Eskom Holdings Limited
Eskom Transmission Division

PROPOSED ESTABLISHMENT OF THE ANDERSON 400kV SUBSTATION IN FLORA PARK, GAUTENG

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DEA Ref No: 12/12/20/1568

October 2012

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PUBLIC REVIEW

This document presents the Draft EIA Report for the proposed Anderson Substation. The main purpose of the report is the following:

- To describe the need for the project;
- To explain the environmental legal framework governing the project;
- To explain the Environmental Impact Assessment (EIA) process;
- To present the assumptions and limitations associated with the EIA;
- To describe how the proposed project will be executed during the project life-cycle;
- To provide a description of the receiving environment that could be affected by the proposed project;
- To provide a summary of the specialist studies conducted as part of the EIA;
- To assess the significant impacts associated with the project;
- To conduct a comparative analysis of the proposed alternative alignments to the transmission line;
- To describe the public participation process that was undertaken to date, as part of the EIA phase; and
- To draw conclusions regarding the EIA and to make recommendations for decision-making.

To date, the following activities have been undertaken as part of the overall EIA process:

- An application form for Scoping and EIA, in terms of Regulation 27 of Government Notice No. R385 of 21 April 2006, was submitted to the Department of Environmental Affairs (DEA) on 29 July 2009 and the following reference number was assigned to the project: **12/12/20/1568**;
- Public participation was conducted for the Scoping phase, which included the identification of Interested and Affected Parties (I&APs), project announcement (via onsite notices, Background Information Documents, newspaper advertisements and public meetings) and public review of the Draft Scoping Report;
- DEA issued approval for the Scoping Report on 03 March 2011 (Appendix A), which allowed the commencement of the EIA phase;
- Specialist studies were undertaken to address certain key environmental issues that were identified during the Scoping phase; and
- The Draft EIA Report has been compiled for review by I&APs.

In accordance with Regulation 58(2) of Government Notice (GN) No. R385 of 21 April 2006, registered I & APs are granted an opportunity to review and comment on the Draft EIA Report. To this end, copies of the report have been lodged at the following places for review from **25 October 2012 until 03 December 2012**:

Location	Address	Tel. No.
Hoërskool Brits	1 Johan Street Brits	Adolf Gouws 012 252 3228
Laerskool Broederstroom	Plot 33, Primula Street, Flora Park	087 940 9167

Madibeng Community Library	51 Van Velden Street, Brits Office Hours: Mon-Fri: 09:00-17:00 Saturdays: 09:00-12:00	012 318 9318
Schoemansville Library	Marais Street, Schoemansville	012 253 1177

The following public meetings will also be held to present the Draft EIA Report:

14 November 2012	**Venue:**	Motozi Lodge, R104 Hartbeespoort
	Time:	17:30-19:30
15 November 2012	**Venue:**	Dassie Paleis, Spoorweg St, Brits
	Time:	17:30-19:30

EXECUTIVE SUMMARY

ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION - OVERVIEW

Electricity is generated, supplied and distributed by Eskom via a network called a “Grid”. The amount of electricity being fed into the grid must always match what the customers are taking out. The amount of electricity required by the customers varies not just from day to day, but from minute to minute. As electricity demand increases, and loads are connected, more power stations and associated substations and lines need to be built to meet the electricity demands. An overview of electrify generation, transmission and distribution is provided in Section 2.1 of this Report.

BACKGROUND AND MOTIVATION: ANDERSON SUBSTATION

The Medupi integration identified the need for the new 2 x Spitskop-Dinaledi 400kV lines to transmit power further into the grid beyond Spitskop. The Dinaledi Main Transmission Substation (MTS) is the main node to link the Waterberg generation and the Mpumalanga pools. Dinaledi MTS is connected by 400kV lines to Bighorn (Rustenburg), Apollo (Pretoria) and will be connected by 2x400kV lines to Spitskop (Northam). This meshed network will be linked to the Central Grid by establishing a new 400kV line from Dinaledi MTS to a new substation called Anderson.

Over the past 15 years, load in the Pretoria area has increased by 80%. This load is anticipated to double in the next 20-30 years, to meet the future electricity requirements in this area and as part of the Tshwane Strengthening project a new substation named Anderson is proposed to feed the Hartbeespoort and neighbouring areas. This new substation will be linked to the existing Dinaledi Main Transmission Substation by a 40km 400kV line.

The proposed Anderson substation is proposed to be located in Flora Park, Gauteng. The Dinaledi – Anderson 400kV line will transmit power from Dinaledi to the Central Grid and strengthen it. This will ensure that the transmission system north of Johannesburg, Brits and Rustenburg are heavily meshed. This will improve the reliability of the Transmission system and sustain economic growth in the three areas.

PROJECT DETAILS

Description

Eskom Holdings Limited is proposing the construction of a new 400kV Transmission Line, and a proposed new 400kV Substation as part of their Tshwane Strengthening Scheme Project. The proposed powerline will be approximately 40km in length and will run between the proposed new Anderson Substation, which will be located in Flora Park (Gauteng), to the existing Dinaledi Substation which is located approximately 8km North East of Brits. The proposed powerline will be constructed in the following two Municipal Areas: Madibeng Local Municipality (North West) and the City of Tshwane Local Municipality (Gauteng). The proposed substation is earmarked for construction within the City of Tshwane Local Municipality. Please note that a separate Environmental Impact Assessment (EIA) process is being undertaken for the proposed Anderson-Dinaledi 400kV Powerline. Both EIA Processes is undertaken by Nemai Consulting. The Draft Environmental Impact Report for both of these projects will be available for Public Review simultaneously.

Location

The Dinaledi Substation is located on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ, which is located approximately 8km North East of Brits. Three site alternatives are being investigated for the proposed construction of the Anderson Substation. Two of the site alternatives are located directly to the north of NECSA, in Broederstroom, within the Madibeng Local Municipality, North West Province. The third site alternative is located in Flora Park, Gauteng. During the EIA Phase a preferred substation site will be selected based on the findings of the specialist studies, as well as the outcome of the impact assessment. The Department of Environmental Affairs (DEA) may authorise the identified preferred site alternative, the Department may authorise the other alternative, or the Department may request that additional information be submitted in order to make a decision regarding the proposed project. In the past the exact location and orientation of the substation in site were only determined once authorisation have been obtained by DEA. DEA indicated that the exact location of the proposed powerline and loop-in and loop-out lines from the substation needs to be incorporated into the Final EIR, however this information is not available for inclusion into the EIR and will only be provided once the preferred route for the transmission line has been approved. DEA provided this comment during a meeting which was held with the Department regarding the proposed project, width of the powerline study corridor and size of the substation site alternatives. Details regarding this meeting are attached to Appendix B.

Three alternative powerline routes have been identified (refer to the locality map attached to Appendix A, and to Figure 2). A 1km buffer area has been placed around each alternative route, which will form the study area/corridor to be investigated during the Scoping and EIA Phase. During the EIA Phase a preferred study area/corridor will be selected. The Department of Environmental Affairs (DEA) may authorise the identified preferred corridor, the Department may authorise one of the other corridors, or the Department may request that additional information be submitted in order to make a decision regarding the

proposed project. Once DEA authorises a corridor, a walk down survey will be undertaken by suitably qualified specialists in order to determine the exact location of the powerline.

The three site alternatives being investigated for the proposed substation is located on various properties. The details of the affected properties are provided in the table below. Each proposed substation alternative study site is approximately 1km^2 in extent.

Site	Affected Properties	Size
Site 1	Portion 82 of the Farm Weldaba 567 JQ	Total Portion = 2737ha Size of Portion location north of the R104 which is earmarked for possible substation construction = 200ha
Site 2	Portion 82 of the Farm Weldaba 567 JQ	
	Portion 65 of the Farm Welgedund 491 JQ	42.82ha
	Portion 25 of the Farm Welgedund 491 JQ	168.3ha
Site 3	Portion 76 of the Farm Schurveberg 488 JQ	58ha
	Portion 82 of the Farm Schurveberg 488 JQ	25ha
	Portion 83 of the Farm Schurveberg 488 JQ	25ha

Construction Footprint/Construction Details

A substation is defined as a high-voltage electric system facility which is used to switch generators, equipment, and circuits or lines in and out of a system. Substations are also used to change alternating current (AC) voltages from one level to another, and/or change alternating current to direct current or visa versa. Substations are generally designed to accomplish the following functions; however, not all substations are designed to perform all of these functions. Details of the construction footprint and construction details are discussed in Section 8 of this Report.

Access

Access to Portions 25 and 65 of the Farm Welgedund 491 JQ can be obtained from the R104. Access to Portion 82 of the Farm Weldaba 567 JQ and Portions 76, 82 and83 of the Farm Schurveberg 488JQ can be obtained from a dirt road leading from the R104. During the construction phase an access road will be required. Access roads to substation are normally tarred roads of 6m wide. The current access road to the property could also be utilised should the landowner agree. The exact position of the access road will be determined based on landowner agreements as well as the exact location of the substation. This access road will also be used during the operational phase to access the substation. Construction and maintenance roads required for the 400kV powerline are discussed in detail in the Anderson-Dinaledi 400kV powerline EIA Report. The access and maintenance required for the 400kV powerline will also be utilised during the construction of the loop-in and loop-out lines to and from the substation.

Roads developed for construction purposes which will not be used during maintenance procedures will be closed and rehabilitated at the end of the construction phase. Where roads needs to be developed on side slopes where the slope is steeper than 4%, cut and fill operations may be required to level the roads. Road construction and levelling will be undertaken in terms of the "Transmission Line Towers and Line Construction" (TRMSCAAC1 – Rev 3) document compiled by Eskom. This document provides certain specification for road construction and levelling to ensure that side slopes are stable.

Where construction and maintenance roads intersect with fences, gates need to be installed. Furthermore all existing infrastructure along the access and maintenance roads should be maintained in its existing condition. Access points and access roads needs to be negotiated with the landowners.

Zoning

The zoning of the three properties which could potentially be affected by the substation are not yet known. Details on the zoning will be included in the EIA Report. An application for rezoning may be required for the temporary construction camps, however, clarity on this matter needs to be obtained from the Local Municipalities.

Ownership

Windeed and Lexis Nexis searched were undertaken by Eskom to determine the landowners of the affected properties. Background information documents was delivered to the landowners and Eskom consulted telephonically with these landowners in order to obtain written consent from the landowners to undertake a Scoping and Environmental Impact Assessment and associated specialist studies on their properties. Only one landowner signed a Consent Form prior to making the Scoping Report available for Public Review.

ANDERSON SUBSTATION IDENTIFICATION OF SITE ALTERNATIVES AND ANDERSON-DINALEDI 400KV POWERLINE ROUTE DESCRIPTION

Eskom Grid Planning is responsible for establishing future electricity demands as a result of growth and development. Once an area has been identified where future growth will result in electricity constraints, methods for strengthening the grid to sustain future growth patterns is considered. The Tshwane Strengthening Scheme is one of these projects which were identified by Eskom to ensure a stable and efficient electricity supply for the future. After Eskom Grid Planning has identified the selected method to strengthen the grid, the various substations and powerlines which will be required for this project was identified.

The transmission line route selection process involves the consideration of various technical criteria to determine where a line could be located within the selected study area where grid strengthening is

required. The technical criteria used by Eskom to determine the route alignments are includes inter alia the following:

- The cost of construction of Transmission Line Routes is directly proportional to the total length, therefore the longer the route the more expensive construction becomes, the shortest route between two points area therefore preferable;
- Bend towers on a Powerline are extremely expensive due to the large quantities of steel and the large foundations required to construct such towers, therefore the least amount of bends in a line is preferable;
- The maximum angle for a bend tower is 60 degrees, therefore a line cannot just be deviated easily, and proper planning is required. For larger bends, special towers have to be constructed;
- Transmission line routes with existing access routes are preferred, as heavy vehicles and cranes are used for tower construction which needs to travel to the servitude area and specifically to tower positions; and
- When planning a route it is preferable to avoid construction on erosive land, land which is undermined where sinkholes occur or where sinkholes could occur in future, furthermore area with poor geotechnical conditions should be avoided as far as possible.

There are various other technical criteria which are considered during the route selection process of a proposed new powerline. A large scale detailed map which shows the proposed alternative routes and associated 1km study areas are attached to Appendix H.

The location of the substation is dependent on the underlying geology in the area, and also on how the substation needs to fit into the grid to strengthen the network in an area. The purpose of the Anderson-Dinaledi project is to bring a powerline to the Dinaledi and proposed new Anderson Substation in order to strengthen electricity supply to the area. Site alternatives were investigated for the proposed Anderson Substation. The Anderson Substation needs to be located to the south of the Magaliesberg in order to split the network north and south of the mountain. Refer to Figure 4-6 for a map showing the location of the alternative substation sites.

Originally, Eskom considered constructing the proposed substation within the property of the Nuclear Energy Corporation of South Africa (NECSA). There is an existing decommissioned partly demolished Anderson Substation located within the NECSA property and it was the intention to construct the new Anderson Substation on the same site as where the decommissioned partly demolished Anderson Substation is located. Various meetings was held with NECSA to discuss the possibility of the construction of the Anderson Substation within the NECSA property. Due to security reasons, limited construction space and dolomites located to the south of the NECSA property the substation cannot be constructed within the NECSA property. A summary of the discussions held with NECSA has been discussed in section 4.4.4. Based on their comments, a third site alternative was then assessed in the EIA phase.

A detailed description of the Powerline route alternatives are provided below. Please note however that a separate Scoping Report has been compiled for the Anderson-Dinaledi 400kV powerline, as separate Environmental Authorisation Processes are being undertaken for the Powerline and Substation.

PROPERTIES AFFECTED BY 1KM STUDY AREA

A list of all properties affected by the construction of the substation has been included in section 7 of this report.

LEGISLATION AND GUIDELINES CONSIDERED

A summary of the legislation and guidelines which will be considered during the Scoping and Environmental Impact Assessment Phases for this project is provided in Section 3 of this Report. Please note this project will be undertaken in terms of the Environmental Impact Assessment (EIA) Regulations of 2006, as the Application Form for undertaking the Environmental Authorisation Phase for this project was submitted to the Department of Environmental Affairs (DEA) on the 29th of July 2009. However, the new EIA Regulations which was promulgated on the 18th of June 2010 and which came into effect on the 2nd of August 2010 will be considered as part of the Scoping and EIA Phases in order to ensure that listed activities under the new EIA Regulations are considered, assessed and addressed. The EIA Regulation of 2006 and of 2010 as well as the relevant listed activities which will be triggered as part of this proposed project is addressed in Section of this Report.

SCOPING AND EIA PROCESS

The proposed Anderson substation project entails certain activities that require authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as described in Section 4.1 of this Report. The process for seeking authorisation is undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations, 2006, promulgated in terms of Section 24(5) of the NEMA.

Section 24C(2)(d)(iii) of the National Environmental Management Amendment Act (Act 62 0f 2008) states that the Minister must be identified as the competent authority in terms of subsection (1) if an activity is undertaken, or is to be undertaken, by a statutory body, excluding any municipality, performing an exclusive competence of the national sphere of government.

Section 4(1) of Regulation 385 of the Environmental Impact Assessment Regulation, 2006, states that if the Minister is the competent authority in respect of a specific application, the application must be submitted to the Department of Environmental Affairs (DEA). Eskom is a parastatal or statutory body, and therefore the decision-making authority for this project in the Department of Environmental Affairs (DEA). The Department will make a decision on whether authorisation will be granted for this project or not based on

the content of the Scoping and Environmental Impacts Assessment Reports which will be submitted to the Department for review and decision making. The Scoping Report has been approved by DEA and the EIA Report will also be submitted to the following authorities for comment:

- Department of Environmental Affairs (DEA);
- Gauteng Department of Agriculture and Rural Development (GDARD);
- North West Department of Agriculture, Conservation and Environment;
- Madibeng Local Municipality;
- City of Tshwane Local Municipality;
- South African National Roads Agency (SANRAL);
- North West Province Roads Department;
- North West Department of Housing;
- Department of Mineral Resources (DMR);
- Department of Water Affairs (DWA);
- National Department of Agriculture (NDA);
- Provincial Heritage Resources Authority, Gauteng; and
- South African Heritage Resources Authority.

Comment received from these authorities will be incorporated into the EIA Report which will be submitted to DEA for review and decision making.

The EIA Phase is the second phase of an Environmental Impact Assessment. The scoping Report which was submitted to the DEA as part of the first phase was approved on the 03 March 2011. A Scoping and EIA process consist of various phases. These phases have been illustrated in a Process Flow Diagram (Figure 2).

An application to undertake Scoping and EIA for this proposed project was submitted to DEA on the 21st of July 2009. DEA acknowledged receipt of this application from and issued the project with the following reference number: 12/12/20/1567.

THE RECEIVING ENVIRONMENT

The Draft Scoping Report provides a general regional and site description of the receiving environment, which allows for the identification of sensitive environmental features and the establishment of possible impacts which the proposed development could have on the receiving environment. Potential Specialist studies required were determined based on the findings of this section. The elements of the receiving environment which are addressed in this section include:

- Geology;
- Topography;
- Climate;
- Soils and Land Capability;
- Land Use;
- Flora;
- Fauna;
- Surface Water;
- Groundwater;
- Air Quality;
- Noise;
- Visual;
- Traffic;
- Socio-Economic Environment;
- Infrastructure and Services; and
- Archaeological and Cultural Historical.

SPECIALIST STUDIES

The necessary specialist studies triggered by the findings of the Anderson Substation Scoping process, aimed at addressing the identified key issues and compliance with legal obligations, include the following:

- Fauna and Flora Impact Assessment;
- Invertebrate Impact Assessment;
- Herpetological Impact Assessment;
- Heritage Impact Assessment;
- Socio-Economic Assessment;
- Agricultural Potential Assessment; and
- Visual Impact Assessment.

The information obtained from the respective specialist studies were incorporated into the EIA report in the following manner:

- The information was used to complete the description of the receiving environment in a more detailed and site-specific manner;
- A summary of each specialist study is contained in the report, focusing on the approach to the study, key findings and conclusions drawn;
- The evaluations performed by the specialists on the alternative routes were included in the comparative analysis to identify the most favourable option;
- The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment;

- Specialist input was obtained to address comments made by I&APs that related to specific environmental features pertaining to each specialist discipline; and
- Salient recommendations made by the specialists were taken forward to the final EIA Conclusions and Recommendations.

IMPACT ASSESSMENT

This section of the EIA Report focuses on the pertinent environmental impacts that could potentially be caused by the proposed Anderson substation during the pre-construction, construction and operation phases of the project.

The impacts to the environmental features are linked to the project activities, which in broad terms relate to the physical infrastructure (emphasis on construction and operation stages). Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities contained in GN No. R386; R387; R544; R545 and R546;
- Issues highlighted by environmental authorities;
- Findings from specialist studies; and
- Comments received during public participation.

The impacts associated with the listed activities and raised by environmental authorities are discussed on a qualitative level. In order to understand the impacts related to the project's components, the activities and environmental aspects associated with the project life-cycle were identified. The following significant environmental impacts associated with the proposed Anderson substation are assessed quantitatively and concomitant mitigation measures are provided.

CONSTRUCTION PHASE	
Feature	**Impact**
Topography	• Visual impact as a result of construction activities
Surface Water	• Impacts where access roads and the turn-in lines cross watercourses
Geology and Soil	• Erosion on steep slopes
Flora	• Damage to sensitive vegetation and habitats
Fauna	• Impacts to animals, herpetofauna and invertebrates • Impact to avifauna
Socio-economic	• Loss of income • Reduction in property value • Damage to property
Agricultural Potential	• Damage to farming practices and livestock
Archaeological and Cultural Features	• Damage to heritage resources
Transportation	• Damage to roads by heavy construction vehicles

CONSTRUCTION PHASE	
Feature	**Impact**
Aesthetics	• Clearing of vegetation. • Construction-related operations.
Tourism	• Visual and noise impacts from construction operations. • Influence to ecotourism.
OPERATIONAL PHASE	
Feature	**Impact**
Topography	• Visual impact as result of structures and infrastructures associated with the substation.
Surface Water	• Inadequate stormwater management on access roads • Damage to substation from major flood events
Geology and Soil	• Potential contamination of soil due to spillage
Flora	• Encroachment by exotic species through inadequate eradication programme. • Clearing of vegetation along maintenance road.
Fauna	• Risk to birds from collision with infrastructure and from electrocution
Socio-economic	• Loss of land with extension of existing servitude • Reduction in property value • Threats to human and animal health from EMF
Agricultural Potential	• Damage to farming practices and livestock
Transportation	• Use of maintenance roads
Aesthetics	• High visibility of substation. • Inadequate reinstatement and rehabilitation of construction footprint.
Tourism	• High visibility of lines • Loss of “sense of place”

Cumulative impacts, such as use of local road network, alien and invasive vegetation, high erodible nature of local soils and benefits to macro-economy, are also considered.

ANALYSIS OF ALTERNATIVES

Through the EIA process, the following site alternatives were identified and assessed (refer to **Section 8.1**):

- **Site Alternative 1**: Construction of the Anderson substation on Portion 82 of the Farm Weldaba 567 JQ, Broederstroom, North West Province.
- **Site Alternative 2**: Construction of the Anderson substation on portion 82 of the Farm Weldaba 567 JQ and portions 65 and 25 of the Farm Welgedund 491 JQ, Broederstroom, North West Province.
- **Site Alternative 3**: Construction of the Anderson substation on portions 76, 82 and 83 of the Farm Schurveberg 488 JQ, Flora Park, Gauteng.

PUBLIC PARTICIPATION PROCESS

A Public Participation Process was conducted as described in Regulation 58 of the EIA Regulations, 2006. The Public Participation Process included the following:

- Consultation and involvement of relevant Authorities at various levels;
- Consultation and involvement of the owners and occupiers of land adjacent to the properties earmarked for development, and within a 100m radius of the boundary of the site where the activity is to be undertaken, by hand delivering Background Information Documents (BID's) to all owners and occupiers within a 100m radius of the properties earmarked for development;
- Consultation and involvement of the municipal ward councillors of the wards in which the properties earmarked for development are located;
- Consultation and involvement of the municipality which has jurisdiction in the area;
- Consultation and involvement of any organ of state having jurisdiction in respect of any aspect of the activity;
- Compilation and placing of advertisements in local and regional newspapers;
- Compilation and placing of site notices on the properties earmarked for development;
- Compilation and distribution of Background Information Documents (BID's) to all relevant Stakeholders within a 100m radius; and
- Hosting of a Public Meeting.

The Public Participation Process is described in detail in Section 13 of this Report.

EIA CONCLUSIONS AND RECOMMENDATIONS

With the selection of the BPEO for the transmission line route, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the Environmental Management Programme (EMPr), it is believed that the significant environmental aspects and impact associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

The EIA Report recommends various conditions that are regarded as critical mitigation measures emanating from the environmental assessment process.

TITLE AND APPROVAL PAGE

TITLE: Proposed Establishment of the Anderson 400 kV Substation between the proposed new Anderson Substation (Flora Park) – Draft EIA Report

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Signature **Date**

APPROVAL

_____ _____

Signature **Date**

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
25 October 2012	Draft Copy for Public Review	0	

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APPENDICES

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1 DOCUMENT ROADMAP

This EIA Report for the proposed **Anderson 400 kV Substation** aims to satisfy the requirements stipulated in Government Notice (GN) No. R385 (21 April 2006), regulation 32(2). **Table 1** presents the document's composition, in terms of the aforementioned requirements.

Table 1: Anderson Substation EIA Report Roadmap

Chapter	Title	Correlation with G.N. No. R385	Description
2	Project Background and Motivation	R32(2)(f)	A description of the need and desirability of the proposed activity.
3	Legislation and Guidelines Considered	–	–
4	Scoping and EIA Process	–	–
5	Assumptions, Uncertainties and Gaps in Knowledge	R32(2)(l)	A description of any assumptions, uncertainties and gaps in knowledge.
6	Environmental Assessment Practitioner	R32(2)(a)	Details of – (i) the EAP who compiled the report; and (ii) the expertise of the EAP to carry out an environmental impact assessment.
7	Project Location	R32(2)(c)	A description of the location of the activity.
8	Project Description	R32(2)(b)	A detailed description of the proposed activity.
		R32(2)(c)	A description of the property on which the activity is to be undertaken and the route of the linear activity.
9	Profile of the Receiving Environment	R32(2)(d)	A description of the environment that may be affected by the activity.
10	Summary of Specialist Studies	R32(2)(i)	A summary of the findings and recommendations of any specialist reports.
12	Analysis of Alternatives	R32(2)(f)	A description identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity.
		R32(2)(h)	A description and comparative assessment of all alternatives identified during the environmental impact assessment process.
11	Impact Assessment	R32(2)(d)	A description of the manner in which the physical, biological, social, economic and cultural features of the environment may be affected by the proposed activity.
		R32(2)(g)	An indication of the methodology used in determining the significance of potential environmental impacts.
		R32(2)(j)	(j) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;

Chapter	Title	Correlation with G.N. No. R385	Description
		R32(2)(k)	An assessment of each identified potentially significant impact, including – (i) cumulative impacts; (ii) the nature of the impact; (iii) the extent and duration of the impact; (iv) the probability of the impact occurring; (v) the degree to which the impact can be reversed; (vi) the degree to which the impact may cause irreplaceable loss of resources; and (vii) the degree to which the impact can be mitigated.
13	Public Participation	R32(2)(e)	Details of the public participation process.
14	EIA Conclusions and Recommendations	R32(2)(m)	An opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.
		R32(2)(n)	An environmental impact statement
Appendix E		R32(2)(o)	A draft Environmental Management Plan.
Appendix D		R32(2)(p)	Copies of any specialist reports and reports on specialised processes.
N/A	N/A	R32(2)(q)	Any specific information that may be required by the competent authority.

2 PROJECT BACKGROUND AND MOTIVATION

2.1 Setting the Scene

Eskom Holdings Limited is proposing the construction of a new 400kV Transmission Line, and a proposed new 400kV Substation as part of their Tshwane Strengthening Scheme Project. The proposed powerline will be approximately 40km in length and will run between the proposed new Anderson Substation, which will be located to the north of the Nuclear Energy Corporation of South Africa (NECSA), located in Broederstroom, to the existing Dinaledi Substation which is located approximately 8km North East of Brits.

Over the past 15 years, load in the Pretoria area has increased by 80%. This load is anticipated to double in the next 20-30 years, and to meet the future electricity requirements in this area and as part of the Tshwane Strengthening project the substation named Anderson is proposed to feed the Hartebeespoort and neighbouring areas and will be linked to the existing Dinaledi MTS by an approximate 40 km 400 kV line.

The Anderson substation together with the a new proposed Anderson Dinaledi 400kV line will transmit power from Dinaledi to the Central Grid and strengthen it. This will ensure that the transmission system north of Johannesburg, Brits and Rustenburg are heavily meshed, which will improve the reliability of the Transmission system and sustain economic growth in the three areas.

Note: This report only focuses on the Anderson substation. A separate EIA process is being conducted for the proposed Anderson-Dinaledi 400kV transmission line.

2.2 Transmission and Distribution of Electricity

Electricity is generated, supplied and distributed by Eskom via a network called a “Grid”. The amount of electricity being fed into the grid must always match what the customers are taking out. The amount of electricity required by the customers varies not just from day to day, but from minute to minute. As electricity demand increases, and loads are connected, more power stations and associated substations and lines need to be built to meet the electricity demands. A diagram of the Eskom Supply Chain is provided in Figure 1 below.

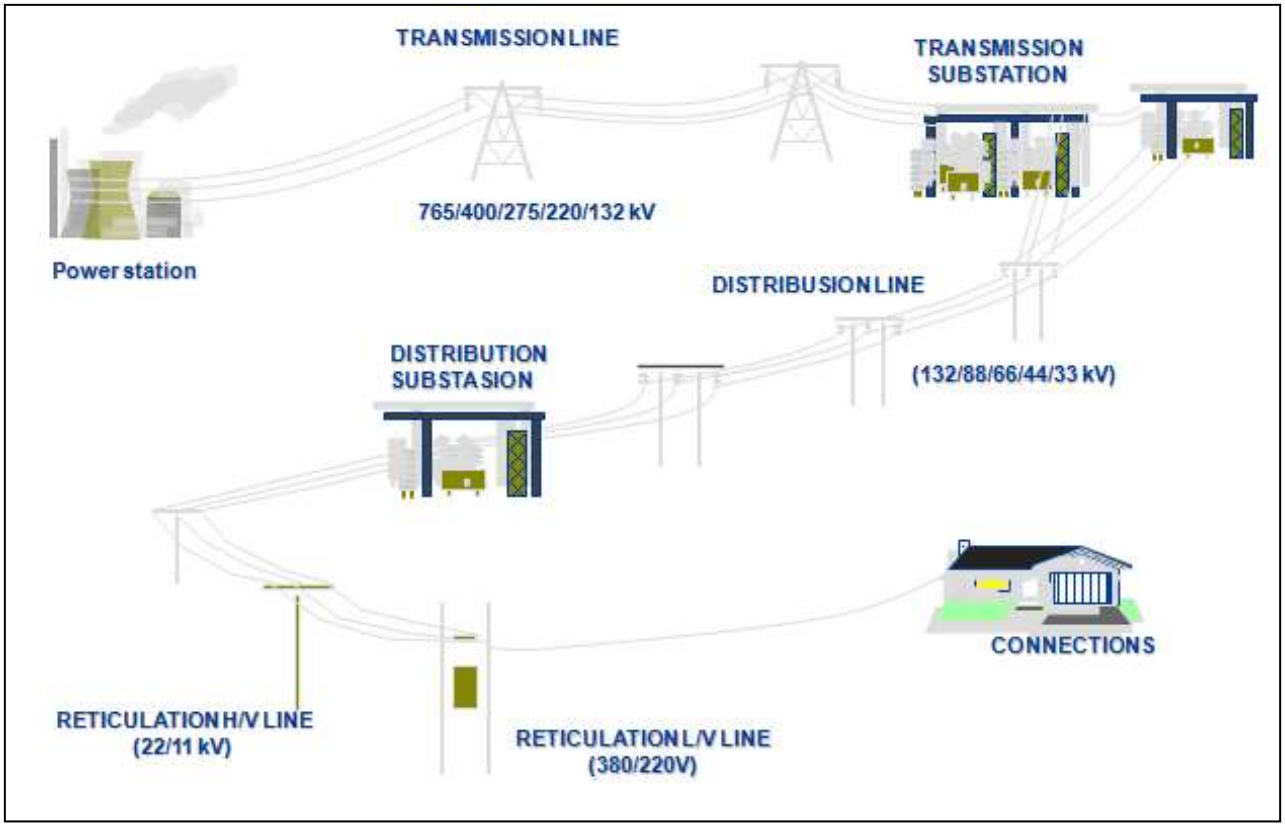


Figure 1 - Eskom Supply Chain

Eskom produces electricity at power stations. Most of the power stations in South Africa are located near coal mines in Mpumalanga and the Waterberg area in the Northern Province. The largest load centres are located are located in Gauteng, the Western Cape and Kwa-Zulu Natal.

After electricity is generated at the power station, it is sent from the power stations to the load centres via high voltage power lines. As electricity leaves the power station, the electricity is boosted by a step-up transformer to voltages such as 400kV, 275kV and 132kV. Electricity is “stepped down” to voltages used for distribution to customers.

3 LEGISLATION AND GUIDELINES CONSIDERED

3.1 Legislation

The legislation that has possible bearing on the proposed Anderson 400 kV Substation line project is captured in the table to follow. A more detailed overview of relevant legislation was provided in the Scoping Report.

Please note this project will be undertaken in terms of the Environmental Impact Assessment (EIA) Regulations of 2006, as the Application Form for undertaking the Environmental Authorisation Phase for this project was submitted to the Department of Environmental Affairs (DEA) on the 29th of July 2009. However, the new EIA Regulations which was promulgated on the 18th of June 2010 and which came into effect on the 2nd of August 2010 was considered as part of the Scoping and EIA Phases in order to ensure that listed activities under the new EIA Regulations are considered, assessed and addressed.

Note: this list does not attempt to provide an exhaustive explanation, but rather an identification of the most appropriate sections from pertinent pieces of legislation.

Table 2: Environmental Statutory Framework

Legislation	Relevance
Constitution of the Republic of South Africa, (No. 108 of 1996)	• Chapter 2 – Bill of Rights. • Section 24 – environmental rights.
National Environmental Management Act (No. 107 of 1998)	• Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment). • Section 28 – Duty of care and remediation of environmental damage. • Environmental management principles. • Authorities – National: Department of Environmental Affairs (DEA); Provincial: North West Department of Agriculture, Conservation, Environment and Rural Development (NWDACERD) and Gauteng Department of Agriculture and Rural Development (GDARD)
National Water Act (No. 36 of 1998)	• Chapter 3 – Protection of water resources. • Section 19 – Prevention and remedying effects of pollution. • Section 20 – Control of emergency incidents. • Chapter 4 – Water use. • Watercourse crossings. • Authority – Department of Water Affairs (DWA).
Environment Conservation Act (No. 73 of 1989):	• Environmental protection and conservation. • Section 25 – Noise regulation. • Section 20 – Waste management. • Authority – DEA
National Environmental Management Air	• Air quality management • Section 32 – dust control.

Legislation	Relevance
Quality Act (No. 39 of 2004)	• Section 34 – noise control. • Authority – DEA.
National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004)	• Management and conservation of the country's biodiversity. • Protection of species and ecosystems. • Authority – DEA.
National Environmental Management: Protected Areas Act (No. 57 of 2003)	• Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes.
National Environmental Management: Waste Act (No. 59 of 2008)	• Chapter 5 – licensing requirements for listed waste activities (Schedule 1). • Authority – provincial (general waste) or national (hazardous).
National Forests Act (No. 84 of 1998)	• Section 15 – authorisation required for impacts to protected trees. • Authority – Department of Agriculture, Forestry and Fisheries
Minerals and Petroleum Resources Development Act (No. 28 of 2002)	• Permit required for borrow pits. • Authority – Department of Mineral Resources (DMR).
Occupational Health & Safety Act (No. 85 of 1993)	• Provisions for Occupational Health & Safety. • Authority – Department of Labour.
National Heritage Resources Act (No. 25 of 1999)	• Section 34 – protection of structure older than 60 years. • Section 35 – protection of heritage resources. • Section 36 – protection of graves and burial grounds. • Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m^2 in extent. • Authority – South African Heritage Resources Agency (SAHRA), Provincial Heritage Resources Agency.
Conservation of Agricultural Resources Act (No. 43 of 1983)	• Control measures for erosion. • Control measures for alien and invasive plant species. • Authority – Department of Agriculture.
National Road Traffic Act (No. 93 of 1996)	• Authority – Department of Transport
Tourism Act of 1993	• Authority – South African Tourism Board

3.1.1 Environmental Impact Assessment Regulations

The Environmental Impact Assessment (EIA) Regulations, 2006, promulgated in terms of Section 24(5) of the National Environmental Management Act ([NEMA], Act 107 of 1998) are divided into two Schedules, R 386 and R 387. R 386 defines activities which will trigger the need for a Basic Assessment and R 387 defines activities which trigger an Environmental Impact Assessment (EIA) process. If activities from both schedules are triggered, then an EIA process will be required.

In order to determine which Environmental Authorisation Process will be required for the proposed project, the EIA Regulations, 2006 was consulted. During the project application phase, the activities as tabled below were identified as activities which could potentially be triggered by the proposed development.

Activities were broadly selected, and therefore some of the activities identified will no longer be applicable. The activities which will not longer be applicable have been shaded in grey.

Relevant Government Notice	Activity	Description	Applicability to Project
R. 387 of 21 April 2006	**1(a)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for – the generation of electricity where – (i) the electricity output is 20 megawatts or more; or (ii) the elements of the facility cover a combined area in excess of 1 hectare.	Not Applicable
R. 387 of 21 April 2006	**1(l)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for – The transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more.	The project involves the construction of a 400kV Transmission Line
R. 387 of 21 April 2006	**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.	This activity was considered as construction of a powerline will occur within a 55m wide servitude over a distance of approximately 40km. Therefore the total project area will be approximately 220ha in extent. However, this activity is not applicable for linear developments and is therefore excluded as a listed activity.
R. 386 of 21 April 2006	**1 (k)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for – the bulk transportation of sewage and water, including storm water, in pipelines with – (i) an internal diameter of 0.36 meters or more; or (ii) a peak throughput of 120 litres per second or more.	The proposed substation will include ablution facilities and stormwater infrastructure. Details regarding this infrastructure are not yet known, therefore this activity is being considered.
R. 386 of 21 April 2006	**1(p)**	The construction of facilities or infrastructure, including associated structures or infrastructure for the temporary storage of hazardous waste.	During the construction phase above ground temporary diesel storage tanks may be required at the construction camps, as well as a temporary grease/chemical store.
R. 386 of 21 April 2006	**7**	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or	Diesel storage tanks may be erected at the construction camps

Relevant Government Notice	Activity	Description	Applicability to Project
		paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.	during the construction phase. The size of these tanks is not known.
R. 386 of 21 April 2006	**12**	The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	It is not yet clear exactly where the proposed powerline will be located as a full 1km study area and alternative routes will be considered for this proposed project. This activity has therefore been included. Authorities have indicated in the past that this activity is not applicable for linear projects, however, should transformation of vegetation occur within the proposed 55m servitude over a long distance within a sensitive area, then this activity may be triggered.
R. 386 of 21 April 2006	**14**	The construction of masts of any material of type and of any height, including those used for telecommunications broadcasting and radio transmission, but excluding - a) masts of 15m and lower exclusively used by (i) radio amateurs; or (ii) for lighting purposes. b) flagpoles; and c) lightning conductor poles.	It is not clear whether pylon structures are included or excluded from this activity, therefore this activity have been included.
R. 386 of 21 April 2006	**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.	Maintenance roads will be required in order for Eskom to access the substation for maintenance purposes. Details on the maintenance roads are not yet known as the exact powerline location is not yet known. It is not anticipated that any of these maintenance roads will be wider than 4m.

In terms of the EIA Regulations of 2006, the establishment of the proposed Anderson substation will trigger activities from both R 386 and R 387, and therefore the establishment of the proposed Substation is subject

to a Scoping and Environmental Impact Assessment Process. The Scoping and EIA phases are detailed below in Section 4.

3.1.2 Environmental Impact Assessment Regulations, 2010

The Environmental Impact Assessment (EIA) Regulations, 2010, promulgated in terms of Section 24(5) of the National Environmental Management Act ([NEMA], Act 107 of 1998) are divided into three Schedules, R 544, R 545 and R 546.

Schedule R544 defines activities which will trigger the need for a Basic Assessment and R 545 defines activities which trigger an Environmental Impact Assessment (EIA) process. If activities from both schedules are triggered, then an EIA process will be required. Regulation 546 defines certain additional listed activities per province for which a Basic Assessment would be required.

Listed activities from these Regulations which will be triggered as part of the proposed powerline project are provided in the table below.

Relevant Government Notice	Activity	Description	Applicability to Project
R. 544 of 18 June 2010	**13**	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres;	Diesel storage tanks may be erected at the construction camps during the construction phase. The size of these tanks is not known.
R. 544 of 18 June 2010	**22**	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres, or for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.	Maintenance roads will be required in order for Eskom to access the substation for maintenance purposes. Details on the maintenance roads are not yet known as the exact powerline location is not yet known. It is not anticipated that any of these maintenance roads will be wider than 4m.
R. 545 of 18 June 2010	**8**	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.	The project involves the construction of a 400kV substation.

Relevant Government Notice	Activity	Description	Applicability to Project
R. 546 of 18 June 2010	**4**	The construction of a road wider than 4 metres with a reserve less than 13,5 metres **(b) In North West :** i. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas (Terrestrial Type 1 and 2 and Aquatic Type 1) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from a biosphere reserve. ii. In urban areas: (aa) Areas zoned for use as public	Access and construction / maintenance roads will be required in order for Eskom to access the substation for construction and maintenance purposes. Alternative substation sites are located within the Magaliesberg Natural Area which forms part of the greater Magaliesberg Protected Environment.

Relevant Government Notice	Activity	Description	Applicability to Project
		open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; (cc) Natural heritage sites.	
R. 546 of 18 June 2010	**12**	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (a) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (b) Within critical biodiversity areas identified in bioregional plans; (c) Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuary, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas.	Vegetation clearing within the servitude may be required. The extent of vegetation clearance is not yet known.

In terms of the EIA Regulations of 2010, a Scoping and Environmental Impact Assessment Process is required for the proposed Anderson Substation.

3.2 Guidelines

The following guidelines were considered during the preparation of the EIA Report:

- Guideline in Alternatives: NEMA Environmental Impact Assessment Regulations (prepared by the Western Cape Department of Environmental Affairs and Development Planning, 2006);
- Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005. Integrated Environmental Management Guideline Series (DEAT, 2005a); and
- Guideline 4: Public Participation, in support of the EIA Regulations. Integrated Environmental Management Guideline Series (DEAT, 2005).

3.3 Environmental Authorisations Required

From the relevant legislation listed in **Section 3.1**, the following environmental authorisations will be required for the proposed Anderson 400 kV substation:

1. Approval required from DEA for listed activities associated with the project. Scoping and EIA conducted under NEMA, in accordance with the EIA Regulations (Government Notice No. R385, R386 and R387 of 21 April 2006).
2. If applicable, permit to be obtained under National Forests Act (No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed.
3. If applicable, permit to be obtained from SAHRA under the National Heritage Resources Act (No. 25 of 1999) if heritage resources are to be impacted on.
4. If applicable, authorisation from DWA, in terms of section 21(i) [and potentially 21(c)] of the National Water Act (No. 36 of 1998), for any activities (including the positioning of the towers) within the extent of a watercourse (i.e. 1:100 year floodline or the delineated riparian habitat, whichever is greatest).
5. If applicable, Environmental Management Programme to be submitted for approval to DMR for burrow pits, under the Minerals and Petroleum Resources Development Act (No. 28 of 2002).

3.4 Regional Plans, Policies and Programmes

The following regional plans were considered during the execution of the EIA:

- Spatial Development Frameworks(where available);
- Integrated Development Plans;
- Relevant provincial, district and local policies and strategies.
- The Gauteng Ridges Guideline Policy – relates to the protection of ridges within the Gauteng Province. Sections of the transmission line routes traverse the Magaliesberg and Witwatersberg.

3.5 Energy Sector Strategic Documents

The EIA further considered Energy Sector Strategic Documents, including the following:

- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- Eskom's Transmission Development Plan;
- Integrated Energy Plan;
- Integrated Strategic Electricity Planning (ISEP);
- Electricity Regulation Act (Act 4 of 2006) as amended;
- National Electricity Response Plan (NERP) (2008);
- National Guidelines on Environmental Impact Assessment for facilities to be included in the Electricity Response Plan (2008); and
- Environmental Impact Assessment Guidelines for transmission lines within the Southern African Power Pool Region (1999).

3.6 Magaliesberg Protected Environment EMF

The main objectives of the Magaliesberg Protected Environment (MPE) Environmental Management Framework (EMF) include the following:

- To maintain and enhance the contribution of the MPE to water quality and quantity to the Crocodile West Water Management Area and specifically to the Elands and Upper Crocodile Sub-management Areas;
- To maintain and promote the contribution of the MPE to the conservation of biodiversity in South Africa, both in terms of ecosystem integrity and species diversity;
- To protect and manage all types of heritage resources within the MPE as an important physical and eco-tourism asset;
- To maintain and enhance the visual and aesthetical character of the MPE with a view to protect the eco-tourism potential of the mountain;
- To manage and build environment and development activities in a sustainable manner, without reducing the aesthetic appeal or ecosystem function of the MPE; and
- To optimize potential economic and social development opportunities compatible with the MPE, and to conserve the MPE's ability to provide and support these opportunities.

The EMF and Plan for the MPE is aimed at addressing the requirements of Section 71 of the EIA Regulations of Government Notice R385 (21 April 2006), as well as the basic components of a Management Plan for a protected area as described in Section 41 of the National Environmental Management: Protected Areas Act (Act 57 of 2003).

The following sub-objectives stipulated in the EMF are of particular importance in terms of the proposed Anderson 400 kV substation:

- **Objective 1.1:** To maintain and enhance water quality emanating from the MPE;
- **Objective 1.3:** To protect and conserve special water features within the MPE (such as mountain streams, wetlands, and natural springs);

- **Objective 1.4:** To maintain the functionality of wetlands in the MPE;
- **Objective 2.1:** To conserve the ecological integrity of ecosystems of the mountain;
- **Objective 2.2:** To conserve indigenous threatened species and other species of high conservation priority in the mountain;
- **Objective 2.3:** To conserve the rich indigenous biodiversity of the mountain;
- **Objective 3.2:** To prohibit the alteration or destruction of heritage resources and cultural landscapes resulting from uncontrolled and unplanned development within and immediately adjacent to the MPE;
- **Objective 4.3** To prohibit the development of bulk infrastructure such as power lines, reservoirs and bulk water supply pipelines, within or traversing the MPE;
- **Objective 5.1:** To manage the intensity of development around the MPE in order to limit the "edge effect" on the MPE boundaries; and
- **Objective 5.5:** To prohibit the development of bulk infrastructure such as power lines, reservoirs and bulk water supply pipelines, within or traversing the MPE.

The construction of bulk infrastructure (including power lines) is regarded as an incompatible activity in the MPE. The MPE EMF recommends that all applications for development activities within the MPE not classified as "compatible activities" be subject to a full EIA process. The EMF further recommends that the EIA reports for all applications in the EMF area should include at least specialist studies which will address the key aspects as outlined in the objectives for the MPE. This is the case with this EIA Report for the Anderson 400 kV Substation, where the specialists have considered the recommendations included in the EMF.

4 SCOPING AND EIA PROCESS

4.1 Environmental Assessment Triggers

As noted in **Section 3.1.1**, the Anderson 400 kV Substation project triggers activities under GN No. R386 and R387 of 21 April 2006, and thus a Scoping and EIA process that conforms to the requirements stipulated in GN No. R385 of 21 April 2006 is required.

4.2 Environmental Assessment Authorities

Section 24C(2)(d)(iii) of the National Environmental Management Amendment Act (Act 62 of 2008) states that the Minister must be identified as the competent authority in terms of subsection (1) if an activity is undertaken, or is to be undertaken, by a statutory body, excluding any municipality, performing an exclusive competence of the national sphere of government.

Section 4(1) of GN No. R385 of the EIA Regulations (2006) states that if the Minister is the competent authority in respect of a specific application, the application must be submitted to the Department of Environmental Affairs (DEA). Eskom is a parastatal or statutory body, and therefore the decision-making authority for this project is DEA. The Scoping and EIA Report will also be submitted to the following authorities for comment:

- Gauteng Department of Agriculture and Rural Development (GDARD);
- North West Department of Agriculture, Conservation, Environment and Rural Development (DACERD);
- Department of Water Affairs (DWA);
- National Department of Agriculture (NDA);
- Provincial Heritage Resources Authority, Gauteng (PHRA-G);
- South African Heritage Resources Agency (SAHRA);
- Madibeng Local Municipality (Environmental and Town Planning Departments); and
- City of Tshwane Metropolitan Municipality (Environmental and Town Planning Departments).

Comments received from these authorities will be incorporated into the EIA Report which will be submitted to DEA for review and decision making.

4.3 Scoping Process

The following milestones were reached during the completion of the preceding Scoping process (as contemplated in regulation 28(e) of GN No. R. 385 of 21 April 2006):

1. An application form for Scoping and EIA, in terms of Regulation 27 of GN No. R. 385 of 21 April 2006, was submitted to DEA on 29 July 2009 and the following reference number was assigned to the project: 12/12/20/1568;
2. Meeting held with DEA on 08 July 2011 to confirm EIA study area and public participation approach.
3. A database of Interested and Affected Parties (I&APs) was compiled, which included (amongst others):
    a. Owners and occupiers of land directly affected by the centreline of each alternative route; and
    b. Key affected stakeholders (e.g. mines, Nuclear Energy Corporation South Africa);
    c. Parastatals (e.g. SANRAL, Transnet);
    d. Local authorities (City of Tshwane Metropolitan Municipality and Madibeng Local Municipality);
    e. Commentary authorities; and
    f. Environmental groups (e.g. Magaliesberg Protection Association, Bird Life Africa, Hartbeespoort Environment).
4. I&APs were notified via onsite notices, Background Information Documents (BIDs), newspaper advertisements and meetings of the proposed project in October 2010;
5. A Scoping-level impact assessment was completed to identify potentially significant environmental issues for detailed assessment during the EIA phase;
6. Feasible alternatives were screened and identified for further appraisal during the EIA phase;
7. A Comments and Response Report was compiled (which was updated during the execution of the Scoping process), which summarised the salient issues raised by I&APs and the project team's response to these matters;
8. A Plan of Study, which explains the approach to be adopted to conduct the EIA, was prepared in accordance with Regulation 29(1)(i) of GN No. R. 385 of 21 April 2006; which included *inter alia* the Terms of Reference for the identified specialist studies;
9. A Draft Scoping Report, which conformed to Regulation 29 of GN No. R. 385 of 21 April 2006, was compiled;
10. The Draft Scoping Report was lodged for public review from 08 November 2010 until 15 December 2010;
11. The final Scoping Report was submitted to DEA in December 2010;
12. DEA issued approval for the Scoping Report on 03 March 2011 (refer to ***Appendix A***), which allowed the commencement of the EIA phase.

A meeting was held with DEA on the 8th of July 2010 during which DEA to discuss the Public Participation process to be followed, and whether DEA finds the 1km study corridor acceptable for the proposed powerline alternatives, and whether a 1x1km study area will be allowed for the proposed substation. Details on the outcome of the meeting with DEA are provided in the Issues and Response Table provided in Section 6 of this Report. The minutes of the meeting with DEA is attached to Appendix B.

4.4 EIA Methodology

4.4.1 Need and Desirability

In terms of Regulation 32(2)(f) of GN No. R385 (21 April 2006), this section discusses the need and desirability of the project.

Note that the questions raised in the Guideline on Need and Desirability (DEA&DP, 2009) was used to complete this section.

Table 3: Need and Desirability of the Project

No.	Question	Response
NEED ('timing')		
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	**Section 2.1** explains the strategic need for the proposed Anderson substation project in an endeavour to ensure the reliability of the transmission system north of Johannesburg, Brits and Rustenburg.
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	Any future development would need to take cognisance of the servitude restrictions.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate)	The Anderson substation will strengthen the Central Grid and sustain economic growth in the Johannesburg, Brits and Rustenburg areas.
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	Current services are sufficient.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	Planning consideration to be given to upgrading of electricity distribution and reticulation infrastructure.
6.	Is this project part of a national programme to address an issue of national concern or importance?	Strengthening of Central Grid will benefit the reliability of the transmission system north of Johannesburg, Brits and Rustenburg
DESIRABILITY ('placing')		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	Through the comparative analysis (**Section 12**), the BPEO was selected.

No.	Question	Response
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and SDF as agreed to by the relevant authorities?	Alternative 1 and 2 poses conflict in terms of the Magaliesberg Protected Environment EMF. Alternative 1 and 2 are located within the Magaliesberg Natural Area and important bird area. Alternative 3 is located within a Critical Biodiversity Area (CBA) and an Ecological Sensitive Area (ESA) as identified in the Gauteng Conservation Plan.
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	The proposed substation for alternative 1 and 2 is regarded as an incompatible activity in the MPE. The MPE EMF recommends that all applications for development activities within the MPE not classified as “compatible activities” be subject to a full EIA process. The EMF further recommends that the EIA reports for all applications in the EMF area should include at least specialist studies which will address the key aspects as outlined in the objectives for the MPE. This is the case with this EIA Report for the Anderson 400 kV substation, where the specialists have considered the recommendations included in the EMF.
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	For alternative 1 and 2, the proposed new substation, due to its close proximity to Hartbeespoort dam and also falling within the 5km buffer of the Pelindaba Nuclear Facility, is considered as one of the strategic important areas in North West province. The vegetation types associated with the new proposed Anderson substation are the Andesite Mountain Bushveld and Gauteng Shale Mountain Bushveld, which in terms of its conservation status are listed as Least Threatened and Vulnerable respectively. For alternative 3, the study area falls within the savanna biome and has been categorised as Andesite Mountain Bushveld vegetation unit. There are no Threatened Terrestrial Ecosystems recorded on the proposed site. Gauteng Conservation Plan 3.3 described the study area as falling within a Critical Biodiversity Area (CBA) and an Ecological Sensitive Area (ESA). The CBAs in the study area is Irreplaceable Area but due to grazing and anthropogenic activities such as human settlements, the study area is not in pristine condition.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	See point 10 above.

No.	Question	Response
12.	How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	• Refer to impact assessment contained in **Section 11**. • Potential risks associated with electromagnetic fields – see ***Appendix C*** (Electric and Magnetic Fields from Overhead Powerlines – A Summary of Technical and Biological Aspects). • Potential impacts during construction phase to be managed through EMP.
13	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs? *[Opportunity costs = the net benefit that would have been yielded by the next best alternative, e.g. if farming is the next best alternative for a piece of land, then the foregone benefit of losing the farming option will be the opportunity cost of any other land use]*	See point 10 above
14	Will the proposed land use result in unacceptable cumulative impacts?	• See **Section 11.11**. • It is believed that the cumulative impacts can be mitigated to a satisfactory level.

4.4.2 Formal Process

Key objectives for the EIA phase include the following:

- Carry out relevant specialist studies;
- Conduct public participation;
- Assess receiving environment;
- Undertake quantitative assessment of significant environmental impacts and identify concomitant mitigation measures;
- Evaluate alternative alignments through a comparative analysis; and
- Compile EIA Report in accordance with the requirements stipulated in GN No. R385 of 21 April 2006, regulation 32(2); for review by I&APs. Refer to **Section 1** for the document's composition, in terms of the regulatory requirements.

An outline of the Scoping and EIA process for the proposed Anderson substation is provided in **Figure 2**.

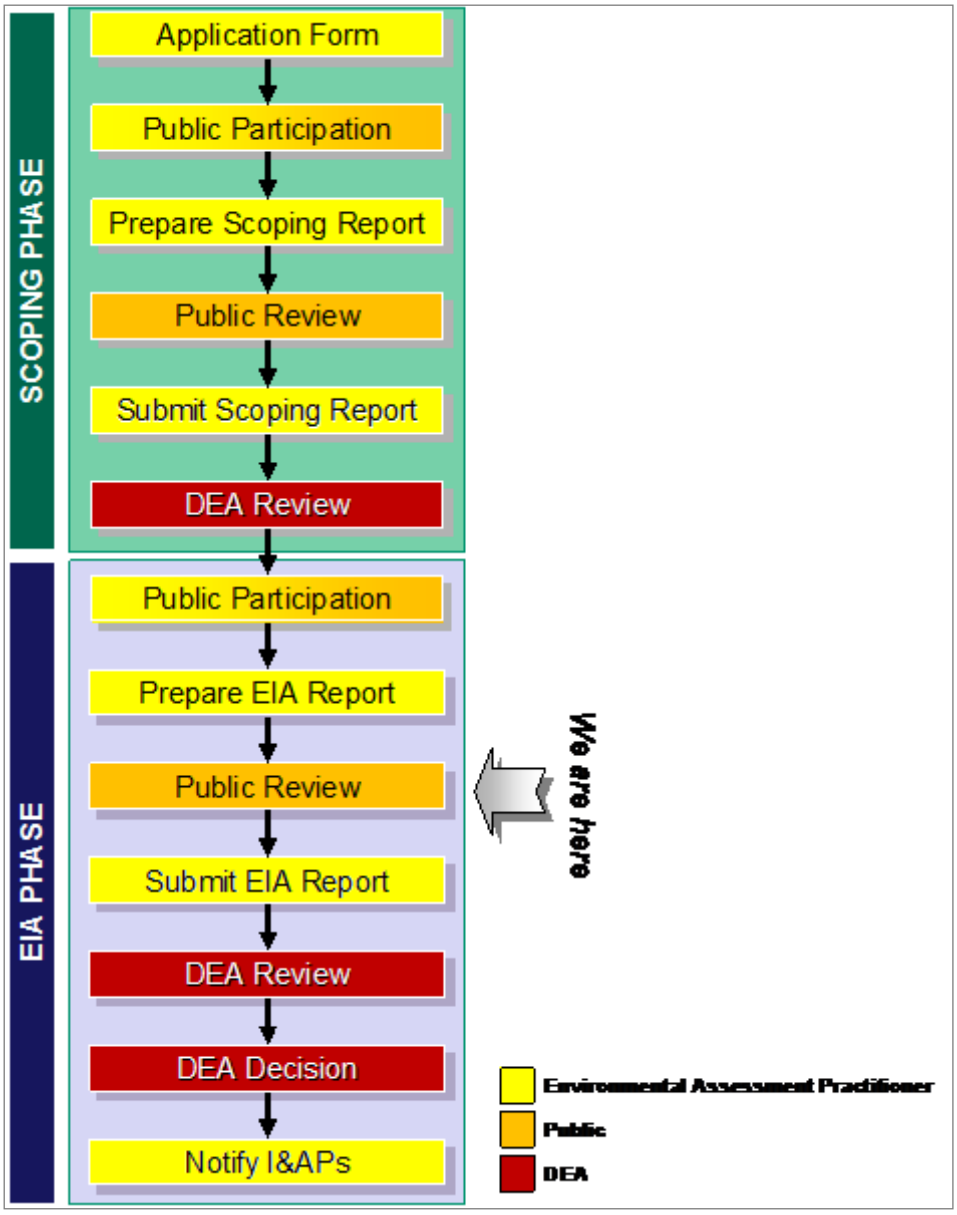


Figure 2: Outline of Scoping and EIA process

4.4.3 Alignment with the Plan of Study

The Plan of Study, which was contained in the Scoping Report and was approved by DEA, explained the approach to be adopted to conduct the EIA for the proposed Anderson 400 kV substation. The manner in which the EIA Report addresses the requirements of the Plan of Study is tabulated below.

Table 4: Alignment of EIA Report with Plan of Study

Plan of Study Requirement	EIA Report Reference
Stakeholder engagement during the EIA - Public participation to include the following (amongst others):	**Section 13**

<table>
<tr><th>Plan of Study Requirement</th><th>EIA Report Reference</th></tr>
<tr><td>

Notification of decision regarding the Scoping Report and commencement of the EIA phase;
Registration of any additional stakeholders;
Notification of the review of the Draft EIA Report;
Convening public meetings;
On-going communication with authorities and stakeholders throughout EIA process; and
Convening steering committee meetings, if required, throughout the EIA phase.

</td><td></td></tr>
<tr><td>Conduct specialist studies -
Identified specialist studies to be conducted to satisfy pre-determined objectives.
<table>
<tr><th>Study Type</th><th>Status</th></tr>
<tr><td>Vegetation Assessment</td><td rowspan="4">Study completed. Combined assessment entitled Flora And Fauna Assessment (Appendix D1)</td></tr>
<tr><td>Fauna Assessment</td></tr>
<tr><td>Avifaunal Assessment</td></tr>
<tr><td>Herpetological Assessment</td></tr>
<tr><td>Invertebrate Assessment</td><td>Detailed study not deemed necessary.</td></tr>
<tr><td>Soil and Land Capability Assessment</td><td>Detailed study not deemed necessary.</td></tr>
<tr><td>Geological and Geotechnical Investigation</td><td>See Appendix D2.</td></tr>
<tr><td>Stormwater Management Plan</td><td>Study forms part of the engineering discipline, and will be conducted during the detailed design stage.</td></tr>
<tr><td>Heritage Impact Assessment</td><td>See Appendix D3.</td></tr>
<tr><td>Electromagnetic Survey</td><td>See Appendix C</td></tr>
</table>
</td><td>Sections 10</td></tr>
<tr><td>Environmental Impact Assessment -
Assess pertinent environmental issues identified during Scoping through quantitative approach and identify suitable mitigation measures.</td><td>Sections 11</td></tr>
<tr><td>EIA Report -
EIA Report to satisfy the minimum requirements stipulated in Regulation 32 of GN No. R. 385 of 21 April 2006</td><td>Section 1</td></tr>
<tr><td>Environmental Management Plan -
Environmental Management Plan (EMP) to satisfy the minimum requirements stipulated in Regulation 34 of GN No. R. 385 of 21 April 2006.</td><td>Appendix E</td></tr>
</table>

The EIA included the following deviations from the Plan of Study:

- The EIA phase does not conform to the timeframes mentioned in the Plan of Study, due to the dynamic nature of the planning and EIA process for the proposed power line and substation. An additional alternative site for the proposed Anderson Substation (12/12/20/1568) was identified through public participation, which needed to be assessed from a technical and environmental perspective. This caused a delay in the execution of the EIA phase.
- The following additional specialist studies were undertaken, over and above what was indicated in the Plan of Study:
  - Visual Impact Assessment (Appendix D5)
  - Socio-Economic Impact Assessment (Appendix D6).

4.4.4 Key Amendments / Clarification of Information from the Scoping Report

Based on comments received from I & AP during the scoping phase, a third site alternative has now been included in the EIR for assessment (see figure 3).

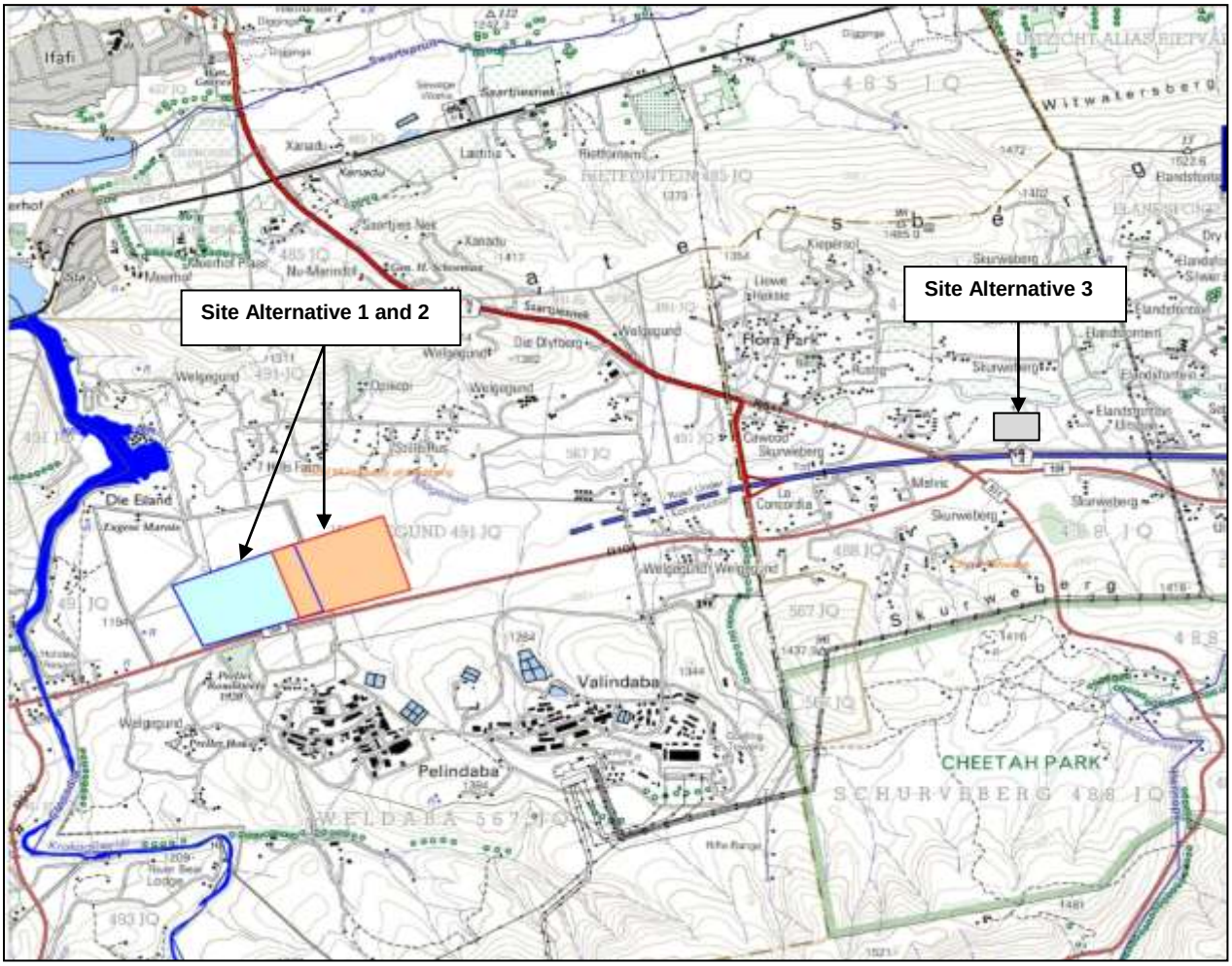


Figure 3: Map showing the three alternative sites for the Anderson substation

The consideration of a new site alternative was triggered by findings of the specialist studies and comments received by Nuclear Energy Corporation South Africa (NECSA) and The North West Department of Transport.

Following several discussions with NECSA, on Monday the 16th of November 2009, Mr Cairns Bain from NECSA informed Nemai on the outcome of the CEO meeting. This response included:

- The Executive Management Committee (EMC) considered the information and decided that Eskom needs to directly communicate with the NECSA CEO and submit a formal letter outlining their needs before any in principle decision can be made; and
- The technical team considered the new information submitted in the updated substation description, which indicated that the footprint of the proposed substation will be 600 X 600 meters. NECSA indicated that old

substation site was only 350m by about 100m. Indicated that because of topography considerations this site would not easily allow for such expansion.

Eskom and NECSA then considered options of establishing the Substation outside of the NECSA high security area, but still within the NECSA property. However, no suitable substation site location existed when eliminating the NECSA high security area and dolomitic areas.

Furthermore, site alternative 1 and 2 are proposed to be located within the M4 road reserve which may hamper any future activities on the widening of that road. As such a 3rd site alternative has been included in this EIR for assessment.

4.4.5 Screening and Assessment of Alternatives

Various alternatives to meeting the project's objectives were considered during Scoping, which included options for the different site locations and the "no go" option.

A comparative analysis of the alternatives (**Section 12**) was also conducted from environmental (including specialist input) and technical perspectives, which included a systematic comparison of the implications of the alternative routes to enable the selection of a Best Practicable Environmental Option (BPEO).

4.4.6 Impact Prediction

Refer to **Section 11** for the impact assessment of the proposed substation.

The potential environmental impacts associated with the project were identified through an appraisal of the following:

- Proposed substation sites, which included site investigations and a desktop evaluation with a Geographical Information System (GIS) and aerial photography;
- Project infrastructure and design considerations;
- Activities and associated environmental aspects (i.e. causes of potential impacts) related to the project life-cycle (i.e. pre-construction, construction, operation and decommissioning);
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (e.g. MPNE);
- Input received during public participation from I&APs;
- Findings of specialist studies;
- Legal and policy context; and
- Cumulative impacts.

The Scoping exercise aimed to identify significant environmental impacts for further consideration and prioritisation during the EIA stage. Note that "significant impacts" relate to whether the effect (i.e. change to

the environmental feature / attribute) is of sufficient importance that it ought to be considered and have an influence on decision-making. During Scoping, the impact prediction was executed on a qualitative level, where the main impacts where distilled by considering factors such as the nature, extent, magnitude, duration, probability and significance of the impacts.

During the EIA stage a detailed assessment is conducted to identify significant impacts, which are evaluated via contributions from I&APs, the project team and requisite specialist studies, and through the application of the impact assessment methodology contained in **Section 11.1.5**. Suitable mitigation measures are proposed to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and are included in the Environmental Management Plan (EMP) (see ***Appendix E***).

4.5 Servitude Negotiation and the EIA Process

Eskom will require a servitude associated with the substation and connecting transmission lines. Transmission lines are constructed and operated within a servitude (55 m wide for 400 kV lines) that is established along the entire length of the line. Within this servitude, Eskom Transmission has certain rights and controls that support the safe and effective operation of the line. The process of achieving the servitude agreement is referred to as the Servitude Negotiation Process (refer to ***Appendix F***).

The EIA process has become important in the initial planning of the proposed substation. For this reason, it is usually preferable that the negotiation process begins after the EIA has been completed. At this stage there is greater confidence that the proposal would be supported by environmental authorisation. However, it may be required that the negotiation process begins earlier, and may begin before, or run in parallel with the EIA process. This may be due to tight timeframes for the commissioning of the new substation, knowledge of local conditions and constraints, etc. Eskom Transmission has a right to engage with any landowner at any time, though they do so at risk if environmental authorisation has not been awarded.

5 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations accompany the EIA for the proposed Anderson 400 kV substation:

- It is accepted that the project motivation and description, as obtained from Eskom Transmission, is accurate.
- The exact locations of the substation can only be determined following detailed design, and the environmental assessment is thus conducted for each alternative.
- It is assumed that the baseline information scrutinised and used to explain the environmental profile is accurate.
- Although specialist studies were conducted, the identification of sensitive environmental features and attributes (e.g. protected flora, sensitive habitat, heritage resources) will be facilitated by a detailed walk-down survey of the final approved route. This will allow for a more detailed site appraisal of the entire route through on-ground inspections by a surveyor and a team of appropriate environmental specialists.
- The EIA process does not make provision for borrow pits. The necessary approval of borrow pits will be required from the Department of Mineral Resources (DMR) in terms of the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002).
- It is assumed that the baseline information scrutinised and used to explain the environmental profile is accurate.
- The locations of camp sites are not known at this stage, and the associated impacts will need to be addressed through suitable mitigation measures in the Environmental Management Plan (EMP).
- Although existing access roads will be utilised as far as possible, it is not known which access roads will be used and where river crossings (if applicable) will take place. Following the walk-down survey and final alignment of the substation, the access roads will be confirmed. The EMP will also need to make provision for managing the related aspects and impacts.
- The following assumptions and limitations relate to the Fauna and Flora Impact Assessment:
    - The survey was based on a single site visit conducted for one day (10 hours) during the winter months in August 2012.
    - No comprehensive vegetation or faunal surveys were conducted due to time and financial constraints and as such several red data plants and animals could still occur in remnant wooded pockets.
    - The majority of threatened plant species are seasonal and only flower during specific periods of the year, time constraints did not allow for repeated sampling over different seasons and so desktop surveys were used to provide additional information.
    - The majority of threatened faunal species are secretive and difficult to observe even during intensive field surveys conducted over several seasons.
    - Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage and Nemai Consulting can thus not accept responsibility for

conclusions and mitigation measures made in good faith based information gathered or databases consulted at the time of the investigation.

- The following assumptions and limitations relate to the Visual Impact Assessment
    - A Visual Impact Assessment is not a purely objective science and often integrates qualitative evaluations based on human perceptions. It is the visual specialist's aim to utilise as much quantitative data as possible to substantiate professional judgement and to motivate subjective opinions;
    - The study area was visited at the beginning of September 2012 and the environment was still in its typical winter condition. Time and budget constraints prevented the visual specialist to return to the site to document the character of the study area during other seasons. The visual specialist is however confident that the information acquired during the site investigation was sufficient to do an assessment;
    - No comments or complaints were received during the public participation events prior to the writing of this report that has specific reference to aesthetic or visual impact issues. The sensitivity of the viewers can therefore not be confirmed firsthand and a generic rating system will be used to determine viewer sensitivity; and
    - The visibility map in **Error! Reference source not found.** of the visual impact assessment eport calculates the screening ability of the landscape based on the natural topography alone. Contour data with a 20 m interval is used to determine the visibility of the substation. The screening effect of trees, structures and man-made landforms is not represented in the maps, but are further discussed under the relevant section.
- The following assumptions and limitations relate to the Socio-Economic Impact Assessment:
    - It is assumed that information related to the social environment obtained from the strategic documents of the affected areas such as North West Growth and Development Strategy (NWGDS) 2004/14; Gauteng Provincial Growth and Development Strategy (GPGDS) 2005; Growth and Development Strategy for the City of Tshwane Metropolitan (GDSCT) 2004/14; Madibeng Local Municipality Integrated Development Plan – Analysis, 2004 etc were accurate.
    - Unless otherwise stated, the statistical data reflected in this report are from the 2001 Census data obtained from the Municipal Demarcation Board: www.demarcation.co.za and South Africa Community Survey 2007; bearing in mind that the social- demographic profiles may have changed in the recent number of years.
    - The study has been limited to the discussions and interviews with the stakeholders such as landowners, residents and Ward Councilors. The additional information was collected using the data from the relevant specialist studies.

      This study has not explored in details the issues dealt with in other specialist reports including broader economic impacts associated with the project; potential impacts of the project on property, heritage study etc.

6 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by Eskom Holdings Limited, Eskom Transmission Division as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed Anderson substation.

In accordance with Regulation 29(2) of GN No. R. 385 of 21 April 2006, this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng), Rustenburg (North West Province), and Durban (KwaZulu Natal).

The members of Nemai Consulting that are involved with the Scoping and EIA process for the Anderson substation captured in **Table 5** below, and their respective Curricula Vitae are contained in to ***Appendix G***.

Table 5: Scoping and EIA Team Members

Name	Qualifications	Experience	Duties
Ms D. Naidoo	• B.Sc Eng (Chem)	17 years	Project Director
Mr D. Henning	• B.Sc (Hons) Aquatic Health • M.Sc River Ecology	10 years	• Project Manager • Compiling EIA Report
Mr C. Chidley	• B.Sc Eng (Civil); • BA (Economics, Philosophy) • MBA	20 years	Quality Reviewer
Ms M Chetty	• BCs (Hons) Biological Science	4 years	EAP

7 PROJECT LOCATION

The Dinaledi Substation is located on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ, which is located approximately 8km North East of Brits. Two site alternatives were initially investigated for the proposed construction of the Anderson Substation. Following the issues and concerns raised in the scoping phase, a third alternative has been included in the EIR for assessment. Site alternatives 1 and 2 are located directly to the north of NECSA, in Broederstroom, within the Madibeng Local Municipality, North West Province. The third site alternative is located in Flora Park, within the City of Tshwane Metropolitan Municipality, Gauteng.

The details of the affected properties are provided in the table below. Refer to Figures 4-6 (Appendix H) for detailed map showing the alternative sites and affected properties. Each proposed substation alternative study site is approximately 1km^2 in extent.

Table 6: Alternative Substation Sites and Affected Properties

Site	Affected Properties	Size
Site 1	Portion 82 of the Farm Weldaba 567 JQ	Total Portion = 2737ha Size of Portion location north of the R104 which is earmarked for possible substation construction = 200ha
Site 2	Portion 82 of the Farm Weldaba 567 JQ	
	Portion 65 of the Farm Welgedund 491 JQ	42.82ha
	Portion 25 of the Farm Welgedund 491 JQ	168.3ha
Site 3	Portion 76 of the Farm Schurveberg 488 JQ	58ha
	Portion 82 of the Farm Schurveberg 488 JQ	25ha
	Portion 83 of the Farm Schurveberg 488 JQ	25ha

Figure 4: Cadastral Map Showing Site Alternatives 1 and 2

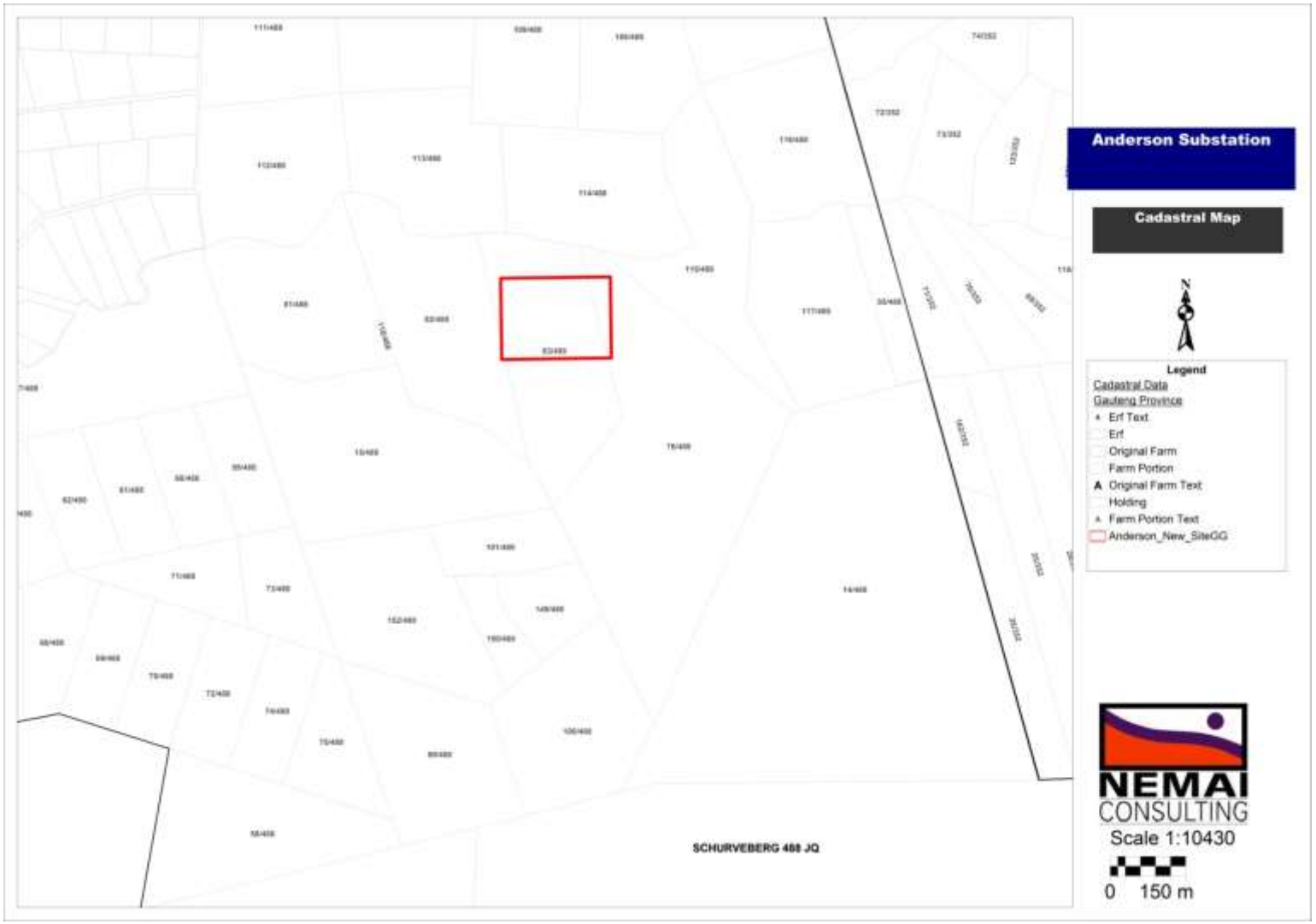


Figure 5: Cadastral Map Showing Site Alternative 3

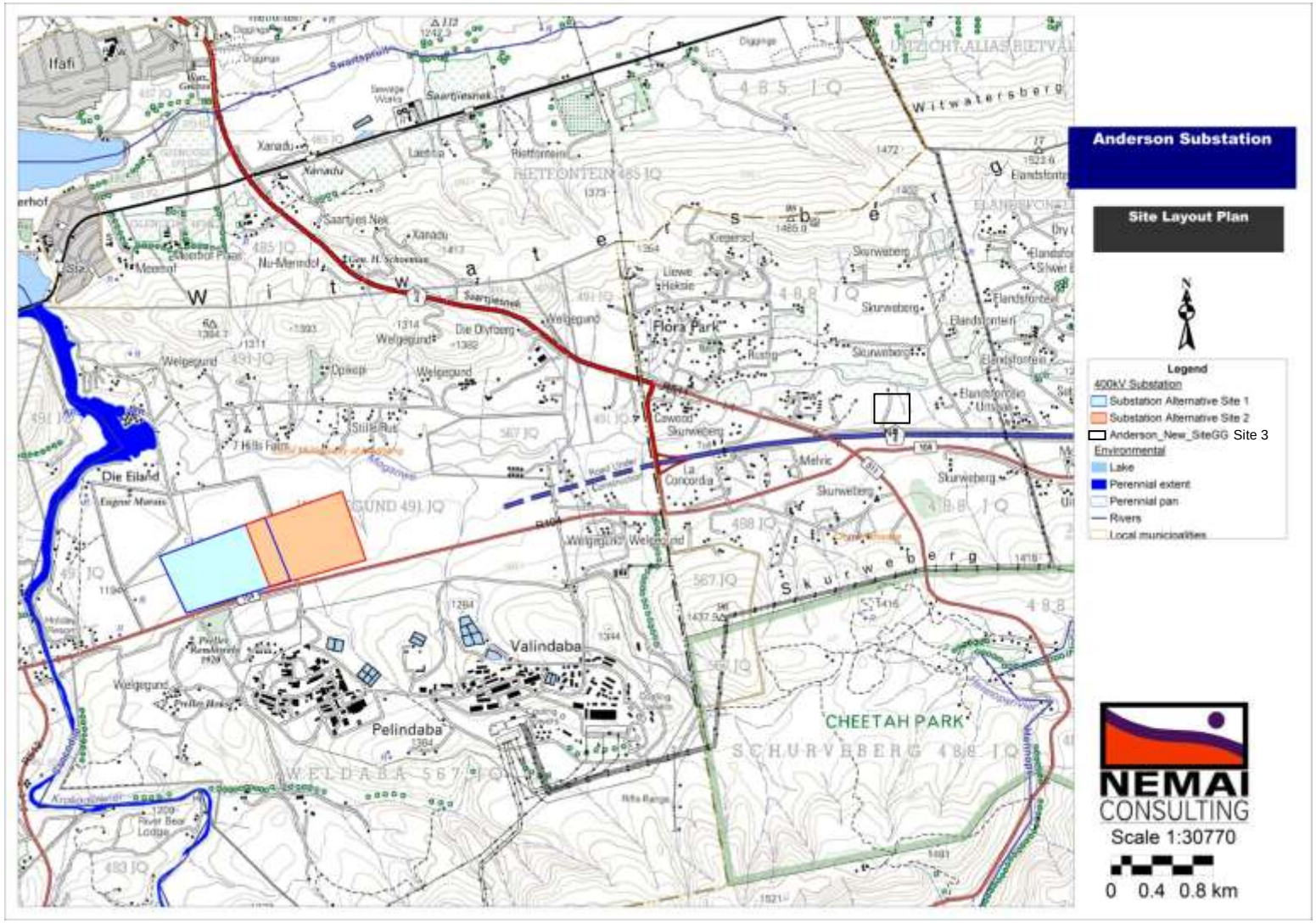


Figure 6: Locality Map

8 PROJECT DESCRIPTION

8.1 Substation

A substation is defined as a high-voltage electric system facility which is used to switch generators, equipment, and circuits or lines in and out of a system. Substations are also used to change alternating current (AC) voltages from one level to another, and/or change alternating current to direct current or visa versa.

Substations are generally designed to accomplish the following functions; however, not all substations are designed to perform all of these functions:

- Changing of voltage from one level to another;
- Regulating of voltages to compensate for system voltage changes;
- Switching transmission and distribution circuits into and out of the grid system;
- Measuring the electric power qualities flowing in the circuits;
- Connecting communication signals to the circuits;
- Eliminating lightning and other electrical surges from the system;
- Connecting electric generation plants to the system;
- Making interconnections between the electric systems of more than one utility; and
- Control reactive kilovolt-amperes supplied to, and the flow of reactive kilovolt-amperes in the circuits

The substation will be constructed as indicated the layout, Appendix H. The major components of a typical substation are provided below:

- Electrical Transformers;
- Circuit breakers or line termination structures;
- High Voltage Switchgear;
- Low Voltage Switchgear;
- Surge and metering equipment;
- Control and metering equipment;
- Office and ancillary buildings;
- Platforms; and
- Access roads.

The exact location of the loop-in and loop-out lines which will connect the substation to the 400kV powerline is not yet known. These details will only become available once a preferred powerline corridor and preferred substation site has been selected and approved by DEA, as the orientation of the substation and the location of the feeder bay depicts where these loop-in and loop-out lines must be located. Upon receipt

of the Environmental Authorisation, a walk–down survey of the routes together with the approved substation site will be undertaken, at which point will the location for the loop-in and loop-out lines be determined and the final EMP will be amended to include the locations.

The first activity to be undertaken during the construction phase of the proposed substation is to clear vegetation on site and to level off and terrace ground surfaces where necessary where the heavy electrical transformers and other switchgear will be located. After this phase foundations and concrete surfaces will be lain for the supporting steelwork, transformers and other switchgear, as well as stormwater drainage pipes and bund walls. Buildings (control room, ablution facilities, storage areas) will then be constructed. The remainder of the open areas located within the substation site which is not covered by foundations or concrete surfaces is normally covered by crushed stone, after the ground surface has been treated with insecticides and herbicides to prevent insect activity and the growth of weeds and plants within the high voltage yard. Steelwork will then be erected, and transformers, circuit breakers and other relevant high voltage equipment will then be delivered to site, erected, tested and ultimately commissioned. Loop-in and loop-out lines and associated towers will then be erected. The substation site will be fenced off with high voltage electric fencing and access control will be very strict with 24 hour security present at the substation.

An access road will be required from the main road to the substation in order to allow for easy access to the substation. Access roads to substation are normally tarred roads. Furthermore, a telecommunication mast may be required at the substation. The establishment of a construction camps to accommodate construction workers, as well as the establishment of a construction camp to house construction material and equipment, including facilities for the temporary storage of hazardous substances (oil, fuel, and lubricants) will be required. The exact position of these construction camps will be negotiated with the relevant landowners. Management measures and conditions for the siting, operations and activities at these construction camps will be addressed in the EMP. Furthermore, an Environmental Control Officer (ECO) will undertake regular monitoring and auditing of all conditions stipulated within the EMP to ensure that all conditions are adhered to, and that any non-compliance to these conditions are addressed and resolved. An example of a substation is provided in Figure 7.

Figure 7: Substation Example

8.1.1 Construction camp establishment

Note that the location of the construction camp associated with the substation is not yet known during the preparation of the EIA Report, although it is anticipated that they will be located within the preferred transmission line corridor in close proximity to the substation. The constructions camp is expected to be approximately 50m x 50m in size. The following areas / tasks may occur within a construction camp:

- Fuel storage and re-fuelling areas;
- Workshops and offices;
- Laydown areas;
- Portable ablution facilities and / or wash areas;
- Designated eating areas;
- Accommodation facilities for contractors;
- Security guardhouse / checkpoint;
- Hazardous chemical store;
- Vehicle, plant, equipment and material storage areas;
- Cement mixing areas; and
- Any other infrastructure required for the construction of the substation.

Contractors will negotiate the siting and erection of camps with landowners. The EMP provides suitable mitigation measures to safeguard the environment from impacts associated with the construction camps. See **Figure 8** for examples of construction camps for Eskom transmission lines and substations.

Figure 8: Examples of Construction Camps

8.1.1.1 Temporary Hazardous Storage Areas

Temporary storage areas will be required as part of the construction camp and the hazardous substances will comprise fuels, oils, and lubricants that will be stored and dispensed at the construction camp. Specifications for the storage and dispensing of fuels, oils, and lubricants include the following:

- Designated hazardous storage areas;
- All structures that are used for the storage of hazardous substances shall be located in a roofed, bunded, lockable structure;
- The hazardous storage area will be equipped with sufficient fire protection equipment and PPE for contractors working these substances;
- The storage area shall be properly signed in all applicable languages.
- All contractors must be properly trained in the storage and dispensing of specific fuels, oils, and lubricants.
- A specific procedure for emergency situations, including accidental spills, must be prepared and available on site at all times.

8.1.2 Rehabilitation

Site reinstatement and rehabilitation are undertaken for each component of the construction phase, which include the following activities (amongst others):

- Removal of excess building material, spoil material and waste;
- Repairing any damage caused as part of the construction activities;
- Rehabilitating the areas affected by temporary access roads;
- Reinstating existing access roads; and
- Replacing topsoil and planting indigenous grass (where necessary).

8.1.3 Decommissioning

GN No. R544 defines “decommissioning” as taking out of active service permanently or dismantling partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. Note that under the aforementioned notice, which represents Listing Notice 1 of the EIA Regulations (2010), the decommissioning of existing facilities or infrastructure for electricity transmission and distribution with a threshold of more than 132kV (which applies to this project) would need to undergo a Basic Assessment to seek authorisation in terms of NEMA.

Decommissioning of the Anderson substation is not anticipated. However, should this be required in the future a decommissioning plan with suitable mitigation measures will need to be developed, including provision for the dismantling of the towers and the disposal or recycling of the material. This plan will also require a site-specific rehabilitation plan for the footprint of the project. All regulatory requirements will need to be complied with for the decommissioning phase.

8.2 Resources Required for Construction and Operation

This section briefly outlines the resources that will be required to execute the project.

8.2.1 Water

During the construction stage, the Contractor(s) will require water for potable use by construction workers and water will also be used in the construction of the foundations for the towers. The necessary negotiations will be undertaken with the landowners / local authorities that are traversed by the transmission line to obtain water from approved sources.

8.2.2 Sanitation

Sanitation services will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier.

8.2.3 Roads

Refer to **Section 8.7.1.5** for a discussion on access roads.

8.2.4 Waste

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at construction camps) and will be removed at regular intervals and disposed of at approved waste disposal sites within each of the local municipalities that are affected by the project. All the waste disposed of will be recorded.

Wastewater, which refers to any water adversely affected in quality through construction-related activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g. equipment, staff); and
- Drainage over contaminated areas (e.g. cement batching / mixing areas, workshop, equipment storage areas).

Suitable measures will be implemented to manage all wastewater generated during the construction period.

8.2.5 Electricity

Electricity will be obtained from diesel generators or temporary electricity connections during the construction phase.

8.2.6 Construction Workers

It is anticipated that when construction activities are at it's peak, which is when the civil related construction activities are being undertaken, there should not be more than approximately 80 people on the site at any time. Employment will be effected either directly with the main contractor, or through sub-contractors. The appointed Contractor will mostly make use of skilled labour to install the components of the substation. In those instances where casual labour is required, Eskom will request that such persons are sourced from local communities as far as possible. Apart from direct employment, local people and businesses will benefit through the supply of goods and services to the appointed contractors

9 PROFILE OF THE RECEIVING ENVIRONMENT

The sub-sections below provide a general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the EIA was conducted. The profile of the receiving environment to follow also provides local and site-specific discussions on those environmental features investigated by the respective specialists where applicable.

This section allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The potential impacts to the receiving environment are discussed further in **Section 11**.

9.1 Geology

The vegetation cover found within the study areas of the proposed substation is provided in the table below (Table 7). A description of the geology found within areas where these vegetation types occur are also provided in this table. The details provided in this table are based on the SANBI data.

Table 7: Vegetation Cover and Associated Geology

Vegetation Type	Geology Description
Andesite Mountain Bushveld	In terms of the SANBI data the area predominately consist of tholeitic basalt of the Klipriviersberg Group (Randian Ventersdorp Supergroup), also dark shale, micaceous sandstone and siltstone and thin coal seems of the Madzaringwe Formation [Karoo Supergroup, and andesite and conglomerate of the Pretoria Group (Vaalian Transvaal Supergroup)].
Gauteng Shale Mountain Bushveld	In terms of the SANBI data the area is dominated by shale and some coarser clastic sediments as well as significant andesite from the Pretoria Group (Transvaal Supergroup), all sedimentary rocks. A part of the area is underlain by Malmani dolomites of the Chuniespoort Group (Transvaal Supergroup). (Although dolomite is found in areas where this vegetation type occurs, no dolomite is found within the specific 1km study corridors of the alternative proposed powerline routes in terms of the Environmental Potential Atlas Data).

From a geological perspective, the sites are suitable for the construction of a substation. Once a preferred site has been chosen, a detailed geotechnical survey will be undertaken prior to commencement of construction activities.

9.2 Topography

9.2.1 Regional Description

The North West Province has one of the most uniform terrains of all South African Provinces with altitudes ranging from between 920-1782 metres above mean sea level (mamsl). The eastern part of the province is mountainous and includes the scenic Magaliesberg, while the western and central parts of the province is characterised by gently undulating plains. The surface topography of the area within the Gauteng Province which the proposed eastern route alternative will traverse is described as a rugged landscape with hills and slopes of the Magaliesberg and the Witwatersberg. Approximately 20 ridges occur in the Tshwane (Pretoria) area, of which the most sensitive ridges include the Bronberge, The Magaliesberg, Daspoort, Meintjieskop, Tuine Bult Koppies and the Witwatersberg.

9.2.2 Site Description

The topography of the study sites 1 and 2 is relatively flat. The north-eastern portion of site 3 is underlain by andesite and the topography is slightly uneven.

In terms of the South African National Biodiversity Institute (SANBI) data, the vegetation cover in the study area is comprised of Andesite Mountain Bushveld and borders on Gauteng Shale Mountain Bushveld. The landscape character associated with each of these vegetation types are tabled below. The landscape character associated with each of these vegetation types are tabled below (Table 8):

Table 8: Vegetation Types and Associated Topography

Vegetation Type	Associated Landscape Character
Andesite Mountain Bushveld	Undulating landscape with hills and valleys.
Gauteng Shale Mountain Bushveld	Low broken ridges varying in steepness with high surface rock cover.

9.3 Climate

9.3.1 Temperature

There are wide seasonal and daily variations in temperature in the North West Province. The summers are warm to very hot with average daily maximum temperatures of 32 ºC in January.

The winter days are sunny and temperate while the winter nights are cool to cold, with average daily minimum temperatures of 0.9 ºC in July. The far western part of the province is arid, with the central part of the province being semi-arid, and the eastern part of the province being predominantly temperate.

Although Gauteng is quite close to the equator, the temperatures are moderate because of the high altitude above sea level. The Tshwane are experiences average daily maximum temperate of 30°C during summer (January), and average daily maximum temperatures of 18.3°C during winter (June). The Tshwane region is the coldest during July when the mercury drops to 1.7°C on average during the night.

9.3.2 Precipitation

The North West Province falls within a summer rainfall region, and rainfall often occurs in the form of late afternoon thundershowers. Rainfall in the province is highly variable both regionally and in time. The western part of the province which is classified as being arid receives less than 300mm of rain per annum, while the central semi-arid region receives 500mm of rain per annum. The eastern and south-eastern temperate part of the region receives over 600mm of rain per annum. Droughts and floods is a regular occurrence at a provincial and local scale. In most parts of the province, evaporation exceeds rainfall.

The Gauteng Province also falls within a summer rainfall region, and rainfall in this province occurs in the form of thunderstorms in the late afternoons from November to March. The average rainfall in the Tshwane area is 573-650mm per annum, with most rainfall occurring during summer. Rainfall in the Tshwane area is lowest during June (0mm) and highest in January (110mm).

9.3.3 Wind

The predominant wind direction in the Tshwane area is north-northeast. Historical wind speed and wind direction information for the Tshwane area was obtained from “MyForecast”. The annual average wind speed and direction of the area is tabled below.

Table 9: Average Wind Speed and Direction for the Pretoria (Tshwane Area)

Tshwane (Pretoria)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Average Windspeed (mph)	6	6	6	6	6	6	7	8	8	7	6	6
Average Wind Direction	NE	E	E	W	w	W	W	W	NE	NE	NE	NE

Historical wind data for the Hartbeespoort Dam area was obtained from Weather SA. Weather SA indicated that this wind information is the only available information for the study area.

A wind rose is provided in Figure 9 which shows the average wind speed and direction in the Hartbeespoort Dam area from November 2009 to October 2010.

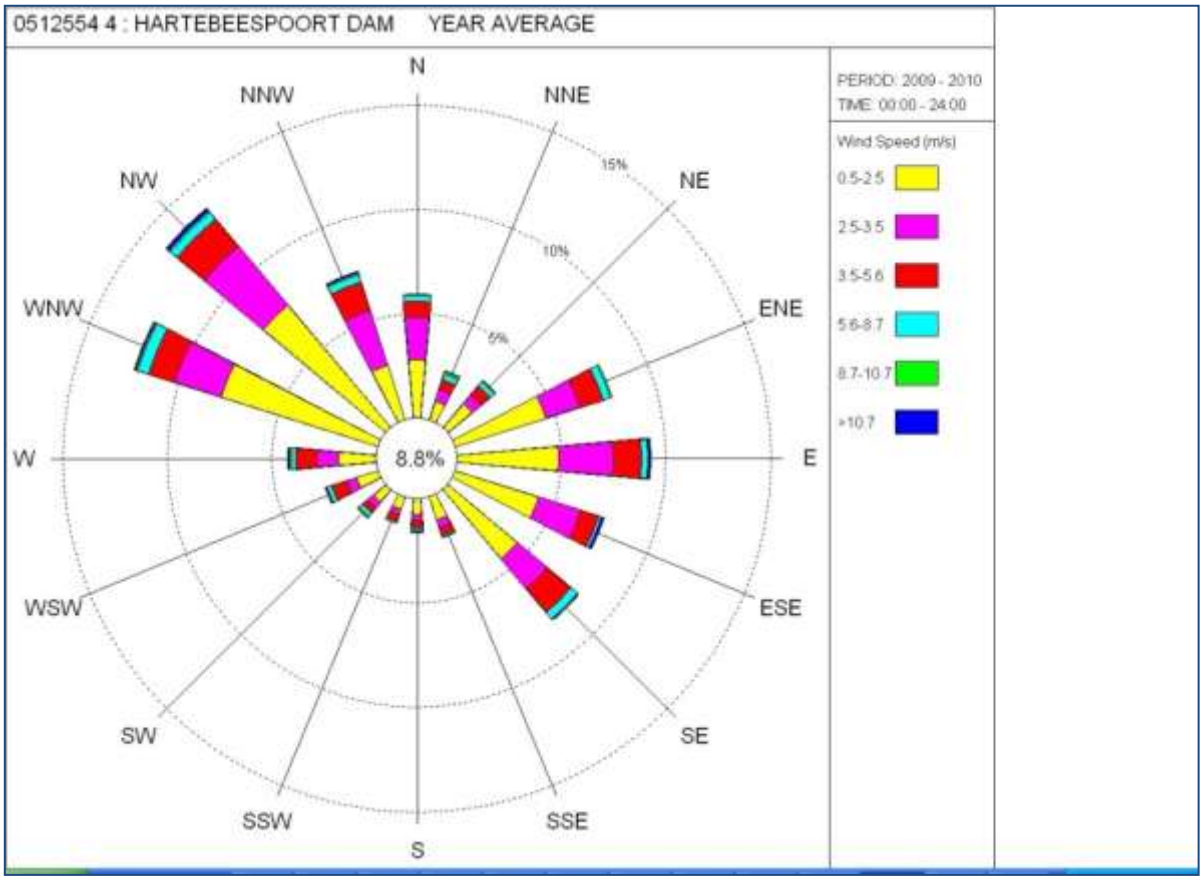


Figure 9: Wind rose for Hartbeespoort Dam (November 2009 – October 2010)

The predominant wind direction for this period as indicated on the wind rose is north-west and west-northwest. The average wind speed for this period was between 0.5-2.5m/s.

9.4 Visual Quality

A Visual Impact Assessment was performed for the project, and it is contained in ***Appendix D***. Refer to the summary and impact assessment of this study contained in **Sections 10.4** and **11.7**, respectively. An extract from this specialist study that explains the visual features of the receiving environment follows. The study area can be described as the area affected by visual impact and usually extends beyond the boundaries of the site.

- For site alternative 1 and 2, the study area is characterised by the Hartebeestpoort dam, the surrounding Magaliesberg Mountains with a rolling, undulating landscape with high topographic variation. Drainage lines meander through to the study area and cause shallow incisions where it meets up with rivers.

The study area consists of cultivated, residential areas, subsistence farming and mining. Extensive mining and farming is located more to the northern side of the study area with scattered farms in the central parts and southern parts. Residential development activities are more intense from the central to southern side of the study area where the cultural homelands is located. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements. Both site alternative 1 and 2 are located within 1km of the NECSA site.

- For site alternative 3, the study area is located in a wide open valley between two parallel mountain ridges. These ridges form part of the Magalies Mountain Range and are locally referred to as the Witwatersberg and Skurweberg on the northern and southern side of the site respectively. In the valley approximately 400 m north of the site is the inconspicuous Moganwe stream which is a tributary of the Crocodile River. The elevated topography is considered aesthetically pleasing with a relatively high scenic value due to its natural character. The area is considered fairly rural but features a variety of land uses. The predominant land use appears to be agricultural with small scale farming visible on the foothills and plains near the Moganwe stream. A great percentage of the study area is covered in natural vegetation especially on the mountain ridges. Natural vegetation is typically dense thorn bushes and trees but in some areas a savannah-like vegetation type occurs with mostly grassland and isolated tree stands. These areas are presumed to be previously cultivated farmland that has rehabilitated to a grassland savannah. Agricultural Holdings (A.H.) such as the small and isolated Flora Park A.H. near the Broederstroom Primary School is one of the most densely populated residential clusters in the study area. It is also located near the Tydstroom Abattoir which is the most prominent business development in the study area but has an agricultural association. Farmsteads are scattered across the study area and are generally located higher up the mountain.

  The NECSA Power Plant is approximately 4 km south west of the site and although most of the infrastructure is hidden behind some hills, the massive cooling towers and stacks are visible from the surrounding landscape. This has impacted on the character of the landscape to some degree and brings an industrial undertone to the study area.

  The existing electricity network is surprisingly inconspicuous when considering the proximity of the NECSA Power Plant. The power plant generates an estimated 20MW power of which most is distributed to the south. A few distribution lines, presumably 88/132kV, traverse the study area but are mounted on low timber poles and are fairly unnoticeable. A small substation is located between the Tydstroom Abattoir and proposed Anderson Substation site, where a convergence of distribution lines occurs. The proposed Dinaledi – Anderson 400kV Transmission line will presumably increase the dominance of the electrical infrastructure due to the oversized transmission towers.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types (e.g. human settlements, subsistence farming, existing infrastructure), which can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses. Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project.

9.5 Transportation

The major linear transportation network in the region is shown in the figure below:

Figure 10: Linear Routes Near the Substation Sites

Major transport routes near the study areas include N4 Highway, R104 and R511 (site 3) and R512 (site 1 and 2). In general the transport infrastructure is sparse but is considered important links between specific tourist attractions and carries relatively high traffic volumes. Little information is available on traffic volumes in the study area and whether major traffic issues occur. The North West Province has relatively good general infrastructure, including a roads, and a well-developed network of tarred roads links the main urban centres in the Province. Many rural settlements in the province are serviced by gravel roads.

It is anticipate that there will be an impact on the traffic along the major routes leading to the proposed site during the construction phase due to the increased number of construction vehicles that are anticipated to utilise these roads. However these impacts are short term and can be mitigated against with the use of the EMP.

9.6 Soils and Land Capability

9.6.1 Regional Description

According to the North West Province State of the Environment Report the province in general is showing signs of increased land and soil degradation. Signs of degradation and desertification can be seen in all magisterial districts. The areas most severely affected are those areas that are communally managed. In terms of soil and land degradation, the province is ranked as the forth worst affected province in South Africa. Soil and land degradation in the province has numerous negative consequences for agriculture in the area, such as decreased productivity of the croplands. Water and wind erosion is the major contributors to soil degradation in the province.

In terms of the Gauteng State of the Environment Report, the Gauteng Province where ranked as the second least degraded province in South Africa. Gauteng has the lowest veld degradation index in South Africa (31 on a scale of 0-540) and the fourth lowest soil degradation index (113 on a scale of –97 to 650).

9.6.2 Site Description

The topography of the study sites is relatively flat. In terms of the South African National Biodiversity Institute (SANBI) data, the vegetation cover in the study area is comprised of Andesite Mountain Bushveld, and Gauteng Shale Mountain Bushveld.

Table 10: Vegetation Type and Associated Soil

Vegetation Type	Soil Description
Andesite Mountain Bushveld	Soils found in areas where this vegetation type occurs is described as shallow, rocky, clayey soils mainly of the Mispah and Glenrosa forms.

Vegetation Type	Soil Description
Gauteng Shale Mountain Bushveld	Soils found in areas where this vegetation type occurs are mostly shallow Mispah, but are deeper at the foot of slopes.

In terms of the Gauteng Conservation Plan (C-Plan) data as compiled by the Gauteng Department of Agriculture and Rural Development (GDARD), the soils found along the portion of the study area which is located within the Gauteng Province varies from having a high agricultural potential to a very low agricultural potential. The majority of the soils are of very low to low agricultural potential with a few sections along the southern part of the eastern route alternative containing moderate to high agricultural potential soils. In terms of the North West State of the Environment Report soil and land degradation in the study area is high.

From a soil and land capability perspective, the proposed sites would be suitable for the proposed construction of the substation as the agricultural potential is low and the degradation of those areas is high.

9.7 Land Use

9.7.1 Regional Description

In terms of the North West Province State of the Environment Report, the North West Province is approximately 11,632,000 ha in extent. Land use in the North West Province mainly comprises of agriculture, mining, conservation, industrial, commercial, recreational and residential.

Approximately 9,421,920 ha (81%) of the total land area is considered as potential farming land. Of this total potential farming land, approximately 2,638,138 ha (28%) is potentially arable, approximately 4,334,083 ha (46%) is grazing land and approximately 603,002.9 ha (6,4%) is used for nature conservation. During 2001 the agricultural land use patterns included the following (Table 11);

Table 11: Land Use Patterns – North West Province (2001)

Agricultural Land Use Pattern	Approximate Area of Coverage
Field Crops	2,06 million ha
Horticultural crops	67 879 ha
Grazing land	2,97 million ha
Mixed farming	1,2 million ha

The land use patterns in the province are linked to ownership. Three main types of ownership occur within the province which includes, privately owned land, communal or tribal lands and state owner land. During 2001, most of the land in the Province was privately owned and the landowners where mainly committed to agriculture.

Livestock and cropping are the main agricultural activities undertaken in the eastern part of the province which is the higher rainfall area, whilst livestock and wildlife farming are prevalent in the western drier parts of the province. Three major irrigation schemes occur within the province which includes the Crocodlie, Vaal and Harts Rivers. The Vaalharts irrigation scheme is the largest scheme in the province. Details of this scheme are detailed below.

Table 12: Details of the Vaalharts Irrigation Scheme

Irrigation Scheme	Approximate Area of Coverage	Crops under Irrigation
Vaalharts irrigation area	43 700 ha	Wheat (36% of area) Maize (23% of area) Groundnut (22% of area)

Several smaller irrigation schemes also occur in the province which includes the Taung, Manyeding, Bodibe and Tlhaping-Tlharo schemes. The total area under irrigation by these smaller schemes is approximately 4,500 ha in extent. The total area under irrigation in the province is approximately 50,000 ha.

Mining forms a significant land use in the province, and several mining areas occur within the province. These mining areas are predominantly located within the Bushveld Complex which is described as a silk-like mineral-rich geological feature of approximately 50,000 km in extent.

Mining activities in the province mainly occur in the Rustenburg area and Southern Districts, and include the extraction of uranium, gold, iron, chrome, manganese, platinum, coal, granite, marble, slate, limestone, wonderstone, and andalusite. Stone crushing, clay and sand pits and quarries are also found in the province. Commercial, industrial, and residential land uses, as well as roads and dams are estimated to contribute to approximately 15% of the total land use.

9.7.2 Site Description

The land use of the properties currently affected by the proposed substation site alternatives are provided in the table below (Table 13).

Table 13: Land Use of the Properties Affected by the Substation Alternatives

Site	Affected Properties	Size
Site 1	Portion 82 of the Farm Weldaba 567 JQ	The portion south of the R104 is developed with Pelindaba and NECSA. The portion to the north of the R104 (portion affected by proposed substation sites) is currently developed with several vacant houses.
Site 2	Portion 82 of the Farm Weldaba 567 JQ	
	Portion 65 of the Farm Welgedund 491 JQ	Developed with a house and associated

		outbuildings as well as a business and workshop area.
	Portion 25 of the Farm Welgedund 491 JQ	Developed with a house and associated outbuildings. Developed with Kudu-Inn
Site 3	Portion 76, 82 and 83 of the Farm Schurveberg 488 JQ.	The predominant land use appears to be agricultural with small scale farming visible on the foothills and plains near the Moganwe stream. A great percentage of the study area is covered in natural vegetation especially on the mountain ridges. Natural vegetation is typically dense thorn bushes and trees but in some areas a savannah-like vegetation type occurs with mostly grassland and isolated tree stands. These areas are presumed to be previously cultivated farmland that has rehabilitated to a grassland savannah.

Land uses surrounding the study sites includes NECSA, Pelindaba and the R104 to the south, and privately owned farm portions to the north, east and west. The foot of the Witwatersberg is located approximately 1km north of the study sites.

The land use of the site will be affected by the proposed activity as the site will be located within open space areas and the land use of that are will change. This have an impact on the farming activities and from a visual perspective, however it is anticipated that the potential impacts can be mitigated against.

9.8 Flora

9.8.1 Regional Description

In terms of the North West State of Environment Report two major biomes occur within the Province which includes the Grassland Biome and the Savanna Biome. As mentioned in Section 5.1.2, the North West Province has one of the most uniform terrains of all South African Provinces with altitudes ranging from between 920-1782 metres above mean sea level (mamsl). The eastern part of the province is mountainous and includes the scenic Magaliesberg, while the western and central parts of the province is characterised by gently undulating plains. The surface topography of the area within the Gauteng Province which the proposed western route alternative will traverse is described as a rugged landscape with hills and slopes of the Magaliesberg and the Witwatersberg.

9.8.2 Site Description

In terms of the North West State of Environment Report, the study area (substation) falls within the Grassland biome. The surface topography of the area within which the proposed substation will be built is described by Mucina & Rutherford (2006) as valley bottom.

In terms of the South African National Biodiversity Institute (SANBI) data, the vegetation cover in the study area is comprised of Andesite Mountain Bushveld, and Gauteng Shale Mountain Bushveld. The table below (Table 14) provides details on the conservation status of the vegetation types found within the study area.

Table 14: Study Area Vegetation Types and Associated Conservation Status

Vegetation Type	Associated Landscape Character	Conservation Status
Andesite Mountain Bushveld	Undulating landscape with hills and valleys.	Least Threatened
Gauteng Shale Mountain Bushveld	Low broken ridges varying in steepness with high surface rock cover.	Vulnerable

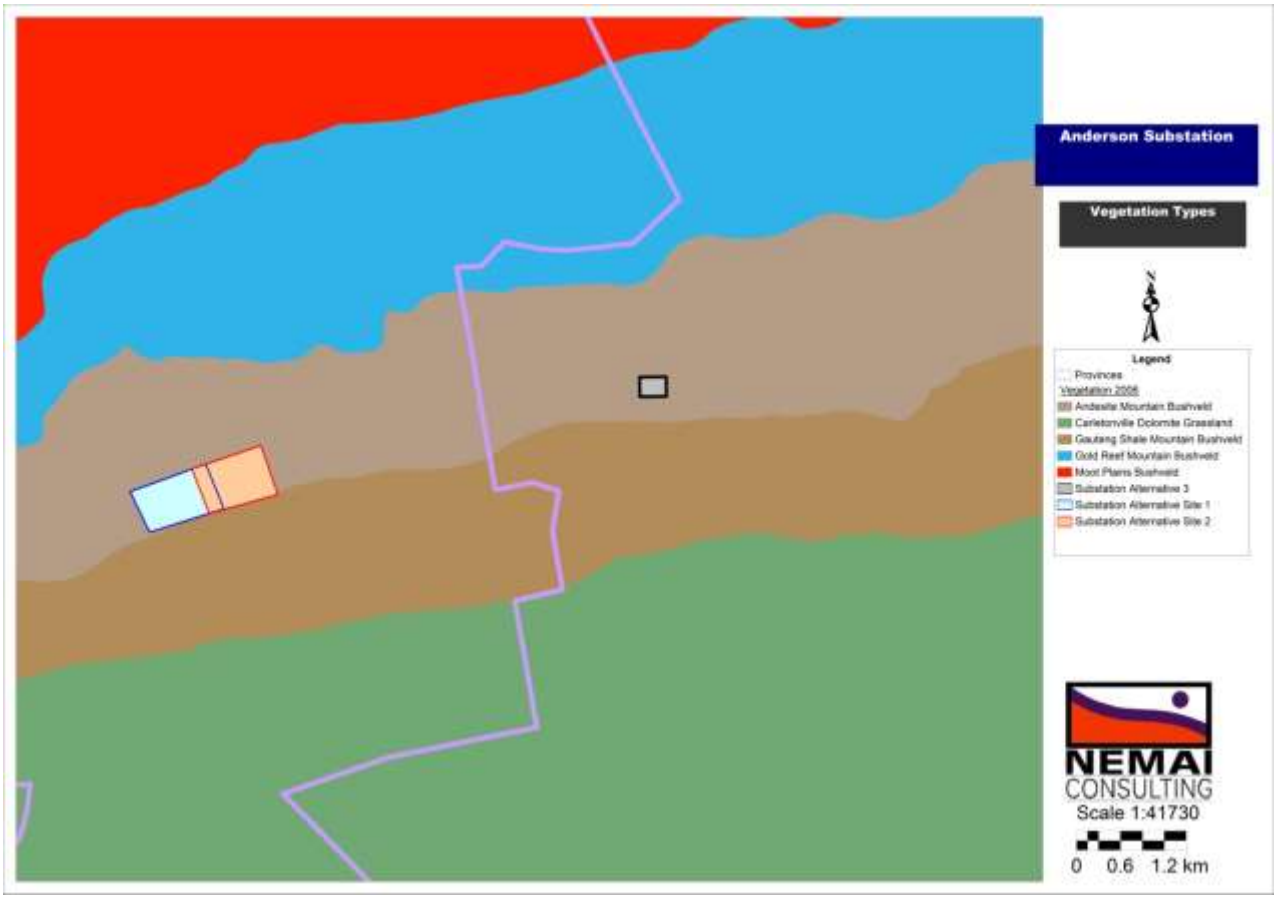


Figure 11: Vegetation Types Found within the Study Area

According to Rutherford & Westfall (1994), the study area falls within the grassland biome. Grasslands host a very high diversity of plant species, second only to the Cape Floral Kingdom (O' Connor & Bredenkamp, 1997).The proposed substation is located within the following quarter degree squares in terms of the 1:50 000 grid of South Africa, namely 2527DD. The SANBI used this grid system as a point of reference to

determine sensitive, vulnerable, Orange and Red Data plant species which occurs in South Africa, or which could potentially occur within an area. The table below (**Table 15**) provides details on the Red Data plant species which have previously been recorded for the quarter degree squares.

Table 15: Red data plant species recorded in grid 2527DD

Family	*Species*	Conservation Status	Form
Amaryllidaceae	*Boophone disticha*	Declining	Geophyte
Aquifoliaceae	*Ilex mitis var. mitis*	Declining	Shrub
Asteraceae	*Callilepis leptophylla.*	Declining	Herb
Capparaceae	*Cleome conrathii*	Near Threatened	Herb
Fabaceae	*Melolobium subspicatum*	Vulnerable	Dwarf shrub
Gunneraceae	*Gunnera perpensa.*	Declining	Herb
Hyacinthaceae	*Bowiea volubilis. subsp. volubilis*	Vulnerable	Climber
Hyacinthaceae	*Drimia elata.*	Data Deficient Taxon	Geophyte
Hyacinthaceae	*Drimia sanguinea*	Near Threatened	Geophyte
Hypoxidaceae	*Hypoxis hemerocallidea*	Declining	Geophyte
Myrothamnaceae	*Myrothamnus flabellifolius.*	Data Deficient Taxon	Dwarf shrub
Orchidaceae	*Habenaria mossii*	Endangered	Geophyte

According to Hartbeestpoort Strategic Environmental Assessment (2006), site alternatives 1 and 2 for the proposed new substation falls within the following areas of strategic importance, namely the Pelindaba Nuclear Facility and its 5km buffer, the immediate area around the dam (1 km from the shore line) and the Witwatersberg natural area and associated Cradle of Humankind world heritage site. Furthermore site alternatives 1 and 2 fall within the Magaliesberg Natural Area, this forms part of the greater Magaliesberg Protected Environment (See figure 12). Site alternative 3 is located in an Ecological Sensitive Area (ESA) and Critical Biodiversity Area (CBA).

Figure 12: Sensitive Areas within the North West Province

9.8.2.1 Plant communities recorded in site alternatives 1 and 2 (Phamphe, 2011)

The following plant communities were identified during the field visits and are described below.

<u>*Acacia* woodlands (site alternatives 1 and 2)</u>

This community is represented by the dominance of *Acacia karroo*. However, a large number of grasses such as *Aloe zebrina* (previously known as *Aloe transvaalensis*), *Aristida congesta* and *Melia azedarach,* associated with this plant community, are prominent.

Weeds and alien invasive species are present on site, mostly near the main road and buildings. There is an artificial dam in the study area which provides aquatic species such as *Cyperus* and *Typha*. Species of conservation importance such as *Hypoxis hemerocallidea* was also recorded on this plant community. A list of the plant species recorded within this community is provided within the fauna and flora report, Appendix D.

<u>Stands of Exotic Trees (site alternatives 1 and 2)</u>

Natural vegetation in some parts of the study area has been displaced by stands of exotic trees, most often *Eucalyptus camaldulensis* (Blue gum) and *Pinus patula* (Patula pine), as indicated in **Figure 13**. These trees occur mostly as localised stands.

Figure 13: Invasion of Ecalyptus camaldulensis (Blue gum) and Pinus patula (Patula pine) on natural grassland

The vegetation is dominated by the declared blue gum invader and patula pine species which are up to 20m high. Grasses present were *Aristida junciformis, Setaria sphacelata var. sphacelata* and *Cortadelia selloana.* The herbaceous component comprises species of the *Solanum mauritianum*, *Tagetes minuta*, and *Sporobolus africanus.*

Natural grassland (site alternatives 1 and 2)

These areas comprise terrestrial grassland that is representative of the regional vegetation types. The likelihood of encountering flora species of importance in these areas was estimated as high.

This community primarily comprises grass with a few scattered single dwarf shrubs. The natural grassland is highly infested with the invasive weed such as Pom pom weed (**Figure 14**).

Figure 14: Invasion of Pom pom Weed on Natural Grasslands

According to Bromilow (2010), once this species has established in an area, it lowers the biodiversity and reduces grazing capacity as it is unpalatable to herbivores.

The natural vegetation is dominated by grass species reaching a height of ~2.5 m tall (*Cymbopogon excavates* and *Hyparrhenia hirta*) while the herbaceous component comprises a cover of about 5%, with very few shrubs and trees. Dominant grass species are *Themeda triandra, Sporobolus africanus*, and *Melinis repens.* The herbaceous and shrub layers are dominated by *Aloe zebrina, Alternanthera pungens, Hypoxis rigidula, Hypoxis hemerocallidea, Oxalis obliquifolia* and *Verbena bonariensis*. According to Bromilow (2010), the presence of the following undesirable and unpalatable species, namely *Sporobolus africanus, Tragus berteronianus, Aristida* spp and *Eragrostis* species, indicate the mismanagement of the veld and also indicate that the severe damage has already occurred on this site.

Plant species of conservation importance recorded in the study area (site alternatives 1 and 2)

In terms of the SANBI plant species list of conservation importance that could be found in the area (**Table 15**), only one species was recorded, namely African potato (*Hypoxis hemerocallidea)* (**Figure 15).** According to Raimondo *et.al.* (2009), this plant species is listed as Declining. Other *Hypoxis* species recorded in the study area was Silver-leaved star-flower (*Hypoxis rigidula).*

According to Pooley (1998), the traditional healers use African potato in traditional medicine to treat dizziness, headaches, and mental disorders and in western medicine, this species is used to treat cancers, inflammation and HIV (Pooley, 1998). Due to its medicinal usage, this species is known to be harvested illegally throughout the country.

Figure 15: *Hypoxis hemerocallidea* growing in natural grasslands

9.8.2.2 Plant communities recorded in site alternative 3 (Phamphe, 2012)

Open natural grassland community (site alternative 3)

Large areas of the study area consist of open grasslands dominated by tall grass species, most notably *Eragrostis plana*, *Hyparrhenia hirta* and *Themeda trianda* as indicated in **Figure 16** below. Other grass species recorded in this community include early several species such as *Cynodon dactylon* and *Eragrostis curvula*. Herbs and shrubs recorded in this community comprise a mixture of indigenous and exotic species including *Berkheya setifera*, *Searsia lancea, Conyza bonariensis* and *Aloe greatheadii* var *greatheadii.* The rest of the species recorded in this community are provided in the fauna and flora report, Appendix D. Only one species of conservation importance was recorded in this community, i.e. *Hypoxis hemerocallidea*.

Figure 16: Open grassland community in the study area

Woodland community (site alternative 3)

This community is characterised by tall bushveld and dominated by species such as *Searsia lancea* and *Acacia karroo*. The common reeds were recorded along the non-perennial dry streams. The herbaceous and shrub layers are dominated by species such as *Aloe greatheadii var greatheadii* and *Berkheya setifera*. All species recorded in this woodland community are provided in the fauna and flora report, Appendix D. No species of conservation importance was recorded.

Alien invasive species recorded (site alternative 3)

Alien invasive plant species within the study area were observed to occur in clumps, scattered or single individuals on site. Invader and weed species must be controlled to prevent further infestation and it is recommended that all individuals of the invader species be removed and eradicated (Henderson, 2001). The exotic species *Eucalyptus grandis* and *Opuntia ficus-indica* (**Figure 17)** were common in the study area.

Figure 17: Alien invasive species recorded on site

Medicinal plants and Red Data Listed plant species (site alternative 3)

According to National Environmental Management Biodiversity Act (Act 10 of 2004), there is a dire need to conserve biodiversity in each province and as such, natural or indigenous resources must be utilised sustainably. Along the proposed pipeline there are a number of plants that are used to provide medicinal products and for which, in some cases, there is merit in protecting or translocating them before the proposed pipeline commences. For example, according to Pooley (1998), traditional healers use African potato in traditional medicine to treat dizziness, headaches, and mental disorders and in western medicine, this species is used to treat cancers, inflammation and HIV.

While many of these plants are indigenous or exotic weeds that have medicinal value and for which no action is necessary with respect to conservation, others are considered to have high economic value and are considered in need of protection. GDARD has a plant and rescue programme, which has been developed for the removal of plants of horticultural and medicinal value from any development site. Recovery plans are designed to reverse the decline of a threatened or endangered species and eventually bring the population to a self-sustaining level.

Hypoxis hemerocallidea (**Figure 15**) declared as “Protected” by the Nature Conservation Ordinance 1974 (No. 19 of 1974) was recorded on site. This plant species is listed as **declining** (Raimondo *et. al.,* 2009). According to Pooley (1998), the traditional healers use African potato (*Hypoxis hemerocallidea*) in traditional medicine to treat dizziness, headaches, and mental disorders and in western medicine, this species is used to treat cancers, inflammation and HIV. There is concern that this species is being collected illegally and unsustainably, causing a decline in populations.

From a flora perspective, sites 1 and 2 are located within the Magaliesberg Natural Area, which forms part of the greater Magaliesberg Protected Environment (see figure 12), in comparison to site 3 which is located in an area identified as a Critical Biodiversity Area (CBA) and ecological sensitive area in terms of the Gauteng C-plan. The CBAs in the study area is an irreplaceable area but due to grazing and anthropogenic activities such as human settlements, the study area is not in pristine condition. In addition, Construction

and operational activities are anticipated to have a significant impact on these areas; however the potential impacts can be reduced with proper mitigation measures.

The only species of conservation importance identified on all three sites was the *Hypoxis hemerocallidea*. A plant and rescue programme must be implemented to rescue and relocate from any of the substation sites to ensure protection of these geophytes.

9.9 Fauna

9.9.1 Mammals

9.9.1.1 Site Alternatives 1 and 2 (Phamphe, 2011)

According to GDARD Conservation Plan 2, the following species (**Table 16**) are known to occur on grid 2527DD.

Table 16: Red data Mammal species recorded in grid 2527DD

Common name	Scientific name	Conservation Status	Assessment of probabilities
Southern African hedgehog	*Atelerix frontalis*	Near Threatened	High
Spotted-necked otter	*Lutra maculicollis*	Near Threatened	High
Hildebrandt's horseshoe bat	Rhinolophus hildebrandti	Near Threatened	Low
Blasius's horseshoe bat	*R. blasii*	Vulnerable	Low
Geoffroy's horseshoe bat	*R. clivosus*	Near Threatened	Low
Schreiber's long-fingered bat	*Miniopterus schreibersii*	Near Threatened	Low
Temminck's hairy bat	*Myotis tricolor*	Near Threatened	Low

Mammals recorded on site

Table 17 indicates nine mammals observed in the study area. The species marked with an asterix (*****) were based on the information provided by the land owners of the properties. Larger mammals such as Kudu were observed on Portion 25 of the Farm Welgedund 491 JQ, which is a nature reserve. No sensitive or endangered mammals were recorded during the site visits.

Table 17: Mammals recorded at site alternative 3

Common name	Species
Impala	*Aepyceros melampus*
Kudu	*Tragelaphus strepsiceros*
Jackal*****	
Scrub Hare	*Lepus saxatilis*
African Mole-rat	*Cryptomys hottentotus*
Springhare	*Pedetes capensis*

Common name	Species
Bushveld Gerbil	*Tatera leucogaster*
Yellow Mongoose	*Cynictis penicillata*
Common Duiker	*Sylvicapra grimmia*

9.9.1.2 Site Alternative 3 (Phamphe, 2012)

Mammal species diversity was low on the proposed substation site. Good habitat cover is present, especially along the Moganwe River, and therefore a wide diversity of small to medium mammalian species is expected to flourish. The river forms an ecological corridor that highly-mobile species would utilize for migratory purposes, and therefore the riparian vegetation promotes ecological functionality. Mammals are sensitive to disturbances and as such many species would occur on or near the Magaliesberg Protected Natural Environment (MPNE) than near the residential areas. Settlement areas have negated the possibility of encountering any medium to large mammals. **Table 18** indicates three mammals observed in the study area and these species commonly occur in the area. A skull of a blesbok was recorded on site. The dumping of domestic refuse provides ideal habitat for opportunistic small mammal species, especially rats (*Rattus rattus*) and mice (*Mus musculus*). No large game or predators, or any signs of them, were observed in the study area during field survey. No indications of other smaller Red Data Listed species were found.

Table 18: Mammals that were recorded at site alternative 3

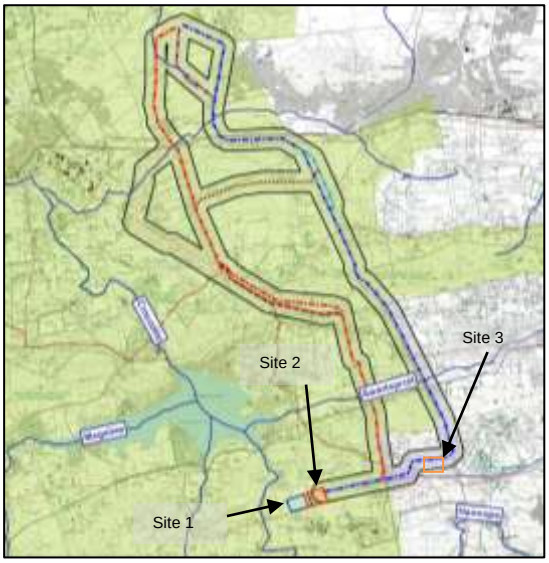
Common name	Species
Bushveld Gerbil	*Tatera leucogaster*
Striped or Four-Striped grass mouse	*Rhabdomys pumilio*
Blesbok	*Damaliscus pygargus phillipsi*

The potential impacts on mammals within any of the alternative sites are not anticipated to be significant as most mammals are mobile and as such will move out the construction area. However should any mammals be identified by on site, contractors must be made aware of how to safely relocate these mammals out of the construction sites. It is anticipated that the potential impacts can be mitigated against.

9.9.2 Avifauna

9.9.2.1 Site alternatives 1 and 2 (Phamphe, 2011)

In terms of Avifauna, the site alternatives 1 and 2 fall within the Magaliesberg and Witwatersberg (ZA018) Important Bird Area (IBA) (Barnes, 1988), as indicated in **Figure 18**.



***Please note that the transmission line route presented in the map is representative of the old route and has since been changed due the addition of alternative 3.

Figure 18: Magaliesberg and Witwatersberg (ZA018) Important Bird Area in green

Within the vegetation types found in the study area and immediate surrounding areas, three major bird habitat systems were identified:

- Dams;
- Grasslands; and
- Woodland.

A comprehensive bird species list requires intensive surveys compiled over several years. Twenty four (24) bird species (**Table 19**) were recorded during the field survey. Species recorded were common and widespread and typical of both grassland and savanna environments.

Table 19: Bird species recorded during the survey

Species	Common name
Anas undulate	Yellow-billed duck
Bubulcus ibis	Cattle Egret
Bostrychia hagedash	Hadeda ibis
Cercomela familiaris	Familiar Chat
Charadrius pallidus	Three-banded plover
Cisticola juncidis	Zitting Cisticola
Columba guinea	(Speckled) Rock pigeon
Corythaixoides concolor	Grey go-away-Bird (Lourie)
Corvus albus	Pied Crow
Elanus caeruleus	Black-shouldered Kite
Euplectes orix	Southern Red Bishop
Hirundo cucullata	Greater Striped Swallow
Lanius collaris	Common Fiscal

Lamprotornis nitens	Cape Glossy Starling
Mirafra africana	Rufous-naped Lark
Phylloscopus trochilus	Willow Warbler
Numida meleagris	Helmeted Guineafowl
Ploceus velatus	Southern masked-Weaver
Pycnonotus tricolor	Dark-capped (Blackeyed) Bulbul
Sigelus silens	Fiscal Flycatcher
Struthio camelus	Common Ostrich
Streptopelia senegalensis	Laughing Dove
Streptopelia capicola	Cape Turtle-Dove
Streptopelia semitorquata	Red-eyed Dove

Even though bird species such as Owls and Red-listed Cape vultures (*Gyps coprotheres*) (Vulnerable) were not observed during field visits, these species have been previously sighted on Portion 25 of the Farm Welgedund 491 JQ. Cape vulture is known to forage over open grassland and woodland and is dependent on tall cliffs for breeding.

9.9.2.2 Site alternative 3 (Phamphe, 2012)

Due to levels of human disturbance the site offers limited suitable habitat for any larger terrestrial birds as well as certain smaller raptor species. Potential nesting sites for raptors were searched for during fieldwork but none found on site. Within the vegetation types found in the study area and immediate surrounding areas, three major bird habitat systems were identified:

- **Rivers and associated riparian vegetation;**
- **Patches of remaining grasslands; and**
- **Woodland**.

A comprehensive bird species list requires intensive surveys compiled over several years. Twenty eight bird species (**Table 20**) were recorded during the field survey. Species recorded were common and widespread. No Red Data bird species associated with the proposed site were recorded within the study area. However, due to the suitable nature of the habitats, occasional visits cannot be discounted without long-term intensive surveys.

Table 20: Bird species recorded during the survey

Number	Common Name	Scientific Name
94	Hadeda ibis	*Bostrychia hagedash*
249	Three-banded plover	*Charadrius pallidus*
255	Crowned lapwing (plover)	*Vanellus coronatus*
348	Feral Pigeon	*Columba livia*
349	Rock pigeon	*Columba guinea*
352	Red-eyed Dove	*Streptopelia semitorquata*
355	Laughing Dove	*Streptopelia senegalensis*

Number	Common Name	Scientific Name
417	Little Swift	*Apus affinis*
424	Speckled mousebird	*Colius striatus*
444	Little bee-eater	*Merops pusillus*
476	Lesser Honeyguide	*Indicator minor*
526	Greater Striped Swallow	*Hirundo cucullata*
548	Pied crow	*Corvus albus*
568	Red-eyed Bulbul	*Pycnonotus nigricans*
635	Lesser swap-warbler	*Acrocephalus griseldis*
683	Tawnyflanked Prinia	*Prinia subflava*
732	Common fiscal (Fiscal Shrike)	*Lanius collaris*
758	Indian Myna	*Acridotheres zeylonus*
787	Whitebellied Sunbird	*Cinnyris talatala*
801	House Sparrow	*Passer domesticus*
814	Southern Masked-Weaver	*Ploceus velatus*
824	Southern Red Bishop	*Euplectes orix*
826	Yellow-crowned Bishop	*Euplectes afer*

In terms of avifauna, although no red-data species were identified during any of the site visits, the cape vulture was previously recorded on site alternative 2, making this site the most sensitive site. The most significant impacts are therefore anticipated to occur on site 2, however it is anticipated that potentials can be mitigated so that potential impacts are minimal.

9.9.3 Reptiles

A list of reptile species that could possibly occur within the study area is included in Table 21. This list was adopted from the South African Reptile Conservation Assessment (SARCA), from the Avian Demographic Unit (ADU), University of Cape Town. This list includes the entire reptile species recorded in grid cell 2527DD.

Table 21: Reptile species that could potential occur in the study which were previously recorded in grid cell 2527DD (SARCA)

Family	Common name	Species	Picture
Colubridae	Rhombic Egg-eater	*Dasypeltis scabra*	
Viperidae	Rhombic Night Adder	*Causus rhombeatus*	
Gekkonidae	Transvaal Gecko	*Pachydactylus affinis*	

Testudinidae	Speke's Hinged Tortoise	*Kinixys spekii*	

9.9.3.1 Site alternatives 1 and 2 (Phamphe, 2011)

Reptiles recorded on study area

Reptile lists require intensive surveys conducted for several years. Reptiles are extremely secretive and difficult to observe during field surveys. The majority reptile species are sensitive to severe habitat alteration and fragmentation. No reptile diversity was observed on the site, even though species such as Rinkhals, Puff adder, Boomslang and Cape cobra were previously observed by land owner on Portion 25 of the Farm Welgedund 491 JQ. Many tall trees such as *Searsia lancea, Eucalyptus camaldulensis* and *Pinus patula* were recorded on the site. Trees including stumps, bark and holes are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors). Limited suitable habitat for any arboreal species occur but suitable habitat for terrestrial reptile species such as Ground Agama, Yellow throated Plated Lizard, Montane Speckled or Striped Skink as well as snake species (Rinkhals, Mole Snake, and Black-headed Centipede Eater). The indiscriminate killing of all snake species as well as the illegal collecting of certain species for private and the commercial pet industry reduces reptile populations especially snake populations drastically (Jacobsen, 2005 cited in Phampe (2011)). The frequent burning of the site will have a high impact on reptiles. Fires during the winter months will severely impact on the hibernating species, which are extremely sluggish. Fires during the early summer months destroy the emerging reptiles as well as refuge areas increasing predation risks (Jacobsen, 2005 cited in Phampe (2011)).

9.9.3.2 Site alternative 3 (Cook, 2012)

Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE). The granitic outcrops to the north of the Magaliesburg offers favorable habitat for Southern African Pythons in the form of the rocky mountainous areas, wetland habitats as well as open and closed woodland vegetation units.

The Striped Harlequin Snake (*Homoroselaps dorsalis*), which is categorised as Rare in the outdated Red Data List (Branch 1988) has been recorded from the grid squares in which the alignments are situated (SARCA).

The proposed Anderson substation site offers no suitable habitat for the Southern African Python (*Python natalensis*) and marginally suitable habitat for the Striped Harlequin Snake (*Homoroselaps dorsalis*) in the form of scattered moribund termite mounds. Under C-Plan version 3 (latest version i.e. version 3.3), no specialist studies for any species of reptile are requested for consideration in the review of a development application in Gauteng Province.

In terms of reptiles the potential impacts can be mitigated against as all alternative sites offer suitable limited / no suitable habitats for reptile species.

9.9.4 Amphibians

According to The North West Biodiversity Site Inventory and Database Development (2003), the following Red Data amphibians are recorded for the North West Province (Table 22).

Table 22: Red Data Herpetofauna Species Recorded for the North West Province

Scientific name	English name	Status
Crocodylus niloticus	Nile Crocodile	Vulnerable
Pyxicephalus adspersus	Giant Bullfrog	Near Threatened
Python natalensis	Southern African Python	Vulnerable
Homoroselaps dorsalis	Striped Harlequin Snake	Rare

The Giant Bullfrog is adapted to opportunistic breeding in temporary pans and rainwater pools and due to the occurrence of various water bodies in the study area, the possibilities of recording this species in the study area are high. According to Yetman (2004) (cited in Phampe, 2011), the Giant Bullfrog is listed as "Near-Threatened" in Southern Africa and is considered a flagship species for southern African grasslands. There is also reason to believe that this species may be far more threatened within the sub-region, where Giant Bullfrogs are suffering a precipitous decline due to industrial and urban development. Although the destruction, degradation and fragmentation of grasslands and wetlands contribute the most to the decline of the Giant Bullfrog, the high mortality of these frogs on roads (usually at night after heavy thunder showers) is also of great concern.

It is anticipated that any potential impacts to amphibians can be mitigated against as construction activities undertaken within 32m from the edge of any watercourse will be minimal. Potential impacts can therefore be mitigated against. Should any giant bullfrog species be identified within any of the sites, then contractors must be made aware of relocation measures and should be on high alert following heavy thunder storms.

9.9.5 Invertebrates

According to Henning & Henning (1989) cited in Phampe 2011, of the 102 threatened butterflies in South Africa 31 (30%) occur in the Grassland Biome of which one of these species is already extinct, and 29 (94%) are endemic to the biome.

Invertebrate species of conservation concern known to occur in the vicinity of the site

Records indicate that six Red Data lepidopteran species of conservation concern are known to occur in the vicinity of the alternative routes for the proposed transmission line, namely *Spialia paula*, *Metisella meninx*,

Acraea machequena, *Lepidochrysops hypopolia*, *Lepidochrysops praeterita* and *Platylesches dolomitica*. Two cetonid beetles of conservation concern are known to occur in the area, namely *Ichnestoma stobbiai* and *Trichocephala brincki*. *Hadogenes gunningi*, formerly listed as a scorpion species of conservation concern is also known to occur in the vicinity of the site.

1. *Spialia paula*, 2. *Metisella meninx*, 3. *Acraea machequena*, 4. *Lepidochrysops praeterita*, 5. *Platylesches dolomitica* and *Lepidochrysops hypopolia* (not observed since 1879), 6. *Ichnestoma stobbiai,* 7. *Trichocephala brincki and* 8. *Hadogenes gunningi.*

Figure 19: Species of concern known to occur in the vicinity of the substation

Care must be taken to ensure that none of the above invertebrate species are on site when construction activities commence. As these are mobile species, contractors must be aware of how to capture and relocate them without causing any harm. The potential impacts are anticipated to be minimal provided that measures recommended by the specialist are adhered to.

9.10 Surface Water

9.10.1 Regional Description

The North West Province is situated within the Crocodile West - Marico Water Management Area (WMA 3) which borders on Botswana. This WMA includes two major river systems, the Crocodile and Groot Marico, which give rise to the Limpopo River at their confluence. Surface water in the North West Province occurs in the form of rivers, dams, pans, wetlands, as well as dolomitic eyes which is fed by aquifers. In the semi-

arid western portion of the province surface water resources are generally scarce. The main rivers in the province include the Crocodile, Groot Marico, Hex, Elands, Vaal, Mooi, Harts and Molopo rivers. There are over 40 wetland areas in the province of which one, the Barbers Pan, is a Ramsar site (recognised as a wetland of international importance).

Surface water runoff from precipitation in the North West Province ranges from less than 1% in the semi-arid western area to approximately 7% in the eastern region, with the average runoff being 6% which is below the national average of 9%. In order to meet water supply needs, the North West Province relies heavily on ground water resources.

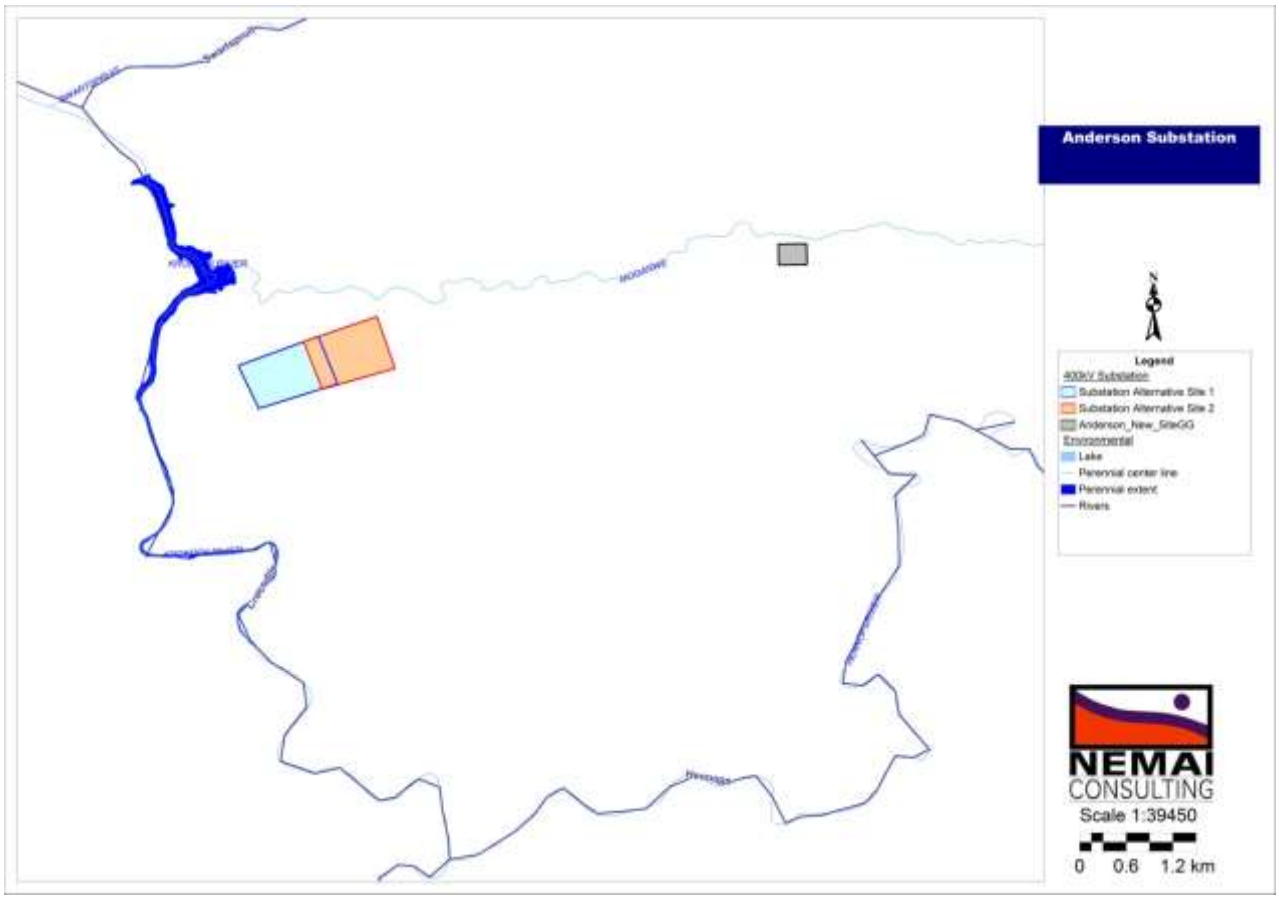


Figure 20: Rivers found within the study area

Surface waters in the Gauteng Province comprise both flowing rivers and lakes or dams, with many of the smaller tributaries being seasonal in nature (i.e. dry in the winter). The Gauteng Province is situated within the upper reaches of three water management areas (WMAs). These WMAs includes the Crocodile West-Marico, Upper Vaal and Olifants River areas. Gauteng's natural water resources comes from surface water runoff as well as from ground water, however due to the high demand for water in the province, raw water is imported from outside the province. The province's main water supply comes from the Vaal River which receives input from the Lesotho Highlands Project. The main rivers and streams in the Tshwane (Pretoria)

area are the Apies River, the Pienaars River and the Moreleta spruit. Approximately 2.1% of surface area in Pretoria is covered by wetlands. Figure 20 shows the watercourses found near the study area.

Due to close location of the sites to watercourses, the construction and operational activities can potentially have an impact and as such all recommended mitigation measures must be implemented to ensure protections of all watercourses as any contamination / destruction can result in a regional impacts.

9.11 Groundwater

9.11.1 Regional Description

The fractured aquifers and dolomitic compartments which occur within the North West Province have resulted in a large reservoir of subterranean water. Although this precious resource occurs in the province, the recharge to this reservoir is considered to be one of the lowest in South Africa with an average of less than 10 mm per annum in the western region of the province. In order to meet water supply needs, the North West Province relies heavily on ground water resources. Groundwater resources in the province are polluted by mining and industrial activities, as well as by agriculture and domestic use. High levels of dissolved minerals, nitrates and fluoride concentrations in certain areas in the province as a result of both natural and human-induced factors are the main groundwater water quality issues in the province.

Due to the varied and complex geology of the Gauteng Province, aquifers found within this province are diverse. Four main types of aquifers occurs within the Gauteng Province. These aquifers are grouped into four hydrogeological types which includes intergranular (alluvial – found in valley bottoms); fractured aquifers; karstic (dolomitic) aquifers; and intergranular and fractured aquifers (in the weathered zone). The quality of water in these aquifers found in the Gauteng Province is highly variable depending on the geology, ecological setting and influence of man.

9.11.2 Site Description

In terms of the North West State of the Environment Report the groundwater storage rock types found within the study area is mainly comprised of fractured igneous rock/metamorphic rock and fractured compact sedimentary rock. No karstic aquifers occur within the study area. No dolomites occur along the section of the eastern route alternative which traverses the Tshwane Municipal area and therefore no karstic aquifers within the area.

9.12 Air Quality

9.12.1 Regional Description

Air quality in the majority of the North West Province is not considered to be a major problem. Areas where air quality in the province shows deterioration includes urban, mining and industrialised areas such as Brits, Rustenburg and Potchefstroom. Vehicular emissions in the urbanised and industrialised areas also contribute to a deterioration in air quality in the province. Furthermore the use of wood and coal for heating and cooking purposes in informal areas contributes to poorer air quality.

The state of air quality in the Pretoria (Tshwane) area is influenced by industrial activities, petrol stations, vehicular emissions from nearby roads and highways, informal settlements, sewerage effluent, and waste dumping. All of these activities contribute to air emissions which deteriorates air quality in the area.

9.12.2 Area/Local Description

Land uses in the study area are comprised of many minor and major roads, agriculture, mining, conservation, industrial, commercial, recreational and residential. Emissions from mining activities, industrial activities as well as and vehicular emissions affects the status of air quality in the study area. Furthermore various informal settlements occur and air emissions as a result of coal and wood burning for heating and cooking purposes also impacts on the state of air quality in the study area.

In terms of air quality, the potential impacts are anticipated to be minimal, as the main impacts may be as a result of dust and construction vehicles. All potential impacts can be mitigated against.

9.13 Noise

9.13.1 Area/Local

As mentioned previously, land uses in the study area are comprised of many minor and major roads, agriculture, mining, conservation, industrial, commercial, recreational and residential. Noise levels in the study area are currently generated by vehicles traffic on the major and minor roads, by heavy vehicles used by the mines and industries in the area, as well as by operational activities undertaken by the mines, quarries and industries. There are various properties which is not located in close proximity to mining and industrial area, where noise levels are lower.

Care must be taken to ensure that the potential impacts to surrounding areas in terms of noise are minimal, most noise is anticipated from construction vehicles and these impacts can be mitigated against.

9.14 Socio-Economic Environment

9.14.1 Regional and Local Context

9.14.1.1 North West Province

The Madibeng Local Municipality, which houses the Dinaledi MTS, is found in the North West Province. The total population number of the North West Province is estimated at 3.043 million. The North West Province is home to 9.5% of South Africa's total population.

The North West Province has four district municipalities and twenty one local municipalities.

9.14.1.2 Gauteng Province

The City of Tshwane, which is to house the new proposed Anderson Substation is found in Gauteng Province.

The Gauteng Province is bounded to the north by the Limpopo Province; to the south by the Vaal River, which separates it from the Free State Province; to the east by the Mpumalanga Province and to the west by the North West Province.

The Gauteng Province is the smallest province in South Africa, with only 1.4% of the land area. The Gauteng Province covers an area of 16 548 km2. The province is highly urbanised containing the cities of Johannesburg and Pretoria. Although it is South Africa's smallest province, the Gauteng Province has the largest population, in 2007, of nearly 10.5 million, almost 20% of the total South African population.
The Gauteng Province comprises of three metropolitan municipalities and three district municipalities which are further divided into nine local municipalities.

The Gauteng Province is considered the fastest growing province, experiencing a population growth of over 20% between the 1996 and 2001 Censuses. The Gauteng Province is highly urbanised with 97% of its population living in urban centres.

9.14.2 Social

The population in the study area including the transmission line totals 20 710. The Magaliesberg Nature Reserve and Pretoria NU are relevant to alternatives 1 and 2 and site alternative 3 respectively.

Table 23: Population figures for the study area

Sub Place	Total
Mothotlung	2 727
Rankotia	144
Damonsville	415
Ga-Rankuwa	4
Brits NU	12 188
Magaliesburg Nature Reserve	114
Pretoria NU	5 118
Total	**20 710**

9.14.3 Economic

The key economic activity of North West Province is mining. This economic activity generates more than half of the North West Province gross domestic product and provides jobs for more than a quarter of the workforce. The main minerals are gold, mined at Orkney and Klerksdorp; uranium, mined at Klerksdorp; platinum, mined at Rustenburg and Brits; and diamonds, mined at Lichtenburg, Christiana, and Bloemhof. The northern and western parts of the North West Province are characterised by sheep farming and cattle and game ranches. The eastern and southern parts of the North West Province, including the study area, are characterised by crop-growing regions producing maize, sunflowers, tobacco, cotton and citrus fruits.
The key economic activities of Gauteng Province are financial and business services, logistics and communications, and mining. Gauteng is the financial capital of Africa and is home to a high number of foreign and South African banks; stockbrokers and insurance corporations.

Agriculture

The second key economic activity of the North West Province is agriculture. The agricultural sector accounts for thirteen percent of the North West Province gross domestic product and provides jobs for approximately eighteen percent of the labour force. The main products that are produced in the region include sunflower seeds, groundnuts, maize, wheat and cattle. Due to higher rainfall the eastern part of the province also produces vegetables, flowers and poultry. Horticulture, aquaculture and bio-fuels are some of the new activities to be undertaken in the region with the North West already having several bio-fuels initiatives underway.

Agriculture in Gauteng is an important economic activity in the province and is focusing on providing cities and towns of the province with daily fresh produce. Bronkhorstspruit, Cullinan and Heidelberg are characterised by agricultural activities where ground-nuts, sunflowers, cotton and sorghum are produced.
Food, food processing and beverages constitute an important part of the province's economy, with half of South Africa's agriprocessing companies operating in Gauteng. New and expanding products under development include organic food, essential oils, packaging, floriculture, medicinal plants, natural remedies and health foods.

9.15 Archaeology and Cultural Historical

9.15.1 Regional Description

Many important cultural heritage sites occurs within the North West Province. These sites includes well represented Stone Age and Iron Age sites, including the Kruger Cave; the Bosworth Rock Engraving site, Thaba Sione near Mafikeng and the stone-walled settlement of Kaditshwene in the Madikwe area. Furthermore, battlefields from the South African War occur in this province such as the Battle of Silikaatsnek (1900), and a number of forts, graves and blockhouses from this period also occurs within the province. A small portion of the Cradle of Humankind World Heritage Site (COHWHS) is located within the province. The condition of the known cultural heritage resources found within North West Province is considered to be relatively good.

Various important cultural assets are found within the City of Tshwane area, and some of these places are of high archaeological value. The Schurveberg area in the Centurion area has many valuable cultural and historical assets, which could be restored and conserved. Another important cultural asset in the study area includes the Tswaing Crater. Furthermore the section of the Magaliesberg in the Crocodile River area has a rich settlement history from the time of Mzilikasi, and British stone blockhouses occur within this area which dates back from the Boer war.

9.15.2 Site Description

Site Alternative 1 and 2

A Phase 1 Heritage Impact Assessment was undertaken and is included in Appendix D3 for review. The main types and ranges of heritage resources that were identified in the greater study area were:

- Monument;
- Graves; and
- Structures

The study concluded that there were no areas of heritage or cultural significance identified within site alternative 1 and 2.

Site Alternative 3

An additional Heritage Impact Assessment was undertaken for site alternative 3. Two graves and scattered stone tools were identified within the site. The identified resources will be handled according to Sections 35 and 36 of the NHRA.

It is therefore recommended that based on the survey that the construction may not proceed until a phase 2 assessment of the proposed site is undertaken to determine whether the site is of archaeological significance. It is possible that the phase 2 will reveal nothing of significance and the substation can proceed. The graves must be protected by means of placing a buffer of 15m around the graves so that no construction activity can impact on them.

10 SUMMARY OF SPECIALIST STUDIES

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite specialist studies triggered during Scoping. According to Minster (2005), a 'trigger' is "*a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input*". The necessary specialist studies triggered by the findings of the Anderson Substation Scoping process, aimed at addressing the identified key issues and compliance with legal obligations, include the following:

- Fauna and Flora Survey (S1, S2 and S3);
- Heritage Impact Assessment (S1, S2 and S3);
- Visual Impact Assessment (S1, S2 and S3);
- Socio-Economic Impact Assessment (S3);
- Invertebrate Impact Assessment (S3);
- Herpetological Impact Assessment (S3); and
- Preliminary Geotechnical Investigation (S2 and S3).

For the inclusion of the findings of the specialist studies into the EIA report, the following guideline was used: *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005). Key considerations included:

- Ensuring that the specialists have adequately addressed any potential issues;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective specialist studies was incorporated into the EIA report in the following manner:

- The information was used to complete the description of the receiving environment (**Section 9**) in a more detailed and site-specific manner;
- A summary of each specialist study is contained in the sub-sections to follow, focusing on the approach to the study, key findings and conclusions drawn;
- The evaluations performed by the specialists on the alternative routes were included in the comparative analysis (**Section 12**) to identify the most favourable option;
- The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 11**; and
- Salient recommendations made by the specialists were taken forward to the final EIA Conclusions and Recommendations (**Section 14**).

Note: Following the scoping phase, I & Aps raised issues with regards to the location of the alternative 1 and 2 substations. These main issues related to the following:

- The close proximity of the NECSA facility;
- The substation would be located within the M4 road reserve; and
- Both sites were located within the Natural bird area sites.

Based on the comments received and findings of the specialist studies, a third site alternative was identified for the preferred location of the substation. A specific invertebrate impact assessment, herpetological assessment and socio-economic assessment was therefore undertaken for site alternative 3 as based on the comments received, it was determined that site alternative 1 and 2 were not preferred by I & Aps and as such it was not necessary to have those separate assessments done . However the fauna and flora assessment covered invertebrates and herpetofauna (reptiles and amphibians). The socio-economic assessment report briefly provides a statement as to why site 1 and 2 is not preferred. A detailed geotechnical investigation will be done once the preferred site is chosen, once a preliminary study was not done for site alternative 1 due to the issues raised by I & Aps.

10.1 Fauna and Flora Survey

Details of the nominated specialist:

Specialist	
Organisation:	Nemai Consulting
Name:	Ronald Phamphe
Qualifications:	MSc Botany
No. of years experience:	8
Affiliation (if applicable):	**Professional Member** of South African Institute of Ecologists and Environmental Scientists **Candidate Natural Scientist**: South African Council for Natural Scientific Professions **Professional Member**: South African Association of Botanists.

This section provides a summary of the Fauna and Flora Surveys for the Anderson substation project, as undertaken by Ronald Phamphe (2011 and 2012), which is contained in ***Appendix F1***.

Summary of fauna and flora specialist studies for site alternative 3 (preferred alternative)

Nemai Consulting was appointed by Eskom as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment for the third site alternative for the proposed Anderson substation. A Flora and Fauna survey was carried out in 2012 to determine the potential impacts of the proposed substation on the receiving environment. The proposed Anderson substation is the third site under assessment and will be on Portions 82, 83 and 76 of Farms Schurveberg 488 JQ.

The study area is dominated by grasslands, woodlands and a residential area. The objective of this study was to identify sensitive species and their habitats in the proposed site. The current ecological status and conservation priority of vegetation on the site were assessed. Potential faunal habitats were assessed in the study area and all mammals and birds known to occur on site or seen on site were recorded. Red data species (both fauna and flora) that are known to occur on site were investigated.

The study area falls within the savanna biome and has been categorised as Andesite Mountain Bushveld vegetation unit. There are no Threatened Terrestrial Ecosystems recorded on the proposed site. Gauteng Conservation Plan 3.3 described the study area as falling within a Critical Biodiversity Area (CBA) and an Ecological Sensitive Area (ESA). The CBAs in the study area is Irreplaceable Area but due to grazing and anthropogenic activities such as human settlements, the study area is not in pristine condition. A specialist investigation has indicated that significant environmental impacts may result if the mitigation measures listed in this report are not implemented.

No Red Data plant species were recorded in this study but only one species of conservation importance (Orange listed species) was recorded on site, namely, *Hypoxis hemerocallidea*. This plant species recorded should be relocated to a safe, suitable area, such as the conservation area.

Only three mammal species were recorded during the field assessment. No sensitive or endangered mammals were recorded within the study area. Taking into consideration the fact that Red Data mammals are reliant on pristine and stable habitats, few, if any, threatened small mammals are expected to occur in the study area. The majority of larger mammal species are likely to have moved away from the area, as a result of habitat alteration and degradation together with the development of human settlements which lead to illegal hunting and poaching. During the construction of the substation, it is anticipated that there would be a further loss of ecologically sensitive and important habitat units; ecosystem function and loss of faunal habitat. It is anticipated that mammals residing on site will move to another area nearby and could move back after the area has been rehabilitated.

An avifaunal study indicated that the riparian vegetation, woodlands and patches of grasslands should provide natural habitats for bird species, however no Red data bird species were observed on the study site. Bird species recorded during a field survey are common and widespread. The study area falls near an Important Bird Area (IBA), namely the Magaliesberg and Witwatersberg (ZA018) IBA, approximately 2km away. IBAs form a network of sites, at a biogeographic scale, which are critical for the long-term viability of naturally occurring bird populations. The proposed substation will only have a negative impact during the construction phase whereafter the birds will return to the area. It is recommended that, for areas in close proximity to sensitive habitats (such as near Moganwe River) disturbance factors must be limited as much as possible. Undue disturbance factors will displace sensitive species.

The proposed development will cause disruption during the construction phase, but as long as mitigation measures are carried out properly, these disruptions should have minimal lasting effect on the ecosystems of the proposed development. From an ecological point of view, the proposed substation should proceed as planned.

Summary of fauna and flora specialist studies for site alternative 1 and 2

Site alternative 2 and 3 for the proposed new Anderson Substation are located to the north of the Nuclear Energy Corporation of South Africa (NECSA), located in Broederstroom on Portion 82 of the Farm Weldaba 567 JQ and Portions 25 and 65 of the Farm Welgedund 491 JQ. Two of the three site alternatives under assessment for the proposed construction of the Anderson Substation and are located within the Madibeng Local Municipality, North West Province.

The land uses surrounding the study sites includes NECSA, Pelindaba and the R104 to the south, and privately owned farm portions to the north, east and west. The foot of the Witwatersberg is located approximately 1km north of the study sites.

Site alternatives 1 and 2, due to its close proximity to Hartbeespoort dam and also falling within the 5km buffer of the Pelindaba Nuclear Facility, is considered as one of the strategic important areas in North West province. The vegetation types associated with the new proposed Anderson substation are the Andesite Mountain Bushveld and Gauteng Shale Mountain Bushveld, which in terms of its conservation status are listed as Least Threatened and Vulnerable respectively.

In terms of avifauna, the study area falls within an Important Bird Area, namely the Magaliesberg and Witwatersberg (ZA018) Important Bird Area.

During the site visits, no Red Data plant or animal species were recorded but the Orange listed plant species, *Hypoxis hemerocallidea* (African potato) was observed in abundance. Gauteng Department of Agriculture and Rural Development have developed Plant and Rescue Policy which deals specifically with the management of the orange listed species and medicinal plants. Even though Hartbeespoort strategic environmental assessment regards the study area as high in terms of open space; rivers, slope and red data species, the results from the field observation suggest the contrary as the area is highly infested with alien invasive plant species. **The conclusions of this report are then that there will be no significant adverse environmental impacts as a result of the development of a substation, and as such, there is no resulting ecological difficulty with the project being approved.** The construction of this new proposed substation will aid in the eradication of the alien invasive species in the study area.

10.2 Herpetological Assessment

Details of the nominated specialist:

Specialist	
Organisation:	N/A
Name:	Mr Clayton Cook
Qualifications:	MSc. Zool. U.P
No. of years experience:	15
Affiliation (if applicable):	• Registered professional member of The South African Council for Natural Scientific Professions (Zoological Science), registration number 400084/04

This section provides a summary of the Herpetological Impact Assessment for the Anderson substation located at alternative 3 only, as undertaken by Mr Clayton Cook (2012), which is contained in ***Appendix D1***.

Eskom Holdings Limited is proposing the construction of a new 400kV substation and Transmission Line as part of their Tshwane Strengthening Scheme Project. The proposed The proposed substation is earmarked for construction within the Madibeng Local Municipality.
The Dinaledi Substation is located on Portion 843 of the Farm Roodekopjes of Zwartkopjes 427 JQ, which is located approximately 8km North East of Brits.

The preliminary herpetological survey/ habitat assessment focused on the description of the available and sensitive habitats along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives as well as new Anderson substation; with special reference to the current status of threatened amphibian and reptile species occurring, or likely to utilize the areas within and surrounding the proposed alignment. It must be stressed that no actual amphibian or reptile surveys were conducted due incorrect timing of survey (late winter months August) as well as large length of the alignment (40km) as well as sever time and financial constraints. Access was also restricted due to several fenced off private properties.

Amphibians

No suitable Giant bullfrog breeding habitat was observed on the site. The transformed and heavily degraded grasslands offer limited suitable foraging, dispersal and aestivation habitat for Giant Bullfrogs. A few scattered termite mounds were observed on the southern portions of the site. Under C-Plan version 3 (latest version i.e. version 3.3), no specialist studies for any species of amphibian are requested for consideration in the review of a development application in Gauteng Province.

Reptiles

The proposed Anderson substation site offers no suitable habitat for the Southern African Python (*Python natalensis*) and marginally suitable habitat for the Striped Harlequin Snake (*Homoroselaps dorsalis*) in the

form of scattered moribund termite mounds. Under C-Plan version 3 (latest version i.e. version 3.3), no specialist studies for any species of reptile are requested for consideration in the review of a development application in Gauteng Province.

10.3 Invertebrate Assessment

Details of the nominated specialist:

Specialist	
Organisation:	Endangered Wildlife Trust
Name:	Mr Vincent van der Merwe
Qualifications:	BSc Entomology (UP), BSc (Hons) Zoology (UP), MSc Conservation Biology (UCT)
No. of years experience:	7 years
Affiliation (if applicable):	Endangered Wildlife Trust, Percy FitzPatrick Institute of Ornithology, Scarab Research Unit, Lepidopterists Society

This section provides a summary of the Invertebrate Impact Assessment for the Anderson substation for site alternative 3, as undertaken by Mr Vincent van der Merwe (2012), which is contained in ***Appendix D1.***

The aim of this report was to provide a description of potential status of Red Data Invertebrate species and habitat that could be potentially suitable for the presence of these species on the proposed Anderson substation site. Results obtained from the sensitivity scan are considered sufficient to highlight sensitive habitat types and potential Red Data habitat. No invertebrate species of conservation concern were observed during the site visit and their presence is unlikely due to the degraded condition of the site. The sensitivity scan was however conducted outside of the flight period of four species of conservation concern known to occur in the vicinity of the site. Follow up surveys are recommended in mid and late summer to confidently establish the absence of *Trichocephala brincki, Lepidochrysops praeterita* and *Lepidochrysops hypopolia and Acraea machequena* from the site.

The site was visited on the 25th of August 2012 by Vincent van der Merwe and Clayton Cook and on the 10th of September 2012 by Vincent van der Merwe. The site has been completely transformed by anthropogenic activities. An existing substation is located immediately west of the proposed new substation site. The area designated for the development of the new substation is currently used for grazing by privately owned horses. A farm homestead and associated infrastructure is located to the immediate south of the proposed substation site. Although small remnants of natural vegetation remain immediately east of the proposed substation site, the development area is completely dominated by the anthropogenic grass species *Hyparrhenia hirta*. Farm infrastructure including roads, stables, a reservoir and housing for labour are also present on or in the immediate vicinity of the proposed substation site.

The site has been completely transformed by anthropogenic activities and little natural vegetation remains. Surrounding areas have also been heavily impacted by development. Invertebrate diversity has been negatively impacted by this development and the presence of invertebrate species of conservation concern on the proposed substation site is unlikely.

10.4 Visual Impact Assessment

Details of the nominated specialist:

Specialist

Organisation:	Axis Landscape Architect

Organisation:	i-Scape
Name:	Mr Mader van den Berg
Qualifications:	Masters in Landscape Architecture (University of Pta)
No. of years experience:	7 years
Affiliation (if applicable):	N/A

This section provides a summary of the Visual Impact Assessment Surveys for the Anderson substation project, as undertaken by I-Scape (2012) and (Axis Landscape Architect (2011), which is contained in ***Appendix D4***.

Summary of Visual Impact Assessment for the proposed Anderson substation - Site alternative 3 (Preferred Alternative)

I-scape was appointed by Nemai Consulting to compile a Visual Impact Assessment (VIA) report for the proposed establishment of the Anderson Substation (Alternative 3) near Flora Park A.H. in the City of Tshwane Municipality, Gauteng.

Study Area

The study area can shortly be described as the area affected by visual impact and usually extends beyond the boundaries of the site. For the purpose of this assessment the study area is limited to a radius of 10 km from the centre of the proposed Anderson Substation site. Within the study area one can define a Zone of Visual Influence (ZVI) or viewshed, which delineates the areas of anticipated visual impact as calculated by computer software.

The factors that most significantly influence the ZVI are topographic variation and land use/cover which could potentially screen the proposed project from critical viewpoints. These factors also contribute to the prevailing landscape character which establishes the context in which the project is proposed. The study area is located in a moderately mountainous region and occupies most of a wide and open valley. The two parallel ridges of the Witwatersberg and Skurweberg provide a visual unit and contain views within the

valley. Although the topographic elevation is not very dramatic it is considered aesthetically pleasing and contributes positively towards the value of the landscape character.

The study area accommodates a variety of land uses of which a rural, agricultural land use is the most prominent. One residential cluster, Flora Park A.H. occurs around the Broederstroom Primary School but for the remainder of the study area the population density is very low and spread out. Three major transport routes traverse the study area and are considered important tourist routes connecting important tourist destinations such as Hartebeespoort Dam and the Cradle of Humankind World Heritage site.

Project Description

In short the project entails the construction of a 400kV substation with a footprint of 300x300 m and a maximum height of 30 m. During construction earthmoving equipment and workforce will be present on site, preparing the substation platform and foundations. Transport vehicles will deliver construction material during the course of the construction phase. The footprint of disturbance is expected to be larger than the 300x300 m substation site, but rehabilitation should occur after completion. The result is that vegetation is damaged and the underlying soil is exposed which cause unsightly scarring in the landscape. During this stage dust clouds may occur on windy days but can be effectively mitigated. Many of a substation's components are housed in buildings which are typically brick structures with corrugated iron roofs. Other components such as the transformers, circuit breakers, busbars etc. are located outside and form the bulk of the substation. A substation has a very industrial character with steel structures and cables connecting the different components. A telecommunication tower is usually also part of a substation which connects the control rooms of various substations. This is often the highest structure of a substation. The perimeter fence can either be a diamond mesh wire fence or a concrete palisade fence. As part of the security of a substation perimeter lighting is installed.

Visual Impact Assessment

Within the study area observers experience and interact differently with their environment and therefore value it differently. They may be affected by the proposed project due to additions or alterations in the landscape character which may influence their experience and views of the visual resource. In this assessment a distinction is made between impacts on the **observers** and impacts on the **landscape character**. The observers represent all people that may be affected visually while the impacts on the landscape character exclusively assess the changes to the landscape character and the impact on its visual value. A highly significant impact on the observers will not necessarily be a highly significant impact on the landscape character and vice versa and that's why the distinction is made.

The following typical impacts may be expected as a result of the construction and operation of the proposed project:

- The project activities or components noticeably change the existing features and the qualities of the landscape;

- The project introduces new features which are uncharacteristic or in contrast with the existing character of the landscape; and/or
- The project removes or blocks aesthetic features in the landscape which subsequently affects the visual value and aesthetic appeal of the visual resource.

The significance of this change/impact is a function of:

- The intensity of the impact;
- The sensitivity of the observers which are impacted or the sensitivity of the landscape character; and
- The exposure of the observer to the impact.

Visual Impacts During Construction Phase

Visual impacts will result from the temporary presence of a construction camp and material stockyard as well as activities and disturbances on the substation site. Typical visual impacts often relate to the unsightly character of such a construction site brought about by the untidy and disorderly placement of ancillary elements and the associated surface disturbances. Construction equipment such as graders, front-end loaders etc. will be active on site. During the preparation of the base major earthworks will be required to level the site. The physical damage to the existing vegetation cover impacts on the landscape character and causes intrusive views.

Visual Impacts During Operational Phase

The addition of a new substation will alter the baseline condition and impact on the character of the landscape due to a change in land use. The new substation will cause an intrusion on observers' views especially to those living or passing within 1 km of the site.

Mitigation Measures

The aim of mitigation is to reduce or alleviate the anticipated impacts that are a consequence of the proposed project's components and activities. The mitigation measures address impacts during the design, construction and operational phase of the substation and are mainly focussed on mitigating intrusive views from sensitive viewpoints. A section on obtrusive lighting mitigation provides practical guidelines for the installation of security lighting.

Conclusion

The findings of this visual impact assessment have provided arguments and evidence that there will be negative impacts during both the construction and operational phase of the substation. During construction the impacts revolve around the extensive clearing of vegetation and the unsightly and intrusiveness nature of the construction site. The impacts will be most significant on the local residents within 1 km of the site as they will experience a high degree of sustained exposure for the duration of the construction phase. Mitigation can be implemented to reduce the significance of the visual impact and is mostly orientated towards screening of the construction site.

During the operational phase it can be expected that the same residents will be negatively affected due a fairly large addition to the landscape and the change in land use that will alter the prevailing landscape character. The change in landscape character is regarded highly significant but on a local scale. Mitigation measures can be introduced in the form of screen planting which will block the substation from sensitive viewpoints.

Summary of Visual Impact Assessment for the proposed Anderson substation - Site alternatives 1 and 2

Axis Landscape Architecture cc was appointed by Nemai Consulting as a sub-consultant to complete a Visual Impact Assessment. This Visual Impact Assessment (VIA) is a specialist study that forms part of the EIA and addresses the visual affects of the proposed substation on the receiving environment.

Two alternative positions were initially proposed for the construction to the substation and associated secondary infrastructure.

The study area contains the extent of both the alternative positions (site 1 and 2) and includes an approximate 5 km buffer area around the alternatives.

Description of alternative alignments

ALTERNATIVES	DESCRIPTION (Refer to **Error! Reference source not ound.**)
Alternative 1	Alternative 1 is located on Portion 82 of the Farm Weldaba 567 JQ, north of the R104.
Alternative 2	Alternative 2 is located on Portion 82 of the Farm Weldaba 567 JQ and Portions 65 and 25 of the Farm Welgedund 491 JQ, north of the R104.

Project Description

The following project components will occur during the construction and operational phases of the project and are identified as elements that may cause a potential landscape and/or visual impact:

- Construction camps and lay-down yards;
- Access roads; and
- Substation.

Of the three project components, the towers of the transmission line and the substation are expected to cause the greatest impacts.

Description of the Environment

The study area is characterised by a rolling, undulating landscape with high topographic variation. Drainage lines meander through to the study area and cause shallow incisions where it meets up with rivers.

The study area is characterised by the Hartebeestpoort dam, the surrounding Magaliesberg Mountains with a rolling, undulating landscape with high topographic variation. Drainage lines meander through to the study area and cause shallow incisions where it meets up with rivers.

The study area consists of cultivated, residential areas, subsistence farming and mining. Extensive mining and farming is located more to the northern side of the study area with scattered farms in the central parts and southern parts. Residential development activities are more intense from the central to southern side of the study area where the cultural homelands is located. Human settlements are scattered throughout the study area and the landscape is degraded around these settlements.

Findings and Recommendations

Landscape Character Sensitivity

The sensitivity of the landscape character is an indication of "…the degree to which a particular landscape can accommodate change from a particular development, without detrimental effects on its character" (GLVIA, 2002).

The majority of the study area is considered to have a *moderate* landscape character sensitivity due to the relative undeveloped and high topographic variation of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. High terrain variability occurs through of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees covers which will provide visual screening for the proposed transmission line.

The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quick from surface disturbances.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the mines and existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

Significance of Landscape Impacts

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses.

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 site. These activities will create surface disturbances which will result in the removal of vegetation and the exposure of the underlying soil.

The extent of the disturbances will generally affect a big footprint area. Access road to the substation is expected to be a tar or dirt road which will create disturbance. During construction, the area around the substation will be disturbed. Vegetation will be trampled and may take months to recover. The size and location of the substation will play a major role in the severity of the landscape impact.

The construction camp and lay-down yard is anticipated to disturb a much smaller area. Due to a lack of technical information, two options are considered namely; the location of construction camp in remote, virgin land, or in/adjacent existing settlements. The initial presence of a construction camp in an undeveloped 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, mitigates the impact. The mitigating result is most effective, the bigger the town or settlement is.

Servitudes of lines entering and exiting the substation will generally be cleared of higher growing and dense vegetation to reduce biomass that may cause a fire hazard if ignited. The complete removal of high growing vegetation and shrubs will result in disturbed areas of exposed soil and difference in texture.

The exposed soil and change in texture will contrast with the intact vegetation around the disturbance footprint and servitudes.

Alternatives 1 and 2 are positioned in a low lying, undeveloped area. Considering the moderate VAC throughout most of the study area, the developed condition of the landscape, the *severity of landscape impact* during the construction stage is expected to be *low* for both Alternatives. The presence of the roads, cultural fields and existing power lines has caused a localised reduction in the visual quality. .

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

Operational phase

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

An additional impact will be caused as a result of the presence of the completed substation, i.e. that of the evenly spaced towers of the lines, buildings and structures. The industrial character and the near monumental vertical scale of the towers will severely contrast with the uniform landscape character that prevails through most of the study area.

Viewer Sensitivity

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

- Residents;
- Tourists; and
- Motorists.

To determine visual receptor sensitivity a, commonly used rating system is utilised. This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys. The sensitivity of the identified visual receptors is discussed in section 5.2.1 of the Visual Impact Assessment.

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

Visual Impact on Residents

Generally, the study area is moderately populated, especially the residential developments and farming communities. These communities are normally situated along main transportation routes or adjacent to rivers or water resources.

Due to the scale of the project, the only sections of the proposed substation will be visible throughout of the study area. The topography provides moderate VAC to visually screen the components of the project and it can therefore be stated that the general visibility of the project will be low.

Construction phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yard. The duration of the potential visual impact will be temporary which will result in an anticipated *low* significance of visual impact for both alternatives. The visual exposure to the construction activity will initially be limited and only local residents will experience views of the site preparation activity. As the structures increase in scale and height, the ZVI increases, resulting in a greater number of affected viewers and a subsequent increase in visual exposure.

The visual intrusion will progressively increase in severity as the concentration of power lines increases to the substation. The cleared site, construction camp and material lay-down yard will appear unsightly and out of character. Large scale construction elements such as cranes, will be highly visible and increase awareness of the construction activity over a considerable area. The visual intrusion caused during the construction stage will be high, but will be temporary in nature.

Operational phase

The residents of the informal settlements and farming communities next to the substation and power lines may experience a high degree of visual intrusion due to their proximity to all the Alternatives. **These residents are within 5 km and in some instances within 1 km from site alternative 1 and 2.** This is considered the zone of highest visibility in which the highest degree of visual intrusion can be expected.

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

Visual Impact on Tourists

The study area is renowned for its biodiversity and undulating landscapes. These characteristics provide the basis for the tourism industry which plays a major role in the economy of the North West and Gauteng Province.

The entire study area is considered to have moderately-high tourism potential.

Construction phase

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

Their exposure to possible unsightly views of the construction camp and the associated activity will however 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

It can be concluded that alternative 1 and 2 will cause the some visual intrusion for tourists travelling through the study area because it is visible from the main routes tourists travel and it is on undeveloped land where alternative will be less visible and it is on agricultural land.

Visual Impacts on Motorists

The major routes in the study area are the old N4, R101 and R511 connecting the towns, residential developments and informal settlements. The secondary and tertiary roads are a loose network of gravel roads linking smaller settlements and farms. These road networks in the study area carries a much lower volume of motorists. Their duration of views will be temporary and it is expected that the visual intrusion that they will experience will be low. For this report only motorists using the main routes will be considered as there are many countless smaller roads within the study area.

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 location and size of the construction camp and lay-down yard that are essential for accurately assessing the visual impact. It is anticipated that views of the construction camp and lay-down yard of Alternatives 1 and 2 may be visible from the R101.

The presence of the construction camp and lay-down yard 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 impact is expected to be *low*.

Operational phase

Alternatives 1 and 2 will be the most visible from the R101and R511. The severity and significance of visual impact for the proposed alternatives on motorists will be low. The speed at which motorists travel also has a moderating effect on the severity of the visual impact and further reduces visual exposure.

Recommendation and mitigation measures

In most cases, the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively. Rehabilitation of the disturbed areas will prevent the exposure of soil, which may cause a reduction in the visual quality of the study area. Sensitive positioning of the construction camps

and lay-down yards should take advantage of the natural screening capacity of the study area by locating the camps outside of the views of sensitive visual receptors.

Conclusion

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

The Alternative locations are rated according to preference by using a two-point rating system, one (1) being the most preferred, to two (2) being the least preferred. The preference rating is informed by the impact assessment discussions in Section 5 and the overall performance of each alternative with regards to the impact on the landscape character and the identified viewers.

Evaluation of alternative alignments

ALTERNATIVES	PREFERENCE RATING
Alternative 1	1
Alternative 2	2

Alternative 1 is regarded as the most preferred alternative in comparison to alternative 2. Its location and position in the landscape is considered to cause the least impact on the landscape character due to the reduced sensitivity of the landscape along the servitudes and the local roads.

The impact of Alternative 1 on visual receptors varies between residents, tourists and motorists. It's great advantage lies in the less significant landscape and visual impact on motorists and residents as compared to the other alternatives.

10.5 Soil Survey and Agricultural Potential Study

Details of the nominated specialist:

Specialist	
Organisation:	INDEX
Name:	Dr A Gouws
Qualifications:	PHD – Integrated Agricultural Development
No. of years experience:	33 years
Affiliation (if applicable):	• Registered with the Counsel of Natural Sciences. No: 400036/93 (Agricultural sciences); and • Member of the Soil Science Society of South Africa

This section provides a summary of the Soil Survey and Agricultural Potential Study for the Anderson substation project for site alternative 3, as undertaken by INDEX (2012), which is contained in ***Appendix D5***.

Index was requested by Nemai Consulting to undertake a desk study to indicate the agricultural potential and land capability for the proposed expansion of the Anderson - Dinaledi Transmission Line and for the new Anderson Substation. The substation site is located in Gauteng.

The substation is located directly north of the N4 highway and is approximately 9,6 hectares. The north-eastern portion is underlain by andesite, the topography is uneven. The rest of the site is underlain by quartzite, which normally weathers into shallow rocky soils. Both of these are not ideal for cultivation. The rainfall is highly variable with the result that rainfed commercial irrigation is not recommended. **The site proposed for the substation is only suitable for livestock grazing and is too small to make a meaningful difference in the income potential of the farm.**

Additional impacts are associated with construction activities, construction brings with it security problems – this can be mitigated against. One must keep in mind that the theft and vandalism associated with construction is often perpetrated by people not related to the project.

Crop yield may be impacted on by dust, which is normally associated with vehicle movement.
The following mitigation measures must therefore be implemented:

- Keep the footprint during construction as small as possible;
- Maintain security of the sites by appointing guards and providing support to the local farmers;
- Spray water on roads to reduce dust, especially during harvest time.

10.6 Socio-Economic Assessment

Details of the nominated specialists:

Specialists	
Organisation:	Nemai Consulting
Name:	Sameera Munshi
Qualifications:	BA (Econ)
No. of years experience:	3 years
Affiliation (if applicable):	N/A

This section provides a summary of the Socio-Economic Studies for the Anderson substation project for site alternative 3, as undertaken by Nemai Consulting (2011 and 2012), which is contained in ***Appendix D6***.

Nemai Consulting was appointed by Eskom as the independent Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment for the proposed establishment of the Anderson 400kv substation. A Socio-Economic Impact Assessment was carried out to determine the potential impacts of the proposed substation on the receiving environment.

The proposed Anderson substation is located in the Gauteng Province in the City of Tshwane Local Municipality. The site lies close to the border between Gauteng Province and the North West Province on Portions 82, 83 and 76 of Farms Schurveberg 488 JQ. This is a privately owned land that is used for residential purposes.

A status quo of the surrounding area of the site was conducted using data from Statistics South Africa Census 2001. It is the most comprehensive data set that is available as it divides statistics by geographical area and sub places. The following sub place was used to conduct the status quo:

Sub-Place	Local Municipal Area	Province	Powerline Route Traversing the Sub-Place
Pretoria NU	City of Tshwane Local Municipality	Gauteng	Eastern Route Alternative

It was found that the total population in the study area was 5 118 persons, of which there are slightly more males (51%) than females (49%). Education levels in the study area for persons over age 20 are provided. Majority of persons have some secondary schooling, completed standard 12, or have some primary. Majority of dwellings in the area are formal dwellings. The population in the study area are classified as low income earners, indicating vulnerability and poverty.

The socio-economic impacts that were discussed in this report include the following

- Economic Impacts;
- Visual and Tourism Impacts;
- Impacts on the social environment;
- Employment and skills transfer;
- Supply of Electricity; and
- Roads and Traffic.

The site location is owned by on landowner who is currently renting out the plot for residential purposes. On the site there are approximately six horses, a family who is renting the plot and there workers. There will be no loss of income from any of the residents or workers who live in on the site location should they be relocated.

The proposed development will cause disruption during the construction phase, but as long as mitigation measures are carried out properly, these disruptions should have minimal lasting effect on the social and economic conditions of the proposed development.

10.7 Heritage Impact Assessment

Details of the nominated specialists:

Specialists	
Organisation:	N/A
Name:	Leonie Marais-Botes
Qualifications:	BA (Cultural History and Archaeology) (UP), BA (Hons) Cultural History (UP), Post Grad Dip Museology (UP), Conservation of Traditional Buildings Cert. (University of Canberra), Post Grad Dip: Heritage (Wits)
No. of years experience:	17
Affiliation (if applicable):	N/A

Organisation:	Nemai Consulting cc
Name:	Khosi Mngomezulu
Qualifications:	BSc (Hons) Archeology
No. of years experience:	1 year
Affiliation (if applicable):	Member of ASAPA

A heritage impact assessment for alternative 3 was undertaken by Khosi Mngomezulu (2012) (reviewed by Jean Beater) and a heritage impact assessment for alternatives 1 and 2 was undertaken by Leoni Marais-Botes (2011) contained in ***Appendix D3***. This section provides a summary of both Heritage Impact Assessments for the Anderson substation project.

Summary of Heritage Impact Assessment for Alternative 3

Eskom Holdings Limited is proposing the construction of a new 400kV Transmission Line, and a proposed new 400kV Substation as part of their Tshwane Strengthening Scheme Project. The proposed power line will be approximately 40km in length and will run between the proposed new Anderson Substation, which will be located to the north east of the Nuclear Energy Corporation of South Africa (NECSA), in Flora Park on portion 83 of the farm Schurveberg 488 JQ, to the existing Dinaledi Substation which is located approximately 8km north east of Brits.

The proposed power line will be constructed in the following two Municipal Areas: Madibeng Local Municipality (North West) and the City of Tshwane Local Municipality (Gauteng). The proposed substation is earmarked for construction within the City of Tshwane Local Municipality. Please note that a separate Environmental Impact Assessment (EIA) process is being undertaken for the proposed Anderson-Dinaledi 400kV Power line.

The surface survey was conducted and completed on 21 August 2012. This report was undertaken according to the National Heritage Resources Act (NHRA) of 1999 (Act No 25 of 1999) (appendix A). Heritage resources were found in and around the proposed substation, namely, two graves and scattered stone tools. The identified resources will be handled according to Sections 35 and 36 of the NHRA.

It is therefore recommended that based on the survey that the construction may not proceed until a phase 2 assessment of the proposed site is undertaken to determine whether the site is of archaeological significance. It is possible that the phase 2 will reveal nothing of significance and the substation can proceed. The graves must be protected by means of placing a buffer of 15m around the graves so that no construction activity can impact on them.

Summary of Heritage Impact Assessment for Alternatives 1 and 2

A Heritage Impact Assessment was undertaken in 2011 for both site alternatives 1 and 2. At the time of this assessment, the proposed site for the Anderson substation was to be located to the north of the Nuclear Energy Corporation of South Africa (NECSA), located in Broederstroom. The proposed substation was at the time earmarked for construction within the Madibeng Local Municipality.

The project (as described above) may impact on any types and ranges of heritage resources that are outlined in Section 3 of the National Heritage Resources Act (Act 25 of 1999).Subsequently a Heritage Impact Assessment was commissioned by Nemai Consulting and conducted by Leonie Marais-Botes (Heritage Foundation).

The main types and ranges of heritage resources that were identified in the greater study area were:

- Monument
- Graves
- Structures

There is no reason, in heritage terms, that the proposed development cannot take place. In heritage context both the identified sites are suitable for development.

10.8 Geotechnical Investigation

Details of the nominated specialist:

Specialist	
Organisation:	Eskom Geotechnical Investigations
Name:	F. A. Grove' and TS Phalanndwa

This section provides a summary of the preliminary geotechnical assessment for site alternative 3 as undertaken by Geotechnical Investigations Transmission Technology, F.A. Grove' (2012) (Appendix D2).

The System Planning Transmission had requested the Geotechnical Assessment, to find a suitable site for this substation within a radius of 3km from the existing Transmission substation, near Pelindaba.

The first phase of this investigation included extensive desk studies, where a few, most suitable sites were identified for the substation. Factors such as geology, topography, farming activities, Eskom installations and power line servitude routes were considered. It should be noted that options for suitable sites are limited in this prime, densely developed area with many pleasure resorts and small holdings. In addition the picturesqueness of the vast area with its hilly (hillock-extremely steep slopes) topography, does not lean itself easily to the construction of a substation platform.

Information collected during this investigation is suitable for site selection purposes, and once the final design is required, a Detailed Geotechnical Investigation will be required to provide design parameters and confirm findings of this investigation.

The objective of this investigation was to obtain geotechnical information during a Preliminary Geotechnical Investigation of the site to confirm findings of the desk study for suitability evaluation.

Flood line studies carried out does not disqualify the suitability of the site, since it was confirmed that revised substation platform design is 40m clear of the 1:50 year flood-line in the north.
The site is underlain by andesitic lava locally with interbedded agglomerate, shale and tuff of the Transvaal System.

The preliminary geometric design indicates cut and fill depth/heights ton be of the order of 4m, with a cut/fill balance quantity of approximately 85 000 m^3.

It is believed that the ground conditions of the Anderson Site will have some effect on conventional construction methods, with reference to excavating rock and spoiling of unsuitable material. As a result the import of some volumes of suitable material will be required for the construction of the substation platform. It is however believed that the import of suitable materials could be drastically reduced with careful design.

No water table was observed but these conditions will change during the summer rainfall season especially close to the river.

It is believed that the Anderson- Site is suitable for the construction of the proposed substation. It should however, be noted that the site has limitations regarding orientation and size of the substation footprint, with reference to the restrictions of the N-4 in the south and the river (floodline) in the north.

Site Alternative 2

This section provides a summary of the preliminary geotechnical assessment for site alternative 2 as undertaken by Eskom Geotechnical Investigations, TS Phalanndwa (2012) (Appendix D).

A preliminary geotechnical investigation was undertaken to determine if the site was geotechnically stable for the proposed substation. A desktop and field assessment was undertaken.

Groundwater seepage was not observed in any of the test pits and no wet areas identified within the development footprint. Excavation on site is expected to be soft and able to be carried out with conventional earthmoving equipment without resorting to blasting.

The area was found to be underlain with transported soils and residual soils derived from andersite bedrock. None of the material that was tested on site was suitable for fill.

From a geotechnical point of view, this site is suitable for the proposed substation, however, it would be more costly to develop the substation on site alternative 2 in comparison to site alternative 3.

11 IMPACT ASSESSMENT

11.1 Overview

This section focuses on the pertinent environmental impacts that could potentially be caused by the proposed Anderson substation during the pre-construction, construction and operation phases of the project.

The impacts to the environmental features are linked to the project activities, which in broad terms relate to the physical infrastructure (emphasis on construction and operation stages). Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities contained in GN No. R386 and R387;
- Issues highlighted by environmental authorities;
- Findings from specialist studies; and
- Comments received during public participation.

11.1.1 Impacts associated with Listed Activities

As mentioned, the project requires authorisation for certain activities listed in the EIA Regulations (2006), which serves as triggers for the environmental assessment process. The impacts associated with the key listed activities follows (note that list is not exhaustive – refer to complete list under **Section 3.1**).

The potential impacts linked to the listed activities are then addressed in the subsequent sections.

Table 24: Impacts associated with the key listed activities

GN No.	Activity	Description	Potential Impact Overview
R387	**1(l)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kilovolts or more.	Ecological, social and economic impacts associated with the project life-cycle of the proposed substation.
R. 386 of 21 April 2006	**1 (k)**	The construction of facilities or infrastructure, including associated structures or infrastructure, for – the bulk transportation of sewage and water, including storm water, in pipelines with – (iii) an internal diameter of 0.36 meters or more; or (iv) a peak throughput of 120 litres per second or more.	Ecological, social and economic impacts associated with the associated infrastructure related to the proposed substation.
R. 386 of 21 April 2006	**1(p)**	The construction of facilities or infrastructure, including associated structures or infrastructure for the temporary storage of hazardous waste.	Pollution of bio-physical environment through poor practices associated with onsite storage of hazardous waste.
R386	**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 1 000 cubic metres at any one location or site.	Pollution of bio-physical environment through poor practices associated with onsite storage of dangerous goods.
R386	**12**	The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Adverse impacts associated with the proposed substation in sensitive, threatened or protected ecosystems.
R386	**14**	The construction of masts of any material or type and of any height, including those used for telecommunication broadcasting and radio transmission, but excluding - (a) masts of 15 metres and lower exclusively used, (i) by radio amateurs; or (ii) for lighting purposes; (b) flag poles; and (c) lightning conductor poles.	Ecological, social and economic impacts associated with the project life-cycle of the proposed substation.

GN No.	Activity	Description	Potential Impact Overview
R386	**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.	Access roads to the construction site, borrow pits and construction camps. In most cases, access is easily available from existing road network.

11.1.2 Issues raised by Environmental Authorities and I & APs

The issues highlighted by authorities (both regulatory and commentary) during meetings and contained in correspondence received (refer to ***Appendix I***).

11.1.3 Project Activities and Environmental Aspects

The main project components include the following:

- Construction of a 400kV substation and associated infrastructure;

In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life-cycle, as shown below:

Table 25: Activities associated with the Anderson Substation Project Life-Cycle

Pre-construction
Project Activities
• Detailed engineering design
• Detailed geotechnical investigations
• Geophysical investigations
• Survey of the site
• Arrangements with individual landowners and/or land users
• Procurement process for Contractors
Construction
Project Activities
• *On-going consultation with affected parties*
• Vegetation clearance
• Pegging of overall footprint
• Site establishment
• Establish construction camps (including material lay-down areas)
• *Construction employment*
• Delivery of construction material
• Storage and handling of material
• Transportation of equipment, materials and personnel
• Install access gates
• Upgrade existing access roads / build new access roads (where necessary)

• Grading of site (where necessary)
• Excavations and Foundation related activities
• Erection of steel structures
• Stringing of transmission cables to connecting towers
• *Construction employment*
• *Refuelling*
• *Crossing* inaccessible sites
• *Crossing* sensitive areas
• *Managing construction sites*
• *Reinstatement and rehabilitation*
• Signing off by landowners
• Handing and taking over of the servitude
Operation
Project Activities
• Access arrangements and requirements
• Routine maintenance inspections
• Management of vegetation clearance
• Repair and maintenance works
• On-going consultation with directly affected parties

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment. The following environmental aspects have been identified for the proposed 400kV substation upgrades and new turn-in lines activities (note that only high-level aspects are provided):

Table 26: Environmental Aspects associated with the Anderson Substation Project Life-Cycle

Pre-construction
Environmental Aspects
• Poor construction site planning and layout
• Inaccurate walk-down survey of substation and turn-in line areas
Construction
Environmental Aspects
• *Lack of environmental awareness creation*
• *Poor consultation with affected parties*
• Indiscriminate site clearing
• Poor site establishment
• Poor management of access and use of access roads
• Poor transportation practices
• Poor fencing arrangements
• Erosion
• Disruptions to existing services
• *Disturbance of topsoil*
• Poor management of excavations
• Inadequate *storage and handling of material*
• Inadequate *storage and handling of hazardous material*

• Lack of *equipment maintenance*
• Poor management of labour force
• Pollution from *ablution facilities*
• Inadequate management of *construction camp*
• Poor waste management practices
• *Wastage of water*
• *Disturbance to landowners*
• Poor management of pollution generation potential
• *Damage to significant flora*
• *Damage to significant fauna*
• *Environmental damage at crossings of* inaccessible sites
• *Environmental damage at crossings of* sensitive areas
• *Disruption of* archaeological and cultural features
• Poor reinstatement and rehabilitation
Operation
Environmental Aspects
• Inadequate management of access, routine maintenance and maintenance works
• Inadequate management of vegetation

11.1.4 Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. Note that it is not the intention of the impact assessment to evaluate all potential environmental impacts associated by the project's environmental aspects, but rather to focus on the potentially **significant** direct and indirect impacts identified during the Scoping phase and any additional issues uncovered during the EIA stage. The significant environmental impacts are listed in **Table 27**.

The EMP strives to provide a comprehensive list of mitigation measures associated with the overall project-related aspects and impacts for the entire project life-cycle (i.e. pre-construction, construction, operation and decommissioning).

The cumulative impacts are discussed in **Sections 11.11**.

Table 27: Significant environmental impacts associated with the project

CONSTRUCTION PHASE	
Feature	**Impact**
Topography	• Visual impact as a result of construction activities
Surface Water	• Impacts where access roads and the turn-in lines cross watercourses
Geology and Soil	• Erosion on steep slopes
Flora	• Damage to sensitive vegetation and habitats
Fauna	• Impacts to animals, herpetofauna and invertebrates • Impact to avifauna
Socio-economic	• Loss of income • Reduction in property value • Damage to property
Agricultural Potential	• Damage to farming practices and livestock
Archaeological and Cultural Features	• Damage to heritage resources
Transportation	• Damage to roads by heavy construction vehicles
Aesthetics	• Clearing of vegetation. • Construction-related operations.
Tourism	• Visual and noise impacts from construction operations. • Influence to ecotourism.
OPERATIONAL PHASE	
Feature	**Impact**
Topography	• Visual impact as result of structures and infrastructures associated with the substation.
Surface Water	• Inadequate stormwater management on access roads • Damage to substation from major flood events
Geology and Soil	• Potential contamination of soil due to spillage
Flora	• Encroachment by exotic species through inadequate eradication programme. • Clearing of vegetation along maintenance road.
Fauna	• Risk to birds from collision with infrastructure and from electrocution
Socio-economic	• Loss of land with extension of existing servitude • Reduction in property value • Threats to human and animal health from EMF
Agricultural Potential	• Damage to farming practices and livestock
Transportation	• Use of maintenance roads
Aesthetics	• High visibility of substation. • Inadequate reinstatement and rehabilitation of construction footprint.
Tourism	• High visibility of lines • Loss of “sense of place”

The findings of the specialists are of particular importance in terms of understanding the impacts of the project and managing the adverse implications of the project life-cycle, as these studies focused on the significant environmental issues identified during the execution of the EIA. As can be seen from the various impact assessments performed by the specialists, there are a host of cross-cutting impacts that are addressed in a number of these studies, with particular reference to the visual, social and economic effects of the proposed transmission line. The mitigation measures proposed by the specialists for these similar types of impacts are not regarded as contradictory, as they are aligned with best practices and principles.

11.1.5 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by using the methodology provided below. Where applicable, the impact assessments and significance ratings provided by the respective specialists are included.

In the case of the specialist studies, most of the impact assessment methodologies deviated from the approach to follow. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of EIA.

For the methodology of the impact assessment, the analysis is conducted on a quantitative basis with regard to the nature, extent, magnitude, duration, probability and significance of the impacts. The following definitions and scoring system apply:

Nature (/Status)
The project could have a positive, negative or neutral impact on the environment.

Extent
- Local - extend to the site and its immediate surroundings.
- Regional - impact on the region but within the province.
- National - impact on an interprovincial scale.
- International - impact outside of South Africa.

Magnitude
Degree to which impact may cause irreplaceable loss of resources.
- Low - natural and social functions and processes are not affected or minimally affected.
- Medium - affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High - natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration
- Short term - 0-5 years.
- Medium term - 5-11 years.
- Long term - impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent - mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability
- Almost certain - the event is expected to occur in most circumstances.
- Likely - the event will probably occur in most circumstances.
- Moderate - the event should occur at some time.
- Unlikely - the event could occur at some time.
- Rare/Remote - the event may occur only in exceptional circumstances.

Significance
Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-
0 - Impact will not affect the environment. No mitigation necessary.
1- No impact before / after mitigation.
2- Residual impact before / after mitigation.
3- Impact cannot be mitigated.

11.1.6 Impact Mitigation

Impacts are to be managed by assigning suitable mitigation measures. According to DEAT (2006), the objectives of mitigation are to:

- Find more environmentally sound ways of doing things;
- Enhance the environmental benefits of a proposed activity;
- Avoid, minimise or remedy negative impacts; and
- Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy – (1) prevent; (2) reduce; (3) rehabilitate; and/or (4) compensate for the environmental impacts.

Figure 21: Mitigation Hierarchy

The proposed mitigation of the impacts includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. The mitigation measures that follow in the subsequent sections are not intended to be exhaustive, but rather focus on the significant impacts identified.

The EMP (refer to ***Appendix E***) provides a comprehensive list of mitigation measures for the entire project, which extends beyond the impacts evaluated in the body of the EIA Report.

	Overview of the EMP
	The scope of the Anderson- 400kV substation EMP is as follows: • Establish management objectives during the project life-cycle in order to enhance benefits and minimise adverse environmental impacts; • Provide targets for management objectives, in terms of desired performance; • Describe actions required to achieve management objectives; • Outline institutional structures and roles required to implement the EMP; • Provide legislative framework; and • Description of requirements for record keeping, reporting, review, auditing and updating of the EMP. All liability for the implementation of the EMP (as well as the EIA findings and environmental authorisation) lies with the project proponent (i.e. Eskom).

11.2 Watercourses

11.2.1 Impact Overview

For the discussion to follow watercourses are considered as rivers, streams, natural channels (perennial and seasonal), wetlands and dams. The substation sites are close to watercourses (Swartspruit, Crocodile and the Moganwe River). The construction of the turn-in lines and / transmission lines and upgrading or

building of new access roads could cause impacts to the "resource quality" of the affected watercourses, which is defined by the National Water Act (Act No. 36 of 1998) as the following:

- Quantity, pattern, timing, water level and assurance of instream **flow**;
- **Water quality**, including physical, chemical and biological characteristics of the water;
- Character and condition of the instream and riparian **habitat**; and
- Characteristics, condition and distribution of the **aquatic biota**.

Impacts to the resource quality of the affected watercourses could include:

- Damage to / loss or habitat (both instream and riparian zone) within the works area;
- Destabilisation of morphology (i.e. river structure);
- Reduction of water quality through sedimentation and poor construction practices;
- Alteration of the flow regime caused by temporary diversions; and
- Reduction in biodiversity of aquatic biota.

Should construction activities encroach upon the regulated area of a watercourse (i.e. 1:100 year floodline / delineated riparian or wetland habitats) water use authorisation will be required in terms of Section 21 of the National Water Act (Act No. 36 of 1998). In accordance with Section 27 of this Act, the following factors need to be taken into consideration by DWA before an authorisation may be issued:

- Existing lawful water uses;
- The need to redress the results of past racial and gender discrimination;
- Efficient and beneficial use of water in the public interest;
- The socio-economic impact of the water use or uses if authorised; or of the failure to authorise the water use or uses;
- Any catchment management strategy applicable to the relevant water resource;
- The likely effect of the water use to be authorised on the water resource and on other water users;
- The class and the resource quality objectives of the water resource;
- Investments already made and to be made by the water user in respect of the water use in question;
- The strategic importance of the water use to be authorised;
- The quality of water in the water resource which may be required for the Reserve and for meeting international obligations; and
- The probable duration of any undertaking for which a water use is to be authorised.

Abstraction of water for construction purposes will not be permitted without the requisite authorisations.

11.2.2 Impact Assessment

Environmental Feature	**1. Flow**
Relevant Alternatives & Activities	**All alternative substation sites; watercourse crossings; construction camps; access roads**

Project life-cycle	Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Alteration of the flow regime caused by instream and riparian construction activities; • Wetlands may be susceptible to erosion during the clearing, grading and excavation activities.	1.1 No construction activities to encroach upon the regulated area of any watercourse (including buffer zones for wetlands). 1.2 Construction camps to be located not closer than 50m from the edge of riparian habitat / wetland buffer zone. 1.3 Special arrangements for stringing activities to avoid impacts to sensitive watercourse features (including sensitive riparian zones) 1.4 As far as possible, use existing bridge crossings as access roads. 1.5 Manage flow passing through works area for access roads to minimise disturbance to flow regime and to prevent erosion. 1.6 Prevent possible erosion caused by temporary instream diversion, associated with construction of access roads. 1.7 Remove diversion following construction of access roads and reinstate and rehabilitate affected works area.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	short-term	Likely	2
After Mitigation	–-	local	medium	short-term	Unlikely	1

Environmental Feature	2. River Morphology
Relevant Alternatives & Activities	**All alternative substation sites; watercourse crossings; access roads; maintenance**
Project life-cycle	**Construction & operation phases**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Destabilisation of morphology (i.e. river structure); • Erosion of watercourse structure; • Damage to / loss of habitat (both instream and in the riparian zone) within the works area.	2.1 Repeat mitigation measures 1.1 – 1.7. 2.2 Select most appropriate crossing point based on geotechnical conditions. 2.3 Select most appropriate crossing point based on sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilisation) and instream habitat, depending on technical feasibility. 2.4 For access roads, reinstate (shaping) and rehabilitate (indigenous riparian vegetation) affected areas. Install suitable buttressing to prevent future erosion, if required.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	permanent	Likely	2
After Mitigation	–-	local	low-medium	short-term	Moderate	1

Environmental Feature	3. Water Quality
Relevant Alternatives & Activities	All alternative substation sites; watercourse crossings; construction camps; access roads; maintenance
Project life-cycle	Construction phase & operation phases

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Contamination of surface water through sedimentation from instream works, silt-laden runoff from disturbed areas, and improper practices (e.g. poor management of waste water and disposal of solid waste).	3.1 Repeat mitigation measures 1.1 – 1.7 and 2.2 – 2.4. 3.2 Temporary diversion and other dewatering techniques (e.g. pumping) to maintain a dry works area. 3.3 Where necessary for access roads, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be maintained and serviced on a regular basis. 3.4 Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses. 3.5 Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand. 3.6 Ensure proper waste management and housekeeping.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	short-term	Likely	2
After Mitigation	–-	local	low-medium	short-term	Moderate	1

Environmental Feature	4. Aquatic Biota
Relevant Alternatives & Activities	All alternative substation sites; watercourse crossings; access roads; maintenance
Project life-cycle	Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Clogging of gills from increased silt loads; • Alteration of habitat; • Disturbance to migration patterns; • Poaching / illegal fishing.	4.1 Repeat mitigation measures 1.1 – 1.7, 2.2 – 2.4 and 3.2 – 3.6. 4.2 Temporary diversion for construction of access roads to allow for movement of aquatic fauna, as far as possible. 4.3 Environmental induction of all construction workers and implementation of disciplinary procedures for non-compliance.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium	short-term	likely	2
After Mitigation	–-	local	low-medium	short-term	moderate	1

Environmental Feature	5. Pans and Wetlands

Relevant Alternatives & Activities	All alternative substation sites; watercourse crossings; access roads; maintenance
Project life-cycle	Construction & operation phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Damage to drainage lines / wetlands from crossings, including erosion, loss of vegetation, adverse effects to biota, and disturbance of flow.	5.1 Repeat mitigation measures 1.1 – 1.7, 2.2 – 2.4, 3.2 – 3.6 and 4.2 – 4.3. 5.2 Identify wetlands during walk-down survey. Wetland systems and their buffer zones are regarded as no-go areas during the project life-cycle.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-term	likely	3
After Mitigation	–-	local	medium	short-term	unlikely	1

11.3 Geology and Soil

11.3.1 Impact Overview

In areas of steep terrain soil erosion could occur following the clearing of vegetation, grading of tower sites, and use of access roads. Use of heavy equipment during the construction phase could lead to soil compaction.

11.3.2 Impact Assessment

Environmental Feature	6. Geology & Soil
Relevant Alternatives & Activities	All alternatives; access roads; construction camps
Project life-cycle	Construction & operation phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

• Soil erosion slopes. • Erosion along access roads. • Potential contamination of soil	• A detailed geotechnical investigation must be undertaken prior to commencement of any construction activities on site to provide design parameters for the substation. • No cutting and filling in areas of 4% sideslope and less. • Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site specific conditions. • Drainage management should also be implemented to ensure the minimisation of potential erosion on access roads. • Acceptable reinstatement and rehabilitation to prevent erosion during operation phase. • A maintenance plan and emergency response plan must be prepared and implemented for the operational phase to prevent leakages, spillages etc

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-long	likely	3
After Mitigation	–-	local	low	short-term	unlikely	1

11.4 Flora

11.4.1 Impact Overview

The main reasons for managing the vegetation under turn-in lines connecting to the substation include the following:

- Ensuring safe clearances under and around turn-in lines;
- Ensuring adequate access for inspection, maintenance and repair activities; and
- Reduction of fuels for fires under power lines that cause flashovers.

Potential impacts to vegetation resulting from the construction of the proposed substation and associated infrastructure include the clearance of vegetation for the substation area and connecting lines.

During the operational phase, vegetation that could possibly interfere with the operation and/or reliability of the power line must be trimmed or completely cleared. In terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983), all alien invasive species in the servitude is cleared and chemically treated for the total width of the servitude.

The walk-down survey team will include an ecological specialist who will identify sensitive floral species within the corridor of the lines connecting to the substation. The necessary permits will be obtained under the National Forests Act (Act No. 84 of 1998) if avoidance of sensitive species is not possible during the siting of the towers and confirmation of the development footprint.

11.4.2 Impact Assessment

Environmental Feature	**Flora**
Relevant Alternatives & Activities	**Site alternatives 1, 2 and 3**
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Damage to sensitive important habitats i.e. the Magaliesberg Natural Area and CBA and ESA	• Prior to the onset of the construction phase, a thorough search through the preferred site should be undertaken during the flowering season of known RDL floral species in order to remove and rescue potentially affected species. • The removal of any plant material from site, including flowers or bulbs is strictly prohibited unless unavoidable and essential for the purposes of construction. • The contractor for vegetation clearing must demonstrate competence and knowledge to be able to identify different indigenous species, protected species, declared weeds and alien species correctly. • Leave as much of the natural vegetation intact as possible in order to maintain ecological corridors for the movement of species and make an effort to increase the natural areas around sensitive features such as ridges and rivers. Minimise the width of the servitude, particularly in sensitive areas.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Local	High	Long-term	Likely	3
After Mitigation	Negative	Local	Medium	Long-term	Likely	2

Environmental Feature	**Flora**
Relevant Alternatives & Activities	**Site alternative 1, 2 and 3**
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

Destruction of species of conservation importance and surrounding habitats	• Prior to the onset of the construction phase, a thorough search through the preferred site should be undertaken during the flowering season of known RDL floral species in order to remove and rescue potentially affected species. • The removal of any plant material from site, including flowers or bulbs is strictly prohibited unless unavoidable and essential for the purposes of construction. • Relocation of plants of conservation importance (such as *Hypoxis hemerocallidea*) should be implemented by a qualified specialist, following issue of relevant permits. • The contractor for vegetation clearing must demonstrate competence and knowledge to be able to identify different species, declared weeds and alien species correctly. • Leave as much of the natural vegetation intact as possible in order to maintain ecological corridors for the movement of species and make an effort to increase the natural areas around sensitive features such as ridges and rivers. Minimise the width of the servitude, particularly in sensitive areas.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	3
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Flora**
Relevant Alternatives & Activities	**Site alternatives 1, 2 and 3**
Project life-cycle	**Pre-construction & construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

• Transformation of vegetation community structures; • Soil disturbances that allow for the establishment of exotic vegetation; • Damage to plant life.	• Existing servitudes and roadways should be utilised as far as possible, thereby limiting the impact of establishing new service roads; • Individuals can be translocated to outside of the footprint area or removed to a suitable botanical garden for cultivation and protection. This should only be done after consultation with the provincial conservation authorities; • Movement of personnel and machinery to be limited to the areas designated for the established access roadways; • No movement of personnel or machinery to take place within any wetland areas in order for this ecologically sensitive habitat unit to retain its features; • Any recruitment of exotic vegetation to be managed on an ongoing basis until indigenous pioneering vegetation has dominated the disturbed areas. These species should be limited to naturally-occurring species representative of the vegetation type for the locality. Ongoing monitoring of exotic vegetation recruitment should be undertaken and any recruitment controlled; • Dumping or storage of topsoil must not be done on established vegetation, but should remain within designated areas; • Workers and machinery to remain inside construction footprint. All labourers to be informed of disciplinary actions for the wilful damage to plants; • Only the taller floral species and those individuals that pose a significant fire risk to the overhead power line should be removed within the savannoid servitude areas. Forested gullies, valleys and riparian vegetation should be spanned as far as possible from higher ground so that the removal of vegetation can be minimised; • Indiscriminate damage of vegetation to be avoided.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Flora**
Relevant Alternatives & Activities	**All alternatives**
Project life-cycle	**Operational Phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

• Damage to plant life outside of the servitude area; • Encroachment of alien vegetation.	• Ecologically sensitive areas should be retained as prohibited areas; • Eskom employees to remain inside servitude. All staff to be informed of disciplinary actions for the wilful damage to plants; • Encroachment of alien vegetation to be monitored for regularly and controlled.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

11.5 Fauna

11.5.1 Impact Overview

For site alternative 3, only three mammal species were recorded during the field assessment. No sensitive or endangered mammals were recorded within the study area for all alternatives. Taking into consideration the fact that Red Data mammals are reliant on pristine and stable habitats, few, if any, threatened small mammals are expected to occur in the study area. The majority of larger mammal species are likely to have moved away from the area, as a result of habitat alteration and degradation together with the development of human settlements which lead to illegal hunting and poaching. During the construction of the substation, it is anticipated that there would be a further loss of ecologically sensitive and important habitat units; ecosystem function and loss of faunal habitat. It is anticipated that mammals residing on site will move to another area nearby and could move back after the area has been rehabilitated.

In terms of avifauna, site alternatives 1 and 2 fall within the Magaliesberg and Witwatersberg Important Bird Area (IBA(ZA018)). IBAs form a network of sites, at a biogeographic scale, which are critical for the long-term viability of naturally occurring bird populations. MPNE provides a suitable habitat for Red data bird species that are known to occur in the area. Cape Vultures and eagles are known to occur on the MPNE. It is however recommended that for areas where the transmission line, turn-in lines and substation are in close proximity to sensitive habitats, the disturbance factors must be limited as much as possible to avoid displacement of sensitive species.

In terms of avifauna, site alternative 3 is the preferred alternative as it is not located within the Magaliesberg and Witwatersberg Important Bird Area (IBA(ZA018)). However parts of the connecting powerline may still traverse these areas.

Various mitigation measures have been proposed to reduce the impacts of collisions of birds with power lines. It is well-known that collisions with the overhead shield (earth) wire far outnumber collisions with the phase (conductor) wires. This is because the earth wire is a single line suspended above the conductor lines, which are often bundled together in groups of four or five lines. These bundled lines are therefore far more visible in comparison to the earth wire. Mitigation measures should therefore be aimed to making the earth wire more visible.

The most favourable mitigation measure to lessen the impacts of bird collisions is to plan the alignment in such a way that migratory routes are avoided. Bird Flight Diverters (BFD's) were developed in Europe and are attached to the conductor wires. Studies, however, have indicated that their use has had limited success in averting collision impacts in South Africa. Another device, known as a Bird Flapper, has been used on a large scale in South Africa since 2001 and has proven to be more effective than the use of BFD's. A Bird Flapper is a reflective metallic disc-type device that is loosely attached to the earth wire. The loose-fitting attachment allows the disc to move freely in the wind. The resulting intermittent reflecting

of the sun off the disc allows for a device that is highly visible from a greater distance. Fitment frequency of these Bird Flappers has been suggested at 10m intervals and staggered along parallel lines, resulting in a bird Flapper device being visible along every 5m of line. These devices should be fitted along all areas were migratory routes have been identified within the survey area along the chosen preferred route alternative. Some RDL species are known to migrate at night, when line visibility is at its lowest. Fluorescent tubes that derive power from the conductor fields of the lines have been shown to avert this impact in high impact areas.

Another mitigation measure that has been suggested is the removal of the earth shield wire from areas where migratory routes have been identified, as long as these areas do not fall within areas that are subjected to major electrical storms. This is considered non-feasible due to technical constraints and implications.

Habitat destruction and the associated displacement of various avifaunal species is thought to be a lesser potential impact on the general avifaunal conservation within the survey area. The general aridity of the survey area, especially within the western regions, means that clearing of vegetation within the servitude to an acceptable height to safeguard against fire hazards and therefore habitat loss could be minimised. River valleys harbour a greater density of taller vegetation. This is especially evident in the riparian forests within the eastern regions of the survey area. These tall trees support breeding of many avifaunal species that will be displaced if the vegetation is cleared to accommodate the servitude. The river valleys occur within lower-lying areas that could be spanned in a manner that would not necessitate vegetation clearing. It is recommended that minimal vegetation be removed from within servitude areas and only limited to a height class that could pose a fire risk to the overhead lines.

The project will adhere to Eskom's Transmission Bird Collision Prevention Guideline (TGL41-335) where necessary.

As with the flora, the walk-down survey team will include an ecologist who will identify suitable habitat for sensitive faunal features. Where possible, these sites will be regarded as no-go for the location of towers for the connecting powerlines.

Environmental Feature	**Avifauna**
Relevant Alternatives & Activities	**Site alternative 2**
Project life-cycle	**Pre-Construction, Construction and operational phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

Potential impact on sensitive avifaunal species i.e. the Cape Vulture	• Avoid indiscriminate damage of natural habitats. Removal of vegetation should be limited to designated areas only. • Avifauna should be mobile and care should be taken not to harm or kill any birds identified on site. • No hunting or poaching is allowed. • Any avifauna rescued or recovered must be relocated in suitable habitat away from the substation. • Stringent and dedicated control not to disturb animals on site. • Contractors must be made aware of sensitive avifauna , where they can be found, their habitats etc.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	3
After Mitigation	Negative	Local	Medium	Long-term	Likely	2

Environmental Feature	**Avifauna**
Relevant Alternatives & Activities	**Site alternative 1 and 2**
Project life-cycle	**Pre-Construction, Construction and operational phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Potential impact on avifaunal species and the Magaliesberg important Natural Bird Area	• Avoid indiscriminate damage of natural habitats. Removal of vegetation should be limited to designated areas only. • Avifauna should be mobile and care should be taken not to harm or kill any birds identified on site. • No hunting or poaching is allowed. • Any avifauna rescued or recovered must be relocated in suitable habitat away from the substation. • Stringent and dedicated control not to disturb animals on site. • Contractors must be made aware of sensitive avifauna , where they can be found, their habitats etc.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	3
After Mitigation	Negative	Local	Medium	Long-term	Likely	2

Environmental Feature	**Avifauna**
Relevant Alternatives & Activities	**Site alternatives 1, 2 and 3**
Project life-cycle	**Operational phase**

Potential Impact	Proposed Management Objectives / Mitigation Measures
Bird streamers causing electrical faults.	• Perch management through the use of perch deterrents (bird guards) can be used and fitted at least 1m directly above and on both sides of the phase conductor. Open perch areas should be allowed to remain after construction.
Collisions of birds with overhead connecting lines	• People responsible for maintaining the area should monitor for collisions and report any incidents. • Ecologically sensitive areas should remain as prohibited areas. • Eskom employees and or subcontractors to remain inside construction footprint. All staff to be informed of disciplinary actions for the wilful damage to plants and animals. • Fitting bird flappers on the lines within migratory pathways and the major migratory routes pertaining to the project area to coincide with sensitive areas such as river valleys and prominent ridge systems. • Maintenance crews to monitor for bird collisions and to mitigate for this impact within areas identified as hotspot collision areas not previously identified during the pre-construction and construction and phase.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Fauna**
Relevant Alternatives & Activities	**Site alternatives 1, 2 and 3**
Project life-cycle	**Construction and Operational phase**

Potential Impact	Proposed Management Objectives / Mitigation Measures
Habitat destruction and fragmentation	• Avoid indiscriminate damage of natural habitats. Removal of vegetation should be limited to designated areas only.
Impact to fauna	• Avoid indiscriminate damage of natural habitats. Removal of vegetation should be limited to designated areas only. • Most fauna should be mobile and care should be taken not to harm or kill any fauna. • No hunting or poaching is allowed. • Any animals rescued or recovered must be relocated in suitable habitat away from the substation. • Stringent and dedicated control not to disturb animals on site.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2

After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Fauna - Invertebrates**
Relevant Alternatives & Activities	**Site alternatives 1, 2 and 3**
Project life-cycle	**Construction and Operational phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

Potential impact on sensitive habitats related to invertebrates	• Building activities must be restricted and carefully monitored to keep disturbance to a minimum, and must be appropriately rehabilitated and managed. This entails the removal and proper disposal of all rubble and litter previously dumped along the proposed route illegally, as well as all scrap materials, building rubble and rubbish dumped on the route during construction, at official municipal dumping grounds. • Dumping of any materials in undeveloped open areas is not allowed and this must be actively managed. • Construction must preferably take place during the dry season and no temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment or any other use of the buffer/flood zone whatsoever, may be permitted during the construction phase. • All construction-related impacts (including service roads) must be contained within the fenced-off development areas. • Adequate erosion preventative mechanisms must be implemented throughout the construction phase. Erosion resulting from the development must be appropriately rehabilitated preventing further habitat deterioration. • Stormwater runoff must be correctly managed during the development. Special care needs to be taken during the construction phase to prevent surface stormwater containing sediments and other pollutants from entering pans, drainage lines and wetlands. A surface runoff and stormwater management plan must be put in place prior to commencement of construction activities. The total sealing of walkways, pavements, drive ways and parking lots should not be permitted in the free space system. These should form part of and be contained within the areas earmarked for development. This would aid in the minimising of artificially generated surface stormwater runoff. • The use of insecticides, herbicides and other chemicals is not permitted within 200m of an open space system. • An integrated pest management programme, where the use of chemicals is considered as a last option, should be employed. However, if chemicals are used to clear invasive vegetation and weedy species or for the control of invertebrate pests, species-specific chemicals should be applied and in the recommended dosages. General spraying is prohibited and the application of chemicals as part of a control programme is not permitted to take place on windy days. • Outside lighting must be designed to minimize impacts, both directly on especially rare or endangered invertebrate species and indirectly by impacts on populations of prey species. All outside lighting must be directed away from sensitive areas. • All disturbed drainage lines that the proposed route will traverse must be rehabilitated and maintained as important biological corridors or migratory passages. The crossing of natural drainage systems must be minimized and should only be constructed along the shortest possible

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

Environmental Feature	**Fauna – Reptiles and Amphibians**
Relevant Alternatives & Activities	**All Alternatives**
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

• Potential impact to sensitive vegetation that houses reptiles and amphibians	• Minimal vegetation clearance and disturbances must occur within the substation footprint and along the connecting powerline route. • Erosion/siltation preventative measures must be implemented throughout all phases of the project. • The object of vegetation clearing is to trim, cut or clear the minimum number of indigenous trees (*Sclerocarya birrea, Acacia caffra, Acacia nilotica*) and vegetation necessary for the safe mechanical construction and electrical operation of the substation and connecting powerlines. • Large exotic trees with large root systems shall be cut manually and removed, as the use of a bulldozer will cause major damage to the soil when the root systems are removed. • Stumps shall be treated with herbicide. Smaller vegetation can be flattened with a machine, but the blade should be kept above ground level to prevent scalping. • Any vegetation cleared on the substation site shall be removed or flattened and not be pushed to form an embankment around the tower. Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated immediately to prevent soil erosion. • The use of herbicides shall only be allowed after a proper investigation into the necessity, the type to be used, the long-term effects and the effectiveness of the agent. Application shall be under the direct supervision of a qualified technician. All surplus herbicide shall be disposed of in accordance with the supplier's specifications. All alien vegetation in the total servitude and densifiers creating a fire hazard shall be cleared and treated with herbicides. • Re-seeding shall be done on disturbed areas as directed by the Environmental Control Officer. • In accordance with the Conservation of Agricultural Resources Act, No 43 of 1983, slopes in excess of 2% must be contoured and slopes in excess of 12% must be terraced. • Other methods of rehabilitation of tower sites may also be used at the discretion of the Environmental Control Officer, e.g. stone pitching, logging, etc. • Contour banks shall be spaced according to the slope on tower sites. The type of soil shall also be taken into consideration. • No open fires are allowed on site. • Fire-fighting equipment must be available on all construction vehicles at all times.

• Potential impact to threatened amphibian species either directly or indirectly	• Construction activities of the Anderson substation must be restricted to daylight hours reducing the potential impact on the nocturnal breeding activities of the majority of amphibian species. • Ideally the installation of the substation must be undertaken during the dry winter months (May-September) when the majority of amphibian species are dormant. • The substation must be positioned 32m from the edge of the riparian zone of the Mokanwane River. • Activities around watercourses must be strictly limited to the proposed servitude. • No Giant Bullfrogs must be collected for food or illegal pet trade. • No activities must be allowed within any adjacent wetland habitat. • As a precautionary mitigation measure it is recommended that the construction contractor as well as an independent environmental control officer (ECO) be made aware of the possible presence of certain threatened amphibian species (Giant Bullfrog) prior to the commencement of the construction of the substation.

Potential impact to threatened reptile species either directly or indirectly	• Termite mounds also provide nesting site for numerous snakes, lizards (varanids) and frogs. If any termite mounds have to be destroyed a qualified herpetologist must be present in case any lizard, snake and blind snakes, or the red data Striped Harlequin Snake (Rare) are unearthed. • As a **precautionary measure**; prior to earth-clearing activities a suitably qualified environmental officer/herpetologist must carefully excavate larger termite mounds as well as around the termite mounds or burrow systems, logs, loosely embedded rocks and other surface material and remove affected animal species (reptiles, amphibians, small mammals). • Any termite mound which must be destroyed should be carefully excavated by hand and pick. • Any animals rescued or recovered must be relocated in suitable habitat away from the substation. • Trees including stumps; bark and holes in trees are vital habitats for numerous arboreal reptiles (chameleons, snakes, agamas, geckos and monitors). The removal of indigenous tree species as well as vegetation clearance must be kept to the minimum area required and be restricted to the servitude. • Indigenous cleared vegetation should form wood piles and logs and stumps. Dead or decaying wood piles should be created as these will provide valuable refuge areas especially due to the clearance of vegetation cover. • Any lizards, geckoes, agamids, monitors or snakes encountered should be allowed to escape to suitable habitat away from the disturbance. No reptile should be intentionally killed, caught or collected during any phase of the project. • Activities should be restricted to the current and proposed servitude especially in these sensitive environments. • Disturbance of topsoil with severe slopes shall be minimised at all costs. • The contractor shall remove the topsoil separately and store it for later use during rehabilitation of the substation. • During backfilling operations, the Contractor shall take care not to dump the topsoil in the bottom of the foundation and then place spoil on top of that. • In sensitive areas, foundations for the substation must be excavated by hand. • Should any threatened animal species (Striped Harlequin Snake, Blunt-tailed Worm Lizard) be exposed during excavation, the construction in the vicinity of the finding must be stopped. A suitably qualified herpetologist must be called to the site to inspect and determine the significance of the discovery. The relevant conservation authorities must be informed within 24hours of the discovery.

• The opening up of existing vegetated areas, thereby creating corridors along which animals can move, may result in increased predation levels on small mammals, reptiles, amphibians, arachnids and scorpions along these corridors.	• The limitation of the disturbance of vegetation cover as well as rocky outcrops, logs, stumps, termite mounds within sensitive areas will ameliorate this impact. Impact will be short-long term depending on the amount of vegetation to be cleared.
• Excessive habitat destruction during construction could reduce the amount of habitat available for reptiles and other herpetofauna.	• This impact is anticipated to be localised, of a long-term nature and of low significance, provided that appropriate mitigation measures are implemented (e.g. the limitation of vegetation clearance within sensitive areas). Prior to construction and vegetation clearance a suitably qualified zoologist (herpetologist) should undertake a walk-through of the preferred alignment and closely examine the proposed tower/pylon construction areas (concrete supports) for the presence of any animal burrows (including spiders and scorpions), rocky outcrops, logs, stumps and other debris and any affected animals to appropriate habitat away from the servitude.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Long-term	Likely	2
After Mitigation	Negative	Local	Medium	Long-term	Likely	1

11.6 Heritage Resources

11.6.1 Impact Overview

A Phase 1 Heritage Impact Assessment, in accordance with Section 38 of the National Heritage Resources Act (Act No. 25 of 1999), was conducted as the entire project including the substation exceeds 300m in length. SAHRA was consulted during the execution of the EIA, and this authority requested a copy of the Heritage Impact Assessment for review.

The National Heritage Resources Act (Act No. 25 of 1999) identifies the following categories of significant heritage sites:

- Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
- Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and

- Grade III: Other heritage resources worthy of conservation, on a local authority level.

The occurrence of sites with a Grade I significance will demand that the development activities be drastically altered in order to retain these sites in their original state. For Grade II and Grade III sites, the application of mitigation measures would allow the development activities to continue.

The primary objective of the EMP in terms of archaeology / historical resources is to ensure that no artefacts of historical or cultural value are negatively impacted, damaged or destroyed.

The project will endeavour to avoid heritage resources. To achieve this, a walk-down survey (which includes a heritage specialist) of the corridor will be undertaken prior to construction to document all heritage sites, features and objects. The siting of the towers will then be considered based on the findings of this survey. No heritage resources are to be affected without a valid permit from SAHRA.

For site alternative 3, the proposed development has the possibility of negatively impacting on the graves. This may occur given the fact that the graves are located in less than 1 kilometre to the proposed site. Although they fall outside the footprint of the project, they may be disturbed during the construction phase; hence a fence must be placed around them. This can however be avoided by ensuring that the substation is not built on the graves and that during the construction phase the graves are protected by means of placing a buffer of 15m around the graves so that no construction activity can impact on them. The development may have a negative impact as the proposed site may hold archaeological material of significance that are presently not visible. This means an application for a permit in terms of the NHRA (Act No. 25 of 1999) will be necessary to conduct the phase 2 assessment.

11.6.2 Impact Assessment

Environmental Feature	**Heritage Resources**
Relevant Alternatives & Activities	**Site alternative 3 and access roads and construction camp use for this site alternative**
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

Disturbance of graves located within 1km of the site boundary	• A phase 2 HIA must be undertaken prior to commencement of construction activities. The findings and report must be submitted to SAHRA for review. • Should remains and/or artefacts be discovered on the site during earthworks, all work will cease in the area affected and the Contractor will immediately inform the Construction Manager. • Should any heritage resources be exposed during excavation or be found on site, a registered heritage specialist must be called to site for inspection. • Should any heritage resources be exposed during excavation or be found on site, the relevant heritage resource agency (i.e. SAHRA) must be informed about the finding. • Under no circumstances may any heritage material be destroyed or removed from site. • Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-term	unlikely	3
After Mitigation	–-	local	low	short-term	unlikely	1

Environmental Feature	**Heritage Resources**
Relevant Alternatives & Activities	**All alternatives; access roads; construction camps**
Project life-cycle	**Construction phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**

Disturbance of heritage resources.	• A phase 2 HIA must be undertaken prior to commencement of construction activities at site alternative 3 only. The findings and report must be submitted to SAHRA for review. • Should remains and/or artefacts be discovered on the site during earthworks, all work will cease in the area affected and the Contractor will immediately inform the Construction Manager. • Should any heritage resources be exposed during excavation or be found on site, a registered heritage specialist must be called to site for inspection. • Should any heritage resources be exposed during excavation or be found on site, the relevant heritage resource agency (i.e. SAHRA) must be informed about the finding. • Under no circumstances may any heritage material be destroyed or removed from site. • Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	local	medium-high	short-term	unlikely	2
After Mitigation	–-	local	low	short-term	unlikely	1

11.7 Visual Quality

11.7.1 Impact Overview

11.7.1.1 Site Alternative 1 and 2

An extract from the Visual Impact Assessment (Axis Landscape Architecture, 2011) pertaining to the impacts to the visual quality of the site alternatives 1 and 2 follows.

Significance of Landscape Impacts

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types it traverses.

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 site. These activities will create surface disturbances which will result in the removal of vegetation and the exposure of the underlying soil.

The extent of the disturbances will generally affect a big footprint area. Access road to the substation is expected to be a tar or dirt road which will create disturbance. During construction, the area around the substation will be disturbed. Vegetation will be trampled and may take months to recover. The size and location of the substation will play a major role in the severity of the landscape impact.

The construction camp and lay-down yard is anticipated to disturb a much smaller area. Due to a lack of technical information, two options are considered namely; the location of construction camp in remote, virgin land, or in/adjacent existing settlements. The initial presence of a construction camp in an undeveloped 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, mitigates the impact. The mitigating result is most effective, the bigger the town or settlement is.

Servitudes of lines entering and exiting the substation will generally be cleared of higher growing and dense vegetation to reduce biomass that may cause a fire hazard if ignited. The complete removal of high growing vegetation and shrubs will result in disturbed areas of exposed soil and difference in texture.
The exposed soil and change in texture will contrast with the intact vegetation around the disturbance footprint and servitudes.

Alternatives 1 and 2 are positioned in a low lying, undeveloped area. Considering the moderate VAC throughout most of the study area, the developed condition of the landscape, the *severity of landscape impact* during the construction stage is expected to be *low* for both Alternatives. The presence of the roads, cultural fields and existing power lines has caused a localised reduction in the visual quality. .

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

Operational phase

Surface disturbances created during construction may remain for an extended period during the operational phase. These are seen as residual affects carried forward from the construction phase and can be completely or substantially mitigated if treated appropriately during the construction phase.
An additional impact will be caused as a result of the presence of the completed substation, i.e. that of the evenly spaced towers of the lines, buildings and structures. The industrial character and the near monumental vertical scale of the towers will severely contrast with the uniform landscape character that prevails through most of the study area.

Significance of Visual Impacts

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

Visual Impact on residents

Construction phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yard. The duration of the potential visual impact will be temporary which will result in an anticipated *low* significance of visual impact for both alternatives. The visual exposure to the construction activity will initially be limited and only local residents will experience views of the site preparation activity. As the structures increase in scale and height, the ZVI increases, resulting in a greater number of affected viewers and a subsequent increase in visual exposure.

The visual intrusion will progressively increase in severity as the concentration of power lines increases to the substation. The cleared site, construction camp and material lay-down yard will appear unsightly and out of character. Large scale construction elements such as cranes, will be highly visible and increase awareness of the construction activity over a considerable area. The visual intrusion caused during the construction stage will be high, but will be temporary in nature.

Operational phase

The residents of the informal settlements and farming communities next to the substation and power lines may experience a high degree of visual intrusion due to their proximity to all the Alternatives. These residents are within 5 km and in some instances within 1 km from the proposed locations. This is considered the zone of highest visibility in which the highest degree of visual intrusion can be expected.

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

Visual Impact on Tourists

Construction phase

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

Their exposure to possible unsightly views of the construction camp and the associated activity will however 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

It can be concluded that alternative 1 and 2 will cause the some visual intrusion for tourists travelling through the study area because it is visible from the main routes tourists travel and it is on undeveloped land where alternative will be less visible and it is on agricultural land.

Visual impact on motorists

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 location and size of the construction camp and lay-down yard that are essential for accurately assessing the visual impact. It is anticipated that views of the construction camp and lay-down yard of Alternatives 1 and 2 may be visible from the R101.

The presence of the construction camp and lay-down yard 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 impact is expected to be *low*.

Operational phase

Alternatives 1 and 2 will be the most visible from the R101and R511. The severity and significance of visual impact for the proposed alternatives on motorists will be low. The speed at which motorists travel also has a moderating effect on the severity of the visual impact and further reduces visual exposure.

11.7.1.2 Site Alternative 3

An extract from the Visual Impact Assessment (I-Scape, 2012) pertaining to the impacts to the visual quality of the site alternatives 3 follows.

Visual Impacts during the construction phase

Visual impacts will result from the temporary presence of a construction camp and material stockyard as well as activities and disturbances on the substation site. Typical visual impacts often relate to the unsightly character of such a construction site brought about by the untidy and disorderly placement of ancillary elements and the associated surface disturbances. Construction equipment such as graders, front-end loaders etc. will be active on site. During the preparation of the base major earthworks will be required to level the site. The physical damage to the existing vegetation cover impacts on the landscape character and causes intrusive views.

Visual Impacts during the operational phase

The addition of a new substation will alter the baseline condition and impact on the character of the landscape due to a change in land use. The new substation will cause an intrusion on observers' views especially to those living or passing within 1 km of the site.

11.7.2 Impact Assessment

Environmental Feature	Visual Quality
Relevant Alternatives & Activities	Site alternative 1 and 2; access roads; construction camps
Project life-cycle	Construction and operational phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
Visual impact to tourists mainly bird watchers, as a result of its location within the Magaliesberg Important bird area	• Care must be undertaken to avoid areas usually used for birdwatching. • Suitable screening of works area during the construction phase. • Construction camps to be situated in areas with reduced impact to tourists. • On-going housekeeping to maintain a tidy construction area. • Proper reinstatement and rehabilitation of construction area. • The substation site must be suitable screened during the operational phase to ensure that potential visual impact is minimised.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	–-	Local	medium-high	short-term	likely	3
After Mitigation	–-	Local	medium	short-term	likely	2

Environmental Feature	Visual Quality
Relevant Alternatives & Activities	All alternatives; access roads; construction camps
Project life-cycle	Construction phase and operational phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
Reduction in visual quality due to construction activities.	• Suitable screening of works area during the construction phase. • Construction camps to be situated in areas with reduced impact to tourists. • On-going housekeeping to maintain a tidy construction area. • Proper reinstatement and rehabilitation of construction area. • The substation site must be suitably screened during the operational phase to ensure that potential visual impact is minimised. This can be done using trees etc.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance

Before Mitigation	–-	Local	medium-high	short-term	likely	2
After Mitigation	–-	local	medium	short-term	likely	1

11.7.2.1 Site Alternative 1 and 2

The impacts assessment for the visual quality and associated attributes is supplemented by the following evaluation conducted as part of the Visual Impact Assessment (Axis Landscape Architecture, 2011).

Landscape Impact

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative 1	Negative – Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover.	Local	Permanent if not mitigated	Low	Definite	Low	Low	High
Alternative 2				Low	Definite	Low	Low	High
Operational phase								
Alternative 1	Negative – Impacting on the visual quality of the landscape due the presence of a substation.	Local	Permanent	Low	Definite	Low	Low	High
Alternative 2				Low	Definite	Low	Low	High

Visual Impact on Residents

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative 1	Negative – Construction camp and lay-down yards may cause unsightly views.	Local	Temporary	Low	Probable	Low	Low	High
Alternative 2				Low	Definite	Low	Low	High
Operational phase								
Alternative 1	Negative – The presence of a substation intrudes on existing views and spoils the open views of the landscape.	Local	Permanent	Low	Definite	Low	Low	High
Alternative 2				Low	Definite	Low	Low	High

Visual Impact on Tourists

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative 1	Negative – Construction camp and lay-down yards may cause unsightly views.	Local	Temporary	Low	Probable	Low	Low	High
Alternative 2				Low	Probable	Low	Low	High
Operational phase								
Alternative 1	Negative – The presence of a transmission line intrudes on existing views and spoils the open views of the landscape.	Local	Permanent	Low	Definite	Low	Low	High
Alternative 2				Low	Definite	Low	Low	High

Visual Impact on Motorists

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Level of Confidence
Construction phase								
Alternative 1	Negative – Construction camp and lay-down yards may cause unsightly views.	Local	Temporary	Low	Probable	Low	Low	High
Alternative 2				Low	Probable	Low	Low	High
Operational phase								
Alternative 1	Negative – The presence of a transmission line intrudes on existing views and spoils the open views of the landscape.	Local	Permanent	Low	Definite	Low	Low	High
Alternative 2				Low	Definite	Low	Low	High

11.7.2.2 Site Alternative 3

The impacts assessment for the visual quality and associated attributes is supplemented by the following evaluation conducted as part of the Visual Impact Assessment (I-Scape, 2012).

Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance of Impact	Level of Confidence
Construction phase – Travelling Tourists						
Without mitigation	Local	Short term	Low	Highly probable	Low	High
With mitigation	Local	Short term	Low	Highly probable	Low	High
Construction phase – Residents						
Without mitigation	Local	Short term	High	Highly probable	High	High
With mitigation	Local	Short term	Medium	Highly probable	Medium	High
Construction phase – Landscape Character						
Without mitigation	Local	Long term	Medium	Definite	Medium	High
With mitigation	Local	Long term	Medium	Highly probable	Medium	High

Nature of Impact	Extent of Impact	Duration of Impact	Intensity of Impact	Probability of Impact	Significance of Impact	Level of Confidence
Operational phase – Travelling Tourists						
Without mitigation	Local	Long term	Medium	Highly probable	Medium	High
With mitigation	Local	Medium term	Low	Highly probable	Low	High
Operational phase – Residents						
Without mitigation	Local	Long term	Medium	Highly probable	Medium	High
With mitigation	Local	Medium term	Low	Highly probable	Low	High
Operational phase – Landscape Character						
Without mitigation	Local	Long term	High	Highly probable	High	High
With mitigation	Local	Medium term	Medium	Highly probable	Medium	High

11.8 Agriculture

11.8.1 Impact Overview

The impacts of a substation on agricultural land use and activities depend on the substation and transmission line design and the type of farming. The substation can affect field operations, irrigation, aerial spraying, wind breaks, and future land development (land use restrictions).

Construction of a substation in a field can:

- Create problems for turning field machinery and maintaining efficient fieldwork patterns;
- Create opportunities for weed encroachment;
- Compact soils;
- Result in safety hazards;
- Hinder or prevent aerial activities by planes or helicopters;
- Interfere with moving irrigation equipment; and
- Hinder future consolidation of farm fields or subdividing land for residential development.

The impacts associated with agriculture are managed through mitigation measures contained in the EMP.

11.8.2 Impact Assessment

Environmental Feature	**Agriculture**
Relevant Alternatives & Activities	**All alternatives; access roads; construction camps**
Project life-cycle	**Construction & operation phase**
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Disturbance to farming practices and livestock.	• Wherever possible, avoid placing connecting transmission line structures in agricultural areas (e.g. span croplands). • Negotiate with landowner the timing of the construction activities within agricultural land. • Suitable access arrangements to be made with landowners. • Safeguarding of livestock against construction activities (e.g. barricading excavations). • Proper reinstatement and rehabilitation of construction area.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	–-	local	medium-high	short-term	likely	2
After Mitigation	–-	local	medium	short-term	likely	1

The impacts assessment for the Agricultural Potential and associated attributes is supplemented by the following evaluation conducted as part of the Agricultural Impact Assessment (Index, 2012).

Criteria	Potential Impact on Grazing
Nature	Access to grazing will be impossible during construction. Only the footprint of the site will permanently be sterilised
Extent	Only the footprint will be sterilised.
Duration	Total withdrawal during the construction period. Permanent for the footprint of the substation.
Intensity	Benign after construction period.
Probability	Very likely to occur.
Status	Negative.
Significance	Low.

11.9 Socio-Economic Environment

11.9.1 Impact Overview

Social impacts do not occur in isolation and are linked to each other or to physical or environmental impacts. Mitigation of social impacts should therefore not be taken in isolation. Social impacts could be the direct result of a proposed development or could result due to a cumulative effect.

A Community Management and Monitoring Committee should be established in order to facilitate communication between the communities and ESKOM. Members of the committee should include representatives from environmental groups, civil society, ward councillors, government departments, construction teams and ESKOM. The committee will play a key role in implementing the proposed mitigation measures for the new substation project. It is expected that most social impacts will occur during the preconstruction and construction phases with minimal impacts during the operational and decommissioning phases.

The following social impacts are anticipated to occur due to the proposed substation:

- Sense of place – The sense of place of the area will be affected by the construction of the proposed substation.
- Land use changes – There will be a change in land use.
- Loss of Income from Tourism Generated Operations - There is a concern that the substation will be visible from many residences on Estate d' Afrique (alternative 1 and 2), this is likely to affect their income potential.

- Decrease in Property Value – There is a concern that the proposed substation will have a negative effect on property values. The Beau Rivage Development is a Residential development, promoting a country style living environment. Site 1 alternative will place the proposed substation right at the entrance road to the Estate which will severely impact on the existing developments in the study area.
- Social investment and infrastructural improvements – Social investment initiatives by Eskom could have a significant positive impact on the surrounding communities. Such initiatives could include upgrading of existing infrastructure such as services.

11.9.2 Impact Assessment

Feature	Socio-Economic Impact
Relevant Alternatives & Activities	Site Alternative 1
Project life-cycle	Construction & operation phases
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Potential decrease in property value especially the Beau Rivage.	There may be a potential decrease in property value however the landowner will be compensated by ESKOM during the negotiation process.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	–-	local	high	long	high	3
After Mitigation	–-	local	high	long	high	2

Feature	Socio-Economic Impact
Relevant Alternatives & Activities	Site Alternative 2
Project life-cycle	Construction & operation phases
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Potential loss of income from tourism generated operations i.e. the Estate de Africa	There may be a potential impact to the tourism facility, however the substation will be screened using trees or any other appropriate measure.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	–-	local	high	long	high	3
After Mitigation	–-	local	high	long	high	2

Feature	Socio-Economic Impacts
Relevant Alternatives & Activities	All alternatives

Project life-cycle	Construction & operation phases
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Loss of sense of place	Areas with great tourism potential must be avoided
Loss of property	Eskom to negotiate with affected land owners regarding mutually acceptable means of mitigation or compensation
Aesthetic impact – high visibility construction operations and substation and connecting lines	• During the construction phase, temporary screening must be implemented where possible. • The substation must be adequately screened during the operational phase.
Temporary disruptions to traffic	• Access to the roads should be limited to Eskom for safety purposes during the construction phase and drivers must be directed to alternate access roads. • Any anticipated traffic disruptions should be forewarned through notices and sign boards. • During the operational phase, maintenance vehicles that use this road must be aware of the surrounding environment and neighbours.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	–-	local	high	long	high	3
After Mitigation	–-	local	high	long	high	1

Feature	Socio-Economic Impacts
Relevant Alternatives & Activities	All alternatives
Project life-cycle	Operational phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Potential health issue associated with the electromagnetic field associated with the substation and connecting lines.	• The substation must be adequately fenced and security placed at the entrance to the site to prevent unauthorised entry.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	–-	local	high	long	high	2
After Mitigation	–-	local	high	long	high	1

Following the scoping phase, I & Aps raised issues with regards to the location of the alternative 1 and 2 substations. These main issues related to the following:

- The close proximity of the NECSA facility;

- The substation would be located within the M4 road reserve;
- Both sites were located within the important natural bird area sites.

Based on the comments received and findings of the specialist studies, a third site alternative was identified for the preferred location of the substation. A socio-economic assessment was therefore undertaken for site alternative 3 as based on the comments received, it was determined that site alternative 1 and 2 were not preferred by I & Aps and as such it was not necessary to have a separate socio-economic assessment done.

The specialist that conducted the socio-economic assessment however mentioned that from an economic and social point of view it also the less preferred site as it is more costly. Furthermore it was stated that since the site is situated on a road reserve, the impacts of using a road reserve in an area that is developing rapidly and where there are plans to increase tourism and the flow of people into the area is to be considered with caution. Development in the area may require the widening of roads as traffic increases. The potential social impact of building along a road reserve would result in major disruption of traffic flow. Using site 1 and 2 can have significant long term effects if not properly mitigated for. Mitigation would be costly in this case. Site 1 and 2 are therefore not recommended for the Anderson Substation.

11.9.3 Site Alternative 3: Impact Overview

Economic Impacts

There is likely to be a short term increase in economic activity as a result of the substation. The construction labour force will not only be earning an income in the area, but consumption will take place this increase the commercial activity and the flow of money in the area. This may result in short term indirect economic gains, which will be in the form of purchasing construction material and transport. Through the employment of locals, skills and knowledge transfer is likely to take place which can increase the employability of these workers. Employment will also increase the income of households and capacity to be more productive.

Visual Impact and tourism

The attraction to the Hartebeespoort area is that the area is scenic. The mountains and open land provides opportunity for tourism. A large proportion of the study area is used for conservation, nature reserves, and accommodation and tourism facilities. Thus there is a visual appeal to the land which has been used to generate income.

The impact of having a substation in such an environment could result in loss of income as the visual appeal of the land is reduced. Specifically in the study area there are many accommodation and leisure

activities which are designed to enjoy the natural unspoilt state of the land. A substation is likely to disrupt the sense of place as the transmissions lines will spoil disturb the visual appeal of the land.

The construction phase can impact negatively as through loss of income or reputation as the natural environment is disturbed. Impacts associated with construction crew actions, resulting in the loss of stock or equipment should also be considered.

Impacts on the social environment

The study area has a high population growth rate and is developing rapidly. With the proposed project which is likely to attract workers, this population growth rate may increase and cause further strain on development needs.

When workers come into an area, there is a need to supply municipal services to these workers. The municipality may or may not have the capacity to support a larger number of people. Thus causing strain on social services. As is common with migrant workers in an area, there may be some social disruption. The relations between locals and new job seekers may not be smooth and lead to conflict in the community.

Workers entering the area will also be competing with locals for employment which may cause tension in the community. Locals and new job seekers will be competing for the same jobs. Thus it is important to deter job seekers and stress on local employment.

Relations between migrant workers and locals can potential cause health problems by rising HIV and AIDS or other sexually transmitted diseases. This is a typically the case when a large number of males enter into an area. Hostel like structures will need to be prevented and awareness campaigns should be conducted.

During construction, the safety and security of labourers around may be at risk when working with the substation and connecting lines. Thus effective mitigation measures will need to be in place to avoid loss of life or injury. The safety of farming livestock will also need to be ensured.

Employment and skills transfer

There is likely to be a positive impact on employment especially during the construction phase. Construction of the substation will require labour construction related activities while the operation phase will require labour for maintenance.

Employment can become a sensitive issue, particularly the concern over local labour. There may conflict is migrant workers are given preference to employment opportunities. However the nature of susbtation requires skilled labour.

Potential secondary employment impacts can result as small business employs more persons to sell goods to labourers.

The project has the potential to positively impact upon household incomes during the construction phase. In the study area, most people are low income earners thus employment of locals will create a positive impact on local communities who can derive some economic benefit from the project.

At least, the contractor should be barred from bringing unskilled labour in from areas outside the immediate area of construction. The contractor should also be encouraged to employ a proportion of their semi-skilled labour requirements from the ranks of the local communities. In addition, the contractor could be obliged to employ labourers on short term contracts of three months, similar to the government sanctioned Expanded Public Works Programme contracts. This would ensure that the project components create as many work opportunities in the affected areas as possible.

The project also has the potential to positively impact upon the skills levels in local communities during the construction phase. Only 19 percent of persons over the age of 20 matriculated. Thus the skill level of the community is not very high. Any local training and skills transfer that results from the project will create a positive impact.

Thus if all other aspects are ambivalent about which routing to follow, the employment and skills transfer aspect would dictate which of the routes would most benefit the affected communities. This conclusion is modified by the proviso that the employment and skills impacts are relatively small and short-term in nature and that the populations of all routes would benefit from the employment and skills transfer potential offered by the proposed project.

Supply of Electricity

The strength of the existing power lines will increase given the proposed substation and connecting lines. Given that Pretoria is expecting to double its electricity demand in the next 20 – 30 years, the project is will secure stable supply of electricity too this region.

There is unlikely that the proposed project will increase electricity supply in the study area or the local community. This is a negative impact as the property values in the study area will fall as a result of the project so will income generation, particularly in the tourism and agriculture sector.

Roads and Traffic

During the construction phase there may be traffic disruptions in the area. Heavy construction vehicles may cause damage to the roads. Currently there is a road on the N4 national route that provides access to the farm. Thus there is potential for the N4 to be disrupted during construction. Traffic will be temporary and mitigation can be done well in advance by awareness of the project.

11.9.4 Site Alternative 3: Impact Assessment

Economic Feature	General Economy
Relevant Alternatives & Activities	Substation alternative site 3
Project life-cycle	Pre- Construction and Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Positive impact on the local economy.	• No mitigation required

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	+	Local	Low	Short	Likely	3
After Mitigation	+	Local	Low	Short	Likely	2

Economic Feature	General Economy
Relevant Alternatives & Activities	Substation alternative site 3
Project life-cycle	Operational Phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Positive impact of stable electricity supply	• No mitigation required

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	+	Local	Low	Long	Likely	3
After Mitigation	+	Local	Low	Long	Likely	3

Economic Feature	Visual , Tourism And Leisure Impacts
Relevant Alternatives & Activities	Substation alternative site 3
Project life-cycle	Pre- Construction and Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Disruption of tourism and leisure facilities due to construction activities which could later the nature of tourism activity. • Poor housekeeping by construction staff. • Stock losses due to poor construction housekeeping.	• Agreement should be reached with each landowner on the construction programme and impacts on the property during construction. Where necessary construction could be scheduled during low tourist season on affected farms. Agreements made prior to construction with respect to property access, the duration of construction and the impacts on the land should be adhered to by both the landowner and the utility. • All local mitigation measures agreed to for each operation should adhered to by Eskom site staff. • Eskom compensates affected landowners at a market-related rate for stock and equipment losses which are directly attributable to construction activities.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Medium	Likely	2
After Mitigation	-	Local	Low	Medium	Moderate	1

Economic Feature	Impacts on the social environment
Relevant Alternatives & Activities	Substation alternative site 3
Project life-cycle	Pre-Construction and Construction phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Social conflict can be disrupted as a result of the potential job seekers entering the area. • The spread of disease due to hostel like living and relations between locals and job seekers take place. HIV/ AIDS and other STDs may spread as a result.	• Any mitigation to avoid new job seekers from entering the area should be avoided. These can be done through the encouragement of local labour and importing of only necessary skilled labour • Education campaigns on and awareness to on sexually transmitted diseases should take place to avoid health related issues. • Should there be significant imported labour, care should be taken to integrated workers into the local community to avoid any conflict and disturbance to the social structure of the surrounding communities.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Medium	Likely	3
After Mitigation	-	Local	Low	Medium	Moderate	2

Economic Feature	Impacts on the social environment
Relevant Alternatives & Activities	Substation alternative site 3
Project life-cycle	Operational Phase

Potential Impact	Proposed Management Objectives / Mitigation Measures
• Social conflict can be disrupted as a result of the potential job seekers entering the area. • The spread of disease due to hostel like living and relations between locals and job seekers take place. HIV/ AIDS and other STDs may spread as a result.	• Any mitigation to avoid new job seekers from entering the area should be avoided. These can be done through the encouragement of local labour and importing of only necessary skilled labour • Education campaigns on and awareness to on sexually transmitted diseases should take place to avoid health related issues. • Should there be significant imported labour, care should be taken to integrated workers into the local community to avoid any conflict and disturbance to the social structure of the surrounding communities.
• Safety and security of the workers and the community may be at risk during the construction phase	• In order to mitigate against theft on farmland during construction, there should be effective consultation and fencing where possible to ensure controlled access to farming land to prevent theft and opportunistic behaviour.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	Local	Medium	Long	Likely	2

After Mitigation	-	Local	Low	Long	Moderate	1

Economic Feature	**Roads and Traffic**
Relevant Alternatives & Activities	**Substation alternative site 3**
Project life-cycle	**Pre-Construction, Construction and Operation phase**

Potential Impact	**Proposed Management Objectives / Mitigation Measures**
• Temporary disruptions to traffic during the construction phase may occur.	• Access to the roads should be limited to Eskom for safety purposes. • Any anticipated traffic disruptions should be forewarned through notices and sign boards.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	Local	Low	Short	Likely	2
After Mitigation	-	Local	Low	Short	Likely	1

11.10 Cumulative Impacts

What is a "Cumulative Impact"?

According to GN No. R. 385 (2006), ***"cumulative impact"***, in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Cumulative impacts can be identified by combining the potential environmental implications of the project with the impacts of projects that have occurred in the past, are currently occurring, or are proposed in the future within the proposed substation site and corridor for the connecting lines.

The substation is considered to be part of a linear project. There are no known substantial linear projects that are planned within the corridor, which could exacerbate impacts associated with the construction phase of the project (e.g. erosion, vegetation clearing, disruption of farming / mining activities). Heavy vehicle construction traffic for the delivery of material and the transportation of construction workers will lead to an increase in traffic on the regional transportation network. Due to the scale of the project, the size of the construction crews and the nature of material to be delivered, significant cumulative impacts are not anticipated.

Rehabilitation and eradication of alien and invasive vegetation is regarded as a crucial management measure, as other smaller linear or localised projects could compound the proliferation of problematic floral species.

A common method for mitigating impacts related to new substations and power lines is corridor sharing, and thereby increasing the footprints of existing linear developments (e.g. roads, power lines, railway lines).

In general, the soils in the project areas are highly erodible due to the. Any previous disturbance (including grazing) will be aggravated by the construction activities if this impact is not properly managed.

The project was initiated due to increasing demands being placed on electricity supply. These demands will result in the respective Grid becoming increasingly unstable which, in turn is likely to have both a regional and macro-economic impact. It is intended for the Anderson-Dinaledi project to improve the reliability of supply of electricity in the Pretoria area. In turn, this will have a positive impact on the macro economy.

12 ANALYSIS OF ALTERNATIVES

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. This section explores the evolution in the identification and refinement of alternatives that occurred during the execution of the EIA process,

The section is concluded with the appraisal of all the environmental and technical considerations associated with the various alternatives through a comparative analysis to eventually distil the Best Practicable Environmental Option (BPEO). Münster (2005) defines the BPEO as the alternative that "*provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*".

12.1 Overview of Alternatives

In order to provide a point of reference for assessing the other alternatives, the "no go" option was also considered in the EIA.

12.1.1 Site Alternatives

Through the EIA process, the following site alternatives were identified and assessed (refer to **Section 8.1**):

- **Site Alternative 1**: Construction of the Anderson substation on Portion 82 of the Farm Weldaba 567 JQ, Broederstroom, North West Province.
- **Site Alternative 2**: Construction of the Anderson substation on portion 82 of the Farm Weldaba 567 JQ and portions 65 and 25 of the Farm Welgedund 491 JQ, Broederstroom, North West Province.
- **Site Alternative 3**: Construction of the Anderson substation on portions 76, 82 and 83 of the Farm Schurveberg 488 JQ, Flora Park, Gauteng.

Should authorisation for the substation be granted by DEA, and following the negotiations with landowners, the final positions of the towers and the centre line for the Anderson-Dinaledi 400 kV Transmission line and the Anderson substation and coordinates of each bend in the line will be determined through a walk-down survey to be conducted by surveyors and the relevant environmental specialists.

12.1.2 "No Go" Option

As standard practice, the "no-go" option was included in the evaluation of the project alternatives.

The implications of the "no go" option are as follows:

- Inability to supply additional Transmission load;
- Poor Transmission reliability and Distribution quality of supply; and
- Possible shedding of Distribution load in the Pretoria area.

This alternative is not supported, as failure to provide the necessary electrical infrastructure could potentially hamper economic activity in this area.

In contrast, should the Anderson-Dinaledi 400 kV project not go ahead, the negative impacts associated with the project highlighted in **Section 11** would be irrelevant and the environmental status quo would not be affected.

12.2 Comparative Impacts of Alternative Routes

The table to follow compares the various route alternatives based on the receiving environment and the outcome of the impact assessment (**Section 11**).

Table 28: Comparative Impacts of Alternative Routes

(Note: Blocks highlighted in orange indicate the preferred option for each environmental feature; where no blocks are highlighted, no obvious preference exists)

Environmental Feature / Attribute	Site Alternative 1	Site Alternative 2	Site Alternative 3	No-Go Option
Topography	The site is relatively flat.	The site is relatively flat.	The topography of the site is uneven.	No impact
Watercourses	There are no major watercourses located within the site.	There are no major watercourses located within the site.	There are no major watercourses located within the site.	No impact
Soil and agriculture	The site consists of cultivated, residential areas and subsistence farming.	The site consists of cultivated, residential areas and subsistence farming.	The site is rural, used for agricultural purposes i.e. grazing.	No impact
Flora	The site is located within the Magaliesberg Natural Area which is part of the greater Magaliesberg Protected Environment.	The site is located within the Magaliesberg Natural Area which is part of the greater Magaliesberg Protected Environment.	The study area falls within a Critical Biodiversity Area (CBA) and an Ecological Sensitive Area (ESA) in terms of the Gauteng C-Plan. The CBAs in the study area is Irreplaceable Area but due to grazing and anthropogenic activities such as human settlements, **the study area is not in pristine condition.**	No impact
Fauna – Avifauna and	The site is located	The site is located	The site is located	No impact

Environmental Feature / Attribute	Site Alternative 1	Site Alternative 2	Site Alternative 3	No-Go Option
Mammals	within the Magaliesberg Important Bird Area which is part of a conservation area.	within the Magaliesberg Important Bird Area which is part of a conservation area.	on a site used for grazing purposes.	
Fauna – Invertebrates and Herpetofauna	There are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).	There are records of the giant bullfrog around the Magaliesburg-Brits area. Southern African Pythons have been recorded from the Magaliesburg Protected Natural Environment (MPNE).	No major breeding habitats of Giant Bullfrogs were observed along the proposed Anderson-Dinaledi 400kV Transmission Line alternatives, however there are records of the giant bullfrog around the Magaliesburg-Brits area. The site offers no suitable habitat for the Southern African Python.	There will be no impact on the fauna in these areas.
Heritage resources	No heritage resources were identified within the site.	No heritage resources were identified within the site.	A phase 2 impact assessment will need to be conducted prior to commencement of construction activities.	No impact
Social	This alternative is not preferred by some of I & Aps due to the fact that site will be located within the NECSA emergency planning zone. Furthermore the Northwest Department of Transport has indicated that the site is located within the N4 road reserve and is therefore not acceptable.	This alternative is not preferred by some of I & Aps due to the fact that site will be located within the NECSA emergency planning zone. Furthermore the Northwest Department of Transport has indicated that the site is located within the N4 road reserve and is therefore not acceptable.	This site is not located within the NECSA planning zone and is not located with the M4 road reserve.	Future development may be compromised if electricity Grid is not strengthened.
Economic	There is a potential for employment during the construction phase. Landowners would need to be compensated for loss of land associated with the substation. This option is considered to be the more expensive	There is a potential for employment during the construction phase. Landowners would need to be compensated for loss of land associated with the substation. This option is considered to be the more expensive	There is a potential for employment during the construction phase. Landowners would need to be compensated for loss of land associated with the substation. This option is considered to be the cheaper option	

Environmental Feature / Attribute	Site Alternative 1	Site Alternative 2	Site Alternative 3	No-Go Option
	option in terms of the construction phase.	option in terms of the construction phase.	for the applicant in terms of the construction phase.	
Visual quality	The potential impacts that may arise from the substation can be mitigated against and therefore the potential impact can be mitigated against. It is also important to note that this area falls within the Magaliesberg protected area which is likely to attract tourists and as such is therefore not preferred.	The potential impacts that may arise from the substation can be mitigated against and therefore the potential impact can be mitigated against. It is also important to note that this area falls within the Magaliesberg protected area which is likely to attract tourists and as such is therefore not preferred.	The potential impacts that may arise from the substation can be mitigated against and therefore the potential impact can be mitigated against.	No impact

12.3 BPEO Selection

Based on the recommendations of the specialists and the comparison of the impacts associated with the various site alternatives, the following options are considered to be the preferred alternative:

Site Alternative 3: In terms of fauna and flora, this alternative is preferred as site alternative 1 and 2 falls within the Magaliesberg protected area and important bird area. In terms of heritage, it is anticipated that provided that the mitigation measures recommended by the specialist are adhered to the potential impact will be minimal. Furthermore a phase 2 HIA will be undertaken prior to commencement of any construction activities and where necessary permits will be applied for.

Following comments received on the scoping report, site alternative 1 and 2 were not suitable to surrounding neighbours due to the close proximity of the site to the South African Nuclear Energy Corporation emergency planning zone and due to the fact that it would be located within the M4 road reserve. Additionally, site alternative 3 was recommended by an I & AP for consideration in the EIA Phase.

13 PUBLIC PARTICIPATION – EIA PHASE

The purpose of public participation includes:

- Providing I&APs with an opportunity to obtain information about the project;
- Allowing I&APs to present their views, issues and concerns with regard to the project;
- Granting I&APs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
- Enabling Eskom and the project team to incorporate the needs, concerns and recommendations of I&APs into the project.

What is an "I&AP"?
According to Government Notice GN No. R. 385 (2006), "*Interested and Affected Party*" (I&AP) means an party contemplated in section 24(4)(d) of the NEMA, and which in terms of that section includes – (a) any person, group of persons or organisation interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity.

The public participation process that was followed for Anderson-Dinaledi Project is governed by NEMA and GN No. R. 385. The Plan of Study for the EIA stipulates the activities to be undertaken as part of the public participation for the Anderson-Dinaeldi project, in accordance with regulatory requirements, which forms the basis of the discussions to follow. Note that the public participation conducted for the Scoping phase will not receive attention in this section as it was comprehensively discussed in the Scoping Report and the Extended Scoping Report. Emphases will thus primarily be placed on the EIA public participation process.

Figure 22 outlines the key milestones in the public participation process undertaken for the Scoping and EIA phases for the proposed Anderson400kV substation.

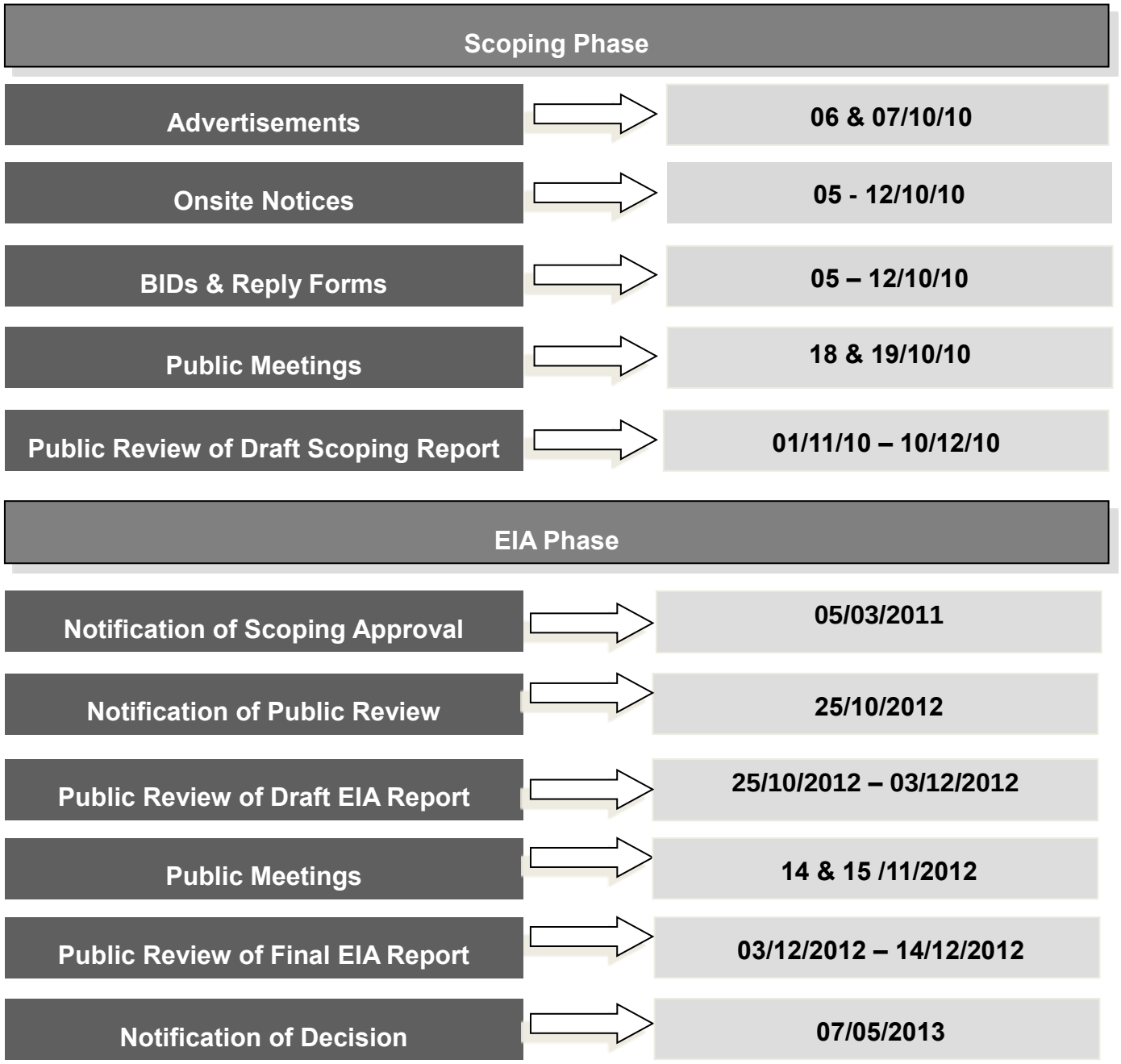


Figure 22: Public Participation Process for Anderson 400 kV substation

13.1 Maintenance of the I&AP Database

The database of I&APs (refer to ***Appendix I***), which contains particulars of *inter alia* authorities, stakeholders, landowners and members of the general public, was maintained during the EIA phase.

Directly affected landowners along the Main Route were identified *inter alia* by using the information provided by Eskom for their existing servitude. The remainder of the details for directly affected landowners were identified through a deed search on affected properties, and through discussions held with the

Agricultural Sector, municipal planning departments, Department of Land Affairs: Deeds Registration and known landowners.

13.2 Notification – Approval of Scoping Report

Advertisements were placed in the following newspapers as notification that the Scoping Report had been approved by DEA (refer to copies of the newspaper advertisements contained in ***Appendix J***):

- The Star: 06/10/2010
- The Beeld: 07/10/2010; and
- The Kormoront: 07/10/2010.

In addition, all I&APs on the database were notified of the approval of the Scoping Report and commencement of the EIA phase via fax, email or registered mail.

13.3 Comments and Response Report

The correspondence received from I&APs during the EIA phase is included in ***Appendix I*** This Report also attempts to addresses the comments through input from the project team. Note that all comments received following the public review of the Draft EIA Report will be included in the final EIA Comments and Response Report.

13.4 Review of Draft EIA Report

13.4.1 Notification

I&APs will be notified as follows of the opportunity to review the Draft EIA Report:

- A notification letter of the Draft EIA Report will be forwarded to I&APs; and
- Newspaper advertisements will be placed as notification on the 25th and 26th October 2012 in the following newspapers:
    - The Star;
    - The Beeld; and
    - The Kormoront.

13.4.2 Lodging and Distribution of Draft EIA Report

The Draft EIA Report will be placed at the locations provided in the table below to allow the I&APs to review the document. A fourty-day review period (from 25th October 2012 until 03rd December 2012) will be granted.

Table 29: Locations for review of Draft EIA Report

Location	Address	Tel. No.
Hoërskool Brits	1 Johan Street Brits	Adolf Gouws 012 252 3228
Laerskool Broederstroom	Plot 33, Primula Street, Flora Park	087 940 9167
Madibeng Community Library	51 Van Velden Street, Brits Office Hours: Mon-Fri: 09:00-17:00 Saturdays: 09:00-12:00	012 318 9318
Schoemansville Library	Marais Street, Schoemansville	012 253 1177

Copies of the Draft EIA Report will be provided to the following Authorities for review:

- Department of Environmental Affairs (DEA);
- Gauteng Department of Agriculture and Rural Development (GDARD);
- North West Department of Agriculture, Conservation and Environment;
- Madibeng Local Municipality;
- City of Tshwane Local Municipality;
- South African National Roads Agency (SANRAL);
- North West Province Roads Department;
- North West Department of Housing;
- Department of Mineral Resources (DMR);
- Department of Water Affairs (DWA);
- National Department of Agriculture (NDA);
- Provincial Heritage Resources Authority, Gauteng; and
- South African Heritage Resources Authority.

The Draft EIA Report was also placed on the Eskom website (www.eskom.co.za/eia) for all I & Aps to review.

13.4.3 Public Meetings

Public meetings were held between October 2012 and November 2012 to present the Anderson substation Draft EIA Report, as per **Table 30**.

Table 30: Details of public meetings held to present the Draft EIA Report

14 November 2012	**Venue:**	Motozi Lodge, R104 Hartbeespoort
	Time:	17:30-19:30

15 November 2012	**Venue:**	Dassie Paleis, Spoorweg St, Brits
	Time:	17:30-19:30

I&APs will be notified via email, fax or post regarding the details of the meetings. The advertisements discussed in **Section 13.4.1** will also contain the particulars of the abovementioned public meetings.

The aims of the public meetings include the following:

- To present the project details (i.e. alternative routes considered);
- To present the findings of the specialist studies;
- To address key issues raised during the Scoping phase, Extended Scoping phase and the EIA phase;
- To elaborate on the potential environmental impacts (qualitative and quantitative), and the proposed mitigation of these impacts;
- To present the findings of the comparative analysis of the alternatives;
- To explain the EIA process; and
- To allow for queries and concerns to be raised, and for the project team to respond.

13.5 Review of Final EIA Report

The Final EIA Report will be lodged in the public domain for a two week period to grant I&APs and opportunity to review the document. Copies of the document will be lodged at the same places listed in **Table 33** and it will be placed on the Eskom website (*www.eskom.co.za/eia*). All attendees of the public meetings will be notified of the review process.

13.6 Notification of DEA Decision

All I&APs will be notified via email, fax or post within 10 days after having received written notice from DEA on the final decision for the Anderson Substation EIA Report. Advertisements will also be placed in local and regional newspapers regarding the Department's decision. These notifications will include the appeal procedure to the decision and key reasons for the decision. A copy of the decision would be provided to I&APs on request.

13.7 Landowner Consent

In terms of regulation 16(1) of GN No. R. 385 of 21 April 2006, landowner consent is required if the applicant (i.e. ESKOM) is not the owner of the land on which the proposed activity is to be undertaken. According to regulation 16(3), this stipulation does not apply to a linear activity provided the applicant "has

given notice of the proposed activity to the owners of the land on which the activity is to be undertaken as soon as the proposed route or route alternatives have been identified". The last mentioned provision was attended to during public participation. Landowner consent will thus not be sought for the linear components of the Anderson substation Project.

14 EIA CONCLUSIONS AND RECOMMENDATIONS

14.1 Sensitive Environmental Features

Should authorisation for the final alignment be granted by DEA, and following the negotiations with landowners and the substation site will also be surveyed to confirm the location of the turn-in lines.

Within the context of the project area, cognisance must be taken of the following sensitive environmental features, attributes and aspects, for which mitigation measures are included in the EIA Report and EMP:

- Erosion control measures are deemed to be crucial especially once the surface soil, vegetation and plant cover has been compromised.
- The encroachment of the construction activities (transmission line, access roads construction camp) into the regulated areas of watercourses (i.e. 1:100 year floodline or delineated riparian / wetland habitats, whichever is greatest) could adversely affect resource quality by altering flow, reducing water quality, altering habitat and impacting on aquatic biota. These impacts could be exacerbated during the rainy season, if suitable mitigation measures are not in place. Accepting that the objectives and measures included in the EMP pertaining to reinstatement and rehabilitation of the watercourses are adopted and implemented and that the regulated areas of watercourses will be avoided, the potential impacts should be temporary and restricted to the construction phase. Specific management requirements and measures are listed in the EMP to address the construction-related impacts to the resource quality of the affected watercourses.
- Although much of the project area is utilised for farming and mining and other land uses that has caused land degradation, all route alternatives incorporate habitat units that would support a variety of faunal and floral species biodiversity to a greater or lesser extent – many of which are RDL and ODL. The proposed transmission lines will traverse the Magaliesberg mountain range, which is a unique mountain range of great ecological, geological and cultural importance and value.
  Sensitive ecological features include:
    - All protected areas;
    - Wetlands, aquatic habitat and riparian areas;
    - Areas that have retained natural ecological features and are not suffering degradation are considered ecologically sensitive.
  - Impacts to avifauna from collision with the lines require specific attention, and the recommendations included in this report need to be implemented.
- Special care should be exercised to minimise traffic disruptions along the national, arterial, main and secondary roads.

- From a socio-economic perspective, the management of impacts to landowners during the construction and operation phases need to be strictly controlled through the mitigation measures recommended by the specialist studies and the EMP.
- Human and animal health risks associated with EMFs need to be closely monitored.

14.2 Environmental Impact Statement

With the selection of the BPEO for the substation, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the EMP, it is believed that the significant environmental aspects and impact associated with this project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

14.3 Key Recommendations

The following key recommendations accompany the EIA for the Anderson substation:

- It is recommended that site alternative 3 be chosen as the preferred alternative for the location of the substation.
- A phase 2 HIA must be done to determine if any items of heritage significance are present within the proposed site.

14.4 Conditions for Authorisation

The following conditions are regarded as critical mitigation measures emanating from the EIA:

- On-going communication with the affected landowners and during the implementation of the project.
- Prior to any construction, undertake necessary negotiations with directly affected landowners and establish requirements for access, fencing, game requirements, existing services, etc.
- Diligent compliance monitoring of the EMP, environmental authorisation and other relevant environmental legislation by an Independent Environmental Control Officer (ECO) is crucial to ensure compliance with the stipulated management measures of the EIR.
- All relevant recommendations made by the specialists relating to the preferred site alternative must be adhered to in terms of fauna, flora, heritage, socio-economic, agricultural, visual and geotechnical issues.

- Areas affected by construction activities need to be suitably stabilised due to the varying topography and watercourses within the project area. Suitable stormwater management measures are also required for access roads to manage erosion.
- Protected flora species are to be relocated prior to vegetation clearance, should avoidance not be possible. Permits need to be obtained under National Forests Act (Act No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed.
- A walk-down survey of the connecting lines and the substation area is to be undertaken, which includes the relevant environmental specialists, to ensure the safeguarding of sensitive environmental features and fauna within the corridor.
- The Construction EMP must be updated to include the findings of the walk-down survey and should be submitted to DEA for approval.
- All access roads and construction camps need to be identified prior to construction and the final EMP should make provision for suitable mitigation measures to manage these project components.
- Suitable fencing and access control required to protect farms.
- Strict security measures to be implemented.
- All relevant permits must be obtained prior to the commencement of construction activities or as deemed necessary.

15 REFERENCES

Cook, C. (2012) Herpetological habitat sensitivity scan for the proposed establishment of the Anderson-Dinaledi 400kV transmission line between the proposed ne Anderson substation and the existing Dinaledi substation (Brits); North West and Gauteng Provinces.

Gauteng Conservation Plan Version 3.3 (C-Plan 3.3). Gauteng Department of Agriculture and Rural Development. Directorate Nature Conservation. Technological Services.

Phampe, R. (2011) Fauna and Flora Assessment: Proposed establishment of the Anderson 400kV Substation in Broederstroom, North West Province.

Phampe, R. (2012) Fauna and Flora Assessment: Proposed establishment of the Anderson 400kV Substation in Flora Park, Gauteng

APPENDIX A: DEA Approval of Scoping Report

APPENDIX B: Minutes of the Meeting Held with DEA

APPENDIX C: Electric and Magnetic Fields from Overhead Lines – A Summary of Technical and Biological Aspects

APPENDIX D: Specialist Studies

1. Fauna and Flora Report

2. Geotechnical Report

3. Heritage Impact Assessment Report

4. Visual Impact Assessment

5. Agricultural Potential Study

6. Socio-Economic Assessment Report

APPENDIX E: Environmental Management Plan (EMP)

APPENDIX F: Servitude Negotiation Process

APPENDIX G: Curriculum Vitaes

APPENDIX H: Site Layout and Locality Maps

APPENDIX I: Comments and Response Table

APPENDIX J: Proof of Public Participation