closely monitored to detect any problems.
- Any nests on the towers should be managed according to the guidelines for nest management – supplied to Eskom by EWT. Note that various raptors such as Martial and Tawny Eagle, and other smaller species may nest on the self support towers. This is a positive impact on the species concerned. The extent of the proposed line should be demarcated on site layout plans, and no construction personnel or vehicles may leave the demarcated area.
- All construction and maintenance activities should be undertaken according to generally accepted best practice guidelines in order to minimise the disturbance of birds in the area.
- The 'walk through' will identify any active nests that are close enough to the alignment to require specific management in order to mitigate against disturbance.
- All those working on site must be educated about the conservation importance of the avifauna occurring on site.
- The ECO must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site.

- The environmental induction should occur in the appropriate languages for the workers who may require translation.
- Mark all sections of line that pass through or close to dams, rivers, wetlands & arable lands with a suitable marking device on the earth wires as per the Eskom standard.
- This effect can be mitigated by leaving woody vegetation that does not have a predicted impact on the integrity of the power lines intact.
- Another possibility may be to thin out the woody vegetation occurring within the servitude but not eliminating it completely as is the present practice.
- The 'walk through' process as described above will identify any breeding areas, which can then be specifically managed.

7.6 AIR QUALITY

7.6.1 Air pollution impacts on the Transmission power line:

Source of the impacts:

Construction activities will result in the liberation of fugitive dust as well as surrounding land uses and activities, which impact on the power line.

Description of the impacts:

The construction phase will comprise a series of different operations including land clearing, topsoil removal, excavation, and construction of footings and stringing of conductors. Each of these operations has its own duration and potential for dust generation. It is anticipated therefore that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This is in contrast to most other fugitive dust sources where emissions are either relatively steady or follow a discernible annual cycle.

Flashovers occur mainly on transmission power lines when combined with condensation, light rain, fog and / or ash and dust build up, result in arcing across insulators as well as dips and spikes in power supply. This repeated occurrence weakens the insulators and can ultimately result in shut down of the power line.

Fires can also impact on the insulators of the power line because of ash generated particles, when combined with humidity can under foggy conditions tend to form a 'conductive fog' that can result in transmission network trips.

Table 14: Impacts of air quality on the Transmission power line

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction and Operational Phases	Pollution sources on insulators	Negative – Flashover/local arching on insulators	Local	Short-term	Medium	Probable	Low	Low
	Repeated arching across insulators	Negative – Shutdown of the power line	Local	Short-term	Medium	Probable	High	Na
	Combination of high humidity under foggy conditions with fires	Negative – Transmission network trips	Local	Long-term	Medium	Probable	Medium	Low

WM = With Mitigation WOM = Without Mitigation

7.6.2 Mitigation measures

- Vegetation must be removed only when soil stripping is required. These areas should be limited to include those areas required for development only, hereby reducing the surface area exposed to wind erosion. Adequate demarcation of these areas should be undertaken.
- Control options pertaining to topsoil removal, loading and dumping are generally limited to wet suppression. (Usually, the options exist in scheduling this activity to coincide with periods when soil moisture can be expected to be optimal. However, in the current case, given the arid nature of the environment, it would be impractical to base a topsoil removal activity schedule based on soil moisture considerations.)
- Where it is logistically possible, control methods for unpaved roads should be utilised to reduce the re-suspension of particulates. Feasible methods include wet suppression (or chemical suppression to reduce water requirements), avoidance of unnecessary traffic, speed control and avoidance of track-on of material onto paved and treated roads.
- The length of time where open areas are exposed should be restricted. Construction of infrastructure should not be delayed after land has been cleared and topsoil removed.
- Dust suppression methods should, where logistically possible, must be implemented at all areas that may / are exposed for long periods of time.
- Blasting and drilling (if required) should be delayed under unfavourable wind and atmospheric conditions.
- Where logistically feasible, seasonal meteorological conditions should be taken into consideration during construction activities (i.e. precipitation and wind field).
- For all construction activities management should undertake to implement health measures in terms of personal dust exposure, for all its employees.
- Manual cleaning of insulators and corn blasting (dry cleaning).
- Refer to the Air Quality specialist report for further details pertaining to the operation and maintenance of the Transmission power line.

Table 15: Dust control measures for implementation during construction activities

Construction Activity	Recommended Control Measure(s)
Truck transport and road dust entrainment	Wet suppression or chemical stabilization of unpaved roads Reduction of mud/dirt carry-out onto paved roads Reduction of unnecessary traffic Require haul trucks to be covered Wet material being hauled Strict speed control
Earthmoving and dozing operations	Wet suppression
General construction	Wind speed reduction Wet suppression Phasing of earthmoving activities to reduce source size Early paving of permanent roads
Open areas (wind-blown emissions)	Reduction of extent of open areas Reduction of frequency of disturbance Early revegetation Compaction and stabilization (chemical or vegetative) of disturbed soil

7.7 HERITAGE AND CULTURAL RESOURCES

7.7.1 Destruction of heritage resources

Source of the impact:

The construction activities (earthworks, movement of equipment and personnel) on site have the potential to impact upon heritage resources coupled with the potential looting of heritage and cultural resources. It should, however, be noted that the existing 275kV power line running along the east of the N1 presently impacts on the known heritage resources. Thus, the placement of the proposed power line parallel to the existing line will not pose a significant impact as a result of the prevailing impacts.

Description of the impact:

Heritage sites are fixed features in the environment, occurring within specific spatial confines. Any impact upon these resources will be permanent and irreversible. Any movement of vehicles, equipment or personnel through areas containing these artefacts could result in the permanent destruction of the artefacts and loss of heritage resources.

Table 16: Impacts of the power line on heritage and cultural resources

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction Phase	Construction of transmission line in archaeologically (undisturbed) sensitive areas	Negative – damage to heritage sites	Local	Permanent	High	Probable	Med	Med
	Construction crew working at or near heritage sites	Negative – removal or destruction of artefacts from sites	Local	Permanent	Medium	Probable	Med	Low
Operational Phase	Maintenance activities	Negative – damage to heritage sites	Local	Permanent	Medium	Probable	Med	Low
	Unscheduled maintenance work and failure to keep to management plans	Negative – removal or destruction of artefacts from sites	Local	Permanent	Low	Improbable	Med	Low

WM = With Mitigation WOM = Without Mitigation

7.7.2 Mitigation measures

- Eskom must ensure that an archaeologist inspects each site selected for the erection of each pylon. If a particular pylon structure impacts on a heritage site

but cannot be shifted, mitigation measures, i.e. the controlled excavation of the site prior to development, can be implemented. This can only be done by a qualified archaeologist after obtaining a valid permit from SAHRA. The same action holds true for any infrastructure development such as access routes, construction campsites.

- In the past, people used to settle near water sources. Therefore riverbanks, rims of pans and smaller watercourses should be avoided as far as possible.
- In this particular part of the country, Iron Age people also preferred to settle on the saddle (or neck) between mountains (hills/outcrops). These areas should also be avoided, if possible.
- Avoid all patches bare of vegetation unless previously inspected by an archaeologist. These might be old settlement sites.
- Rock outcrops might contain rock shelters, engravings or stone walled settlements, and should therefore be avoided unless previously inspected by an archaeologist.
- Communities living close to the proposed corridor should be consulted as to the existence of sites of cultural significance, e.g. graves, as well as sites that do not show any structures but have emotional significance, such as battlefields.
- All graves or cemeteries should be avoided, unless when totally impossible. The correct procedure, i.e. notification of intent to relocate them, consultation with descendants and permit application, should then be followed in relocating the graves. If any of the graves are older than 60 years, they can only be exhumed by an archaeologist. Graves of victims of conflict requires additional permits from SAHRA before they can be relocated.
- Archaeological material, by its very nature, occurs below ground. The developer should therefore keep in mind that archaeological sites might be exposed during the construction work. If anything is noticed, work in that area should be stopped and the occurrence should immediately be reported to a museum, preferably one at which an archaeologist is available. The archaeologist should then investigate and evaluate the find.
- Any mitigation measures applied by an archaeologist, in the sense of excavation and documentation, should be published in order to bring this information into the public domain.

7.8 VISUAL IMPACT

The visual impacts will be discussed in terms of landscape character and viewer response.

7.8.1 Alteration of landscape character and viewer response

Source of the impacts:

Construction and operation of the proposed transmission power line

Description of the impacts:

Landscape character

The towers have an industrial appearance as a result of the steel lattice framework and the electrical cables linking the towers. It has a near-monumental scale in relation to the predominantly changing topography along the ridges and the low growing vegetation, which occur in the study area. The entire Transmission line will be perceived as a rhythmic arrangement of vertical towers forming a linear element through the landscape. The electrical cables emphasises the linear character of the Transmission power line but are easily absorbed in the background when viewed from distances greater than one (1) km. An aerial perception of the power line is indicated in Plate 2 (the tower structures are circled in yellow) it should be noted that the views within the landscape are significantly different. Such a view may present a very different picture from a plane or plateau point of view (Plate 3).

Plate 2: An aerial view of a typical power line

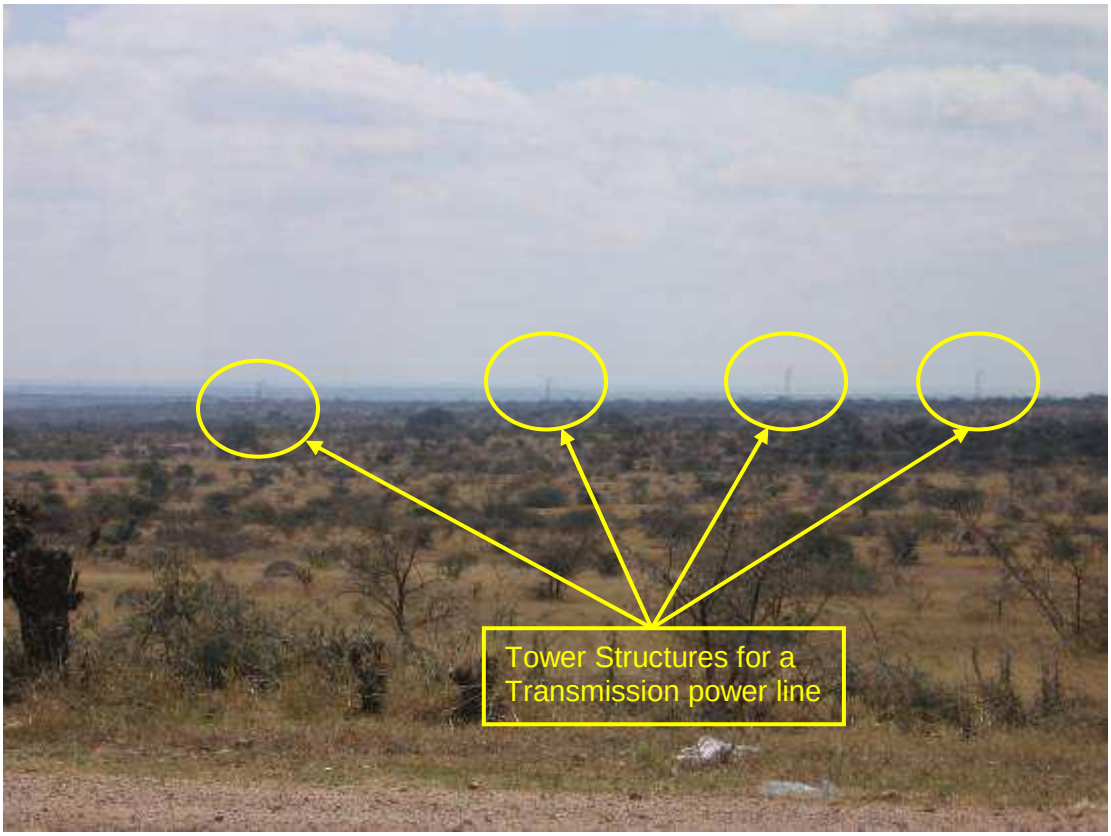


Plate 3: A plateau view of a typical power line

Viewer response

Within the receiving environment, specific visual receptors experience different views of the proposed development site. Visual receptors will be affected by alteration to their prevailing views and are therefore identified as part of the receiving and affected environment. The visual receptors are grouped according to the similarities in views. The visual receptors included in this study are: Residents; Recreational users (tourist); and Motorists.

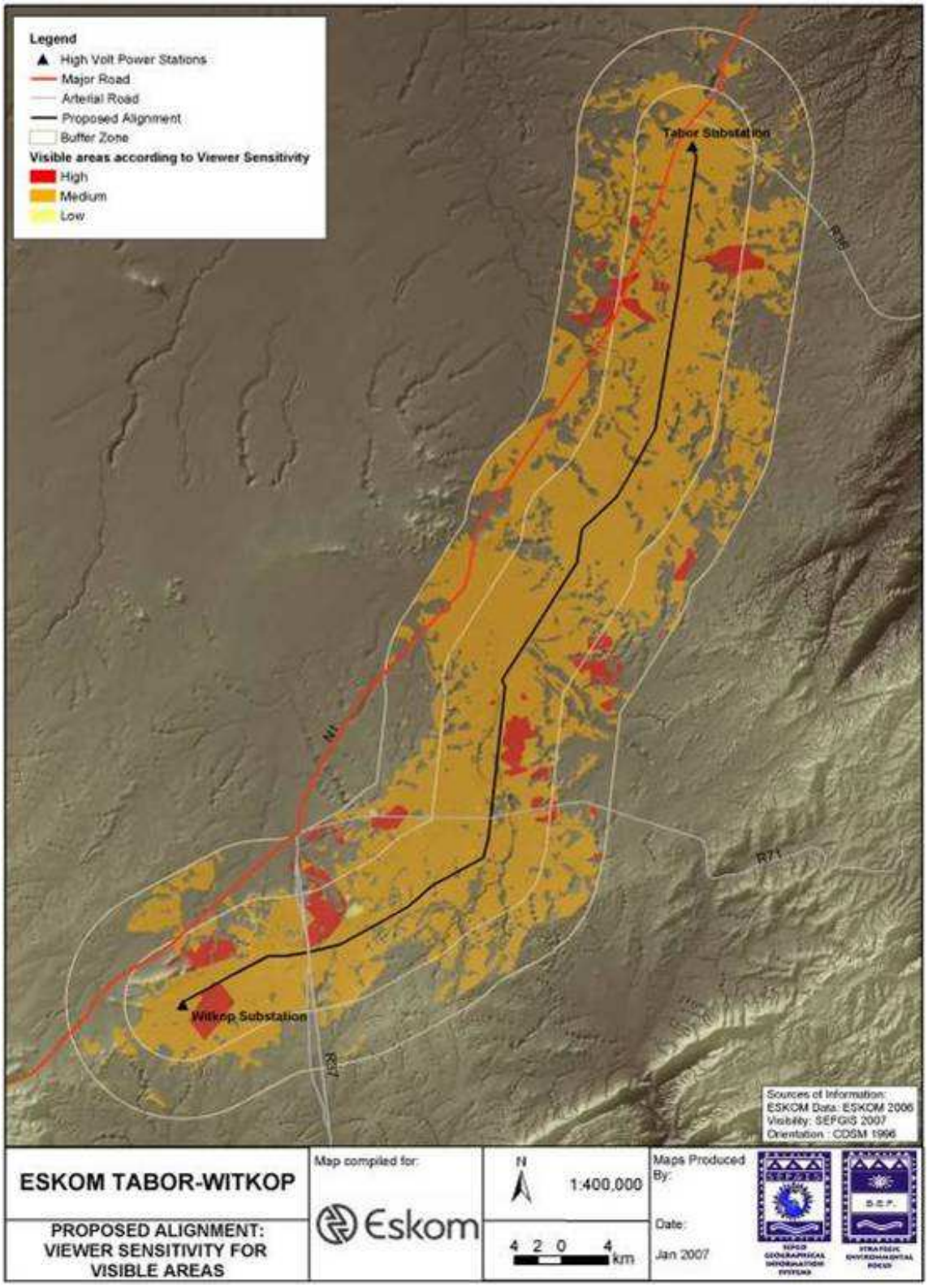


Figure 26: Viewer sensitivity of the proposed alignment

Alteration of Landscape Character

Construction phase

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

The construction camps and lay-down yards are anticipated to disturb a relatively large area. Due to a lack of technical information, two options are considered namely; the location of construction camps at remote, green fields sites, or in/adjacent to existing settlements. The initial presence of a construction camp in a pristine landscape will cause a temporary and localised alteration to the landscape character. A construction camp located in or adjacent to an existing town or settlement will be easily associated with the town and therefore the presence of the town.

Alternative 1 is aligned along existing servitudes and power lines between the Tabor and Witkop substations. The presence of the roads and existing power lines has caused a localised reduction in the visual quality of the landscape. Areas along these routes are occupied by cultivated or fallow cropland, which further reduces the quality of the landscape. The VAC between Tabor and Witkop is also considered moderate due to the varied topography. These factors limit the severity of landscape impact to a moderate degree.

Alternatives 2 and 3 are also aligned along the existing servitudes and power lines between the Tabor and Witkop substations but due to the low VAC throughout most of the study area, the undeveloped condition of the northern parts of the study area and the slow recovery rate of the endemic vegetation, the severity of the landscape impact during the construction stage is expected to be high. The impact will extend over the entire length of the alignments and may vary in degrees of severity along the linear length as it transects landscape types of varying VAC.

Operational phase

Landscape impact will occur as a result of the presence of the completed transmission line, i.e. that of the evenly spaced towers. The industrial character and the near monumental vertical scale of the towers, will severely contrast with the simple and undeveloped landscape character that prevails through most of the study area.

The remoteness of the northern part of the study area is considered as a landscape amenity that provides the study area with a unique and valued sense of place. This quality of the landscape will be adversely affected with the presence of a transmission line of this scale and extent. Game reserves will experience major loss in visual quality, which will impact on the landscape character and the value of experience of the reserve.

Alternative 1 is aligned along the existing linear infrastructure such as the existing transmission line servitude and existing distribution lines as well as various routes. The co-existence of transport routes and transmission lines is a common sight in South Africa. These two man-made features are often associated with each other and are considered compatible land uses. A localised reduction of landscape character sensitivity occurs along the R37, R71 and N1 routes which will result in a low significance of landscape impact.

The northern alignment of Alternatives 2 and 3 traverses over landscape types with a moderate VAC and undeveloped land. A reduction of landscape character sensitivity occurs along southern parts of the alignment of the alternatives, which will result in a moderate significance of landscape impact.

Viewer Response: Residents

The study area is moderately populated, especially the informal settlements and farming communities. These communities are normally situated along main transportation routes, near agricultural areas or adjacent rivers or water resources. The sparse distribution of residents across the study area results in a relatively low number of affected viewers.

Construction phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yards. The uncertainty pertaining to the number, location and size of the construction camps, relates to a moderate level of confidence in the assessment of the visual impact. The duration of the potential visual impact will be temporary, which will result in an anticipated moderate significance of visual impact for the alternatives.

Operational phase

The residents of the informal settlements and farming communities along the existing servitudes and power lines may experience a high degree of visual intrusion due to their proximity to Alternatives 1, 2 and 3. These residents are within 5 km and in some instances within 1 km from the proposed alignment. This is considered the zone of highest visibility in which the highest degree of visual intrusion can be expected. Alternatives 2 and 3 southern alignment will affect the largest number of residents compared to the other alternatives. Visual exposure is considered high due to the proximity of the alignment to the informal settlements and the high level of visibility that can be expected.

The VAC of the different landscape types plays a major role in the visibility of the proposed transmission line. A diverse land cover and topographically varied terrain does have the ability to decrease the severity of visual impact (Bishop *et al.*, 1985) by creating a backdrop. The steel frame of the towers (especially the cross-rope suspension type) presents a high degree of visual permeability, and hence a low degree of visual obstruction. This characteristic of the towers allows it to readily blend with the background colours and patterns of the landscape. This results in a

reduced ZVI because the visibility of the individual towers is reduced to a smaller distance.

The degree of visibility of a series of transmission towers in a relatively flat landscape is mostly determined by distance, since the silhouette effect against the sky tends to increase visibility and hence, increase the severity of visual impact over a much larger ZVI. This would be the case for all the alternatives that cross through Bushveld landscape types.

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

The study area is renowned for its biodiversity and Bushveld landscapes. These characteristics provide the basis for the tourism industry, which plays a major role in the economy of the Limpopo Province. The entire study area is considered to have a high tourism potential.

Construction phase

The temporary duration of the construction phase is not expected to cause major visual impacts. The location, number and size of the construction camps and lay-down yards will be crucial factors in determining the impact. Detail information about the location and nature of the camps is not available and it is anticipated that the visual impact will be localised and that a limited number of tourists will be adversely affected during construction.

The construction camps may, however, cause a higher visual intrusion on tourists visiting the mostly vacant, eastern areas of the study area where the possibility of integrating it with existing settlements/towns is low. It is highly probable that a number of construction camps will have to be established in pristine landscapes, which may temporarily interfere with the undisturbed views that will be experienced by tourists at that time. Their exposure to possible unsightly views of the construction camps and the associated activity is expected to be minimal and localised.

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

Operational phase

Considering the extent of the proposed alternatives, a great number of tourists will be affected during their visit to the Capricorn Tourism Region. The presence of a transmission line in this undeveloped landscape will severely spoil the picturesque views that are experienced over the undulating hills.

It can be concluded that alternatives 2 and 3 will cause highly visual intrusion in the views expected by tourists travelling through the study area. The western part of the

study area generally has a low VAC which will cause a greater ZVI. The severity of the visual impact will be moderate to high, causing a moderate to high significant visual impact.

Viewer Response: Motorists

The major routes in the study area are the N1, R37 and R71 connecting the towns and informal settlements. Secondary and tertiary routes form a loose network of gravel roads in the remote areas, linking smaller settlements. This assessment will be limited to motorists utilising the main routes, as the countless smaller roads are considered as scenic routes, mostly utilised by tourists and residents.

Construction phase

The potential visual impact that may be experienced by motorists during the construction phase is considered to be minimal. Limited information is available and the number, location and size of the construction camps and lay-down yards are essential for accurately assessing the visual impact. It is anticipated that views of the construction camps and lay-down yards of Alternative 1, 2 and 3 may be visible from the N1. The possibility that a construction camp will be established at this location is high and can be motivated from an accessibility point of view, due to the proximity to a major route.

The presence of the construction camp and lay-down yards may create unsightly views. Motorists' visual exposure to the impact will be brief and the severity of visual impact will be low. The significance of potential visual impacts is expected to be low.

Operational phase

The N1, R37 and R71 are the most prominent, carrying the highest volume of traffic. Alternative 2 and 3 will be the most visible from the N1 and Alternative 1 will be most visible from the R37 and R71. The severity and significance of visual impact for the proposed alternative 1 and 2 on motorists will be low and moderate for alternative 3.

The severity of visual impact for the proposed alternative 1 and 2 on motorists will be low. The speed at which they travel reduces their sensitivity and also contributes to short periods of visual exposure, which results in a low significance of visual impact.

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	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
LANDSCAPE IMPACT								
Construction Phases	Alternative 1	Negative – Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover.	Localised impacts over an extensive area	Permanent if not mitigated	Moderate	Definite	Moderate	Low
	Alternative 2				High	Definite	High	Low
	Alternative 3				High	Definite	High	Low
Operational Phase	Alternative 1	Negative – Impacting on the visual quality of the landscape due the presence of a transmission line.	Regional	Permanent	Low	Definite	Low	None
	Alternative 2				High	Definite	Moderate	Low
	Alternative 3				High	Definite	Moderate	Low
VISUAL IMPACT ON RESIDENTS								
Construction phase	Alternative 1	Negative – Construction camp and lay-down yards may cause unsightly views.	Local	Temporary	Low	Probable	Moderate	Low
	Alternative 2				Moderate	Probable	Moderate	Low
	Alternative 3				Moderate	Probable	Moderate	Low
Operational Phase	Alternative 1	Negative – The presence of a transmission line intrudes on existing views and spoils the open panoramic views of the landscape.	Regional	Permanent	Low	Definite	Low	None
	Alternative 2				Moderate	Definite	Moderate	Low
	Alternative 3				Moderate	Definite	Moderate	Low
VISUAL IMPACT ON TOURISTS								

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction Phase	Alternative 1	Negative – Construction camp and lay-down yards may cause unsightly views and spoil the undisturbed views over the landscape.	At a number of point locations	Temporary	Moderate	Highly Probable	Moderate	Low
	Alternative 2				Moderate	Highly Probable	Moderate	Low
	Alternative 3				High	Highly probable	High	Moderate
Operational Phase	Alternative 1	Negative – The presence of a transmission line intrudes on existing views and spoils the open panoramic views of the landscape	Regional	Permanent	Low	Definite	Low	Low
	Alternative 2				Moderate	Definite	Moderate	Low
	Alternative 3				High	Definite	High	Moderate
VISUAL IMPACT ON MOTORISTS								
Construction Phase	Alternative 1	Negative – Intruding on existing views of the landscape.	At a number of point locations	Short period	Low	Probable	Low	Low
	Alternative 2				Low	Probable	Low	Low
	Alternative 3				Medium	Probable	Medium	Low
Operational Phase	Alternative 1	Negative – Intruding on existing views of the landscape.	Local	Intermittent	Low	Definite	Low	Low
	Alternative 2			Intermittent	Low	Definite	Low	Low
	Alternative 3			Intermittent	Medium	Definite	Medium	Low

WM = With Mitigation WOM = Without Mitigation

7.8.2 Mitigation measures

General

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

Transmission Towers

- Avoid crossing over or through ridges, rivers, pans or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation is not resilient and takes extended periods to recover;
- The preferred type of tower is the compact cross-rope or the cross-rope suspension tower. These two tower types are the most visually permeable and create an extremely low degree of visual obstruction;
- Avoid changing the alignment's direction too often in order to minimise the use of the self-supporting strain tower. This tower type is the most visually intrusive as the steel lattice structure is more dense than the other two tower types, hence creating more visual obstruction;
- Where practically possible, provide a minimum of one km buffer area between the transmission line and sensitive visual receptors; and
- Rehabilitate disturbed areas around pylons as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil.

Access Routes

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

Cleared Servitudes

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

Construction Camps and Lay Down Yards

- If practically possible, locate construction camps in areas that are already disturbed or where it isn't necessary to remove established vegetation like for example, naturally bare areas;
- Utilise existing screening features such as dense vegetation stands or topographical features to place the construction camps and lay-down yards out of the view of sensitivity visual receptors;
- Keep the construction sites and camps neat, clean and organised in order to portray a tidy appearance; and
- Screen the construction camp and lay-down yards by enclosing the entire area with a dark green or black shade cloth of no less than two metres in height.

7.9 SOCIAL CHANGE PROCESSES

7.9.1 Alteration of social structures and processes

Source of the impacts:

Construction and operation of the transmission power line along any one of the four corridors

Description of the impacts:

Reliable power supply ensures continued industrial and economic growth in the Polokwane region and job creation, with possible spin-offs for towns along the corridor.

- Impact on community's quality of life in terms of exposure to dust, noise, odour, vibration, artificial light, personal safety and hazard exposure and crime and violence.
- Lack of adequate physical infrastructure.
- Loss of income and its impact on game farmers.
- Impact on property values and resale potential as a result of the proposed transmission power line.
- Construction of the line along alternative A or B through the existing township of Seshego.

Resettlement

The proposed alternatives A and B run through the township of Seshego and the resettlement of houses is very likely should one of these alternatives be approved. In this event, the social impact on the Seshego community is likely to encompass several social variables and it is anticipated to be widespread. It is anticipated that many households will have to be uprooted from their homes and resettled in alternative areas; perhaps kilometres away from their current communities. Seshego is already highly over populated and the resettlement of these households will not only be disruptive to the resettled individuals but also to the greater community. In addition, the Polokwane Local Municipality has indicated that the provision of residential sites, to relocate people living in informal settlements, is proving to be problematic.

Displacement / dispossession

Construction of the line through agricultural / wildlife land, resulting in the loss of productivity or suitability of that land

People depend on the land to make a living, either by means of agricultural practices, small scale subsistence farming, grazing for cattle or tourism related uses such as game farms and conservancies. The construction of a power line across individuals' land may cause problems related to access areas, access roads and division of land. The area within the servitude will have to be cleared of large trees and shrubs and this could be disruptive to the landowners' farming practices and daily activities.

Feelings In Relation to the Project

Feelings in relation to the project, where:

- Public do not have access to electricity, but power-lines cross property;
- Rubble left by workers; and
- Interaction between community and workers.

Proposed projects often generate uncertainty or fear and sometimes the impacts perceived in anticipation of the planned intervention can be greater than the impacts that ultimately result from the intervention. These impacts include uncertainty, annoyance[6], dissatisfaction due to a failure of the project to deliver promised benefits, and an experience of moral outrage, for example where a project leads to violation of deeply held moral or religious beliefs or requires households to relocate their houses to make way for the new Transmission Power Line.

Concerns generally include the fear of allowing strangers access to private property (in terms of safety or the negligence of leaving access gates open). The potential impacts of the Transmission Power Line are more likely to affect the residents in rural communities. These residents, who either have no electricity or suffer from regular power cuts/failures, expressed hopes of this being rectified, and unless this is addressed, the community may harbour negative feelings in relation to the new Transmission Power Line.

In addition, landowners expressed their dissatisfaction regarding the state in which their properties have been left after the decommissioning of power lines. Landowners and farmers are developing more negative attitudes towards Eskom, due to their failure to clean up the servitude of a decommissioned line. Stakeholder relations should be managed and improved upon to minimise any negative feelings with regard to this project.

[6] A feeling/experience due to disruption of life, but which is not necessarily directed at the intervention itself.

However, the community in general is very positive about the proposed new Transmission Power Line as was indicated during the initial Public Participation Phase.

Crime and violence

Influx of construction workers into small communities and subsequent hostility between residents and construction workers. Landowners may be concerned with allowing strangers access to their properties. Moreover, the presence in local beer halls (shebeens) may in itself lead to conflict with the residents. This conflict, combined with the inevitable consumption of alcohol, is likely to turn violent.

Property values

Construction of the line along alternative A or B through the existing township of Seshego. The proposed alternatives A and B run through the township of Seshego and the loss of property value and resale potential is very likely should one of these alternatives be approved. In certain instances Eskom will have to acquire servitudes and landowners will receive compensation for their land.

Table 17: Socio-economic Impact Table

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction and Operational Phases	Proposed routing of the alternative A (west of N1) and B (west of N1 and crosses N1)	Negative – relocation of the Seshego community	Local	Permanent	High	Definite	High	High
	Lack of access to electricity for people whose properties the transmission line would cross	Negative – increased impacts on community if the transmission power line would cross their properties and if they still have no access to electricity	Local	Medium-term	High	Probable	High	Medium
	Lack of maintenance of the proposed transmission power line	Negative – community's dissatisfaction regarding Eskom's conduct on maintenance issues	Local	Medium-term	Medium	Improbable	Medium	Low
	Impact of noise and increased traffic on communities	Negative – increased noise and traffic as a result of construction	Local	Short-term	Medium	Probable	Medium	Low
	Poor conduct of contractors	Negative – decreased quality of life	Local	Short-term	Medium	Probable	High	Medium
	Introduction of people on site during construction and threats of fires	Negative – decreased personal safety and hazard exposure	Local	Long-term	Medium	Improbable	Medium	Low
	Lack of adequate physical infrastructure	Negative – should the existing "vacant" servitude not be chosen, new physical infrastructure will have to be built	Local	Long-term	High	Probable	High	Medium
	Loss of income from hunting and inability to count game	Negative – loss of income that can be derived from tourism	Local	Long-term	Medium	Probable	Medium	Low
	Devaluation of property values	Negative – the property value directly impacts on the livelihoods of the affected land owners	Local	Long-term	High	Probable	High	Medium
	Increased social problems	Negative – impact on social networks	Local	Long term	Medium	Probable	High	Medium

	Use of local labour from surrounding townships	Positive – increased employment levels in the area	Regional	Short-term	Low	Improbable	Low	Positive
	Use of local labour from surrounding townships	Positive – higher wages in the area	Regional	Short term	Low	Improbable	Low	Positive
	Use of existing and/or foreign labour for construction	Positive – increased business sales	Regional	Short term	Low	Improbable	Positive	Positive
	Use of foreign labour for construction	Negative – value conflict between new and long-time residents	Regional	Short-term	Low	Improbable	Medium	Low
	Use of foreign labour for construction	Negative – increased pressure on local amenities, clinics etc. due to higher population	Regional	Short term	Low	Improbable	Medium	Low

WM = With Mitigation WOM = Without Mitigation

7.9.2 Mitigation measures

- The proposed alignment should be diverted to avoid resettlements
- In the event of no feasible alternatives, provide counseling to individuals and community
- Provide appropriate compensation and housing to resettled households. Involve and communicate openly with the affected landowners and users
- Educate landowners in terms of their rights and responsibilities prior to the construction phase
- Provide constructive advice on how best to use and maintain the land within the servitude.
- Involve and communicate openly with the affected landowners and users;
- Educate landowners in terms of their rights and responsibilities prior to the construction;
- Develop awareness programs on HIV/ AIDS;
- Eskom to ensure the timely and complete clearance of their equipment and structures after the decommissioning phase; and
- Eskom to inform community about alternatives e.g. self-build schemes. Community Management and Monitoring Committee to approach local municipality to engage Eskom Distribution about possible solutions.
- Eskom must liaise with the farmers unions and a protocol for gaining access to farms should be established and distributed to all parties involved

- Construction teams should be clearly identified by wearing uniforms or identification cards that should be displayed in a visible place on their person at all times.
- Construction workers should conform to a code of conduct, with penalties when transgressed.
- The proposed alignment should be diverted to avoid resettlements
- In the event of no feasible alternatives:
    - provide counselling to individuals and community;
    - provide appropriate compensation and housing to resettled households; and
    - Eskom's Land Acquisitions Unit must be in contact with the affected parties throughout the process.

7.9.3 POSITIVE SOCIO-ECONOMIC IMPACTS

The positive social impacts will not be analysed in the above format, as no mitigation will be required. Certain measures to enhance positive impacts will be listed.
The transmission line will have the following positive impacts:

- Capacity building: there is a low positive impact in this regard, as the pylon construction and conductor stringing is usually conducted by skilled teams. Where possible, it would be beneficial to:
    - Recruit and train local residents to supply unskilled labour during the construction phase
    - Recruit and train local residents to maintain the power lines during the operational phase
    - Create a permanent skills base in the area.
- Strengthening of electricity network: the community will benefit from the improved service delivery in the region.

7.10 HEALTH, SAFETY AND SECURITY

7.10.1 Threat to health and safety of fauna and workers

Source of the impacts:

Construction of the pylons, operation and maintenance of the transmission power line

Description of the impacts:

Unhygienic and hazardous working conditions, leading to the spread of diseases and / or injuries with possible loss of lives, separation of male workers from their partners, possibly leading to promiscuity; Livestock loss due to electrocution, or theft; Threat to animal safety. trespassing; failure to close substation gates and poor maintenance of gates.

Being a predominantly farming community, the overwhelming majority of safety and security risks are associated with farm attacks; farm theft; safety of farm workers, implements or farm animals; and aviation safety. Some of these safety issues such as electrocution are, however, associated mainly with Eskom's Distribution Lines rather than transmission lines. One issue that specifically pertains to transmission lines is Livestock and game loss due to theft or electrocution.

Construction Phases

The construction phase will be characterised by several activities involving a number of people. There will be need for a construction campsite, which could imply that a large number of male workers will be camping in the area, close to one of the numerous farms in the study area. This could be a security threat, even if only a perception (Table 18). The following problems associated with the presence of construction workers could also arise:

- Escalation of livestock theft and damage to farm property;
- Unhygienic living and working conditions with consequent impacts on the spread of diseases. The spread of sexually transmitted diseases could also escalate if male workers are living far away from their partners;
- Ethnic clashes could arise if workers from neighbouring areas, rife with unemployment, are not employed instead of foreign labour;
- Trespassing into private land, or over-stepping the bounds of the agreed access area could result in negative incidents between construction workers and landowners;
- Any activity that could potentially result in loss of income to farmers could have economic implications for Eskom. For instance, Eskom could be held liable for the loss of livestock or farm implements either due to theft or damage during construction activities; and
- Eskom must note that the establishment of the construction campsite and the enforcement of safety and security measures during construction will depend very much on the Contractor.

Operational Phase

Once erected, the maintenance of the transmission line will require occasional access into private land. Eskom and the Landowners need to establish an agreement that guarantees the safety of maintenance workers. This is important, especially for game farms, where worker could be at risk from wild game.

Furthermore, the potential for maintenance workers to trespass into private land, or over-step the bounds of the agreed access area, could result in negative incidents between maintenance workers and landowners.

The safety of crop spraying could be significantly at risk, if due mitigation measures are not implemented to make the transmission line either more visible or better still far away form areas, with intensive crop spraying.

Table 18: Impacts on Health, Safety and Security

	Activity	Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance	
							WOM)	WM*
Construction Phases	Various construction activities	Negative – unhygienic and hazardous working conditions, leading to the spread of diseases and / or injuries with possible loss of lives	Local	Short-term	Medium	Probable	Medium	Low
	Establishing the construction campsite for the line	Negative – unhygienic and hazardous working conditions, leading to the spread of diseases and / or injuries with possible loss of lives	Local	Short-term	Medium-high	Probable	Medium-high	Medium-low
		Negative – separation of male workers from their partners, possibly leading to promiscuity and spreading of STDs	Local (Regional if STDs are transmitted)	Short-term	Medium-high	Probable	Medium-high	Medium-low
		Negative loss of livestock due to theft or trespassing; failure to close substation gates	Local	Short-term	Medium	Probable	Medium	Low
Operational Phase	Operations of maintenance crew	Negative loss of livestock due to electrocution, or theft, trespassing; failure to close substation gates and poor maintenance of gates at substation	Local	Long-term	Medium	Probable	Medium	Low
	Lack of maintenance around the pylons	Negative – collision of game with the stays that are not visible in the dense vegetation	Local	Long-term	Medium	Probable	Medium	Low

WM = With Mitigation WOM = Without Mitigation

7.10.2 Mitigation measures

Construction Phase

Selection of the construction campsites

- The location of the construction camps must be done with the assistance and approval of the landowner or the designated local authority. Input from the Limpopo Health Department should be obtained.
- No campsites should ideally be located close to townships in urban centres, with high unemployment rather than near farmsteads.
- All campsites must be fenced along the entire perimeter of the camp. Not only will this define the limits of the campsite accommodation and service area, it will also help to prevent livestock from entering the campsite.
- On completion of the use of the campsite, all structures and equipment must be removed from the site. Also, pit latrines must be backfilled and compacted. Thereafter, all remaining materials (including fencing and concrete foundations) must be removed.

Hygiene, safety and security at campsite

- Arrangements must be made with the landowner or the local authority for a suitable source of potable water for use at the campsite. Payment for water must be agreed to with the supplier. Abstraction of water from streams or a borehole on the site without prior approval and arrangement with the landowner is not permitted.
- Where a camp site has been established, suitable refuse containers must be provided for the temporary storage of all domestic refuse prior to their removal to a registered land-fill site in the area.
- Burning of waste such as packaging materials, paper and plastic is strictly prohibited due to the high risk of uncontrolled veld fires.
- Mobile toilets and other hygiene facilities must be provided at the campsite. All toilets are to be cleaned and disinfected regularly. The disposal of waste should occur at a registered waste disposal site.
- Only gas, paraffin or petrol stoves are to be used for cooking and water heating purposes. Open fires, fires in perforated metal barrels, and wood and coal fired stoves are prohibited due to the high risk of uncontrolled fires. By inference, the collection of firewood on site is prohibited.

Security of access and control during construction

- Where the access road passes through farms, all existing farm gates must be closed and locked immediately after use or in accordance with the specific conditions laid down by the landowner and agreed to by all parties. The movements of Eskom Transmission's teams must be known to the landowner. In particular, movement of vehicles during the hours of darkness is strictly limited to emergencies only. At all times, vehicles are to travel with caution due to the risk of collision with cattle and game.

Fire Arms

- No unauthorised firearms are allowed on site. The landowner must be notified of all personnel carrying firearms. The discharge of any firearms on the site must be reported to the South African Police Service.

Poaching

- Hunting, poaching or collection, removal or disturbance of vegetation, artefacts, rocks or the like is strictly prohibited. At all times, the teams must maintain minimal disturbance whilst undertaking the work required.

Vehicle access from campsite to construction site

- A route to the construction area from the camp site must be identified with the assistance and approval of the landowner.

Auditing of the environmental management stipulations

- These measures should be included in the final EMP submitted to the contractor. The EMP is to be monitored by Eskom Transmission's Negotiator, an independent environmental consultant and the landowner to ensure compliance.

Operational Phase

Formal notice of any maintenance work should be given in advance to the landowner and approval requested for access to the farmland, if it is necessary to gain access to the servitude. Otherwise access to the line must be via the approved access roads and corridors (agreed with the landowner). The request must give details of the purpose of the access, the contact person and number of people to be involved, time frames and machinery that will be used. Anchors must be marked with material that will be visible to animals and ESKOM must ensure that regular clearance of vegetation takes place around the pylons.

7.11 NOISE POLLUTION

7.11.1 The generation of noise pollution during the construction, operation and maintenance of the Transmission power line

Source of the impacts:

Construction of the pylons, operation and maintenance of the transmission power line

Description of the impacts:

Presently, the study area is impacted by minimal noise from the surrounding land uses as there are mainly sparsely populated settlements and agricultural activities taking place within the study area.

Construction Phase

The construction period could result in a temporary increase of the noise levels due to construction and delivery vehicles moving to and from the site as well as general installation activities. Increase in traffic flow within the study area could increase the nuisance levels in terms of noise generation.

Operational Phase

The operation of the proposed transmission power line could be a source of noise pollution.

Table 19: Impacts on Noise Pollution

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Construction Phase	Construction activities	Negative – increased noise	Local	Short-term	Medium	Probable	Low	Low
	Increased traffic to the construction site	Negative – increased noise	Local	Short-term	Medium	Probable	Low	Low
Operational Phases	Operation of the transmission power line	Negative – increased noise	Local	Short-term	Medium	Probable	Low	Low

WM = With Mitigation WOM = Without Mitigation

7.11.2 Mitigation

Construction Phase

- Institute noise control measures throughout the construction phase for all applicable activities, including the construction times
- Working hours must be in accordance with the national laws and local by laws.
- Limit the working hours during the construction phase between at least 07:00 and 18:00 during weekdays. No construction work should occur during weekends.
- Traffic and construction issues should be discussed before the construction starts. It is suggested that the Community Liaison Forum (CLF) meets with representatives from Eskom to discuss how the matter should be handled. As a result of the discussion, a construction plan should be drawn up which can inform the affected parties when construction will take place in the area, and what disruptions they can expect. This plan should be updated continuously, and the relevant parties must be kept informed.
- Construction traffic should be scheduled for off peak times (also related to harvest times and times of transporting livestock – therefore off peak times might not be the same as in urban areas.

Operational Phase

The noise from the existing Tabor Witkop 275kV transmission power line is corona discharge which is caused by either a spacer damper or hardware connection on the insulators that has a loose connection or pollution on the insulators.

7.12 DECOMMISSIONING

7.12.1 Impacts associated with the decommissioning phase

Source of the impacts:

Demolition of structures and the creation of construction camp and vehicles on the site

Description of the impacts:

The decommissioning phase refers to all the activities, which relate to the proposed Transmission power line when it is no longer in use. Potential issues that relate to the decommissioning phase refers to impacts such as the pylons lying strewn around, lack of rehabilitation of the access roads, overgrown vegetation along the servitudes etc.

Decommissioning Phase

During the decommissioning phase, the demolition activities are likely to have similar impacts on the environment as were identified for the construction phase. These include potential impacts such as sedimentation, surface water, visual impact, dust and noise pollution, a risk of fires and explosions, safety and security and traffic impacts.

Table 20: Impacts of the decommissioning activities of the proposed transmission power lines

	Activity	Nature of Impact	Extent of impact	Duration of impact	Intensity of impact	Probability of impact	Significance	
							WOM	WM
Decommissioning Phases	Demolition activities	Sedimentation	Regional	Medium	Medium	Highly Probable	Medium	Low
		Surface water pollution	Regional	Medium	Medium	Probable	Medium	Low
		Dust pollution	Regional	Short	Low	Highly probable	Medium	Low
		Noise	Regional	Short	Low	Highly probable	Medium	Low
		Visual Impact	Site	Medium	Medium	Highly probable	Medium	Low
	Construction Camp	Hygiene	Site	Medium	Low	Highly probable	Medium	Low
	Construction vehicles	Impact on traffic	Regional	Medium	Medium	Probable	Medium	Low
	Personnel & equipment	Safety & security	Site	Medium	Medium	Probable	Medium	Low

WM = With Mitigation WOM = Without Mitigation

7.12.2 Mitigation

Decommissioning Phase

- Ensure that excavated and stockpiled soil material is 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 cause erosion or where water would naturally accumulate.
- Decommissioning activities should preferably take place during the dry winter months to prevent soil erosion caused by heavy thunderstorms.
- Wet all unprotected cleared areas and stockpiles with water to suppress dust pollution.
- Cover materials such as sand and other rubble during transport to and from the site with a tarpaulin.
- The property must be graded and re-vegetated to ensure that rainwater drains gradually over the site without creating erosion gullies.
- Institute noise control measures throughout the decommissioning phase for all applicable activities.
- Restrict construction activities to normal working days and working hours, that is 08:00 to 17:00, Mondays to Fridays.
- Ensure that no refuse wastes are burnt on the premises or on surrounding premises and that the property is litter free at all times.

- Ensure that no refuse or generated on the site be placed, dumped or deposited on adjacent/surrounding properties including road verges, roads or public places and open spaces during or after the decommissioning period.
- All fuel on site must be stored in sealed containers to prevent accidental fires and explosions.
- All fuel reserves must be removed from the site during the decommissioning phase.
- The temporary toilets must be emptied regularly and maintained in a working order throughout the decommissioning phase.
- The temporary ablution facilities should be located in the higher lying area of the site.
- Take cognisance of peak traffic times when heavy machinery/trucks must not be present on the local road system.
- Ensure that the handling of equipment and materials is supervised and adequately instructed.
- The contractor will have to provide his own security arrangements while on site.
- Ensure that construction vehicles are under the control of competent personnel.
- Provide adequate facilities on site to treat emergencies to staff.
- It is recommended that the decommissioning phase be audited twice by an independent consultant. Auditing should coincide with mid-stage decommissioning and approximately one week prior to finalisation.

7.13 CUMULATIVE IMPACTS

Cumulative impacts result from actions, which may not be significant on their own, but are significant when added to the impact of other similar actions. In this instance, the cumulative impact would be the addition/erection of another transmission power line to an area where there are existing impacts. Cumulative impacts relating to the construction of the proposed transmission power line include:

- The contribution of vegetation clearing, earthworks, alteration of drainage lines, to soil erosion and contamination of the surface water resources in the study area;
- The contribution of the sterilisation of parcels of potential arable land (varying in size from small to large) to the overall decrease in agricultural production in the affected area;
- The contribution of the presence of additional power lines in an area where there are existing transmission and distribution lines to the overall aesthetic appearance of the study area;
- The contribution of potential devaluation of land that could otherwise be used in various tourism ventures in future; and
- The contribution of varying small-scale impacts of a socio-economic nature on the lives and means of livelihood of the communities in the study area.

The proposed alignment (east of the N1) will also allow for the optimisation of the existing infrastructure and concentration of impacts in an already disturbed area, which will prevent unnecessary environmental impacts through the creation of new access roads. Thus the proposed alignment will therefore have a lower cumulative impact when compared with that of the other alternatives.

The cumulative impact on soil and agricultural resources is considered negligible as a result of the confined footprints of the individual pylons, the limited agricultural potential of the soil and the utilisation of existing access roads. However, soil erosion and disturbance on hydrological systems could have a far reaching impact on the already limited water resources through sedimentation and pollution. It is imperative the management measures as outlined in the detailed EMP are implemented during the construction and operational phases in order to limit the probability and extent of these impacts.

The proposed alternative will entail the placement of the power line in parallel to the existing 275kV power line, which will run along the granitic outcrops. From an ecological view point, the outcrops are of high ecological value and are generally associated with heritage and cultural resources. However, the existing power line renders the impacts less severe and will ultimately result in the concentration of the ecological and visual impacts into a confined area rather than the dispersal of the impacts over wide areas. Various mitigation measures address these cumulative impacts that were suggested in the previous sections of the report.

From a socio-economic perspective, the construction of the power line will allow for an increased reliance on the power supply as well as enhanced economic growth potential, which will contribute to an overall material improvement of the Polokwane region. The proposed alignment will prevent the necessity to relocate communities and thus the cumulative impacts will be insignificant compared with that of the other two alignments.

7.14 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:

- The loss of land types with arable potential, leading to a decrease in agricultural production, with impacts on the productivity of the study area.
- The implications of having the transmission line on cultivated land, pertaining particularly to access for maintenance purposes.
- The EMP is drafted in such a manner as to set out the Best Management Practices for the construction and operation of the transmission line.

8 COMPARISON OF ALTERNATIVE ROUTES / CORRIDORS

The preferred alignment was determined based on the following:

- The opinion of the public, ascertained through the public consultation process;
- Specialists' recommendations;
- Environmental constraints;
- Minimal environmental impacts;
- Optimisation of existing infrastructure, such as access roads; and
- Economic cost-benefit analyses.

Table 21 provides a technical comparison of the advantages and disadvantages associated with the three alternatives. Table 22 presents a summary of the salient points raised with respect to each aspect, as highlighted during a specialist integration meeting held on the 30th July 2007 at SEF's offices. The alternative alignments were compared using the modified Delphi approach.

Table 21: Brief technical comparison of the advantages and disadvantages associated with the potential corridors

Alternatives	Advantages	Disadvantages
Proposed Alternative (parallel to the existing power line - east of the N1)	Utilisation of existing access routes, which reduces unnecessary disturbance to the environment Concentration of the negative environmental impacts to a single existing servitude, which serves to minimise edge effects Limits the visual impacts through the physical concentration of the power lines in the landscape Limits the disturbance to a relatively disturbed area as a result of the existing servitude Optimises the efficiency in terms of maintenance as a result of its physical proximity to an existing line The shortest distance between the two substations – economically viable and preferred	A cumulatively larger servitude area Cumulative impacts on the receiving environment area Located in close proximity to the Pietersburg Game Reserve
Alternative A (west of the N1)	A possible Servitude is available for the northern part of the line Not located in close proximity of the Kuschke and Pietersburg nature reserve The alignment will continue along relatively flat topography	Ecological processes within the existing servitude of the decommissioned power line, have begun to rehabilitate Construction of new access routes will be required The power line will pass through Seshego, a local community.
Alternative B (crosses the N1)	A shorter distance than alternative A Joins up with the existing power line - localising impacts close to the Witkop substation	Ecological processes within the existing servitude of the decommissioned power line, have begun to rehabilitate Construction of new access routes will be required The power line will pass through Seshego, a local community. Located on the periphery of the Kuschke Nature reserve

Table 22: Summary of specialist comparative analyses of route / corridor alternatives

Specialist field	Proposed (east of N1 along the existing power line)	Alternative A (west of the N1)	Alternative B (crosses N1 north of Kuschke Nature Reserve)
Air quality	Preferred: avoids populated and cultivated areas as well as quarries and mines	Viable, but greater possibility of seasonal dust deposition.	Viable, but greater possibility of seasonal dust deposition.
Heritage	Preferred: absence of Grade I sites as well as the least number of sites that would be impacted on	Potentially viable, but more heritage sites affected	Potentially viable, but more heritage sites affected
Social	Preferred: the impact on the local population will be more easily mitigated due to previous exposure and experience related to the construction of Transmission Power Lines. Furthermore, no resettlement will be required.	Unsuitable: • Relocation of several houses in Seshego, Bloodriver and Nirvana necessitated. • Line traverses through Garamongwana, an established community.	Unsuitable: • Relocation of several houses in Seshego, Bloodriver and Nirvana necessitated. • Line traverses through Garamongwana, an established community.
Visual	Preferred: lowest impact. The proposed route is regarded as the most preferred alternative. Its alignment along the N1, the existing distribution line and transmission servitude is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the roads and servitudes. A large section of the alignment traverses the Capricorn Residential and Agricultural which has a moderate Visual Absorption Capacity (VAC). Alternative 1's great advantage lies in the less significant visual impact on tourists and residents as compared to the other alternatives. The public association with transmission lines and major public roads is a common perception which makes the co-existence of these two features more acceptable.	Medium suitability. High intensity impact on landscape during construction and operation phases. Due to the low VAC throughout most of the study area, the undeveloped condition of the northern parts of the study area and the slow recovery rate of the endemic vegetation, the *severity of the landscape impact* during the construction stage is expected to be *high.* The western part of the study area generally has a low VAC which will cause a greater ZVI (Zone of Visual Influence). *Moderate* intensity of impact on tourists.	Lowest suitability. High intensity impact on landscape during construction and operation phases. Due to the low VAC throughout most of the study area, the undeveloped condition of the northern parts of the study area and the slow recovery rate of the endemic vegetation, the *severity of the landscape impact* during the construction stage is expected to be *high.* The western part of the study area generally has a low VAC which will cause a greater ZVI. *High* intensity impact on tourists.

Specialist field	Proposed (east of N1 along the existing power line)	Alternative A (west of the N1)	Alternative B (crosses N1 north of Kuschke Nature Reserve)
Agricultural potential	As far as soils and agricultural potential are concerned, there is little difference between the alternatives to the east of the N1 (Existing Route) and those to the west (Alternatives A and B). Both routes cross virtually the same set of land types, and neither route encounters either a substantial area of high potential soils or a significant area with rocks and/or shallow soils. The existing route crosses a longer area of dominantly deep, alluvial soils (land type Ia132), but since this is an existing servitude, there should be minimal disturbance.		
Geotechnical	The proposed route east of the N1 is probably the most suitable in terms of geotechnical conditions and the cost of construction.	Less suitable	Least suitable
Avifaunal	Preferred: The proposed alternative runs adjacent to existing 275kV lines for its entire length. This minimizes the impact it will have on birds as the area is already to some extent disturbed. Furthermore positioning lines together will make them more visible to birds thereby reducing the risk of collision. Subsequently, it is concluded that this alternative is preferred from a bird impact perspective.	Alternative A appears to make little or no material difference and has not been discussed in any depth	Alternative B runs through much less pristine woodland (game farms) than Alternative A, particularly in the northern sections of the study area
Terrestrial ecology	Preferred: The proposed alignment follows an existing servitude with existing power line infrastructure. The pre-existence of this line dictates that most ecological impacts have already taken place and thus following the route of this line will not add significantly to the ecological impacts that currently occur.	Additional edge effect, fragmentation of habitat and destruction of habitat will result.	Additional edge effect, fragmentation of habitat and destruction of habitat will result.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

The environmental impacts associated with the construction of the power line, in accordance with the preferred alignment, as identified through the EIA process serves to minimise environmental impacts through the concentration of impacts and the optimisation of existing infrastructure. Thus, the positive socio-economic impacts associated with the construction of the line are considered to out weight that of the negative impacts, provided that the implementation measures as stipulated in the detailed EMP and implemented. A brief overview of the key environmental impacts associated with each aspect is presented in Table 23.

Table 23: Summary of the key environmental impacts

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Terrestrial & Aquatic Ecology	To limit the loss of protected tree species To identify any no-go areas in terms of the existence of species of conservation importance. To maintain ecological functionality of the wider region as well as hydrological systems The avoidance or management of adverse impacts ensure that the abundance and diversity of all faunal species are maintained through relocation To identify any no-go areas in terms of the existence of rare or threatened species To minimise pollution and soil erosion, which will affect associated hydrological regimes	Potential loss of floral species with medium conservation value Displacement of faunal species and the subsequent loss of faunal habitats Destruction of Granite hills and associated ecological systems Damage to river and wetland systems through sedimentation and pollution Fragmentation of faunal populations	Limit vegetation clearing Strive to undertake majority of the construction during the dry season Utilisation of brush packs to cover exposed land areas Top soil stockpiles should not exceed two metres Accessibility of spill kits for utilisation during accidental spills Strategic placement of pylons in order to avoid rivers / wetlands Utilisation of existing tracks where possible Selection of corridor with minimal impacts i.e. corridor running east of the N1, with the placement of the line in close proximity to the existing Transmission power line Detailed EMP 'walk through', upon finalisation of the preferred corridor, which will allow for minor deviations to minimise the impacts and conserve species of conservation importance

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Avifauna	Through the avoidance or management of adverse impacts ensure that the abundance and diversity of all faunal species are maintained through effective management	Collisions with earthwires Habitat destruction Disturbance of breeding avifauna	Selection of corridor with minimal impacts i.e. corridor running east of the N1. The placement of the line in close proximity to the existing Transmission power line will allow for concentration of the impacts into an area, rendering the lines more visible to avifauna. Minimise collisions through the utilisation of suitable marking devices as per the Eskom Transmission standard in appropriate areas. Monitor and identify 'hot spots' bird collision areas and mitigate appropriately The EMP 'walk through' will identify any active nests that are located in close proximity to the alignment. Nests will requires specific management in order to mitigate against disturbance

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Heritage and Cultural aspects	To prevent and / or mitigate the negative impacts on heritage and cultural resources.	Disturbance and / or destruction of heritage and cultural resources	Divert the alignment around identified areas of heritage and cultural value. However, the placement of the line along the existing line (east of the N1) will allow for the concentration of impacts on already disturbed heritage and cultural resources (granite hills). Avoid outcrops, bare patches of vegetation and watercourses as these may be associated with heritage and cultural resources. However, the 'walk through' will serve to effectively identify heritage and cultural resources and recommend minor deviations to the alignment, where possible. Through the implementation of an effective EMP, ensure that heritage and cultural resources uncovered during construction and/or operation are reported to the Limpopo HRA and the correct mitigation measures are implemented.
Visual aspects	To reduce the impact on visual quality due to intrusive line infrastructure and activities	Alteration of landscape character Viewer response	Effective planning of the location of infrastructure to minimise visual impact Avoid elevated areas such as the granite koppies, watercourses and ridges. However, placement along the existing line (east of the N1) will allow for the physical concentration of the power lines in the landscape, which will minimise the visual impacts. Preferably utilise the compact cross rope or the cross rope suspension tower as these towers are relatively visually permeable and create a relatively low degree of visual obstruction.

Environmental Factor	Environmental Objective	Potential Impacts	Potential Management
Socio-economic	Ensure that the current socio-economic status quo is improved	*Negative* • Loss of tourism potential of the area • Property values • Visual impact *Positive* • Employment and training opportunities for people in the local community and local contractors • Improvement of infrastructure • Social upliftment and community development programmes • Economic benefits	Selection of the corridor running east of the N1, along the existing line, will not require the relocation of settlements. Implementation of community development programmes upgrading of infrastructure Involve and communicate openly with the affected landowners and users Educate landowners in terms of their rights and responsibilities prior to the construction phase Provide constructive advice on how best to use and maintain the land within the servitude.

9.2 RECOMMENDATIONS

Three alternative corridors were objectively assessed and compared by the relevant specialists. It can be concluded that the most suitable corridor is that which runs east of the N1 along the existing Transmission power line (also referred to as the preferred / proposed corridor). In addition, the public and specialists concur (public meeting held on the 14th February 2007 & specialist integration meeting held on the 30th July 2007) that the route running east of the N1, along the existing power line is preferable.

The line will traverse granitic outcrops of ecological and heritage value, however, the existing power line currently presents a form of disturbance to the rocky outcrops and thus it is preferable to concentrate the impacts to a single area in the landscape. However, a detailed 'walk through' by the heritage; avifaunal and ecological specialists will be undertaken in order to ascertain the minor deviations within the proposed servitude as well as provide specific mitigation measures with respect to the actual footprints of the individual pylons and access routes. The detailed mitigation and management measures will be documented in a detailed EMP, which will thereby serve to minimise negative impacts identified during the process.

Provided that the management measures as stipulated in the EMP are implemented during the various phases of the proposed 400kV transmission power line, it is recommended the route running east of the N1, primarily along an existing transmission power line, receives authorisation to proceed in terms of the NEMA.

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APPENDICES

APPENDIX ONE: AUTHORITY CONSULTATION

APPENDIX TWO: PUBLIC PARTICIPATION

APPENDIX THREE: SPECIALIST STUDIES

APPENDIX FOUR: DRAFT ENVIRONMENTAL MANAGEMENT PLAN