Proposed construction of two 132kV Chickadee Lines to the new Zonnebloem Switching Station

Mpumalanga Province

Basic Assessment Report

April 2018

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PROJECT DETAILS

Title	:	Environmental Assessment Process Basic Assessment Report for the proposed construction of two 132kV Chickadee Lines to the new Zonnebloem Switching Station, Mpumalanga Province
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ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBA	Critical Biodiversity Area
DEA	National Department of Environmental Affairs
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESA	Ecologically Sensitive Area
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
m^2	Square meters
m/s	Meters per second
MPNCA	Mpumalanga Nature Conservation Act (Act 10 of1998)
MVA	Mega Volt Ampere
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NFEPA Wetland	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NWA	National Water Act (Act No. 36 of 1998)
RE	Remaining Extent
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework

SUMMARY AND PROJECT OVERVIEW

1. OVERVIEW OF THE PROPOSED PROJECT

The Mpumalanga region as a whole has been earmarked for the development and expansion of various mining developments and operations. Mining in the Steve Tshwete Local Municipality (LM) is the highest contributor to the Municipality's Gross Domestic Product (GDP) and contributes up to 45,8% according to the Steve Tshwete LM Local Economic Development Strategy 2015-2020. Glencore Operations South Africa (Pty) Ltd plans to expand mining operations east of the study area and would require connection to the existing electrification networks and services. Eskom Holdings SOC Limited (Eskom) is therefore proposing to establish a new 40MVA 132/22kV switching station, to be known as the 132/22kV Zonnebloem Switching Station. Associated infrastructure includes two loop-in-loop-out (LILO) Chickadee power lines to connect to the existing 132kV Mafube/Pan Traction power line, accommodating the expansion of the Zonnebloem Coal Mine situated approximately 6km east of the study area. The proposed power lines and Zonnebloem Switching Station will be constructed, owned and operated by Eskom. Glencore Operations South Africa (Pty) Ltd will be responsible for the construction and operation of a 132kV overhead power line to connect the new coal mining point to the Zonnebloem Switching Station. It should be noted that this power line does not form part of this application and will be assessed in a separate application.

The project is located approximately 24km east of Middelburg on the Remaining Extent of the Farm Patattafontein 412, the Remaining Extent of the Farm Zevenfontein 415 and Portion 4 of the Farm Gemsbokfontein 411 located within the Steve Tshwete Local Municipality and within the greater Nkangala District Municipality, Mpumalanga Province.

The proposed project will consist of the following activities:

- Construction and operation of the new 40MVA Zonnebloem 132/22kV switching station and ancillaries (including a communication tower, metering station, laydown area, access roads, control building and associated infrastructure).
- Two 500m 132kV LILO Chickadee power lines from the existing 132kV Mafube/Pan traction power line to the newly proposed Zonnebloem switching station. Each power line will have a 32m wide servitude.

A study area of 84ha situated within the project site[1] of 2456ha in extent was investigated to allow for optimisation of the infrastructure layout in order to accommodate specialist findings where necessary. All infrastructure associated with the proposed project will fall within this assessed area.

[1] The project site includes the three affected properties which consist of the Remaining Extent of the Farm Patattafontein 412, the Remaining Extent of the Farm Zevenfontein 415 and Portion 4 of the Farm Gemsbokfontein 411 within which the project is being proposed.

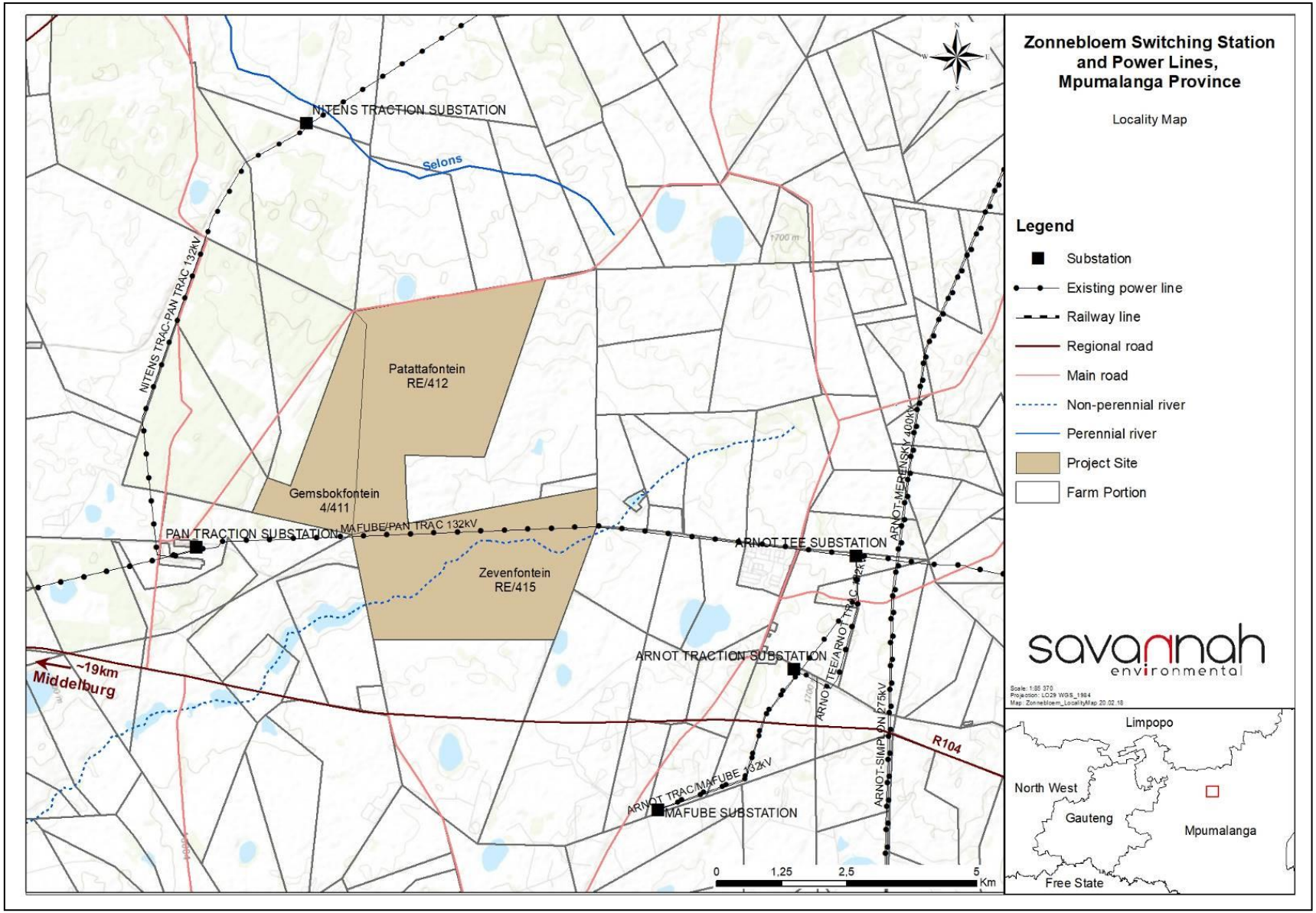

Figure 1: Locality map showing the location of the project site location in relation to the surrounding area (**Appendix A1**).

Table 1: Location of the study area

Province	Mpumalanga Province	
District Municipality	Nkangala	
Local Municipality	Steve Tshwete	
Ward number(s)	Ward 9	
Nearest town(s)	~23km east of Middleburg and ~35km south west of Belfast	
Farm Name/Portion and 21 Digit SG Code Preferred Substation site	**FARM NAME**	**PORTION NUMBER**
	Remaining Extent of the Farm Patattafontein 412,	T0JS00000000041200000
	Remaining Extent of the Farm Zevenfontein 415	T0JS00000000041500000
	Portion 4 of the Farm Gemsbokfontein 411	T0JS00000000041100004
Current Land Use	Agricultural	
Site Coordinates	Northern-most extent: 25°42'46.236" S	29°44'7.620" E
	Eastern-most extent: 25°44'57.214" S	29° 44' 44.087" E
	Southern-most extent: 25° 46' 32.323" S	29° 44' 15.260" E
	Western-most extent: 25° 45' 13.656" S	29° 40' 46.444" E
	Centre: 25° 45' 05.994" S	29° 42' 23.926" E

2. NEED AND DESIRABILITY FOR THE PROPOSED INFRASTRUCTURE

The need for this project is based on the requirement to accommodate the expansion of the Zonnebloem coal mine situated approximately 6km east of the study area. The Mpumalanga region as a whole has been earmarked for the development and expansion of various mining developments and operations. Mining in the Steve Tshwete Local Municipality (LM) is the highest contributor to the Municipality's Gross Domestic Product (GDP) and contributes up to 45,8% according to the Steve Tshwete LM Local Economic Development Strategy 2015-2020. The mining industry not only provides numerous employment opportunities, it also provides opportunities for skills development. In a broader sense, by the proposed project providing support for the expansion of mining operations, it also assist with realising the benefits associated with the expansion.

The project itself would contribute positively towards employment creation within the Province and specifically within the local and district municipality. It is anticipated that temporary employment opportunities would be generated during the construction phase of development, while permanent employment opportunities would result from the operational and maintenance phase.

From an overall environmental sensitivity and planning perspective, the proposed project supports the broader strategic context of the municipality as it is directly linked to the one of the municipality's investment opportunities which includes utilising of land with the potential for coal mining. No exceedance of social, ecological, palaeontological, archaeological or avifaunal limits will result from the construction of the proposed project and no detrimental impact is expected, as detailed in this Basic Assessment Report.

3. REQUIREMENTS FOR A BASIC ASSESSMENT PROCESS

In terms of the Environmental Impact Assessment (EIA) Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), Eskom Holdings SOC Ltd requires authorisation for the construction and operation of two new 132kV chickadee power lines and the

newly proposed Zonnebloem Switching Station. In terms of sections 24 and 24D of the National Environmental Management Act (No 107 of 1998), as read with the newly gazetted EIA Regulations, 2014, of GN R327, 325 and 324 of April 2017, a Basic Assessment process is triggered by the proposed project.

In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As Eskom is a State-Owned Corporation (SOC), and the proposed project triggers a Basic Assessment Process, the National Department of Environmental Affairs (DEA) is identified as the competent authority[2] and the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MP DARDLEA) will act as the commenting authority.

3.1. Legal Requirements

This report has been compiled in accordance with the requirements of the EIA Regulations of 2014, as amended on 07 April 2017 (refer to **Table 2** below) and includes details of the activity description; the site, area and property description; the public participation process; the impact assessment; as well as the recommendations proposed by the Environmental Assessment Practitioner (EAP).

Table 2: Legal Requirements of GN. R. 326, Appendix 1 included in the 2014 EIA Regulations, as amended on 07 April 2017.

NEMA REGULATION GNR 326, SECTION 19 REQUIREMENTS FOR THE CONTENT OF BASIC ASSESSMENT REPORTS AS PER APPENDIX 1	**CROSS REFERENCE IN THIS REPORT (refer to the following parts in the report)**
(1) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include— (a) details of— (i) the EAP who prepared the report; and	Summary and Project overview Section 4
(ii) the expertise of the EAP, including a curriculum vitae;	Appendix G3
(b) the location of the activity, including: (i) the 21 digit Surveyor General code of each cadastral land parcel;	Chapter 1, Section 1
(ii) where available, the physical address and farm name;	Chapter 1, Section 1
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Chapter 1, Section 1
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale;	Figure 1
or, if it is— (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Chapter 1, Section 1 Appendix I1
(d) a description of the scope of the proposed activity, including— (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including	Chapter 1, Section 1.2 and 1.3

[2] The National Department of Environmental Affairs is the competent authority due to the fact that Eskom is a State owned Enterprise.

NEMA REGULATION GNR 326, SECTION 19 REQUIREMENTS FOR THE CONTENT OF BASIC ASSESSMENT REPORTS AS PER APPENDIX 1	CROSS REFERENCE IN THIS REPORT (refer to the following parts in the report)
associated structures and infrastructure ;	
(e) a description of the policy and legislative context within which the development is proposed including— (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and	Chapter 1, Section 2
(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	Chapter 1, Section 2
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Chapter 1, Section 1.4
(g) a motivation for the preferred site, activity and technology alternative;	Chapter 1, Section 1.1
(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Chapter 1, Section 1.1 Chapter 3 Appendix E
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 2
(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Chapter 4
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Chapter 4, Section 1
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 1, section 1.1 Chapter 4
(viii) the possible mitigation measures that could be applied and level of residual risk;	Chapter 4 Appendix F
(ix) the outcome of the site selection matrix;	N/A – the site selection process was based on technical considerations which was then assessed from an environment perspective

NEMA REGULATION GNR 326, SECTION 19 REQUIREMENTS FOR THE CONTENT OF BASIC ASSESSMENT REPORTS AS PER APPENDIX 1	CROSS REFERENCE IN THIS REPORT (refer to the following parts in the report)
(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	Chapter 1, Section 1.1
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Chapter 4, Section 4.9.5
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Chapter 4
(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Chapter 4
(j) an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	Chapter 4
(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Chapter 4 Appendix F
(l) an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Chapter 4, Section 4.8 and 4.9
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Appendix F
(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	N/A
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Summary and Project Overview, Section 5
(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any	Chapter 5, Section 5.2

NEMA REGULATION GNR 326, SECTION 19 REQUIREMENTS FOR THE CONTENT OF BASIC ASSESSMENT REPORTS AS PER APPENDIX 1	CROSS REFERENCE IN THIS REPORT (refer to the following parts in the report)
conditions that should be made in respect of that authorisation;	
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	N/A
(r) an undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	Appendix G2
(s) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
(t) any specific information that may be required by the competent authority; and	N/A
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A

3.2. Listed Activities triggered by the proposed project

Eskom requires Environmental Authorisation for the proposed project in terms of Sections 24 and 24D of the National Environmental Management Act (No 107 of 1998), as read with the EIA Regulations of 2014, GN R. 326, 327 and 324. The following Listed Activities are applicable to the project.

Table 3: Listed Activities triggered by the proposed Project

Activity listed in GNR 327, 325 and 324	Relevance to the project
GN327, Activity 11(i): The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	The construction of two 132kV loop-in-loop-out power lines from the existing 132kV Mafube/Pan Traction power line to the proposed new Zonnebloem Switching Station. The switching station and power lines to be constructed will be situated outside of the urban edge.
GN327, Activity 24(ii): The development of a road (ii) with a reserve wider than 13,5m, or where no reserve exists where the road is wider than 8 metres.	The access road required to be established for the project will be 8m in width.
GN327, Activity 27: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation.	The construction of the Zonnebloem Switching Station, LILO power lines (including 32m servitude for each) and associated infrastructure may require the clearance of 1 ha of indigenous vegetation. However, the likelihood of this is low due to the degraded condition of most of the site.
GN327, Activity 28 (ii): Residential, mixed, retail, commercial, industrial or	The development footprint of the project will exceed 1ha and is proposed within the larger project site which is

institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	currently being utilised for agricultural purposes.

The nature and extent of the proposed project, and the potential environmental impacts associated with the construction, operation and decommissioning phases are explored in more detail in this Basic Assessment Report.

4. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER AND EXPERTISE TO CONDUCT THE BASIC ASSESSMENT

The Savannah Environmental staff has acquired considerable experience in environmental management from working in this field for more than 19 years, and have been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries.

Savannah Environmental is currently responsible for environmental assessment and environmental management services on a number of built infrastructure projects throughout South Africa, including several renewable energy projects.

Table 4 provides a summary of the experience and expertise of the Savannah Environmental project team, as well as credentials of the specialists contracted to undertake the necessary studies.

Table 4: Project Team details

Team Member and Role	Position in Team	Experience
Savannah Environmental		
Sharon Meyer	Project Manager, Senior EAP	Has 17 years of work experience in the environmental consulting space. She has an MSc in Environmental Management and Zoology. She is a *Pr. Sci. Nat.* with SACNASP (400293/05), and her particular focus is on integrated Environmental Authorisation Processes, managing multi-disciplinary teams on complex energy projects. She works closely with the client, authorities and stakeholders to identify practical solutions to project challenges.
Thalita Botha	Junior EAP, GIS consultant	Holds a Bachelor degree with Honours in Environmental Management and has 02 years of experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects.
Gabriele Stein	Public participation consultant	Holds an Honours Degree in Anthropology, obtained from the University of Johannesburg. She has 9 years of consulting experience in public participation and social research. Her experience includes the design and implementation of public participation programmes and stakeholder management strategies for numerous integrated development planning and infrastructure projects. Her work focuses on managing the public

Team Member and Role	Position in Team	Experience
		participation component of the Environmental Impact Assessment processes undertaken by Savannah Environmental.

Savannah Environmental has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation, transmission and distribution projects through their involvement in related EIA processes. Savannah Environmental has completed the EIA process and received environmental authorisations for numerous energy-related projects and their associated infrastructure. In order to adequately identify and assess potential environmental impacts associated with the proposed project, Savannah Environmental has appointed the following specialists to conduct specialist impact assessments:

» Ecology and Avifauna – Gerhard Botha (Eco-Care Consultancy);
» Heritage - Jaco van der Walt (Heritage Contracts and Archaeological Consulting (HCAC)); and
» Palaeontology - Elize Butler (Banzai Environmental (Pty) Ltd).

Curricula vitae for the Savannah Environmental project team consultants and specialist consultants are included in **Appendix G**.

5. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are applicable to the studies undertaken within this Basic Assessment Process:

» All information provided by the proponent to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development sites identified by the proponent represent technically suitable sites for the establishment of the proposed project (taking into account that optimisation of the layout might be required based on geotechnical investigations).
» Studies and overall conclusions made assume that any potential impacts on the environment associated with the proposed development will be avoided or mitigated accordingly based on the findings of this Basic Assessment Report and the associated Specialist Studies.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices D1 – D4** for specific limitations.

BASIC ASSESSMENT FOR PUBLIC COMMENT

This Basic Assessment Report has been prepared by Savannah Environmental in order to assess the environmental impacts associated with the construction and operation of the project undertaken. This process was undertaken in support of an application for Environmental Authorisation to the National Department of Environmental Affairs (DEA). The report is available for public review at the following locations:

The 30-day review period for the Basic Assessment Report is from **13 April 2018** to **15 May 2018.** The report is available for public review at the following locations:

- Gerlad Sekoto Public Library (Middelburg Public Library) (Cnr of Wonders Street and Walter Sisulu Street); and
- www.savannahsa.com.

To obtain further information, register on the project database, or submit written comment please contact:

Gabriele Stein **Savannah Environmental** **Tel:** 011 656 3237 **Fax:** 086 684 0547 **Email:** gabriele@savannahsa.com **Post:** PO Box 148 Sunninghill, 2157
The due date for comments on the Basic Assessment Report is **15 May 2018**

CHAPTER 1: INTRODUCTION AND PROJECT DESCRIPTION

This chapter provides an introduction to the proposed Zonnebloem Switching Station and associated infrastructure as well as a description of the project location and project characteristics.

1. PROJECT DESCRIPTION

The Mpumalanga region as a whole has been earmarked for the development and expansion of various mining developments and operations. Mining in the Steve Tshwete Local Municipality (LM) is the highest contributor to the Municipality's Gross Domestic Product (GDP) and contributes up to 45,8% according to the Steve Tshwete LM Local Economic Development Strategy 2015-2020. Glencore Operations South Africa (Pty) Ltd plans to expand mining operations east of the study area and would require connection to the existing electrification networks and services. Eskom Holdings SOC Limited (Eskom) is therefore proposing to establish a new 40MVA 132/22kV switching station, to be known as the 132/22kV Zonnebloem Switching Station, and two loop-in-loop-out (LILO) Chickadee power lines to connect to the existing 132kV Mafube/Pan Traction power line to accommodate the expansion of the Zonnebloem Coal Mine situated approximately 6km east of the study area. The proposed power lines and Zonnebloem Switching Station will be constructed, owned and operated by Eskom. Glencore Operations South Africa (Pty) Ltd will be responsible for the construction and operation of a 132kV overhead power line to connect the new coal mining point to the Zonnebloem Switching Station. It should be noted that this power line does not form part of this application and will be assessed in a separate application.

The project is located approximately 24km east of Middelburg on the Remaining Extent of the Farm Patattafontein 412, the Remaining Extent of the Farm Zevenfontein 415 and Portion 4 of the Farm Gemsbokfontein 411 located within the Steve Tshwete Local Municipality and within the greater Nkangala District Municipality, Mpumalanga Province (refer to **Figure 1.1**). A study area of 84ha situated within the project site[3] of 2456ha in extent was investigated to allow for optimisation of the infrastructure layout in order to accommodate specialist findings where necessary. All infrastructure associated with the proposed project will fall within this assessed area (refer to **Figure 1.2** for the layout map).

The proposed project will consist of the following activities:

- Construction and operation of the new 40MVA Zonnebloem 132/22kV switching station and ancillaries (including a communication tower, metering station, laydown area, access roads, control building and associated infrastructure).
- Two 500m 132kV LILO Chickadee power lines from the existing 132kV Mafube/Pan traction power line to the newly proposed Zonnebloem switching station. Each power line will have a 32m wide servitude and a separation distance of 15m will be applied between the power lines.

Two alternative alignments for the access road are being considered:

- Alternative A: Access road will be up to 8m wide and approximately 990m in length.
- Alternative B: Access road will be up to 8m wide and approximately 805m in length.

[3] The project site includes the three affected properties which consist of the Remaining Extent of the Farm Patattafontein 412, the Remaining Extent of the Farm Zevenfontein 415 and Portion 4 of the Farm Gemsbokfontein 411 within which the project is being proposed.

Photographs of the site where the switching station and power lines are proposed and the general location have been included in **Appendix B**. A facility illustration providing a concept of how the switching station and power lines will look are included as **Appendix C**.

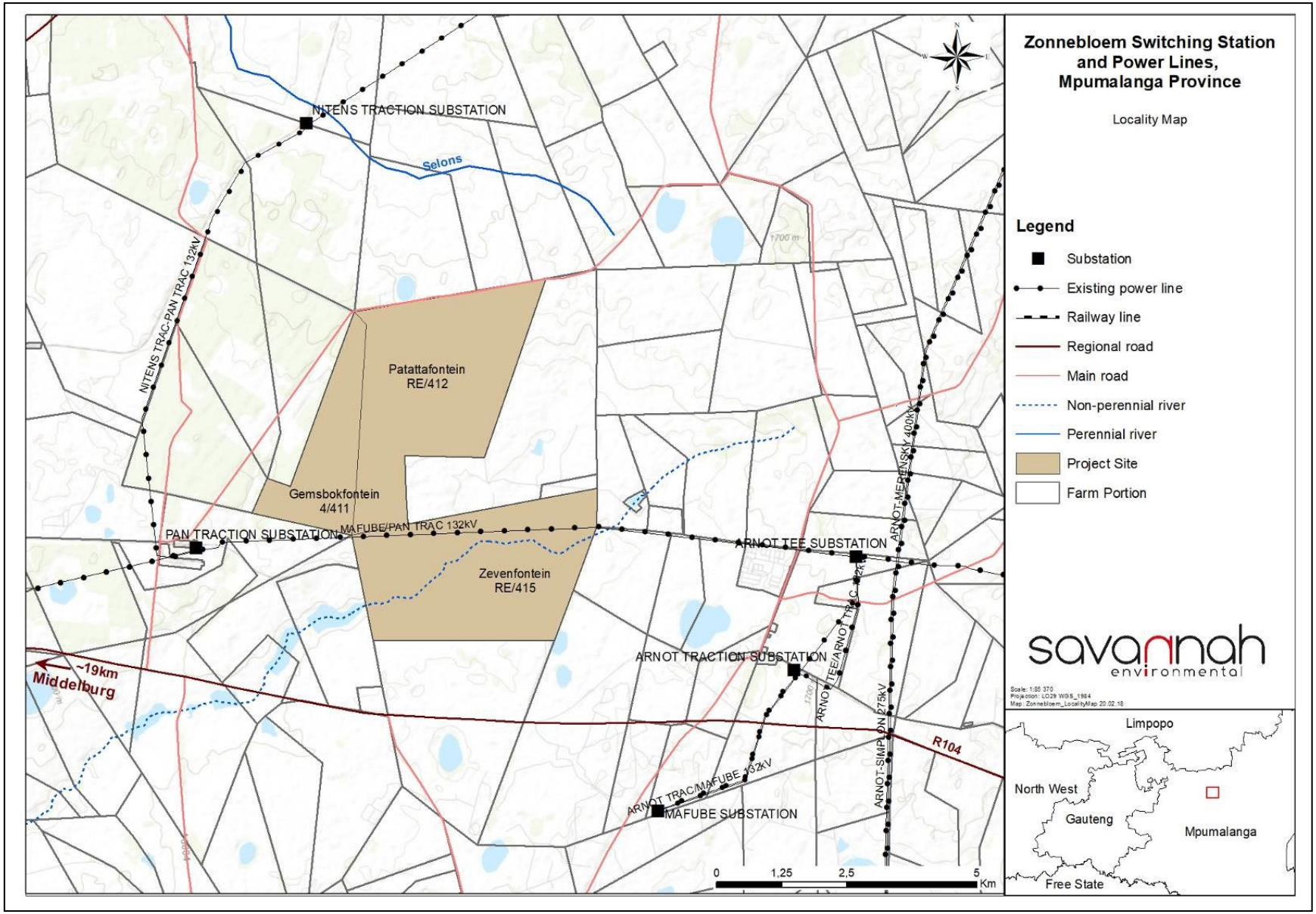

Figure 2.1: Locality map showing the location of the project site location in relation to the surrounding area (**Appendix A1**).

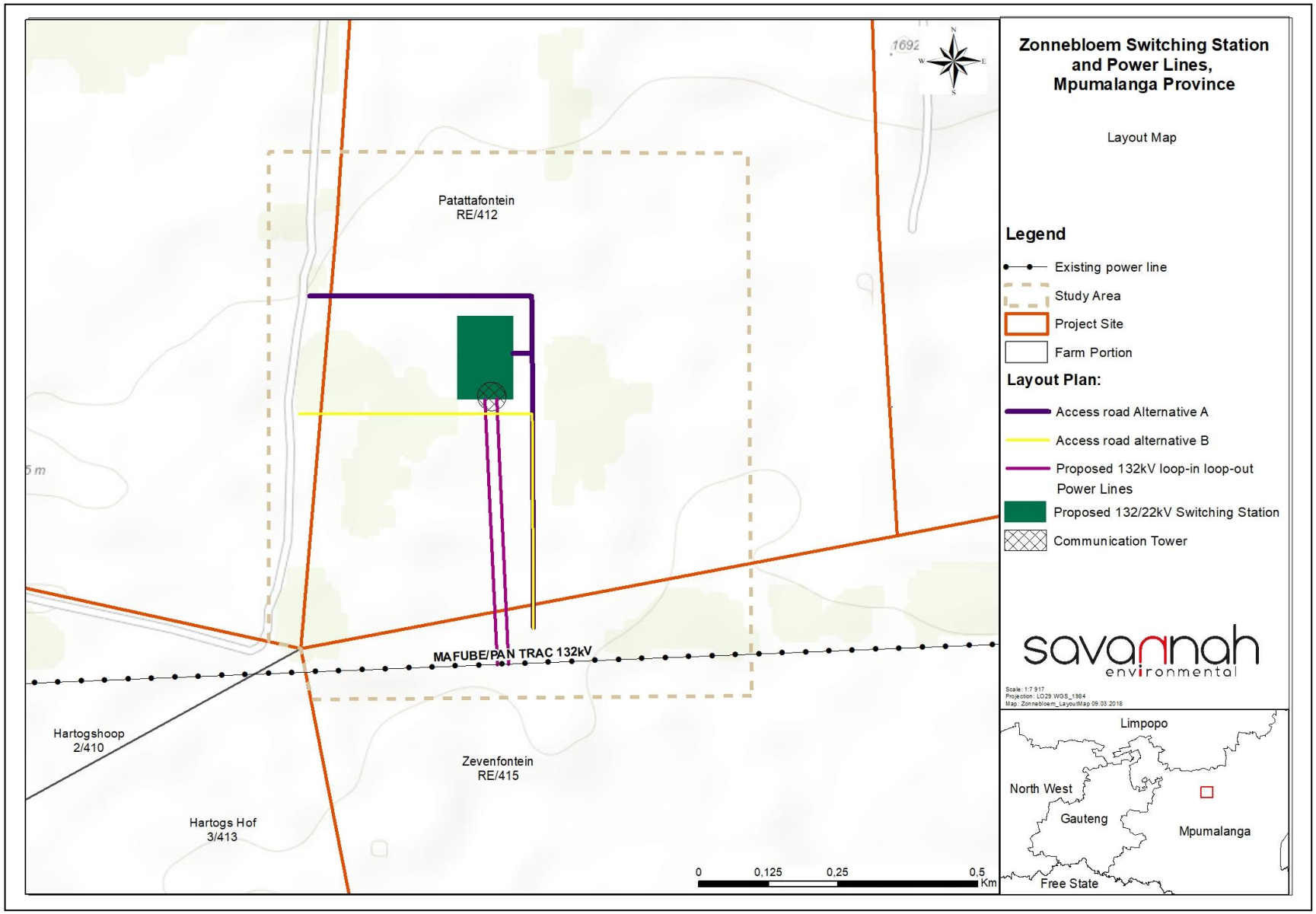

Figure 3.2: Layout map showing the development footprint of the project and access road alternatives (**Appendix A2**)

The table below provides the details of the location of the Zonnebloem Switching Station and associated infrastructure.

Province	Mpumalanga Province	
District Municipality	Nkangala	
Local Municipality	Steve Tshwete	
Ward number(s)	Ward 9	
Nearest town(s)	~23km east of Middelburg and ~35km south west of Belfast	
Farm Name/Portion and 21 Digit SG Code Preferred Substation site	**FARM NAME** Remaining Extent of the Farm Patattafontein 412, Remaining Extent of the Farm Zevenfontein 415 Portion 4 of the Farm Gemsbokfontein 411	**PORTION NUMBER** T0JS00000000041200000 T0JS00000000041500000 T0JS00000000041100004
Current Land Use	Agricultural	
Site Coordinates	Northern-most extent: 25°42'46.236" S 29°44'7.620" E Eastern-most extent: 25°44'57.214" S 29° 44' 44.087" E Southern-most extent: 25° 46' 32.323" S 29° 44' 15.260" E Western-most extent: 25° 45' 13.656" S 29° 40' 46.444" E Centre: 25° 45' 05.994" S 29° 42' 23.926" E	
Project Site	2456ha	
Study Area	84ha	
Site Access	Main access to the project site will be via the Regional Road R104 which connects Middelburg and Belfast or the R555 which connects Middelburg and Stoffberg. Direct Access to study area is possible via the use of existing main roads (gravel). Apart from these, farm entrances and gravel farm roads (including the existing power line service road), can be used where permissible. The new access road to be constructed will also be used.	

1.1 Project Alternatives

The section below described the alternatives which have been considered and assessed as part of the project. The alternatives considered include site alternatives, layout alternatives, technology alternatives and the no-go alternative.

1.1.1 Site alternatives

The site was identified by the applicant as technically feasible due to the nature and purpose of the development (i.e. to accommodate the expansion of mining operations). The location of the project is largely dependent on factors such as the availability of land, topography and available grid connection:

- *Availability of land:* The Remaining Extent of the Farm Patattafontein 412 is owned by Glencore Operations South Africa (Pty) Ltd. As the main purpose of the project is to accommodate the expansion of mining operations for Glencore, the site was chosen as the preferred site in terms of availability and land ownership.
- *Topography:* The study area chosen is situated on a relatively flat area which requires less cut and fill.
- *Available grid connection:* For the switching station to connect to the national electricity grid, a viable connection point is required. The area chosen for the development of the project is traversed by the

existing 132kV Mafube/Pan Traction power line. This eliminates the need for additional power lines which are extensive in length.

A study area of 84ha in extent has been assessed to ensure the optimal placement of the Zonnebloem Switching Station and associated infrastructure within the study area. Based on the factors mentioned above, no other site alternatives have been assessed.

1.1.2 Layout alternatives

Switching station

The design and layout of the Eskom switching station alternatives must conform to Eskom's technical standards as it forms part of the national electricity supply network and must fit in with the existing network systems, technology and infrastructure. Therefore no alternative switching station layouts have been considered.

Power lines

The two 132kV chickadee LILO power lines will connect to the existing 132kV Mafube / Pan Traction power line between lattice tower 53 and lattice tower 54. The design of the power line is required to conform to Eskom's technical standards as it forms part of the national electricity supply network and must fit in with the existing network systems, technology and infrastructure. The study area being assessed within this Basic Assessment allows for the avoidance of identified environmental sensitivities to some extent through the appropriate placement of the 32m wide servitudes within the study area.

The proposed power lines will connect the Zonnebloem Switching Station to the existing 132kV Mafube / Pan Traction power line. The start- and end-points of the powerline are therefore dependant on the location of the switching station and the loop-in-loop-out point from the existing power line. This limits the potential alternate routings that can be considered.

The routing proposed in this application represents the most feasible and desirable alternative that has been identified based on technical considerations and environmental sensitivities.

Access roads

Two access road alternatives are proposed within the study area and include:

- Alternative A: Access road will be up to 8m wide and approximately 990m in length and will join two existing farm roads (gravel) close to the western and southern boundaries of the study area (refer to **Figure 1.2** below).
- Alternative B: Access road will be up to 8m wide and approximately 805m in length and will join two existing farm roads (gravel) close to the western and southern boundaries of the study area (refer to **Figure 1.3** below).

Figure 1.2: Google Earth image depicting access road Alternative A (dark purple) to the location of the switching station (green).

Figure 1.3: Google Earth image depicting access road Alternative B (yellow) to the location of the switching station (green).

1.1.3 Technology alternatives

No feasible technological alternatives exist for the distribution of electricity and as a result thereof no alternative has been assessed in this regard.

1.1.4 Design Alternatives

Switching station

The design of the switching station will be based on widely proven and accepted industry standards and does not significantly affect the environmental impact of the proposed development in any way as its footprint will not exceed the specifications or extend beyond the assessed study area of 84ha. The switching station must be constructed according to the authorised standards approved by Eskom Holdings SOC Ltd.

Power lines

The design of the power line will be based on widely proven and accepted industry standards and does not significantly affect the environmental impact of the proposed development in any way, as its footprint will not exceed the specifications, or extend beyond the assessed study area. In all likelihood, use will be made of steel monopole structures for the proposed power line, which is preferable over the lattice tower structures due to the smaller overall footprint. This will however be dictated by the site-specific conditions and landowner requirements. The power line must be constructed according to the authorised standards for a power line approved by Eskom Holdings SOC Ltd.

Alternative 1 (preferred power line design) – Single Circuit Overhead Power Line	**Alternative 2 (alternative power line technology) – Underground cabling**
The use of single circuit overhead power lines to distribute electricity is considered the most	Underground cables are typically only used over short distances, are predominately used in medium-

appropriate technology. The technology has been developed in consideration of environmental conditions and terrain as specified by Eskom specifications and best international practice. Based on all current landscape and ecological parameters a single circuit overhead power line is considered the most environmentally practicable technology available for the distribution of power. This option is considered appropriate for the following reasons: » Lower installation and maintenance costs compared to other types of pylon structures that could potentially be erected. » Limited environmental damage during installation.	and low-voltage networks, as well as for power distribution in densely built-up areas with high electricity demand. Furthermore, underground cables have economic and ecological disadvantages and have therefore not been taken into consideration for this project.

1.1.5 No-go alternative

The No-go option implies that the **Project does not proceed**. This means that the *status quo* of the environment would remain unchanged and no impacts would occur.

However, the implementation of the No-go alternative will also result in a situation where none of the benefits associated with the proposed project and expansion of the mining operations will be realised and the new coal mining point for the Zonnebloem Coal Mine approximately 6km west of the study area, will not be connected to the National Eskom electricity grid. This may lead to the mining operations being constrained and may ultimately not be able to expand. In addition, it would be an undesirable option from a socio-economic perspective as it would result in negative impacts at a local, regional and national scale from a socio-economic and economic perspective and is not considered desirable. The negative impacts of the no go alternative are considered to outweigh the positive impacts of this alternative. The no go option is therefore not preferred.

The no-go alternative is assessed within this Basic Assessment Report.

1.2 Project Activities

The following activities will be undertaken as part of the construction, operation and decommissioning phases of the project.

1.2.1 Construction Phase

The duration of the construction phase for the Zonnebloem Switching Station and all associated infrastructure is expected take approximately 10 months to complete.

Switching station

The proposed Zonnebloem Switching Station is proposed to be construction on the Remaining Extent of the Farm Patattafontein 412. The following sequence will be followed with the construction of the Zonnebloem Switching Station:

Step 1: Conduct geotechnical investigations to determine founding conditions;
Step 2: Conduct site survey;
Step 3: Vegetation clearance and construction of access road;
Step 4: Site grading and levelling;
Step 5: Construction of foundations;
Step 6: Import of switching station components;
Step 7: Construction of switching station;
Step 8: Rehabilitation of disturbed area and protection of erosion sensitive areas; and
Step 9: Testing and commissioning.

Power lines

The two 132kV LILO chickadee power lines considered within this Basic Assessment Report (BAR) will be approximately 500m in length and would be located within the assessed study area. Overhead power lines are constructed in the following simplified sequence:

Step 1: Survey of the routes;
Step 2: Determination of the conductor type;
Step 3: Selection of best-suited conductor, towers, insulators, foundations;
Step 4: Final design of line and placement of towers;
Step 5: Issuing of tenders, and award of contract to construction companies;
Step 6: Vegetation clearance and construction of access roads (where required);
Step 7: Stay pegging;
Step 8: Assembly and erection of towers;
Step 9: Stringing of conductors;
Step 10: Rehabilitation of disturbed area and protection of erosion sensitive areas; and
Step 11: Testing and commissioning.

i. Technical Details

The footprint of the switching station may include a metering station, control building, communication tower and associated infrastructure. The construction of ancillary infrastructure will follow a similar sequence as that of the substation described above. The table below provides an overview of the technical details of the switching station components to be constructed.

Table 5: Technical details of the project components to be constructed and operated

SWITCHING STATION	
Project Component	**Specification**
Mega Volt Ampere	40MVA
Size of the substation	4240m^2
Distance between equipment	9m
Footprint of the development	100m x 100m
Number of transformers	One 40 MVA transformer
Number of feederbays	Two 132kV feederbays

Communication tower	Up to 30m in height
Temporary Laydown Area	70,3m x 60,3m
LILO POWER LINES	
Project Component	**Specification**
Pylon Type	Steel monopoles and/or self-supporting towers
Line Capacity	132kV
Pylon Height	20m – 26m on average
Separation distance between the parallel lines	15m
Pylon Separation Distance	Average distance of 200m apart
Pylon foundation footprint	10mx10m (100m²)
Servitude	32m

High voltage power lines require a large clearance area for safety precautions. The Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) provides for statutory clearances. Minimal distances include:

» Vertical Distance of structures not forming part of the power line should be >3.8m
» Vertical distance of conductors to the ground should be >6.3m
» Distance between trees and shrubs and the bare phase conductor should be >3.8m
» Minimal clearance to other overhead line conductors should be >2m
» Above roads and in towns, proclaimed roads should be >7.5m.

ii. Access

Ready access is not currently available at the switching station site and as such an access road of up to 8m in width will need to be constructed as part of the construction phase. Two access road alternatives are proposed within the study area and include:

» Alternative A: Access road will be up to 8m wide and approximately 990m in length and will join two existing farm roads (gravel) close to the western and southern boundaries of the study area.
» Alternative B: Access road will be up to 8m wide and approximately 805m in length and will join two existing farm roads (gravel) close to the western and southern boundaries of the study area.

Main access to the study area will be via the Regional Road R104 which connects Middelburg and Belfast or the R555 which connects Middelburg and Stoffberg. Direct Access to study area is possible via the use of existing main roads (gravel). Apart from these, farm entrances and gravel farm roads, including the existing power line service roads can be used where permissible. The proposed access road will be gravel in nature for low-bed trucks and maintenance trucks. Impacts on the surrounding environment associated with the access road alternatives have been assessed within this report.

iii. Waste Management

It is anticipated that construction waste will be generated and will be mainly comprised of soil material from excavation activities as well as metal and cabling offcuts. Non-recyclable waste will be removed from site by a suitable contractor and will be transported to the nearest registered waste disposal facility for appropriate disposal. In order to comply with legal requirements, should there be excess solid construction waste after recycling options have been exhausted, the waste will be transported to the nearest registered waste disposal facility for appropriate disposal.

iv. Dust and Noise

During the construction phase, it is expected that there will be short term, localised dust generation and emissions from vehicles and machinery. However the dust and emissions will be of short term duration and have limited impact in terms of extent and severity. Appropriate dust suppression measures must be implemented to reduce the impacts. It is recommended that construction vehicles be serviced and kept in good mechanical condition in order to minimise possible exhaust emission.

Short term noise impacts are anticipated during the construction phase of the project. It is anticipated that the noise will be localised and contained within the construction area and its immediate surroundings. During operation, maintenance of the substation could potentially generate noise, however this is likely to be minimal. Moreover, the Preferred Substation location is isolated in the environmental and unlikely to pose any noise impacts on sensitive receptors.

v. Water Use

The project will require 5000l of potable water during the construction phase and will be provided by the contractor. No abstraction, storage or discharge of water is expected on site during the construction, operation or decommissioning of the infrastructure.

Several hydrological features have been identified within and surrounding the study area and includes depression wetlands, seepage wetlands and unchannelled valley-bottom wetlands. The ecological condition of these azonal habitats varies from severely degraded and transformed (Depression, Wetland Flat and some of the Seepages) to mostly disturbed and transformed (Valley-bottom Wetland and remaining seepages). A depression wetland located on the southern boundary of the study area is traversed by access road Alternative B. According to the Ecological Impact assessment (refer to Appendix D1) the significance of the impact of the access road on the depression wetland with the implementation of mitigation measures will be low. The remaining infrastructure falls within the regulated area of the wetlands. No direct impact is expected to occur on wetlands due to the remaining infrastructure. A risk assessment and General Authorisation may be required to be undertaken for the project. No application has been lodged with the Department of Water and Sanitation (DWS) as yet.

1.2.2. Operation and Maintenance

The Zonnebloem Switching Station and the LILO power lines will be operational for more than 20 years and will require routine maintenance work throughout this period. The switching station and power lines will be accessed via existing roads where possible and where required access roads will be established during the construction phase. During the operation and maintenance phase, vegetation around the switching station and within the power line servitudes will require management only if it impacts on the safety and operational objectives of the project. Operation and maintenance of the switching station and power lines will be undertaken by the Eskom.

1.2.3 Decommissioning phase

When the project has reached the end of its economic life, it will be decommissioned. The following decommissioning activities are expected to be undertaken:

a) Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment and the mobilisation of decommissioning equipment.

b) Disassemble Components

The components would be disassembled, reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

c) Rehabilitation

Following decommissioning and removal of all project material from the site, the disturbed areas will be rehabilitated to the pre-project land capability. Where possible, rehabilitation will be conducted concurrently with decommissioning. The following rehabilitation activities are relevant:

- The existing profiles of the land affected will be improved and stabilised thereby leaving profiles compatible with the topography of the area, which is essentially flat.
- Ripping of compacted soils will be done prior to adding topsoil, which will be done by mechanical means. It is expected that there will be a sufficient amount of topsoil and/or subsoil moved and stockpiled during the construction phase to facilitate rehabilitation. If required, areas or land for extracting topsoil or subsoil will be identified. The land capability characteristics of such areas should be similar to the affected soils (same texture, colour, permeability, etc.).
- Vegetation will be re-established. The plant species to be used will match those naturally occurring in the area. This will be conducted in consultation with a biodiversity specialist.

1.3 Applicable Listed Activities applied for in terms of the EIA Regulations, 2014, as amended

When considering the nature of the proposed development, the location of the project infrastructure and the size of the development the following listed activities are required to be authorised in order for the development to be constructed and operated. Activities relevant to the current application have been identified and are listed in the table below.

Activity listed in GNR 327, 325 and 324	Relevance to the project
GN327, Activity 11(i): The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	The construction of two 132kV loop-in-loop-out power lines from the existing 132kV Mafube/Pan Traction power line to the proposed new Zonnebloem Switching Station. The switching station and power lines to be constructed will be situated outside of the urban edge.
GN327, Activity 24(ii): The development of a road (ii) with a reserve wider than 13,5m, or where no reserve exists where the road is wider than 8 metres.	The access road required to be established for the project will be 8m in width.
GN327, Activity 27: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation.	The construction of the Zonnebloem Switching Station, LILO power lines and associated infrastructure may require the clearance of 1 ha of indigenous vegetation. However, the likelihood of this is low due to the degraded condition of the on-site floral communities.
GN327, Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used	The development footprint of the project will exceed 1ha and is proposed within the larger project site which is

for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	currently being utilised for agricultural purposes.

1.4 Activity Motivation: Need and Desirability

The need for this project is based on the requirement to accommodate the expansion of the Zonnebloem coal mine situated approximately 6km east of the study area. The Mpumalanga region as a whole has been earmarked for the development and expansion of various mining developments and operations. Mining in the Steve Tshwete Local Municipality (LM) is the highest contributor to the Municipality's Gross Domestic Product (GDP) and contributes up to 45,8% according to the Steve Tshwete LM Local Economic Development Strategy 2015-2020. The mining industry not only provides numerous employment opportunities, it also provides opportunities for skills development. In a broader sense, by the proposed project providing support for the expansion of mining operations, it also assist with realising the benefits associated with the expansion.

The project itself would contribute positively towards employment creation within the Province and specifically within the local and district municipality. It is anticipated that temporary employment opportunities would be generated during the construction phase of development, while permanent employment opportunities would result from the operational and maintenance phase.

From an overall environmental sensitivity and planning perspective, the proposed project supports the broader strategic context of the municipality as it is directly linked to the one of the municipality's investment opportunities which includes utilising of land with the potential for coal mining. No exceedance of social, ecological, palaeontological, archaeological or avifaunal limits will result from the construction of the proposed project and no detrimental impact is expected, as detailed in this Basic Assessment Report.

When considering the provincial and municipal planning strategies and policies for the area, as well as certain national considerations, the development of the project is supported in terms of the Mpumalanga Environmental Implementation Plan (EIP), Mpumalanga Economic Growth and Development Path (2011), Nkangala District Municipality Environmental Management Framework (EMF), Nkangala District Municipality Integrated Development Plan (IDP) and the National Development Plan (NDP).

1.4.1 Mpumalanga Environmental Implementation Plan (EIP) 2016

An Environmental Implementation Plan (EIP) was compiled by the Mpumalanga Province as NEMA calls for the development of a national and provincial Environmental Implementation Plans (EIPs) and Environmental management plans (EMPs).

The EIP was compiled in order to improve the Province's environmental performance and co-operative governance. The EIP recognises the impacts of environmental issues on environmental sustainability. The EIP aims to improve decision-making and ensure that governance is carried out using adequate available environmental resource information in order to ensure sustainable and appropriate environmental management.

One of the key goals for the EIP is to ensure effective management of municipal operations that have a potential to cause adverse impacts to the environment. This is achieved for this project through the execution of this Basic Assessment process within which sensitive and significant environmental features associated within the study area are considered and the option with the least environmental intrusion and the most acceptability is implemented as part of the development.

1.4.2 Mpumalanga Economic Growth and Development Path (2011)

The Mpumalanga Economic Growth and Development Path (2011) aims to improve the labour absorption of the economy (the jobs yields of each billion rand of investment and each one percent of growth in GDP), to reduce carbon emissions, and to strengthen the link between science and technology on the one hand and growth and jobs on the other, and is largely based on the New Growth Path. The New Growth Path seeks to provide bold, imaginative and effective strategies to create the millions of new jobs South Africa needs; and lays out a dynamic vision for achieving a more developed, democratic, cohesive and equitable economy and society over the medium term, in the context of sustained growth.

The Mpumalanga Growth and Development Path modelled two scenarios to qualify what rate of Economic growth is desirable to significantly reduce unemployment in Mpumalanga in the foreseeable future. The preferred scenario (Scenario 2) would see the achievement of a 15% unemployment rate by 2025 – Firstly through creating 70 600 net jobs annually for the next 15 years; and secondly, through accelerated and sustained Economic growth of approximately 4.6% annually.

The development of the proposed project would contribute positively towards employment creation within the Province. It is anticipated that temporary employment opportunities would be generated during the construction phase of development, while permanent employment opportunities would result from the operational and maintenance phase. The construction and operation of the project would not only create direct employment opportunities but also indirectly by accommodating the expansion of the Zonnebloem Mine which will create employment opportunities in itself.

1.4.3 Nkangala District Municipality Environmental Management Plan (EMP)

The Nkangala District Municipality Environmental Management Plan (EMP) highlights the critical commitment of the district municipality in ensuring and creating a sustainable environment for future generations through adopting programmes and plans that are in compliance with environmental legislation of South Africa.

The Nkangala District Municipality is considered as the best performing municipality in the country and will continue to develop and implement environmental management tools that promote sustainable development within the Municipality. The Municipality undertook a gap analysis exercise and identified several environmental issues to be associated with Environmental Management and Environmental Governance.

Through the execution of this Basic Assessment process, within which sensitive and significant environmental features associated within the study area are considered and appropriate mitigation measures are proposed, the process contributes to acceptable Environmental Management and Environmental Governance within the Municipality.

1.4.4 Nkangala District Municipality Integrated Development Plan (IDP) 2016/2017 – 2020/2021

Economic development and job creation is one of the key issues identified by the Nkangala District Municipality in its 2016/2016 – 2020/2021 IDP. Nkangala is the economic hub of Mpumalanga and is rich in minerals and natural resources. As a result, the mining sector, together with electricity generation, generates the bulk of the District Municipality's income. The total value of the amount of goods and services produced by the District increased from R75 billion in 2010 to R103 billion in 2014, and the growth of the mining industry has been critical to this progress. Natural resources make a significant and direct contribution to the District economy in the mining sector, however socio-economic challenges such as unemployment and persistent poverty levels still occur.

The objectives of economic growth and employment creation can be served by the development of this project. The proposed project would contribute positively towards employment creation and in doing so reduce unemployment and poverty levels within the District.

1.4.5 Steve Tshwete Local Municipality Integrated Development Plan (IDP)

According to the Steve Tshwete Local Municipality Draft IDP (2017-2022), the majority of employed people in the municipal jurisdiction are male, while female are the most unemployed (21,8%). The overall unemployment rate for the Municipality has decreased from 197% in 2011 to 16,4% in 2015. The largest employing industries in the LM are considered to be trade. This includes industries such as tourism, community/government services and mining.

With the development of the proposed Zonnebloem Switching Station and associated infrastructure, several new employment opportunities will be established which will contribute to employment creation within the Municipality.

1.4.6 National Development Plan (NDP), 2030

The National Development Plan for 2030 identified the following nine main challenges to be addressed by 2030:

1. Too few people work;
2. The standard of education for most black learners is of poor quality;
3. Infrastructure is poorly located, under-maintained and insufficient to foster higher growth;
4. Spatial patterns exclude the poor from the fruits of development;
5. The economy is overly and unsustainably resource intensive;
6. A widespread disease burden is compounded by a failing public health system;
7. Public services are uneven and often of poor quality;
8. Corruption is widespread; and
9. South Africa remains a divided society.

The proposed project is aligned with the National Development Plan, as it will help promote local economic growth. This electricity supply will facilitate development (expansion of mining operations) in the local area, which in turn could promote local job opportunities.

2. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

The following legislation, policies and guidelines are relevant to the development of the Zonnebloem Switching Station, two LILO power lines and associated infrastructure. Through the consideration of the relevant legislation, policies and guidelines associated with the project, the necessary formal requirements are identified which needs to be complied with for the duration of the project. This is considered at a national, provincial and local level.

Table 6: Applicable Legislation, Policies and/or Guidelines associated with the development of the project

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	National Legislation		
National Environmental Management Act (Act No. 107 of 1998)	The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. In terms of GNR 983 and 985 of June 2010 a Basic Assessment Process is required to be undertaken for the proposed project.	» National Department of Environmental Affairs (DEA) » Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs – commenting authority	The listed activities triggered by the proposed project have been identified and assessed in the EIA process being undertaken (i.e. Basic Assessment). This Basic Assessment Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No. 107 of 1998)	In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or	» National Department of Environmental Affairs (DEA)	The implementation of mitigation measures are included as part of the EMPr and will continue to apply throughout the life cycle of the project.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	minimised.		
National Environmental Management: Biodiversity Act (Act No. 10 of 2004) and Alien Invasive Species Regulations 2014	In terms of S57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA Phase. The Act provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and	» National Department of Environmental Affairs (DEA) » Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs	A Specialist Ecological Impact Assessment was undertaken as part of the Basic Assessment process (refer to **Appendix D1**). As such the potential occurrence of critically endangered, endangered, vulnerable, and protected species, as well as critically endangered (CR), endangered (EN), vulnerable (VU) or protected ecosystems and species and the potential for them to be affected has been considered. A permit is required to remove or relocate listed species affected by the project. This Basic Assessment report includes an Alien Plant and Open Space Management Plan as part of the EMPr (**Appendix C**).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (GG 34809, GN 1002), 9 December 2011). Invasive Species are categorised into four categories: » **Category 1a** Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combatted or eradicated. » **Category 1b** Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled. » **Category 2** Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be » **Category 3** Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.		

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	○ Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3. Section 76 of the Act requires that all Protected Area Management Authorities and all other "Organs of State in all spheres of government", including all municipalities, draw up an "Invasive Species Monitoring, Control and Eradication Plan for land under their control." These plans have to cover all Listed Invasive Species in terms of Section 70(1) of this Act.		
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of	» National Department of Environmental Affairs (DEA) » Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs	As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMPr (refer to **Appendix F**).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	this Act (GN 921), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities (Category A and B) while Category C Activities (such as storage of waste) must be undertaken in accordance with the necessary norms and standards. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented.		
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	S18, S19, and S20 of the Act allow certain areas to be declared and managed as "priority areas." Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.	» National Department of Environmental Affairs (DEA) » Steve Tshwete Local Municipality	Dust Control Regulations describe the measures for control and monitoring of dust, including penalties. These regulations might be applicable during the construction phase of the project. Dust management has also been accounted for in the EMPr (see **Appendix F**)

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	GN R 827 – National Dust Control Regulations prescribes general measures for the control of dust in all areas		
National Water Act (Act No. 36 of 1998)	Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation. In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	» Department of Water and Sanitation	A General Authorisation may be required in terms of Section 21 of the Act due to the proximity of the infrastructure to wetlands which could be impacted by the proposed project. A risk assessment and General Authorisation may be required to be undertaken for the project. No application has been lodged with the Department of Water and Sanitation (DWS) as yet.
Environment Conservation Act (Act No. 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	» National Department of Environmental Affairs (DEA) » Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs	Noise impacts are expected to be associated with the construction phase of the project and are not likely to present a significant intrusion to the local community. There is no requirement for a noise permit in terms of the legislation.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	An Environmental Authorisation and mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.	» Department of Mineral Resources	As no borrow pits are expected to be required for project, no mining permit or Environmental Authorisation is required to be obtained for borrow pits.
National Heritage Resources Act (Act No. 25 of 1999)	» S38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding	» South African Heritage Resources Agency » Mpumalanga Heritage Resources Authority	A permit may be required should any identified cultural/ heritage sites on site be required to be disturbed or destroyed as a result of the proposed development.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	300 m in length; » Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent » The relevant Heritage Authority must be notified of developments such as linear developments (i.e. roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. » Standalone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
National Forests Act (Act No. 84 of 1998)	» In terms of S5(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except	» Department of Agriculture, Forestry and Fisheries	No protected trees were identified within the development footprint and therefore no permits would be required in this regard.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » The list of protected tree species was published in GN 877 of 22 November 2013.		
National Veld and Forest Fire Act (Act 101 of 1998)	» In terms of S12 the landowner would be obliged to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. » In terms of S12 the firebreak would need to be wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. » In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	» Department of Agriculture, Forestry and Fisheries	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operation phase of the project.
Conservation of Agricultural Resources Act (CARA) (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5). » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048) » **Category 1** - prohibited and must be controlled; » **Category 2** – must be grown within a demarcated area under permit; and » **Category 3** - ornamental plants that may no longer be planted, but existing	» Department of Agriculture, Forestry and Fisheries	Some alien plant species are present within the site. Alien plants are also likely to establish when the site is disturbed during construction. Mitigation measures have been recommended to avoid the risk of increased alien invasion during construction, operation and maintenance phases of project (**Appendix F**). All alien plants present at the site should be controlled using the best practice methods for the species present.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodlines of watercourses and wetlands		
Hazardous Substances Act (Act No. 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.	» Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license could be required to be obtained from the Department of Health.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
National Road Traffic Act (Act No 93 of 1996)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts. » The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	» Provincial Department of Transport (provincial roads) » South African National Roads Agency Limited (national roads)	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits could be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Depending on the trailer configuration and height when loaded, some of the components may not meet the specified dimensional limitations (height and width) and would need to apply for the relevant permit/ clearance.
Provincial Policies / Legislation			
Mpumalanga Nature Conservation Act (Act 10 of 1998)	» Provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora	» Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs	A permit is required for any activities which involve species listed under schedule 11 or 12. The following provincially protected plant species

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require. The Act also lists protected fauna and flora under different schedules ranging from specially protected Game (Schedule 1), protected plants (schedule 11) to specially protected plants (schedule 12). The Act, accompanied by all amendments, are regarded by the Mpumalanga Province as the legal binding, provincial documents, providing regulations, guidelines and procedures with the aim of protecting game and fish, the conservation of flora and fauna, and the destruction of problematic (vermin and invasive) species.		according to Schedule 11 were found within the study area but not within the development footprint » *Aloe ecklonis,* » *Eucomis autumnalis,* » *Habenaria galpinii,* » *Gladiolus* spp. Therefore, a permit could be required for removal of such species. A permit could be required from Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs to relocate protected plants and to clear natural vegetation at the substation site.

Various Guidelines have been consulted throughout this Basic Assessment Report. These include:

» Eskom – Vegetation management guideline
» Eskom – Monitoring, Control and Eradication Plan for Invasive Species
» Eskom – Utilisation of flight bird diverters on Eskom overhead lines
» Eskom – Waste Management Standard

CHAPTER 2: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter provides a description of the environment within which the development of the project is located and that will be affected by the development. The description of the environment considers both biophysical aspects, as well as social and cultural aspects in order to provide a completed consideration of the features available.

1. LAND-USE AND GENERAL DESCRIPTION OF THE AREA

Land use within the project site and the surrounding area mainly relates to agricultural activities such as the cultivation of maize. A small portion to the south of the study area forms part of an extensive cultivated land (maize). Most of the study area has been subjected to historical cultivation. Surrounding land use activities mainly include activities associated with agricultural practices such as maize cultivation (extensive areas under cultivation to the north, south and east) and Afforestation (*Pinus* plantations) to the west and north west of the study area. Small patches of grazing land persist as fractured islands (isolated from each other by ploughed areas and plantations), and are mainly associated with lower lying wetland areas where ploughing mostly cannot occur. Most of the grazing lands outside of wetlands have been historically subjected to some form of disturbance, mainly ploughing. No cultivation occurs within the development footprint of the project and is not expected that the project will impact on any existing agricultural activities.

There are numerous transmission infrastructure in the broader area and the existing 132kV Mafube/Pan Traction power line traverses the southern boundary of the study area.

The study area has a gradient of between 1:50 and 1:20. The landform of the western as well as north-western portion of the study area can be described as a higher lying area containing gentle, gradual slopes and moderate topographical variations. A Wetland Flat located in the north-western corner contributes to this topographical variation. The slopes within the eastern and south-eastern portion are more pronounced. Topographical features within this gradual sloping area includes seepages and a south to south-east flowing unchanneled valley-bottom wetland.

2. THE BIOPHYSICAL ENVIRONMENT

This section describes the biophysical features present within the area which could be impacted on by the development.

2.1 Climate and Rainfall

Middelburg and the surrounding area falls within the subtropical high-pressure belt and can be described as mild, and generally warm and temperate. The study area is characterised by early to mid-summer rainfall within very dry winters.

The climate of the area surrounding Middelburg has the following characteristics (as illustrated in **Figure 2.1** and **Figure 2.2**) as extracted from https://en.climate-data.org/location/10646/:

i) the mean annual rainfall is approximately 683mm, with November being the wettest month, averaging at about 115mm and July being the driest with an average of only 5mm;

ii) the average annual temperature in Middelburg is 15.5°C, with January being the warmest (ave. 20.3°C) and June being the coldest (ave 8.5°C).

iii) Frost is fairly frequent in winter (mean frost days up to 13 days per year).

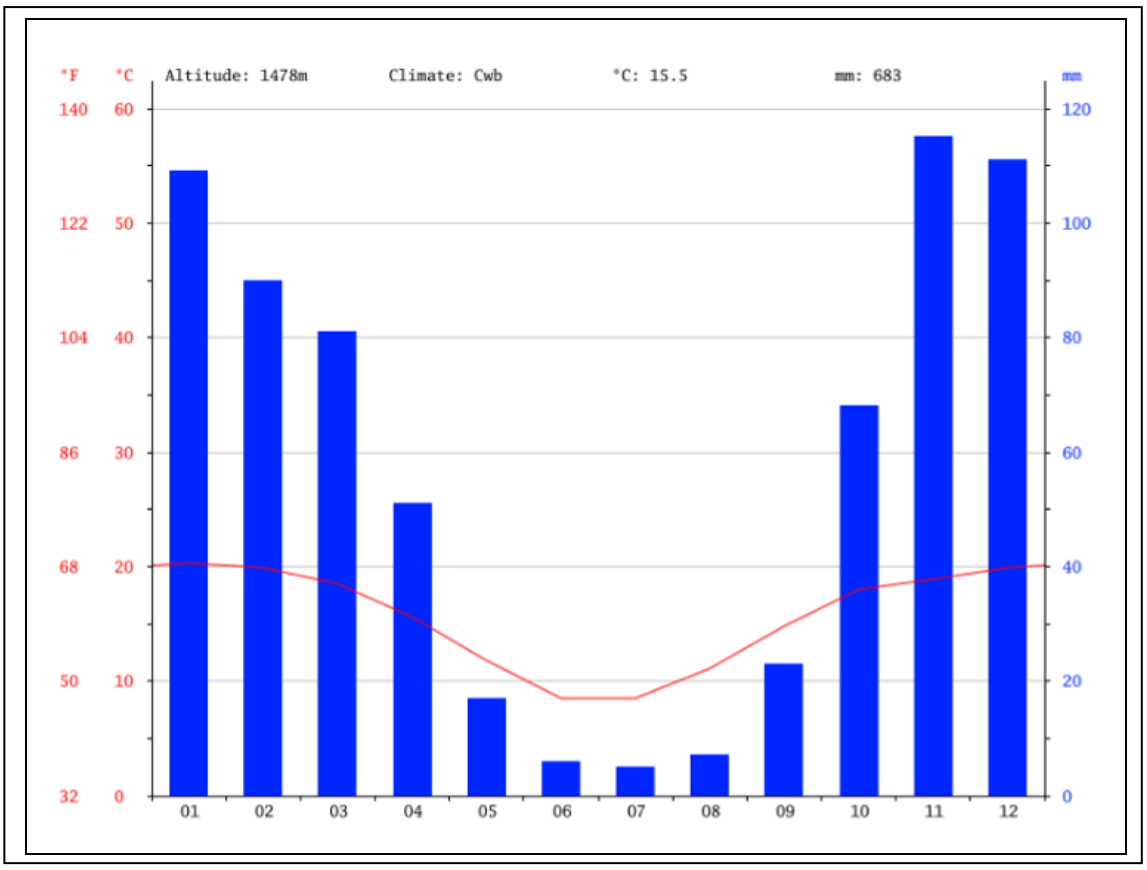

Figure 2.1: Climate graph of the Middelburg region (https://en.climate-data.org/location/10646

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	20.3	19.9	18.5	15.6	11.8	8.5	8.5	11.1	14.8	18	18.9	19.9
Min. Temperature (°C)	13.7	13.4	11.5	7.8	3	-1	-1	1.4	5.8	10.1	11.9	13.2
Max. Temperature (°C)	27	26.5	25.6	23.4	20.6	18.1	18.1	20.9	23.8	25.9	25.9	26.7
Avg. Temperature (°F)	68.5	67.8	65.3	60.1	53.2	47.3	47.3	52.0	58.6	64.4	66.0	67.8
Min. Temperature (°F)	56.7	56.1	52.7	46.0	37.4	30.2	30.2	34.5	42.4	50.2	53.4	55.8
Max. Temperature (°F)	80.6	79.7	78.1	74.1	69.1	64.6	64.6	69.6	74.8	78.6	78.6	80.1
Precipitation / Rainfall (mm)	109	90	81	51	17	6	5	7	23	68	115	111

Figure 2.2: Climate table of the Middelburg region (https://en.climate-data.org/location/10646/)

2.2 Topography, Soils and Drainage

The larger surrounding landscape can be described as highly variable with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. As a result of the geomorphological setting of the extended local drainage network, the area is characterised by numerous small, short non-perennial streams flowing in a largely south-eastern and south-western direction to join the Springbokspruit River. Hydrological features associated with these non-perennial streams are valley-bottom wetlands and small lateral seepages.

The study area, including all project infrastructure, is situated within the Ba19 land type with the Bb14 land type found to south where the lower lying valleys are underlined by rocks of the Rooiberg Group.

» Ba land type consists of plinthic catena characterised by dystrophic and/or mesotrophic, red and/or yellow soils. The presence of duplex and margalithic soils are rare. These soils are moderately (mesotrophic) to highly (dystrophic) leached with a high texture range. Soils contain a greyish subsoil layer (plinthic) where iron and manganese accumulate in the form of mottles, due to seasonally fluctuating water tables. With time these mottles may harden (or even cement) to form concretions. These plinthic layers will cause restricted water infiltration and root penetration. In drier areas, however, they may help to hold water in the soil that plants can use. Dominant soil forms include Hutton, Bainsvlei, Avalon and Longlands forms.

» The Bb land types also consists of a plinthic catena where red soils are not widespread and plinthic properties occur in subsoil horizons. A subsoil horizon is a subsurface horizon that consists of 10% or more of an iron rich, humus-poor mixture of kaolinitic clay with quartz and other diluents. This horizon changes irreversibly to a hardpan or to irregular aggregates on exposure to repeated wetting and drying with free access to oxygen. Dominant soil forms include Mispah, Hutton, Glenrosa, Glenco, Cartef, Avalon, Wasbank, Longlands and Clovely forms.

2.3 Ecological Profile

2.3.1 Broad-Scale Vegetation Patterns

According to the national vegetation map (Mucina & Rutherford 2006), the study area comprises the Rand Highveld Grassland vegetation type (**Figure 2.3**). This vegetation type is considered to be Vulnerable according to NEM:BA and Endangered according to Mucina & Rutherford (2006). Up to 41.5 % of the Rand Highveld Grassland is transformed by to cultivation, plantations, mines, urbanisation and by building of dams.

The distribution of this vegetation type is spread across the Mpumalanga, Gauteng and North-West Provinces. This unit occupies areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugerdorp centred in the vicinity of Derby and Potchefstroom. The Rand Highveld Grassland occupies areas between 1 300m and 1 635m, but may extend to altitudes of 1 760m. The typical landscape associated with this vegetation is highly variable, containing extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda,*

Eragrostis, Heteropogon and *Elionurus*. High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra, P. welwitschii, Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus Searsia is most prominent (Mucina and Rutherford (2006)). The herbaceous layer is dominated by grasses.

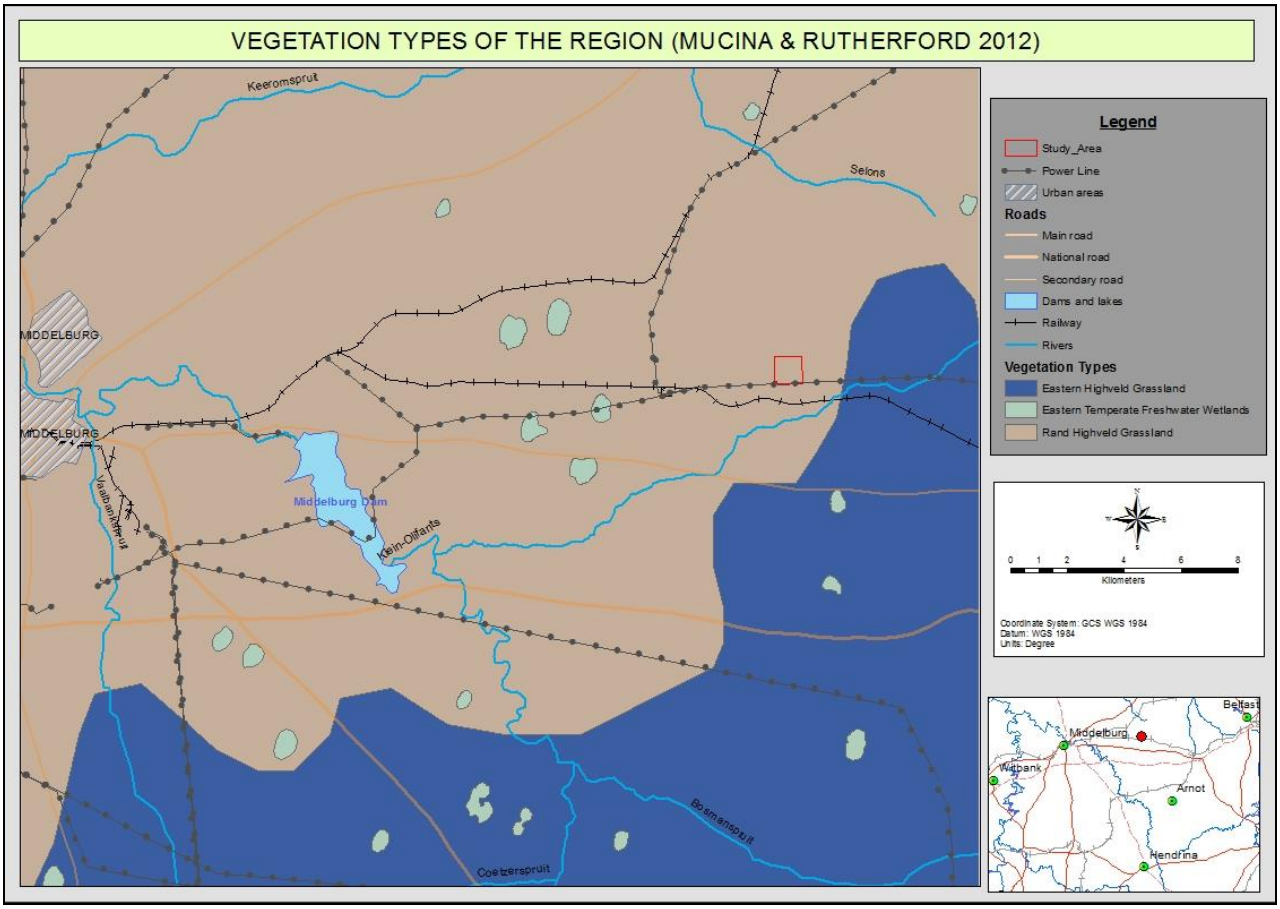

Figure 2.3: Broad-scale overview of the vegetation in and around the proposed study area (Mucina & Rutherford, 2012).

2.3.2 Fine-Scale Vegetation Patterns

The study area contains extremely little vegetation that resembled Rand Highveld Grassland with most of the study area in a severe degraded and disturbed condition mainly due to historical cultivation activities as well as afforestation activities (plantations and woodlots). The previous disturbed areas as well as the surrounding areas contain a vegetation cover comprising of numerous weeds, alien plants as well as pioneer and sub-climatic species associated with such disturbed areas. Some invasive alien trees have also settled within these areas (apart from the woodlots). Almost 97% (81.52ha) of the study area has been transformed and disturbed. The remaining 2.8% is regarded as slightly disturbed to semi-natural and contains some elements of the natural occurring grassland and occurs as isolated patches associated mostly with the wetland habitats.

A total of 147 different plant species were recorded within the study area of which 54 species were alien plant and weeds (12 were listed invasive alien plants), subsequently contributing 36.7% to the total species composition of the study area.

As a result of the highly transformed and degraded state of the study area, this portion of land provides very limited ecological functions and services, including some habitat for a very limited amount of biota (flora and fauna). Very little grazing potential is provided by this area due to the dominance of unpalatable weeds and forbs as well as pioneer grasses.

Three azonal habitats (hydrological systems) were identified within the study area of which two of the hydrological systems appear to be endoreic, namely the Wetland Flat and Depression Wetland. The unchanneled valley-bottom wetland as well as associated seepages form part of a larger draining system (extending well beyond the study area), flowing largely in a southern direction. The ecological condition of these azonal habitats varies from severely degraded and transformed (Depression, Wetland Flat and some of the Seepages) to mostly disturbed and transformed (Valley-bottom Wetland and remaining seepages). Disturbances within these habitats are mainly due to invasive alien plant invasion, historical ploughing, trampling, roads and afforestation.

The vegetation habitats that would be affected by the development include:

» *Seriphium plumosum – Pollichia campestris* Unit (Vegetation Unit 1): Transformed mixed forb/grass land on gravelly compacted soils: This mixed forb/grassland has re-established on formerly transformed cultivation land characterized by a slightly higher grit/gravel content which tends to compact when exposed. The vegetation is characterized by a mixture of dwarf shrubs, forbs and sub-climatic grasses (refer to **Figure 2.4**). Weedy species and alien plants contribute approximately 50 - 60% of the total vegetation cover of this unit. This unit is moderate to poor in terms of species diversity with numerous weeds and alien plants contributing to the species diversity. Dense patches of *Acacia mearnsii and Eucalyptus camaldulensis* woodlots are present within this unit with some of the species establishing outside of the woodlots. The conservation value of this unit is considered to be low.

» *Conyza sumatrensis – Senecio pentactinus* Unit (Vegetation Unit 2): *Transformed mixed forb/grass land on deep sandy soils:* This mixed forb/grassland has re-established on formerly transformed cultivation land characterized by deep, fine textured sandy soils (refer to **Figure 2.5**). A relatively tall forb layer (comprising mostly of *Conyza sumatrensis, Bidens pilosa, Senecio pentactinus, Tagetes minuta* and *Verbena brasiliensis*) dominates this vegetation unit. Weedy species and alien plants contribute approximately 70 - 80% of the total vegetation cover of this unit. This unit is moderate to poor in terms of species diversity with numerous weeds and alien plants contributing to the species diversity. The majority of the development footprint will occur within this vegetation unit. The conservation value of this unit is considered to be low.

Figure 2.4: *Seriphium plumosum – Pollichia campestris* Unit (Vegetation Unit 1) within the study area.

Figure 2.5: *Conyza sumatrensis – Senecio pentactinus Unit* (Vegetation Unit 2) within the study area.

» *Leersia hexandra – Kylinga erecta var. erecta Unit* (Vegetation Unit 3)*: Permanent saturated wetland zone:* The vegetation of this unit can be described as moisture loving graminoids adapted to extended periods of soil saturation with occasional seasonal inundation (normally for short periods of time following sufficient precipitation) (refer to **Figure 2.6**). This vegetation unit is mostly associated with the wetland flat and valley-bottom wetland. Disturbances within the wetlands themselves as well as within the catchment have resulted in the significant alteration of the hydrological and morphological character of these wetland areas, subsequently resulting in an alteration/transformation of the species composition of these areas, leaving some locations exposed to invasion by alien plants. Sedges and hydrophytic grasses dominate this unit with some forbs present, especially in disturbed areas. Weedy species and alien plants contribute approximately 15 - 25% of the total vegetation cover of this unit. This unit is poor in terms of species diversity with numerous weeds and alien plants contributing to the species diversity. This vegetation unit is excluded from the development footprint and will not be impacted. Vegetation Unit 3 is considered to be of a medium to high ecological sensitivity and should be regarded as no-go areas.

» *Agrostis lachnantha – Juncus oxycarpus Unit* (Vegetation Unit 4*): Seasonal to temporary saturated wetland zone:* This vegetation unit comprise two hydrological zones (temporary and seasonal saturated zones) and can be described as a mixture of moisture loving graminoids accompanied by high base cover of forbs (mainly weeds and alien plants) (refer to **Figure 2.7**). The boundaries between these two zones are difficult to distinguished based on vegetation composition as these units share most species. Slight differences in terms of the dominant species and constant species as well as percentage cover of some of the species provide some distinction. Disturbances within these wetland zones include historical ploughing, afforestation, high density weed and alien plant invasion and some trampling. The degree of disturbance within these zones differs, with the pan wetland (containing both zones) being severely altered and degraded, to an extent where most of this wetland's functions and services have been lost.

Weedy species and alien plants contribute approximately 20 - 30% of the total vegetation cover of these zones. The temporary and seasonally wet zones are poor in terms of species diversity with numerous weeds and alien plants contributing to the species diversity. One Red Data Species (Hypoxis hemerocallidea – Declining) and four MPNCA Protected species (*Eucomis autumnalis*, *Habenaria galpinii, Gladiolus spp. and Aloe ecklonis*) have been recorded within this unit. None of these species occurred within the development footprint and will subsequently not be impacted by

the proposed development. Most of these wetland zones are excluded from the development footprint and will not be impacted upon, apart from the depression wetland located along the central portion of the western boundary of the study area. Access road Alternative B will slightly impact on this wetland. Vegetation Unit 3 is considered to be of a medium to high ecological sensitivity and should be regarded as no-go areas.

Figure 2.6: *Leersia hexandra – Kylinga erecta var. erecta* Unit (Vegetation Unit 3) within the study area.

Figure 2.7: *Agrostis lachnantha – Juncus oxycarpus* Unit (Vegetation Unit 4) within the study area.

Figure 2.8 provides an overall ecological sensitivity map which illustrates the vegetation units as described above.

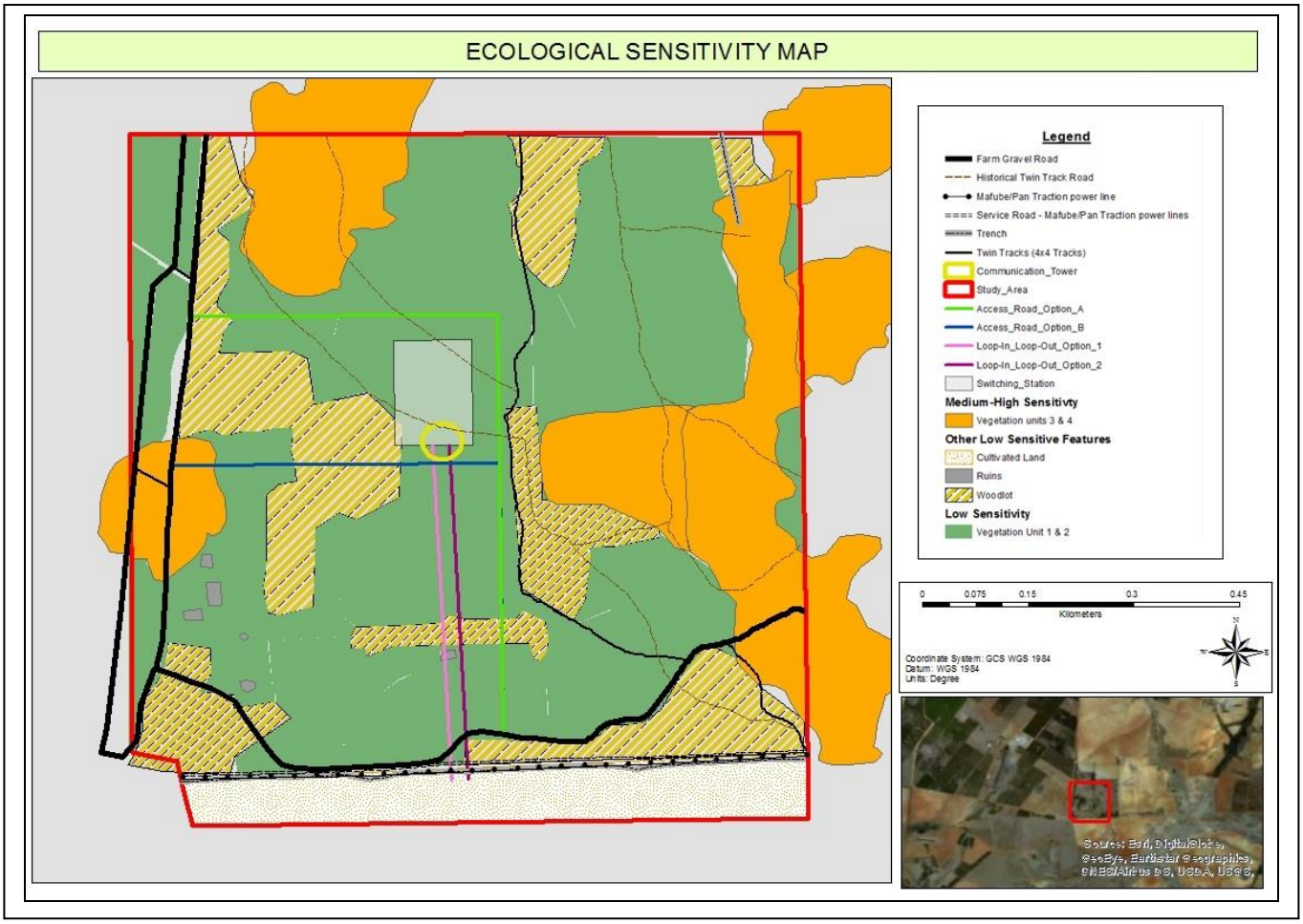

Figure 2.8: Ecological sensitivity map indication the vegetation units.

2.3.3 Listed and Protected Plant Species

According to the SANBI POSA database, 504 species have been recorded from the 2529D Degree Grid with Quarter Degree Grid 2529DC being relatively underrepresented (likely due to lack of sampling in this grid) with 101 species being recorded. Of the species that are considered to occur within the geographical area under consideration, nine species are regarded as conservation worthy, of which eight species recorded in the degree grids are listed on the Red List plant species. These species include:

- Miraglossum davyi (Vulnerable),
- Khadia carolinensis (Vulnerable),
- Anacampseros subnuda subsp. Lubbersii (Vulnerable),
- Jamesbrittenia macrantha (Near Threatened),
- Khadia alticola (Rare),
- Eucomis montana (Declining),
- Ilex mitis var. mitis (Declining), and
- Callilepis leptophylla (Declining).

One species was listed within the POSA species list, which is protected within the National Forests Act, 1998 (Act No. 84 of 1998), namely Pittosporum viridiflorum.

According to Mucina and Rutherford (2006) four species are known to be Northern sourveld endemics (*Agapanthus inapertus subsp. pendulus, Eucomis vandermerwei, Huernia insigniflora* and *Melhania randii*) with 8 species being South African endemics (*Melanospermum rudolfii, Polygala spicata, Anacampseros subnuda subsp. lubbersii, Frithia humilis, Crassula arborescens subsp. undulatifolia, Delosperma purpureum, Encephalartos lanatus* and *Encephalartos middelburgensis*). Apart from the Red Data species, a further 28 species are protected within the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (MNCA).

Five conservation worthy species were recorded within the study area including one Red Data Species (Hypoxis hemerocallidea – Declining) and four MNCA protected species, namely *Gladiolus spp., Habenaria galpinii, Eucomis autumnalis and Aloe ecklonis*. All of these species were identified outside of the development footprint and subsequently will not be impacted by the proposed development.

2.3.4 Critical Biodiversity Areas (CBAs) and Broad-Scale Processes

According to the Mpumalanga Biodiversity Sector Plan Handbook, the majority of the site is classified as Moderately Modified (Old Lands) with some sections along the southern, northern and western boundary classified as Other Natural Areas. Most of the study area is covered by areas which were subject to historical ploughing (cultivated), with large areas furthermore covered by woodlots. Almost the entire study area comprises of a highly disturbed and transformed vegetation cover with very little element of the original vegetation type preserved. As such, the study area provides minimal contribution to the conservation of the Rand Highveld Grassland, and as such the development will have no impact on any Critical Biodiversity Areas.

2.3.5 Faunal Communities

Disturbances such as the transformation of natural veld, historical cultivation, human presence and the fractured nature of the landscape have contributed to an extremely low faunal biodiversity, especially in terms of mammals, consisting of highly adaptable and/or secretive species.

Mammals

Listed mammals which may occur in the area include the Rough-haired Golden Mole (Critically Endangered), Serval (Near Threatened), White-tailed Mouse (Endangered), Brown Hyaena (Near Threatened), Black-footed Cat (Vulnerable), Honey Badger (Near Threatened) and South African hedgehog. Although the potential diversity of mammals within the study area is high with as many as 70 terrestrial mammals, there are several factors which will reduce the actual number of species present. This includes the proximity to coal mines and major roads (i.e. R104, R555 and the N4) in the area.

Numerous small rodent burrows were noted throughout Vegetation Unit 2 with a preference of the unit's finely textured sandy soil. Mammals most likely include Swamp musk shrew, Forest Shrew, Four-striped grass mouse and Multimammate Mouse. Highly adaptable and mobile species such as Steenbok, Yellow Mongoose, Cape porcupine and Scrub Hare may occasionally utilise the study area. A few tremitarias were noted although not abundant throughout the study area and may provide some food source and habitat for species such as Aardvark and Lesser Dwarf Shrew. Within the Wetland Flat, signs of rodent activity was noted and likely belonged to South African Vlei Rat. The impact associated with the development on mammals can be regarded as low.

Reptiles

Of the 28 reptilian species that have been recorded within the 2529D degree grid, 7 species have been recorded within the quarter degree grid (2528 DB). None of these species (recorded within the relevant degree grid) are listed as Red Data species. Of the 28-reptilian species 4 are regarded as region endemic. No reptile activity were noted during the survey of the study area. The impact associated with the development on reptiles can be regarded as low.

Amphibians

Of the 21-amphibian species that have been recorded within the 2529D degree grid, 14 species have been recorded within the quarter degree grid (2529 DC). Only one of these species (recorded within the relevant quarter degree grid) are listed as a Red Data species, namely Giant Bull Frog. The Giant Bull Frog is classified as Near Threatened within the Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland (2004). The wetland flat systems identified within the north-western corner of the study area may potentially (although likelihood is low) be a suitable habitat for these species. Furthermore, of the 21-amphibian species only one species is regarded as a regional endemic, namely the Delalande's River Frog.

No amphibian activity was noted during the survey of the study area. The following species were noted within a wetland outside of the study area and have a likelihood to occur within the seasonally inundated portions of the valley-bottom wetland within the study area and include the Striped Stream Frog and Painted Reed Frog. The impact associated with the development on amphibians can be regarded as low.

Avifauna

Most of the abundance and distribution of avian species can usually be attributed to the vegetation types and bioregions within an area. Four important avian micro-habitats have been identified to be associated with the study area and the surrounding area:

» Degraded Grasslands:
  - *Conyza sumatrensis – Senecio pentactinus* herbland
  - *Seriphium plumosum – Pollichia campestris* herbland
» Wetland Habitats:
  - *Leersia hexandra – Kylinga erecta* permanent wet grassland
  - *Agrostis lachnantha – Juncus oxycarpus* seasonal to temporary wet grassland
» Alien tree clusters:
  - *Acacia mearnsii – Eucalyptus camaldulensis* woodlots
» Artificial landscapes including:
  - Existing Mafube/Pan Traction Power Line
  - Cultivated lands

Other micro-habitats outside of the study area include Secondary Plagioclimatic grassland, open water bodies (Dams) and the railway line and associated bridges.

» *Degraded Grassland:* These areas are located on historical cultivated areas and have been re-vegetated with a vegetation cover that can rather be described as a herbland than grassland and is

dominated by a tall weedy herb/forb layer also containing numerous alien plants. Grass species cover a relatively low percentage of this area and comprise mostly of pioneer and sub-climatic species. Typical species found within this area include weeds and alien plants; such as *Senecio petactinus, Serephium plumosum, Bidens pilosa, Conyza bonariensis, Conyza sumatrensis, Richardia brasiliensis, Tagetes minuta* and *Verbena brasiliensis*. Grass species found within this area include *Aristida bipartite, Aristida congesta, Eragrostis curvula, Eragrostis gummiflua* and *Eragrostis racemosa*. Alien trees are also scattered throughout this unit although they are more confined to the woodlots. Such alien trees include *Acacia mearnsii* and *Eucalyptus camaldulensis*.

Typically, grasslands represent significant foraging and/or hunting areas for many bird species and subsequently from important and extensive microhabitat within the region. Such grasslands may attract Blue Crane, Southern Bald Ibis, Blue Korhaan, Secretary bird, Abdim's Stork and White Stork. Pristine patches of grassland, near wet areas such as wetlands and streams, may provide breeding habitat for the African Grass Owl. The grassland patches are also a favourite foraging area for game birds such as francolins and Helmeted Guineafowl, as well as being hunting habitat for small raptors such as Lesser Kestrel, Amur Falcon and Black-shouldered kite.

Due to the highly degraded and transformed state of the study area, resources and habitat are severely limited and is furthermore impacted by the highly fractured nature of the area (surrounded by anthropogenic habitats) as well as regular human movement. Subsequently, avifaunal diversity has been severely affected within this area, comprising mostly a few highly adaptable species, especially smaller seed eaters (granivores) and insectivores (gleaning), that move regularly between the herbland and surrounding woodlots and wetland habitats. Such species includes: Levaillant's Cisticola, Wailing Cisticola, Zitting Cisticola, Black-chested Prinia, African Stonechat and Common Waxbill.

Other species less regularly noted within this habitat included Helmeted Guineafowl and Swainson's Spurfowl near clearings such as dirt roads fringed by the tall standing herblands, Black-winged Kite and Red-backed Shrike found on power-lines and fence posts used as perches as well as European Bee-eater. No red data species or conservation worthy avifaunal populations were noted within this habitat type. The majority of the proposed development footprint will occur within this micro-habitat.

» *Wetlands and small watercourses:* The area, is characterized by numerous small, short non-perennial streams flowing in a largely south-eastern and south western direction to join the Springbokspruit River (south of the study area). Two small non-perennial watercourses drain the eastern portion of the study area and flow in a southern direction for approximately 2km to drain into the Springbokspruit. Associated with these non-perennial streams are valley-bottom wetlands and small lateral seepages. The upper portion of this hydrological system comprises a largely unchanneled valley-bottom wetland which transitions into a channelled valley-bottom wetland south of the service road for the Mafube/Pan Traction power line. A few isolated wetland bodies are furthermore dotted throughout the region and include a small to medium sized depression wetland, seepages and wetland flats. A highly transformed and impacted depression wetland (pan) is located on the western boundary of the study area.

The vegetation of these wetlands is dominated by grasses and sedges but also contain a high diversity of herbs/forbs, especially weedy species and alien plants. Key species includes *Leersia hexandra, Kylinga erecta, Eleocharis acutangularis* and the weed *Persicaria lapathifolia* for the permanent soil

saturated areas and *Agrostis lachnantha, Juncus ocyscarpus, Aristida junciformis, Eragrostis curvula, Imperata cylindrica, Paspalum urvillei, Persicaria lapathifolia* and *Helichrysum aureonitens* for the seasonal to temporary soil saturated zones. Disturbances within these wetland zones include historical ploughing, afforestation, high density weed and alien plant invasion and regular human movement (with small packs of dogs).

Such microhabitats in their true form represent important habitats for many species such as storks, herons, egrets, warblers, kingfishers and a variety of other water birds, while connected watercourses also provide important flight paths/corridors for many species. As a result of the numerous disturbances associated with these habitats, species diversity is greatly altered within the study area as well as surrounding study area. Species recorded with these habitats (within study area) included Hadeda Ibis, Blacksmith Lapwing, Levaillant's Cisticola, Zitting Cisticola, Southern Masked Weaver, Common Waxbill and Cape Wagtail.

The impact of disturbances on avifaunal activity was evident after surveying less disturbed habitats outside of the study area where seepages and valley-bottom wetlands contained all of the above-mentioned species as well as numerous Bishops (Yellow-crowned, Southern Red), Widowbirds (Long-tailed and Withe-winged), small waders (Wood Sandpiper), various swallows and martins, African Snipe, Malachite Kingfisher, African Pipit and Black-throated Canary. Another contributing factor to the higher diversity "downstream" was the presence of inundated areas and the fact that these wetland areas were surrounded by more natural grasslands. No red data species or conservation worthy avifaunal populations were noted within this habitat type.

» *Alien Tree Woodlots:* Woodlots of *Acacia mearnsii* and *Eucalyptus camaldulensis* are a prominent feature of the study area. From historical satellite images it is evident that these woodlots covered more extensive areas of the study area in the past. Other alien trees within these woodlots include *Acacia dealbata* and *Eucalyptus globulus*. Most of these woodlots were characterized by a low ground cover and as such food sources within these micro-habitats are limited. A very low diversity of avifaunal species was recorded within these woodlots and included African Cuckoo-Hawk, Speckled Pigeon, Red-eyed Dove, Southern Fiscal and Cape Robin-Chat. Where such woodlots encroached into wetland areas, the fringes of such woodlots contained some nests of Southern Masked Weavers and small flocks of Common Waxbills regularly moved between the wetland habitats and the cover of the woodlots. These alien tree stands may provide roosting and nesting habitat for various raptor species, larger birds such as francolins, Guineafowl, herons and Hadeda Ibises, as well as the European Bee-eater. No Red Data species were recorded within this micro habitat. During the survey no large nests were noted, similarly no important roosting sites were observed.

» *Artificial landscapes:* A small portion to the south of the study area forms part of an extensive cultivated land (maize) as well as the greater surroundings. This has resulted in extensive loss of natural habitats, especially grasslands. Arable or cultivated lands may potentially represent significant feeding areas for many avifaunal species. Through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds and other predators. Crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. Relevant bird species that may be attracted to these areas include most importantly Blue Crane, Southern Bald Ibis, Abdim's Stork and White Stork.

Small island strips of tall grasslands serve as important roosting and perching sites for smaller avifaunal species although species diversity during the survey was relatively low within these areas. Species that were recorded, was relatively abundant with some forming regular, small to medium sized flocks. Species recorded within the cultivated areas as well as the grassland strips, included: Swainson's Spurfowl, Helmeted Guineafowl, Black-headed Heron, Speckled Pigeon, Red-backed Shrike, Southern Fiscal, Levaillant's Cisticola, Zitting Cisticola, African Stonechat, Cape Sparrow, Southern Masked Weaver, Red-billed Quelea, Yellow-crowned Bishop, Southern Red Bishop, Long-tailed Whydah, Common Waxbill, Pin-tailed Whydah and Black-throated Canary. No red data species or conservation worthy avifaunal populations were noted within this habitat type.

Overhead linear structures such as power lines and telephone lines are regularly used as perching sites for raptors and other avifaunal species such as some swallows, shrikes etc. Power lines and towers may also be utilised as roosting and nesting sites (e.g. swallows, Helmeted Guineafowl, various raptors). The existing Mafube/Pan Transmission power line traverses the southern boundary of the study area and provides perching and potential roosting sites for species such as; Helmeted Guineafowl, Black-winged Kite, Steppe Buzzard, Red-eyed Dove, Laughing Dove, Red-backed Shrike, Southern Fiscal, Cape Sparrow and Pin-tailed Whydah. During the survey no large nests were noted as well as no important roosting sites.

2.3.6 Hydrology

The study area is situated within the upper reaches of the Olifants Catchment Water Management Area (WMA), and is located in the Middelburg Dam sub-catchment, forming part of the Loskop Dam catchment, and within the quaternary sub-catchment B12C of the Limpopo-Olifants primary drainage region. Local watercourses drain into the Klein-Olifants River, which in turn drains into Middelburg Dam. Thereafter the Klein-Olifants flows into the Olifants River, which drains into the Loskop Dam. The Klein-Olifants quaternary catchment (B12C) is drained by the Mooifontein Spruit, the Springbokspruit, and ultimately the Klein Olifants River. According to DWAF's 1999 Present Ecological State (PES 1999), the condition of the Springbokspruit as well as Klein Olifants River, are classified as Class C, which indicates that the rivers have undergone moderate levels of modifications. Two such small non-perennial streams drain the eastern half of the study area and flow in a southern direction for approximately 2km to drain into the Springbokspruit.

The water users in the catchment vary, and include agriculture (irrigation), afforestation, municipal including commercial and domestic use. The water quality in the Middelburg Dam has deteriorated steadily since the 1970's when mining started in the catchment.

Due to the geomorphological setting of the extended local drainage network, the area is characterised by numerous small, short non-perennial streams flowing in a largely south-eastern and south western direction to join the Springbokspruit River (south of the study area). The upper portion of this hydrological system comprises a largely unchannelled valley-bottom wetland (covering an extensive area of the south eastern portion of the study area) which transitions into a channelled valley-bottom wetland south of the service road for the existing Mafube/Pan Traction power line.

A few isolated wetland bodies are furthermore dotted throughout the region, including small to medium sized depression wetlands, seepages and wetland flats. Such a wetland flat is present north west of the study area with the distal portion of the wetland extending into study area. A highly transformed and

impacted depression wetland (pan) is located in the centre of the western boundary of the study area. These wetlands are seasonally to temporarily saturated, with small isolated sections which may be permanently saturated. Such an isolated section occur within the southern portion of the unchannelled valley-bottom wetland directly above the Mafube/Pan Power Line's service road (refer to **Figure 2.9**).

The unchanneled valley-bottom wetland as well as associated seepages form part of a larger draining system (extending well beyond the study area), flowing largely in a southern direction.

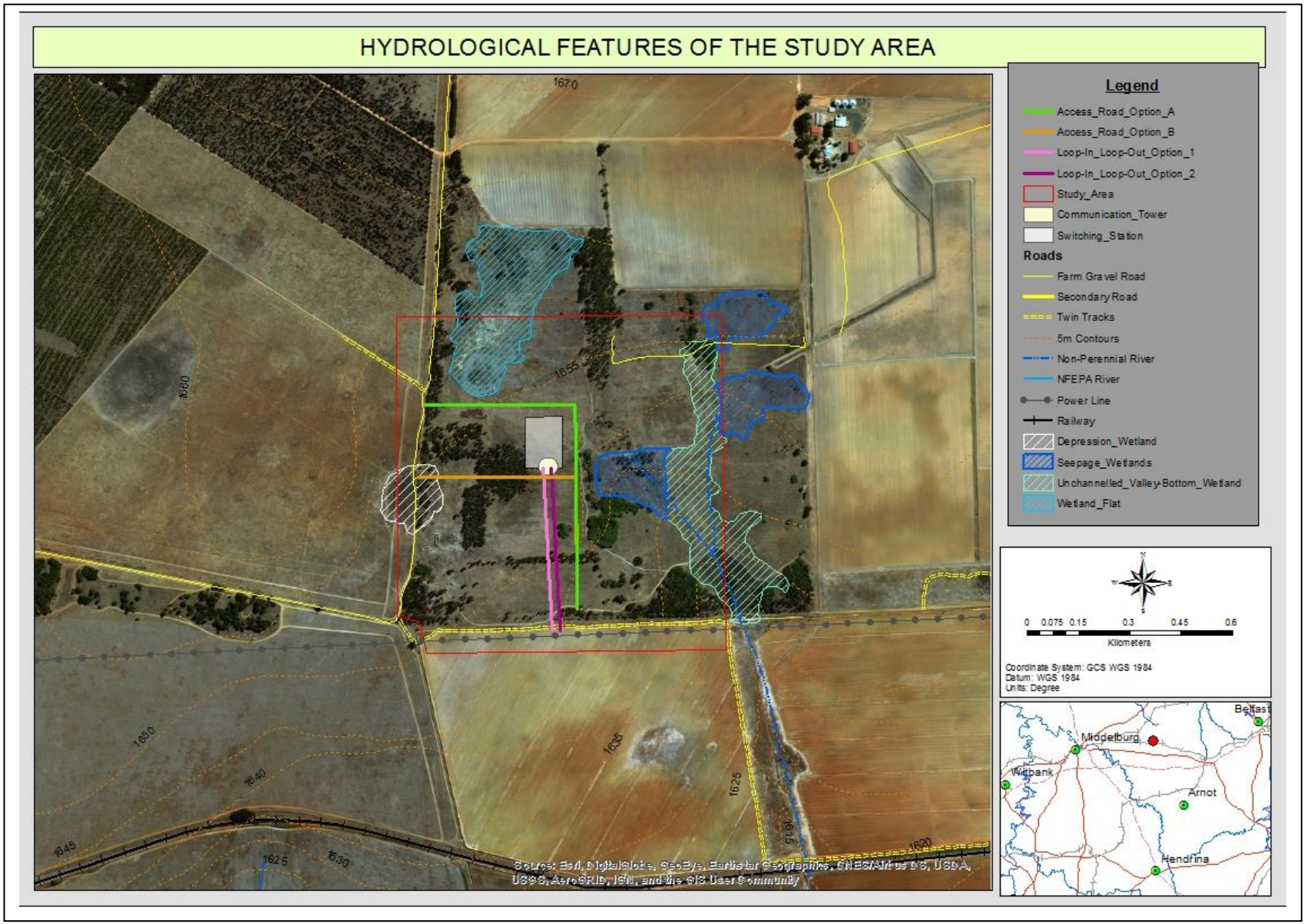

Figure 2.9: Hydrological features identified within the study area

2.4 Heritage features of the region

2.4.1 Archaeology

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within a regional, variation regarding characteristics and time ranges can be expected. The three main phases can be divided as follows:

» Later Stone Age (LSA); associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago.
» Middle Stone Age (MSA); associated with Homo sapiens and archaic modern humans. 30-300 thousand years ago.
» Earlier Stone Age (ESA); associated with early Homo groups such as Homo habilis and Homo erectus. 400 000-> 2 million years ago.

Very few Early Stone Age sites are on record for Mpumalanga and no sites dating to this period are expected for the study area. An example in Mpumalanga of an ESA site is Maleoskop on the farm Rietkloof where ESA tools have been found. The MSA has not been extensively studied in Mpumalanga but evidence of this period has been excavated at Bushman Rock Shelter, a well-known site on the farm Klipfonteinhoek in the Ohrigstad district. The MSA layers show that the cave was repeatedly visited over a long period. Lower layers have been dated to over 40 000 BP (Before Present) while the top layers date to approximately 27 000 BP (Esterhuizen & Smith in Delius, 2007; Bergh, 1998). Some isolated finds were recorded to the north east of the project site close to Witbank as well by Huffman (1999) on the farm Rietfontein directly west of the project site.

The LSA was marked by numerous technological innovations and social transformations within these early hunter-gatherer societies. These people may be regarded as the first modern inhabitants of Mpumalanga, known as the San or Bushmen. They were a nomadic people who lived together in small family groups and relied on hunting and gathering of food for survival. Evidence of their existence is to be found in numerous rock shelters throughout the Eastern parts of Mpumalanga where some of their rock paintings are still visible. A number of these shelters have been documented throughout the Province (Bornman, 1995; Schoonraad in Barnard, 1975; Delius, 2007). These include areas such as Witbank, Ermelo, Barberton, Nelspruit, White River, Lydenburg and Ohrigstad.

During the survey, four features were recorded which consist of farm related infrastructure and dwellings. These structures are all demolished, dilapidated, and currently inhabited by vagrants.

» *Feature 1:* The feature is marked by a cement slab measuring approximately 8 x 4 meter and the remnants of a stone and cement wall is visible on the corners of the feature and along the western elevation of the feature (**Figure 2.10**). The feature is possibly a stock enclosure but is almost completely demolished and overgrown. This structure is not older than 60 years and its potential to contribute to aesthetic, historic, scientific and social aspects is non-existent and is therefore of no heritage significance.

» *Feature 2:* This consist of the ephemeral foundations of a linear stone wall. The stone wall foundation is approximately 10m in length mostly covered by grass and sand (**Figure 2.11**). The stone wall

foundations do not form part of another feature and due to its ephemeral nature are of no heritage significance.

» *Feature 3:* This feature is a large dug out hole/reservoir with stone-built walling against the sides of the excavated area acting as a buttress (**Figure 2.12**). Although its specific purpose is unknown it is assumed to be farming related and associated with Feature 4 and therefore of low significance. The field rating for this feature is Generally Protected B (GP. B): Recording before destruction.

» *Feature 4:* This feature is located in the south western portion of the study area and is marked by several dilapidated and partially demolished sand stone structures (**Figure 2.13**). These ruins are currently inhabited by vagrants. These structures are not older than 60 years and the feature's potential to contribute to aesthetic, historic, scientific and social aspects are non-existent but does form part of the cultural landscape relating to farming practises in the area and are therefore of low heritage significance. The field rating for this feature is Generally Protected B (GP. B): Recording before destruction.

Figure 2.10: Feature 1 - Stone and cement wall.

Figure 2.11: Feature 2 - Ephemeral foundations of a linear stone wall.

Figure 2.12: Feature 3 - Large dug out hole/reservoir with stone-built walling against the sides.

Figure 2.13: Partially demolished sand stone structures.

2.4.2 Palaeontology

The proposed development footprint is primarily underlain by the Vryheid Formation of the Permian Ecca Group and a small section of the south western corner falls within the Damwal Formation (Rooiberg Group, Bushveld Complex) while a small section of the project site is underlain by the Rashoop Granophyryre Suit (**Figure 2.14**).

» *Vryheid Formation*: The Vryheid Formation forms part of the north eastern formations of the Ecca Group. The lithofacies of this Formation is mostly deltaic mudrocks and sandstones although non-deltaic cycles have been reported. The Vryheid Formation is characterised by fine to coarse sandstone and siltstone sediments. The dark coloured siltstones can be accredited to the existence of carbon enrichment and coal beds. These sediments most probably were deposited on a sandy shoreline that stretched out beyond massive swamplands. In these swamps, plants accumulated and formed the coal deposits that are mined today (Johnson et al, 2006).

  The Vryheid Formation is world renowned for the occurrence of coal beds formed by the accumulation of plant material. This formation has a Very high Palaeontological Sensitivity. Bamford (2011) reported that only a small amount of data have been published on the potentially fossiliferous plant deposits of the Vryheid Formation and that most likely well preserved material is present around coal mines, while in other areas the exposures are poor and of little interest. When plant fossils do occur they are usually abundant. Plant fossils of the Vryheid Formation include Glossopteris Flora (rich diversity of glossopterids, lycopods, scarce ferns and horsetails, cordaitaleans, conifers and ginkgoaleans), and rare fossil wood which are present with diverse palynomorphs. In recent years plant fossils have been under-collected despite continuing mining activities.

  Abundantly found trace fossils with a low diversity are also recovered from the Vryheid Formation as well as rare insects, possible conchostracans, non-marine bivalves and fish scales. This Formation is also characterised by its trace fossil assemblages of the non-marine Mermia Ichnofacies and insect fossils track ways. The Mesosaurus reptile may also be present.

» *Damwal Formation*: The Rooiberg Group comprised of the Selons River Formation which was split in the Klipnek Member and the Doornkloof Member. Schweitzer *et al*. (1995, and followed in this study) correlated the Doornkloof and Klipnek Members of the Selons River Formation (SACS, 1980) with the Schrikkloof and Kwaggasnek Formations, thus allowing the Selons River Formation and its members to be terminated. The Kwaggasnek, Schrikkloof, Damwal and Dullstroom Formations are now recognised as the Rooiberg Group and contains volcanic units. Metamorphosed sediments of quartzites, sandstones, mudrocks and cherts are present which is mainly fluvial in origin. The Damwal Formation consist of igneous rock which is unfossiliferous and has a very low palaeontological sensitivity.

» *Rashoop Granophyryre Suite:* The Rashoop Granophyryre Suite of the Bushveld Complex consist of igneous rock which is unfossiliferous and has a very low palaeontological sensitivity.

The development footprint falls within Vryheid Formation. During a field survey of the development footprint (including the two access road alternatives), no fossiliferous outcrops were found.

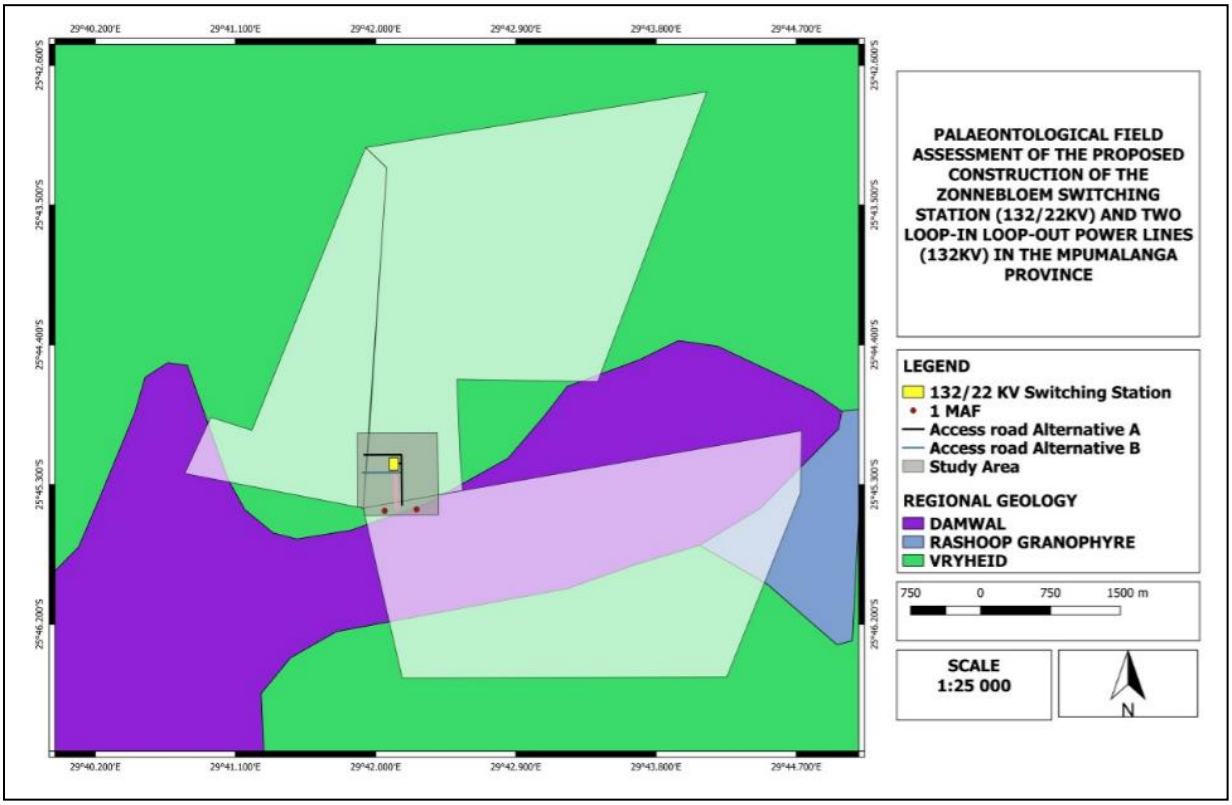

Figure 2.14: The surface geology of the study area and the surrounding area.

3. THE SOCIAL ENVIRONMENT

Steve Tshwete Local Municipality (LM)

The Steve Tshwete Local Municipality has a total population of 229 831 people. From the population aged 20 years and older, 3,4% have completed primary school, 30,8% have some secondary education, 35% have completed matric and 14,4% have some form of higher education. Of the age group 20 and older, 7,% have no form of schooling. The Municipality has an unemployment rate of 19,7%, and 27,1% among youth (Census, 2011).

According to the Steve Tshwete Local Municipality Draft IDP (2017-2022), the majority of employed people in the municipal jurisdiction are male, while female are the most unemployed (21,8%). The overall unemployment rate for the Municipality has decreased from 197% in 2011 to 16,4% in 2015. The largest employing industries in the LM are considered to be trade. This includes industries such as tourism, community/government services and mining.

The high unemployment rate for both the District and Local Municipalities can be explained by the high level of illiteracy of the population and the population's dependency on seasonal employment brought on by the agricultural sector.

Steve Tshwete LM identifies eight potential economic sectors within the municipality, which include:
» Mining;
» Community services;

- Agriculture;
- Construction;
- Manufacturing;
- Electricity;
- Trade; and
- Transport.

According to the Steve Tshwete LM Spatial Development Framework (SDF) of 2008, as a result of growth in the remaining sectors, the relative importance of the manufacturing sector decreased during 19961999 but during 19992002 the relative contribution of the manufacturing sector increased to levels higher than in 1996. The mining sectors proportional contribution increased during 19961999 and decreased to levels lower than in 1996.

Nkangala District Municipality (DM):

The Nkangala District Municipality (DM) is one of three district municipalities in Mpumalanga Province. The Nkangala DM has a population of 1 308 125 people, equating to 32% of the total population of the Province. According to the Nkangala DM Integrated Development Plan (IDP) (2017-2022), up to 295 000 people are formally employed in 2015, which is approximately 81.83% of total employment. The number of people who are employed in the informal sector are up to 65 600 which is 18.17% of the total employment in the Municipality.

The close proximity of Nkangala DM to Gauteng Province opens up prospects for a larger job market and results in the migration of people from the DM in search of better employment opportunities (Nkangala District Municipality, 2015). The Nkangala DM has a total surface area of 16 758km² and a population density of 78.06 people/km² (Stats SA, 2011) and consists of six local municipalities. The Nkangala DM is predominantly rural in its nature and comprises of extensive farming, forestry, nature reserves and mining areas. There are approximately 165 towns and villages spread across the DM, and these are mainly classified as towns, villages (residential), and settlements (associated with mining or electricity generation activities) (Nkangala District Municipality, 2015). The prevalent scattered rural nature of the region has resulted in the district having a dispersed spatial structure. The northern region of the DM offers tourism opportunities that are associated with scenic qualities, conservation areas and wetlands (Mpumalanga Government, 2015).

CHAPTER 3: PUBLIC PARTICIPATION AND BASIC ASSESSMENT PROCESS

The public participation process followed for the Zonnebloem Switching Station, LILO power lines and associated infrastructure has been undertaken in line with Regulation 39, 40, 41, 42, 43 and 44 of the EIA Regulations, 2014, as amended April 2017.

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations under NEMA, specifically the EIA Regulations. The sharing of information forms the basis of the public participation process and offers the opportunity to Interested and Affected Parties (I&APs) to become actively involved in the EIA Process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner to assist them to:

» identify issues of concern and suggestions for enhanced benefits;
» assist in identifying reasonable alternatives; and
» contribute relevant local information and knowledge to the environmental assessment.

The sections below detail the tasks which were undertaken as part of the public participation process within the Basic Assessment Process to date, as well as the process followed as part of the Basic Assessment.

3.1 BASIC ASSESSMENT PROCESS

The following process was followed during the undertaking of the Basic Assessment Process:

» The compilation and submission of an application for Environmental Authorisation to the DEA together with a declaration of independence from the consultant.
» Independent specialist studies were undertaken by specialists in order to assess the impact of the development on the respective environmental fields (i.e. ecology, avifauna, heritage and palaeontology).
» The impacts associated with the project have been assessed in terms of the requirements of Appendix 1 of the EIA Regulations, 2014, as amended in April 2017 (including an assessment of the nature, extent, duration, probability and significance).
» An Environmental Management Programme (EMPr) for all life-cycle phases of the substation has been prepared in accordance within Appendix 4 of the EIA Regulations, 2014, as amended in April 2017.
» A public participation process in line with the EIA Regulations, 2014, as amended in April 2017, has been undertaken as detailed in the section below.

Following the 30-day review period of the Basic Assessment Report all comments and issues raised will be included and collated into the final Basic Assessment Report for the consideration by the National Department of Environmental Affairs (DEA).

3.2 PUBLIC PARTICIPATION PROCESS

In order to ensure effective participation, the public participation process includes the following:

- Distribution of project related information in the form of notification letters at the time of the release of the draft Basic Assessment Report.
- Identification of potential I&APs including:
    - State departments that administer a law relating to matters affecting the environment relevant to an application for an environmental authorisation;
    - all organs of state which have jurisdiction in respect of the activity to which the application for environmental authorisation relates;
    - owners, person in control of and occupiers of the site where the activity is to be undertaken or to any alternative site where the activity is to be undertaken;
    - owners, person in control of, and occupiers of land adjacent to the site where the activity is to be undertaken or to any alternative site where the activity is to be undertaken;
    - the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
    - the municipality which has jurisdiction in the area.
- Placement of site notices at the affected property/properties and any alternative properties being considered.
- Placement of an advertisement in a local newspaper.
- Compilation of an I&AP database which is updated throughout the Basic Assessment process.
- On-going consultation with all registered I&APs regarding the progress in the Basic Assessment process through stakeholder consultation via notification letters, written correspondence, telephone calls where required and consultation meetings.
- Release of the draft Basic Assessment report for a 30-day review period.

3.2.1 STAKEHOLDER IDENTIFICATION

The first step undertaken as part of the public participation process was the identification of potential I&APs. I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the study area and a registration process involving the completion of a registration and comment sheet. Key stakeholders and affected and surrounding landowners have been identified and registered on the project database as per Regulation 42 of the EIA Regulations, 2014 (as amended in April 2017). Other stakeholders are required to formally register as stakeholders or interested and affected parties (I&APs) for the EIA process.

Refer to **Appendix E3** for a list of all registered interested and affected parties, including key stakeholders, on the project database. The register of I&APs contains the names, contact details and addresses of:

- all persons who requested to be registered on the database in writing;
- all organs of state which hold jurisdiction in respect of the activity to which the application relates; and
- all persons who submitted written comments or attended meetings during the public participation process.

While I&APs have been encouraged to register their interest in the EIA process from the onset, the identification and registration of I&APs will be on-going for the duration of the EIA process. The register of I&APs will be updated throughout the EIA process, and will act as a record of the parties involved in the public participation process.

3.2.2 ADVERTISEMENT AND NOTIFICATION

The Basic Assessment Process was announced in April 2018 with the invitation to Organs of State, potentially affected and neighbouring landowners and the general public to register as I&APs and to actively participate in the Basic Assessment process.

A notification letter will be distributed to all I&APs with the submission of the Application to the DEA as well as the 30-day review period within which the Basic Assessment Report will be made available for review. Proof of distribution of the notification letter will be included in **Appendix E2**.

The table below provides the details of the advertisement placed in the Middleburg Observer at the commencement of the 30-day review period and the details and proof will be included in the report.

Publication name	Middleburg Observer	
Date published	**13 April 2018** – Notification of the availability of the Basic Assessment Report for review and the duration of the 30-day review period for the project.	
Site notice position at:	**Latitude**	**Longitude**
R104 and main road T-junction	25°47'24.31"S	29°43'53.85"E
At the entrance gate of the Remaining Extent of Zevenfontein 415	25°45'44.01"S	29°43'27.84"E
On the boundary fence between the Remaining Extent of the Farm Patattafontein 412 and Portion 4 of the Farm Gemsbokfontein 411	25°44'42.63"S	29°41'58.25"E
Within Portion 3 of the Farm Gemsbokfontein at the entrance of Patattafontein 412	25°44'10.47"S	29°41'5.27"E
Date placed	19 March 2018	

Refer to **Appendix E1** for proof of the advertisements and site notices placed for the project.

3.2.3 ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Through the public participation process for the Basic Assessment undertaken to date no comments have been raised by I&APs.

With the 30-day review period of the Basic Assessment Report, undertaken from 13 April 2018 – 15 May 2018, all issues and comments raised will be collected, recorded and addressed in the final Basic Assessment Report.

All comments received will be included in **Appendix E4**, and the meeting minutes will be included as part of **Appendix E6**.

3.2.4 COMMENTS AND RESPONSE REPORT

All comments received from the I&APs as part of the Basic Assessment process for the project will be collated into a Comments and Responses Report which will include the details of the comments submitted as well as the responses from the EAP.

Comments received during the 30-day review period will be included and responded to in the Comments and Responses report. Refer to **Appendix E5**.

CHAPTER 4: IMPACT ASSESSMENT

This chapter provides an assessment of the impacts anticipated to be associated with the development of the Zonnebloem Switching Station, two 132kV chickadee power lines and associated infrastructure.

A summary and anticipated significance of the potential impacts that are likely to occur as a result of the Planning and Design, Construction Phase, Operation Phase, Decommissioning Phase and the No-Go Option of the project are provided in the tables which follow.

4.1 ASSESSMENT METHODOLOGY

The Environmental Impact Assessment methodology assists in the evaluation of the overall effect of a proposed activity on the environment. This includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive).

- The **nature**, which includes a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 was assigned as appropriate (with 1 being low and 5 being high).
- The **duration**, wherein it was indicated whether:
  - the lifetime of the impact will be of a very short duration (0 – 1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2 – 5 years) – assigned a score of 2;
  - medium-term (5 -15 years) – assigned a score of 3;
  - long term (> 15 years) – assigned a score of 4; or
  - permanent – assigned a score of 5;
- The **magnitude**, quantified on a scale from 0 – 10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which describes the likelihood of the impact actually occurring. Probability was estimated on a scale of 1 -5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, was determined through a synthesis of the characteristics described above and can be assessed as **LOW**, **MEDIUM** or **HIGH**; and
- the **status**, which was described as either positive, negative or neutral.
- the degree of which the impact can be reversed,
- the degree to which the impact may cause irreplaceable loss of resources,
- the degree to which the impact can be mitigated.

The significance was calculated by combining the criteria in the following formula:
S=(E+D+M)P where;

- S = Significance weighting
- E = Extent
- D = Duration
- M = Magnitude
- P = Probability

The significance weightings for each potential impact are as follows;

- < 30 points: **LOW** (i.e. where the impact would not have a direct influence on the decision to develop in the area),
- 30 – 60 points: **MEDIUM** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: **HIGH** (i.e. where the impact must have an influence on the decision process to develop in the area).

4.2 CONSTRUCTION PHASE IMPACTS

The following impacts have been identified, through this Basic Assessment Process, to be associated with the construction phase of the project.

4.2.1 Ecology

During the construction phase impacts on the ecology of the affected area is expected to occur (**Appendix D1**). Two impacts have been identified and include:

- *Impacts on vegetation* - The most likely and significant impact will be on the vegetation. The proposed development will lead to the general loss of vegetation within the development footprint area.

- *Direct and indirect faunal impacts* – Faunal species will primarily be affected by the overall loss of habitat. Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna during construction. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals or reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the presence of construction personnel. This impact is likely to occur during the construction-phase and would also potentially occur with resident fauna within the facility after construction. Disturbance of faunal species can be maintained to a minimum and low significance by implementing effective mitigation measures.

- Soil erosion and degradation of ecosystems - Soil erosion is a frequent risk due to vegetation clearance and disturbance associated with the construction phase of the development and may continue occurring throughout the operational phase. Hard impenetrable surfaces will generate an increase in runoff during intense rainfall events and may exaggerate the effects of erosion.

- *Impacts on wetlands (only applicable to access road alternatives)* - Construction will lead to some local, direct loss of or damage to the depression wetland if this option is selected to be the preferred

option. However, this depression wetland is already in a severely degraded and transformed condition, retaining very little ecological functioning and as such the significance of this impact on this habitat is regarded as moderate. Physical alteration to the depression wetland can have an impact on the functioning of the wetlands. Consequences may include:

- increased loss of soil;
- loss of/or disturbance to indigenous wetland vegetation;
- fragmentation of sensitive habitats;
- impairment of wetland function;
- change in channel morphology.

It is expected that no direct impacts to wetlands will occur due to the remaining development footprint and access road Alternative A.

» *Impacts on Formal Biodiversity Areas (as classified within the Mpumalanga Biodiversity Sector Plan - MBSP):* As the study area is largely situated within areas identified within the MBSP as Moderately Modified (Old Lands) as well as Other Natural Areas which has been assessed as being highly disturbed during the survey, this impact will not be assessed as no Critical or Ecological Support Areas will be impacted.

i. Switching Station and all associated infrastructure (excluding access roads)

Impacts on vegetation during construction

Impact Nature: Impacts on vegetation would occur due to vegetation clearance associated with the construction of the facility and associated infrastructure and will be maintained through the operational phase.
The most likely consequences include:

» local loss of habitat (to an extent as a natural ground covering will be maintained where possible);
» very small and local disturbance to processes maintaining local biodiversity and ecosystem goods and services.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (15)
Status	Slightly Negative	Slightly Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Very slight loss of resources	Very slight loss of resources
Can impacts be mitigated?	To some extent. Areas of vegetation will be replaced with infrastructure and hard surfaces. The only recommended mitigation is to ensure that all activities occur within the development footprint with no disturbance of vegetation outside of the development boundary.	

Mitigation

» Pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated.
» Since all of the identified conservation worthy species with the study area are geophytes and succulents with relative shallow rooting systems (e.g *Hypoxis hemerocallidea, Gladiolus spp., Habenaria galpinii, Eucomis autumnalis* and *Aloe ecklonis*), the potential for successful translocation is high. Before construction commences individuals of listed species within the development footprint that would be affected, should be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-

construction walk-through survey, and according to the recommended rations. Permits from the relevant provincial authorities, i.e. the Mpumalanga Tourism and Parks Agency, will be required to relocate and/or disturb listed plant species.

- » Any individuals of protected species affected by and observed within the development footprint during construction should be translocated under the supervision of the ECO and/or Contractor's Environmental Officer (EO).
- » Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
- » All construction vehicles should adhere to clearly defined and demarcated roads. No driving outside of the development boundary.
- » Rehabilitation of disturbed areas is important. Disturbed areas containing no infrastructure and hard surfaces should be allowed to rehabilitate with natural vegetation as soon as possible to avoid the potential of erosion and invasion with alien plants. The area should be monitored on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has been rehabilitated to a satisfactory level.

Cumulative Impacts

Cumulative impacts on vegetation are likely to be very low given the fact that most habitats are already in a highly disturbed and transformed condition and given the limited expected footprint of the facility.

Residual Impacts

Some loss of vegetation is inevitable and cannot be avoided.

Faunal impacts during construction

Impact Nature: Construction activities such as the operation of heavy machinery and the presence of construction personnel at the site could result in direct (e.g. road mortalities) and indirect impacts as a result of noise and dust pollution on terrestrial fauna at the site during construction. The most likely consequence of this impact will be reduction in area of occupancy of some of the affected species.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Minor (2)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Low (12)
Status	Slightly Negative	Slightly Negative
Reversibility	Medium	High
Irreplaceable loss of resources	Slight loss of resources	No
Can impacts be mitigated?	Noise and disturbance during the construction phase cannot be avoided but would be transient in nature and with appropriate mitigation no long-term impacts from the construction phase can be expected if the development is strictly maintained within the pre-determined footprint area.	

Mitigation

- » Site access should be controlled and no unauthorised persons should be allowed onto the site.
- » Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- » The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site.
- » Fires should not be allowed on site.
- » A firebreak should be maintained around the development boundary to avoid potential fires occurring within the facility from spreading into the surrounding grasslands, subsequently posing a threat to faunal species occurring within the surrounding environment.
- » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- Construction vehicles limited to a minimal footprint on site.

Cumulative Impacts

The construction of the infrastructure would contribute to cumulative disturbance and habitat loss for fauna, but the contribution would be very small and is not considered significant.

Residual Impacts

Residual impacts would be very low with a very slight loss of natural habitat for faunal species.

Potential increased erosion risk during construction

Impact Nature: During construction, there will be a lot of disturbed and loose soil at the site which will render the area vulnerable to erosion.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Low (4)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (12)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Slight loss of resources	No
Can impacts be mitigated?	Yes	

Mitigation

- Any erosion problems observed should be rectified immediately and monitored thereafter to ensure that they do not re-occur.
- All bare areas, affected by the development, should be re-vegetated with locally occurring species, to bind the soil and limit erosion potential.
- Re-instate as much of the eroded area to its pre-disturbed, "natural" geometry (no change in elevation and any banks not to be steepened).
- Roads and other disturbed areas should be regularly monitored for erosion problems and problem areas should receive follow-up monitoring by the EO to assess the success of the remediation.
- Topsoil should be removed and stored separately and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- Practical phased development and vegetation clearing should be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time.

Cumulative Impacts

Cumulative impacts within the surrounding environment are low due to the general low erosion potential of the area as described by Mucina and Rutherford (2016). Erosion features will thus be local with a low potential to spread beyond the development footprint.

Residual Impacts

With appropriate avoidance and mitigation residual impacts will be very low and may be limited to very limited and local area containing some erosion features with little potential to spread beyond the point of origin.

ii. Access road alternatives

Impacts on vegetation during construction

Impact Nature: Construction may potentially lead to some direct or indirect loss of or damage to some wetland portions. This wetland however, has already been altered and transformed, subsequently loosing much of its functions and services.

Impacts include

- » increased loss of soil;
- » loss of/or disturbance to indigenous wetland vegetation;
- » fragmentation of sensitive habitats;
- » impairment of wetland function;
- » change in channel morphology.

The potential for these impacts to occur can furthermore be eluded with diligent and effective mitigation measures in place.

	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	Low (21)	Low (15)	Low (21)	Low (15)
Status	Slightly Negative	Slightly Negative	Slightly Negative	Slightly Negative
Reversibility	Moderate	High	Moderate	High
Irreplaceable loss of resources	Very slight loss of resources	Very slight loss of resources	Very slight loss of resources	Very slight loss of resources
Can impacts be mitigated?	To some extent. Areas of vegetation will be replaced with infrastructure and hard surfaces. The only recommended mitigation is to ensure that all activities occur within the development footprint with no disturbance of vegetation outside of the development boundary.			

Mitigation

- » Pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated.
- » Since all of the identified conservation worthy species with the study area are geophytes and succulents with relative shallow rooting systems (e.g *Hypoxis hemerocallidea, Gladiolus spp., Habenaria galpinii, Eucomis autumnalis* and *Aloe ecklonis*), the potential for successful translocation is high. Before construction commences individuals of listed species within the development footprint that would be affected, should be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey, and according to the recommended rations. Permits from the relevant provincial authorities, i.e. the Mpumalanga Tourism and Parks Agency, will be required to relocate and/or disturb listed plant species.
- » Any individuals of protected species affected by and observed within the development footprint during construction should be translocated under the supervision of the ECO and/or Contractor's Environmental Officer (EO).
- » Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
- » All construction vehicles should adhere to clearly defined and demarcated roads. No driving outside of the development boundary.
- » Rehabilitation of disturbed areas is important. Disturbed areas containing no infrastructure and hard surfaces should be allowed to rehabilitate with natural vegetation as soon as possible to avoid the potential of erosion and invasion with alien plants. The area should be monitored on a weekly basis throughout the construction phase and on a monthly basis thereafter and to the point where the area has been rehabilitated to a satisfactory level.

Cumulative Impacts

Cumulative impacts on vegetation are likely to be very low given the fact that most habitats are already in a highly disturbed and transformed condition and given the limited expected footprint of the facility.

Residual Impacts

Some loss of vegetation is inevitable and cannot be avoided.

Faunal impacts during construction

Impact Nature: Construction activities such as the operation of heavy machinery and the presence of construction personnel at the site could result in direct (e.g. road mortalities) and indirect impacts as a result of noise and dust pollution on terrestrial fauna at the site during construction. The most likely consequences include the reduction in area of occupancy of some of the affected species.

	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	Low (21)	Low (15)	Low (21)	Low (15)
Status	Slightly Negative	Slightly Negative	Slightly Negative	Slightly Negative
Reversibility	Moderate	High	Moderate	High
Irreplaceable loss of resources	Very slight loss of resources	Very slight loss of resources	Very slight loss of resources	Very slight loss of resources
Can impacts be mitigated?	Noise and disturbance during the construction phase cannot be avoided but would be transient in nature and with appropriate mitigation no long-term impacts from the construction phase can be expected if the development is strictly maintained within the pre-determined footprint area.			

Mitigation

- Site access should be controlled and no unauthorised persons should be allowed onto the site.
- Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site.
- Fires should not be allowed on site.
- A firebreak should be maintained around the development boundary to avoid potential fires occurring within the facility from spreading into the surrounding grasslands, subsequently posing a threat to faunal species occurring within the surrounding environment.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- Construction vehicles limited to a minimal footprint on site.

Cumulative Impacts

The construction of the infrastructure would contribute to cumulative disturbance and habitat loss for fauna, but the contribution would be very small and is not considered significant.

Residual Impacts

Residual impacts would be very low with a very slight loss of natural habitat for faunal species.

Potential increased erosion risk during construction

Impact Nature: During construction, there will be a lot of disturbed and loose soil at the site which will render the area vulnerable to erosion.

	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)	Medium-term (3)	Short-term (2)
Magnitude	Low (4)	Small (1)	Low (4)	Small (1)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)

Significance	Low (24)	Low (12)	Low (24)	Low (12)
Status	Negative	Negative	Negative	Negative
Reversibility	Moderate	High	Moderate	High
Irreplaceable loss of resources	Slight loss of resources	No	Slight loss of resources	No
Can impacts be mitigated?	Yes			

Mitigation

- Roads and other disturbed areas should be regularly monitored for erosion problems and problem areas should receive follow-up monitoring by the EO to assess the success of the remediation.
- Re-instate as much of the eroded area to its pre-disturbed, "natural" geometry (no change in elevation and any banks not to be steepened).
- Topsoil should be removed and stored separately and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- Practical phased development and vegetation clearing should be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time.

Cumulative Impacts

Cumulative impacts within the surrounding environment are low due to the general low erosion potential of the area as described by Mucina and Rutherford (2016). Erosion features will thus be local with a low potential to spread beyond the development footprint.

Residual Impacts

With appropriate avoidance and mitigation residual impacts will be very low and may be limited to very limited and local area containing some erosion features with little potential to spread beyond the point of origin.

Potential impacts on depression wetlands

Impact Nature: Construction may potentially lead to some direct or indirect loss of or damage to some wetland portions. This wetland however, has already been altered and transformed, subsequently loosing much of its functions and services.

Impacts include

- increased loss of soil;
- loss of/or disturbance to indigenous wetland vegetation;
- fragmentation of sensitive habitats;
- impairment of wetland function;
- change in channel morphology.

The potential for these impacts to occur can furthermore be eluded with diligent and effective mitigation measures in place.

	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	N/A	N/A	Local (1)	Local (1)
Duration	N/A	N/A	Permanent (5)	Medium-term (2)
Magnitude	N/A	N/A	Low (3)	Minor (2)
Probability	N/A	N/A	Highly Probable (4)	Probable (3)
Significance	N/A	N/A	Medium (36)	Low (15)
Status	N/A	N/A	Negative	Slightly Negative
Reversibility	N/A	N/A	Low	High
Irreplaceable loss of resources	N/A	N/A	Very small loss of resources	Very small loss of resources
Can impacts be mitigated?	To a limited extent.			

Mitigation

- Any areas disturbed during the construction phase should be encouraged to rehabilitate as quickly and

effectively as possible. » Natural indigenous species applicable to the specific habitat should be used and the area should be monitored on a monthly basis by the Environmental Officer (EO) to ensure effective rehabilitation and to avoid erosion and the invasion with weeds and alien invasive species. » No unnecessary vegetation clearance may be allowed. » Any eroded areas observed should be rehabilitated as soon as possible.
Cumulative Impacts There will be no cumulative impact as this depression is endorheic and has no connection to other wetland habitats. Furthermore, due to the severe degraded state of this depression this wetland and its associated vegetation and ecosystem services and functions (in its current state) do not contribute to the general conservation status of similar habitat types. As such an assessment of this impact is not necessary.
Residual Impacts A limited area will be altered although both access road alternatives are located within a largely disturbed area with limited ecological functioning and as such the residual impact on functions and services will be very limited.

4.2.2 Avifauna

Impacts expected to occur on the avifauna within the area during the construction phase includes:

» Habitat destruction;
» Disturbance.

During the construction phase of the project, disturbance levels will be significantly higher in the immediate vicinity than previously experienced. This disturbance will result from machinery and vehicle disturbance as well as other construction activities. As the significance of impacts associated with the switching station will be different than for the power lines and access roads, the impacts below have been separated to provide a more complete assessment. Refer to **Appendix D2**.

i. Switching Station

Habitat destruction

Impact Nature: During the **construction** of the switching station, some habitat destruction and alteration will occur, although this is will be limited. These activities may have a very slight impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

No Red Data species were recorded within the immediate area of the proposed power line routes, the switching station, as well as within the surrounding area. Due to lack of suitable habitat it is envisaged that very limited avifauna will be impacted with the likelihood of no Red Data species that will lose valuable habitat. Furthermore, the limited displacement that may occur, will only be from a very restricted area. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local and very restricted in extent, and will not have a significant effect on regional or national populations.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (15)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources

Can impacts be mitigated?	Yes

Mitigation

- The temporal and spatial footprint of the development should be kept to a minimum.
- The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area.
- Provide adequate briefing for site personnel on the possible important (Red Data) species occurring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of area until appropriate recommendations have been provided by an avifaunal specialist).
- The above measures must be covered in a site specific EMPr and monitored by an ECO.

Cumulative Impacts

The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the footprint and the fact that the switching station is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Residual Impacts

The residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity. Furthermore, the vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place

Disturbance

Impact Nature: The disturbance of avifauna during the **construction** of the switching station may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed switching station is anticipated to be of low significance as birds will move away from the area temporarily. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (24)	Low (15)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	

Mitigation

- Strict control must be maintained over all activities during construction, in line with an approved construction EMPr.
- During construction, if any of the Red Data species identified in this report are observed to be roosting and/or

breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such a buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice.
» The construction equipment camps must be as close to the site as possible.
» Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.

Cumulative Impacts

Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.

Residual Impacts

Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some form of disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

ii. Power lines and communication tower

Habitat destruction

Impact Nature: During the **construction** of the power lines (loop-in loop-out) and communication tower, some habitat destruction and alteration will occur, although this will be limited due to the short distance. These activities may have a very slight impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

No Red Data species were recorded within the immediate area of the proposed power line routes as well as within the surrounding area. Due to lack of suitable habitat it is envisaged that very limited avifauna will be impacted with the likelihood of no Red Data species that will lose valuable habitat. Furthermore, the limited displacement that may occur, will only be from a very restricted area. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local and very restricted in extent, and will not have a significant effect on regional or national populations.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (28)	Low (15)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes	

Mitigation

» The temporal and spatial footprint of the development should be kept to a minimum.
» The boundaries of the development footprint are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area.
» Provide adequate briefing for site personnel on the possible important (Red Data) species occurring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of area until appropriate recommendations have been provided by a specialist).
» The above measures must be covered in a site specific EMPr and monitored by an ECO.

Cumulative Impacts

The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Residual Impacts

The residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.

Disturbance

Impact Nature: The disturbance of avifauna during the **construction** of the power lines (loop-in loop-out) as well as the communication tower may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed substation is anticipated to be of low significance as birds will temporarily move away from the area. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (3)	Minor ()
Probability	Highly Probable (4)	Probable (3)
Significance	Low (24)	Low (15)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	

Mitigation

- Strict control must be maintained over all activities during construction, in line with an approved construction EMPr.
- During construction, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice.
- The construction equipment camps must be as close to the site as possible.
- Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.
- Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.

Cumulative Impacts
Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

Residual Impacts
The residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

iii. Access road alternatives

The impacts are considered to be the same for both access road alternatives.

Habitat destruction

Impact Nature: During the **construction** of the access road, some habitat destruction and alteration will occur, although this will be limited due to the short distance. These activities may have a very slight impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

No Red Data species were recorded within the immediate area of the proposed access road alignment options as well as within the surrounding area. Due to lack of suitable habitat it is envisaged that very limited avifauna will be impacted with the likelihood of no Red Data species that will lose valuable habitat. Furthermore, the limited displacement that may occur, will only be from a very restricted area. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local and very restricted in extent, and will not have a significant effect on regional or national populations.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (28)	Low (15)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes	

Mitigation
- The temporal and spatial footprint of the development should be kept to a minimum.
- The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area.
- Provide adequate briefing for site personnel on the possible important (Red Data) species occur-ring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of the area until appropriate recommendations have been provided by a specialist).
- The above measures must be covered in a site specific EMPr and monitored by an ECO.

Cumulative Impacts
The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the access road and the fact that both access road alternatives is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Residual Impacts
The residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some

habitat loss during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area. Furthermore, the vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place.

Disturbance

Impact Nature: The disturbance of avifauna during the **construction** of the access route may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern are may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed access route is anticipated to be of low significance as birds will temporarily move away from the area. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (24)	Low (15)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	

Mitigation

- Strict control must be maintained over all activities during construction, in line with an approved construction EMPr.
- During construction, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice.
- The construction equipment camps must be as close to the site as possible.
- Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.
- Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.

Cumulative Impacts

Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.

Residual Impacts Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some form of disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

4.2.3 Archaeology

The impact on heritage sites by the proposed development is considered to be of low significance. Any direct impacts that may occur would be during the construction phase only by the proposed power lines and would be of very low significance confined to Feature 1.

The following are expected to occur during the construction phase (**Appendix D3**):

» It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure needed for the construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.
» During the construction phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

The impact below includes all project infrastructure. It should be noted that no impact is envisaged for the recorded heritage resources during the operation or decommissioning phases for the project.

i. Switching Station and all associated infrastructure (excluding access roads)

Impacts on archaeological heritage resources

Impact Nature: During the pre-construction and construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	24 (Low)	24 (Low)
Status	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources	**No resources were recorded therefore no loss is expected**	**No resources were recorded therefore no loss is expected.**
Can impacts be mitigated?	Yes, a chance find procedure should be implemented.	
Mitigation » Chance Find Procedure should be implemented for the project should any sites be identified during the construction process.		
Cumulative Impacts In any archaeological contexts the impacts are once-off permanent destructive events.		
Residual Impacts		

If sites are destroyed it will result in the depletion of the heritage sites relating to the cultural landscape of the area. However, if sites are recorded and preserved or mitigated this adds to the record of the area.

ii. Access road alternative

Impact Nature: During the pre-construction and construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.				
	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	24 (Low)	24 (Low)	24 (Low)	24 (Low)
Status	Negative	Negative	Negative	Negative
Reversibility	Not reversible	Not reversible	Not reversible	Not reversible
Irreplaceable loss of resources	**No resources were recorded therefore no loss is expected**	**No resources were recorded therefore no loss is expected.**	**No resources were recorded therefore no loss is expected**	**No resources were recorded therefore no loss is expected.**
Can impacts be mitigated?	Yes, a chance find procedure should be implemented.			
Mitigation » Chance Find Procedure should be implemented for the project should any sites be identified during the construction process.				
Cumulative Impacts In any archaeological contexts the impacts are once-off permanent destructive events.				
Residual Impacts If sites are destroyed it will result in the depletion of the heritage sites relating to the cultural landscape of the area. However, if sites are recorded and preserved or mitigated this adds to the record of the area.				

4.2.4 Palaeontology

During the construction phase, excavations and site clearance of vegetation will consist of significant excavations into the uppermost sediment cover as well as into the underlying bedrock. These excavations will transform the present topography and may disrupt, destroy or permanently close-in fossils that are then unavailable for research. The extent of the area of potential impact is thus limited to the project site and thus categorised as local (**Appendix D4**).

No impacts are expected to occur during the operation or decommissioning phase of the project.

i. Switching Station and all associated infrastructure (excluding access roads)

Impact on palaeontological resources

Impact Nature: *T*he excavations and clearing of vegetation during the construction phase will consist of digging into the superficial sediment cover as well as underlying deeper bedrock. These excavations will change the existing topography and may possibly disturb, destroy or even permanently close-in fossils at or below the ground surface. These fossils will then be lost for research.		
	Without Mitigation	**With Mitigation**
Extent	Local(1)	Local(1)

Duration	Long term/permanent (5)	Long term/permanent (5)
Magnitude	Minor (2)	Minor (1)
Probability	Improbable (1)	Improbable (1)
Significance	Low (8)	Low (7)
Status	Negative	Neutral
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Not necessary	
Mitigation » No mitigation will be necessary. The lack of appropriate exposure at the proposed development footprint indicates that the impact is of low significance.		
Cumulative Impacts In any palaeontological contexts the impacts are once-off permanent destructive events.		
Residual Impacts Loss of palaeontological heritage.		

ii. Access road alternative

Impact on palaeontological resources

Impact Nature: *T*he excavations and clearing of vegetation during the construction phase will consist of digging into the superficial sediment cover as well as underlying deeper bedrock. These excavations will change the existing topography and may possibly disturb, destroy or even permanently close-in fossils at or below the ground surface. These fossils will then be lost for research. Impacts on Palaeontological Heritage are likely to happen only within the construction phase. No impacts are expected to occur during the operation phase.

Two alternative alignments for the access road are being considered:

» Alternative A: Access road will be up to 8m wide and approximately 990m in length.

» Alternative B: Access road will be up to 8m wide and approximately 805m in length.

	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local(1)	Local(1)	Local(1)	Local(1)
Duration	Long term/permanent (5)	Long term/permanent (5)	Long term/permanent (5)	Long term/permanent (5)
Magnitude	Minor (2)	Minor (1)	Minor (2)	Minor (1)
Probability	Improbable (1)	Improbable (1)	Improbable (1)	Improbable (1)
Significance	Low (8)	Low (7)	Low (8)	Low (7)
Status	Negative	Neutral	Negative	Neutral
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible
Irreplaceable loss of resources	No	No	No	No
Can impacts be mitigated?	Not necessary			
Mitigation » No mitigation will be necessary. The lack of appropriate exposure at the proposed development footprint indicates that the impact is of low significance.				
Cumulative Impacts In any palaeontological contexts the impacts are once-off permanent destructive events.				
Residual Impacts Loss of palaeontological heritage.				

4.3 OPERATION PHASE IMPACTS

The following impacts are expected to occur with the operation and maintenance of the substation.

4.3.1 Ecology

During the operation phase of the substation, as well as the maintenance required for the facility ecological impacts are expected and include (**Appendix D1**):

» *Increased alien plant invasion during operation* - Major factors contributing to invasion by alien invader plants includes habitat disturbance and associated destruction of indigenous vegetation. Consequences of this may include:
- further loss and displacement of indigenous vegetation;
- change in vegetation structure leading to change in various habitat characteristics;
- change in plant species composition;
- change in soil chemistry properties;
- loss of sensitive habitats;
- loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
- fragmentation of sensitive habitats;
- change in flammability of vegetation, depending on alien species;
- hydrological impacts due to increased transpiration and runoff; and
- impairment of wetland function.

Although the potential severity of this impact may be high, it can be easily mitigated through regular alien control.

» *Faunal impacts* – The operation and presence of the project may lead to disturbance or persecution of fauna within or adjacent to the project.

» Soil erosion and degradation of ecosystems - Soil erosion is a frequent risk due to vegetation clearance and disturbance associated with the construction phase of the development which may continue occurring throughout the operational phase. Hard impenetrable surfaces will generate an increase in runoff during intense rainfall events and may exaggerate the effects of erosion.

The tables below include the switching station and all associated infrastructure (including access roads).

Increased alien plant invasion

Impact Nature: The disturbed and bare ground that is likely to be present at the site after construction will leave the site vulnerable to alien plant invasion for some time, and pose a potential threat to surrounding grasslands and wetlands.		
	Without Mitigation	**With Mitigation**
Extent	Local – Regional (3)	Local (1)
Duration	Long-term (4)	Very short-term (1)
Magnitude	Moderate (5)	Minor (2)
Probability	Highly Probable (4)	Improbable (2)
Significance	Medium (48)	Low (8)
Status	Negative	Slightly Negative

Reversibility	No	High
Irreplaceable loss of resources	Potential loss of resources	No
Can impacts be mitigated?	Yes, to a large extent	

Mitigation

- A site-specific eradication and management programme for alien invasive plants should be included in the Operation Environmental Management Programme (OEMPr).
- Regular monitoring by the EO for alien plants at the site should occur and could be conducted simultaneously with erosion monitoring.
- When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.
- Clearing methods should aim to keep disturbance to a minimum.
- No planting or importing any listed invasive alien plant species (all Category 1a, 1b and 2 invasive species) to the site for landscaping, rehabilitation or any other purpose.

Cumulative Impacts

Cumulative impacts within the surrounding environment due to the spread and settlement of alien invasive species beyond the initial disturbed area will lead to the replacement of natural indigenous vegetation and subsequently in natural grazing land etc.

Residual Impacts

With appropriate mitigation such as regular monitoring and eradication residual impacts will be very low will likely comprise of few alien plants establishing for short periods of time between monitoring and eradication phases.

Faunal Impacts due to operation

Impact Nature: The operation and presence of the project may lead to disturbance or persecution of fauna within or adjacent to the project.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Minor (1)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	Low (15)	Low (8)
Status	Slightly Negative	Slightly Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Some aspects such as those relating to human activity can be mitigated, but habitat loss cannot be mitigated	

Mitigation

- No unauthorised persons should be allowed onto the site.
- Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.
- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.

Cumulative Impacts

The development would contribute to cumulative habitat loss for fauna, but the contribution would be very small and is not considered significant.

Residual Impacts

Some habitat loss is an inevitable consequence of the development and cannot be fully mitigated.

Increased erosion risk during operation

Impact Nature: Increased erosion risk as a result of soil disturbance and loss of vegetation cover as well as increased runoff generated from hard impenetrable surfaces.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium term (3)	Very Short term (1)
Magnitude	Minor (1)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	Low (15)	Low (4)
Status	Negative	Slightly Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Slight loss of resources	No
Can impacts be mitigated?	Yes	

Mitigation

- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All cleared areas should be revegetated, preferably with indigenous perennial grasses (no invasive plants may be used).

Cumulative Impacts

Cumulative impacts within the surrounding environment are low due to the general low erosion potential of the area as described by Mucina and Rutherford (2016). Erosion features will thus be local with a low potential to spread beyond the development footprint.

Residual Impacts

If erosion at the site is controlled, then there will be no residual impact.

4.3.2 Avifauna

During the operation phase of the project there will be some vehicle activity when maintenance of the infrastructure is carried out (**Appendix D2**).

Avifaunal impacts associated with the operation of the substation include:

- Disturbance;
- Electrocution of birds due to overhead power line infrastructure;
- Collisions of birds with overhead power lines.

i. Switching Station

Disturbance

Impact Nature: The disturbance of avifauna during the **operation** of the switching station may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed switching station is anticipated to be of low significance as birds will move away from the area temporarily. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this

	Without Mitigation	**With Mitigation**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Minor (1)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (18)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	

Mitigation

- Strict control must be maintained over all activities during operation, in line with an approved operation EMPr.
- Contractors and working staff should remain within the development footprint and movement outside these areas, especially into avian micro-habitats, must be restricted.

Cumulative Impacts

The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Residual Impacts

Some disturbance during the operational phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.

Electrocution of birds due to switching station infrastructure

Impact Nature: Since there is live hardware in the switching station yard, the potential exists for birds to bridge the gap between a phase and earth resulting in electrocution. However, very few electrocutions have been recorded on switching stations. Species likely to be affected are crows, ravens and other species that are tolerant of disturbance. Small raptors such as Lanner Falcons, Amur Falcons and Lesser Kestrel are sometimes attracted into switching station yards in pursuit of species nesting there such as sparrows and canaries and may be susceptible to electrocutions.

The impact of electrocution from the switching station infrastructure are considered to be much lower of significance once mitigation in the form of bird friendly structures and bird deterrent measures have been put in place. Species likely to be affected are crows and other non-threatened species with the majority of threatened species avoiding the switching station yard as they are sensitive to disturbances.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Minor (2)

Probability	Probable (3)	Improbable (2)
Significance	Low (24)	Low (14)
Status	Negative	Negative
Reversibility	Low (birds will be injured or killed)	Low (birds will be injured or killed)
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	

Mitigation

- All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting, 2002).
- Installation of artificial bird space perches and nesting platforms, at a safe distance from energised components (Goudie, 2006; Prinsen et al., 2012).

Cumulative Impacts

Due to the fact that the larger area is characterised by numerous overhead power lines and other infrastructure posing similar threats, the cumulative impact of electrocution is probably the most potential significant impact. However, due to the limited size of the switching station as well the fact that the proposed footprint is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of the power line to this cumulative impact is small.

Residual Impacts

The switching station and associated infrastructure will be within the area over a long period of time, if not permanently. However, if the facility and infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

ii. Power lines and communication tower

Disturbance

Impact Nature: During the **operation and maintenance** of the power lines (loop-in loop-out) and communication tower, some alteration will occur, although this will be limited due to the short distance. These activities may have a very slight impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

No Red Data species were recorded within the immediate area of the proposed power line routes as well as within the surrounding area. Due to lack of suitable habitat it is envisaged that very limited avifauna will be impacted with the likelihood of no Red Data species that will lose valuable habitat. Furthermore, the limited displacement that may occur, will only be from a very restricted area. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local and very restricted in extent, and will not have a significant effect on regional or national populations.

	Without Mitigation	**With Mitigation**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (21)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes	

Mitigation

- Strict control must be maintained over all activities during operation, in line with an approved operation EMPr.
- Vehicle movements must be restricted to existing roads and a speed limit of 30km/h must be implemented on all roads associated with the power line during the operation phase.
- Contractors and working staff should remain within the development footprint and movement out-side these areas, especially into avian micro-habitats, must be restricted.

Cumulative Impacts

The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Residual Impacts

The residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.

Electrocution of birds on overhead power lines

Impact Nature: Electrocution of birds on associated overhead power lines is an important cause of mortality for a variety of large bird species particularly storks, cranes and raptors in South Africa (Van Rooyen & Ledger 1999). Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004; Lehman et al. 2007).

Due to the short distance of the proposed loop-in loop-out power lines, limited space for perching is available. However, numerous small raptor species such as Black-winged Kite, Steppe Buzzard and Amur Falcon were recorded, using the existing Mafube/Pan traction line as perch and thus it is highly likely that some of these species may also use the new proposed loop-in loop-out lines. The impact assessment found the impact of electrocution on avifauna to be may be of moderate significance before mitigation, and low significance after the mitigation (in the form of bird friendly structures).

	Without Mitigation	**With Mitigation**
Extent	Medium (2)	Medium (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	Moderate (36)	Low (20)
Status	Negative	Negative
Reversibility	Low (birds will be injured or killed)	Low (birds will be injured or killed)
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation

- A "Bird Friendly" structure, with a bird perch (as per standard Eskom guidelines) must be used for the tower structures.
- All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002).
- Installation of artificial bird space perches and nesting platforms should be installed, at a safe distance from energised components (Goudie 2006; Prinsen et al. 2012).
- Line inspections should be ongoing for the operational life of the line.

Cumulative Impacts

Due to the fact that the larger area is characterised by numerous overhead power lines the cumulative impact of electrocution along with collision is probably the most potential significant impacts. However, due to the limited extent of the power lines as well the fact that the proposed alignment is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of the power line to this cumulative impact is small.

Residual Impacts

The power line infrastructure will be within the area over a long period of time, if not permanently. However, if the power line infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

Collisions of birds with overhead power lines

Impact Nature: Collisions are the biggest single threat posed by transmission power lines to birds in Southern Africa (van Rooyen 2004). Avian species most susceptible and impacted upon are bustards, storks and cranes. These species are heavy-bodied birds with limited manoeuvrability (as a result of high wing loading), which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (Van Rooyen 2004, Anderson 2001). Many of the collision sensitive species are considered threatened in Southern Africa.

The Red Data species that are vulnerable to power line collisions are generally long living, slow reproducing species. Furthermore, various species require specific conditions for breeding, resulting in very few successful breeding attempts and breeding might be restricted to very small areas. Consistent high adult mortality over an extensive period could have a serious long term effects on the population.

Potential collision impacts (risk) with the proposed power line by certain species such as Bustard, Cranes and Secretary birds are possible. This is particularly true for the Bustards which have low manoeuvrability once in flight. All three-species mentioned have been recorded within the top ten avian species in South Africa prone to collisions with overhead power lines.

No Red Data species were recorded within the immediate area of the proposed power line routes as well as within the surrounding area. Due to lack of suitable habitat, it is envisaged that very limited avifauna, especially Red Data species will utilise the area and subsequently overall, the impact assessment found this risk impact are considered to be of moderate to low significance. This rating is related to the number and frequency of large avifaunal species such as bustard and korhaan inhabiting or visiting the traversed habitat.

	Without Mitigation	**With Mitigation**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	Moderate (33)	Low (18)
Status	Negative	Negative
Reversibility	Low (birds will be injured or killed)	Low (birds will be injured or killed)
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation

- Mark sections of line in high to medium-high sensitive areas with anti-collision marking devices (diurnal and nocturnal diverters) to increase the visibility of the power line and reduce likelihood of collisions. Marking devices should be spaced 10 m apart, and must be installed as soon as the conductors are strung.
- These line marking devices include spiral vibration dampers, strips, Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags and aviation balls (Prinsen et al. 2012).
- Construction of the power lines in close proximity to the existing power line will reduce the cumulative impacts and collision risk. All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002).
- Line inspections should be ongoing for the operational life of the line.

Cumulative Impacts

Due to the fact that the larger area is characterised by numerous overhead power lines the cumulative impact of electrocution along with electrocution is probably the most potential significant impacts. However, due to the limited extent of the power lines as well the fact that the proposed alignment is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of the power line to this cumulative impact is small.

Residual Impacts

The power line infrastructure will be within the area over a long period of time, if not permanently. However, if the

power line infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

iii. Access road alternatives

The impacts are considered to be the same for both access road alternatives.

Disturbance

Impact Nature: The disturbance of avifauna during the **operation** of the access route may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern are may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed access route is anticipated to be of low significance as birds will temporarily move away from the area. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.

	Without Mitigation	**With Mitigation**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (21)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes	

Mitigation

- Strict control must be maintained over all activities during operation, in line with an approved operation EMPr.
- Vehicle movements must be restricted to existing roads and a speed limit of 30km/h must be implemented on all roads associated with the power line during the operation phase.
- Contractors and working staff should remain within the development footprint and movement outside these areas, especially into avian micro-habitats, must be restricted.

Cumulative Impacts

The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Residual Impacts

Some disturbance during the operational phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.

4.4 DECOMMISSIONING PHASE

The impacts included as part of the decommissioning phase relate to the decommissioning of the proposed project after it has reached its economic life expiry.

4.4.1 Ecology

The ecological impacts associated with the decommissioning phase includes:

» *Direct and indirect faunal impacts* – Faunal species will primarily be affected by the overall loss of habitat. Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna during decommissioning. Sensitive and shy fauna would move away from the area during the decommissioning phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the decommissioning activities and might be killed. Some mammals or reptiles would be vulnerable to illegal collection or poaching during the decommissioning phase as a result of the presence of personnel. Disturbance of faunal species can be maintained to a minimum and low significance by implementing effective mitigation measures.

» Soil erosion and degradation of ecosystems - Soil erosion is a frequent risk due to disturbance associated with the decommissioning phase of the development. Hard impenetrable surfaces will generate an increase in runoff during intense rainfall events and may exaggerate the effects of erosion.

Faunal impacts during decommissioning

Impact Nature: Decommissioning activities such as the operation of heavy machinery and the presence of personnel at the site could result in direct (e.g. road mortalities) and indirect impacts as a result of noise and dust pollution on terrestrial fauna at the site. The most likely consequence of this impact will be reduction in area of occupancy of some of the affected species.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Minor (2)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Low (12)
Status	Slightly Negative	Slightly Negative
Reversibility	Medium	High
Irreplaceable loss of resources	Slight loss of resources	No
Can impacts be mitigated?	Noise and disturbance during the decommissioning phase cannot be avoided but would be transient in nature and with appropriate mitigation; no long-term impacts from the decommissioning phase can be expected if the development is strictly maintained within the pre-determined footprint area.	
Mitigation » Site access should be controlled and no unauthorised persons should be allowed onto the site. » Any fauna directly threatened by the decommissioning activities should be removed to a safe location by the ECO or other suitably qualified person. » The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site. » Fires should not be allowed on site.		

- A firebreak should be maintained around the development boundary to avoid potential fires occurring within the facility from spreading into the surrounding grasslands, subsequently posing a threat to faunal species occurring within the surrounding environment.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.

Cumulative Impacts

The decommissioning of the infrastructure would contribute to cumulative disturbance and habitat loss for fauna, but the contribution would be very small and is not considered significant.

Residual Impacts

Residual impacts would be very low.

Potential increased erosion risk during decommissioning

Impact Nature: During decommissioning, there will be a lot of disturbed and loose soil at the site which will render the area vulnerable to erosion.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Low (4)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (12)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Slight loss of resources	No
Can impacts be mitigated?	Yes	

Mitigation

- Any erosion problems observed should be rectified immediately and monitored thereafter to ensure that they do not re-occur.
- All bare areas, affected by the development, should be revegetated with locally occurring species, to bind the soil and limit erosion potential.
- Re-instate as much of the eroded area to its pre-disturbed, "natural" geometry (no change in elevation and any banks not to be steepened).
- Roads and other disturbed areas should be regularly monitored for erosion problems and problem areas should receive follow-up monitoring by the EO to assess the success of the remediation.
- Topsoil should be removed and stored separately and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- Practical phased development and vegetation clearing should be practiced so that cleared areas are not left unvegetated and vulnerable to erosion for extended periods of time.

Cumulative Impacts

Cumulative impacts within the surrounding environment are low due to the general low erosion potential of the area as described by Mucina and Rutherford (2016). Erosion features will thus be local with a low potential to spread beyond the development footprint.

Residual Impacts

With appropriate avoidance and mitigation residual impacts will be very low.

4.4.2 Avifauna

The main impact expected to occur during the decommissioning phase relating to avifauna is disturbance (**Appendix D2**).

i. Switching Station

Disturbance

Impact Nature: The disturbance of avifauna during the **decommissioning** of the switching station may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed switching station is anticipated to be of low significance as birds will move away from the area temporarily. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (24)	Low (15)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Only a slight loss of resources	Only a slight loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	

Mitigation

- Strict control must be maintained over all activities during operation, in line with an approved operation EMPr.
- Contractors and working staff should remain within the development footprint and movement outside these areas, especially into avian micro-habitats, must be restricted.

Cumulative Impacts

Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

Residual Impacts

Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some form of disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

ii. Power lines and communication tower

Disturbance during the decommissioning phase

Impact Nature: The disturbance of avifauna during the **decommissioning** of the power lines (loop-in loop-out) and communication tower may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed substation is anticipated to be of low significance as birds will temporarily move away from the area. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (3)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (24)	Low (15)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes	

Mitigation

- Strict control must be maintained over all activities during decommissioning, in line with an approved construction EMPr.
- During decommissioning, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice.
- The decommissioning equipment camps must be as close to the site as possible.
- Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.
- Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.

Cumulative Impacts

Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

Residual Impacts

Some disturbance during the decommissioning phase is inevitable. It is likely that some species will be disturbed and potentially displaced. However, most of these species will move to similar artificial habitats. Some species will likely return post decommission.

iii. Access road alternatives

The impacts are considered to be the same for both access road alternatives.

Disturbance

Impact Nature: The disturbance of avifauna during the **decommissioning** of the access route may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories. Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern are may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed access route is anticipated to be of low significance as birds will temporarily move away from the area. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (24)	Low (15)
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent	

Mitigation

- Strict control must be maintained over all activities during decommissioning, in line with an approved construction EMPr.
- During decommissioning, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice.
- The decommissioning equipment camps must be as close to the site as possible.
- Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.
- Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.

Cumulative Impacts

Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.
Residual Impacts Some disturbance during the decommissioning phase is inevitable. It is likely that some species will be disturbed and potentially displaced. However, most of these species will move to similar artificial habitats. Some species will likely return post decommission.

4.5 CUMULATIVE IMPACTS

There are a number of cumulative impacts in the area, most notably the existing substation and power line infrastructure within a 10km radius as well as mining activity taking place in close proximity to the study area. There are numerous similar infrastructure within a 10km radius from the project site. These include:

- Mafube 13kV Substation situated ~7,9km south-east of the study area;
- Nitens 132kV Substation~7,8 km north of the study area;
- 132kV Mafube/Pan Traction power line which traverses the southern boundary of the project site;
- 132kV Nitens Trac-Pan Traction power line ~4km west of the study area;
- 132kV Kleindam Traction/Nitens Traction power line ~7,9km south-east of the study area;
- 132kV Arnot Traction/Mafube power line ~7,3km north of the study area;
- 275kV Arnot Simplon power line ~7,9km south-east of the study area;
- 400kV Arnot Merensky power line ~7,9km south-east of the study area; and
- 132 kV Derwent Trac-Pan Traction ~10km east of the study area.

4.5.1 Ecology

The proposed Zonnebloem Switching Station, LILO power lines and associated infrastructure may potentially exacerbate the invasion of exotics and invasive species into the broader area. Due to the location of the project and associated infrastructure within an already degraded and transformed habitat cumulative contribution will be negligible and as such assessment of this impact is deemed unnecessary.

Minimum natural occurring, indigenous vegetation persists within the study area and provide such a limited form of resources for biological cycles and diversity that a loss of this area will not result in any change and degrade of the larger ecological environment.

Refer to **Appendix D1.**

4.5.2 Avifauna

Cumulative impacts are expected to occur on the avifauna of the area and includes habitat destruction, disturbance, the electrocution of birds due to the switching station and power line infrastructure and collision (**Appendix D2**).

The larger surrounding area is characterized by numerous disturbances including current cultivation, historical cultivation, plantations, numerous power line structures, as listed above, railway line and numerous roads and other infrastructure. Subsequently all of these disturbances have had a cumulative impact on avifaunal populations and it is expected that the proposed development will also contribute to

these impacts including further loss of available habitat, disturbance of species most notably, Red Data Species, important populations and breeding populations. Red Data species and important bird populations of the region as well as a larger scale (national) may potentially by furthermore impacted through mortality due electrocution and collision with associated infrastructure. However, due to the limited size of the proposed development as well the fact that the proposed footprint is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of this development to such cumulative impacts are regarded as low to minor.

Habitat destruction

Impact Nature: The proposed development will be largely situated within an area characterised by numerous disturbances resulting in a severely altered and transformed landscape. The study area for the development itself is situated within a severely degraded landscape (old cultivated area) and subsequently suitable habitat has been lost to a great extent, with little avifaunal biodiversity recorded within the study area. Included within the study area are existing power line infrastructure (Mafube/Pan Traction Line etc.). Subsequently, due to above mentioned, the cumulative impact of the development will be low. Minimal additional destruction and alteration of habitats will occur, cumulative and thus, will also have limited impact on foraging, breeding and roosting ecology of avian species.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (0)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	Low (10)	Low (14)
Status	Neutral to Slightly Negative	Neutral to Slightly Negative
Reversibility	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes	

Mitigation

- The temporal and spatial footprint of the development should be kept to a minimum.
- The boundaries of the development footprint are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area.
- Provide adequate briefing for site personnel on the possible important (Red Data) species occur-ring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of area until appropriate recommendations have been provided by ECO).

The above measures must be covered in a site specific EMPr and monitored by an ECO.

Residual Impacts

Although some habitat destruction will be unavoidable, the residual impact will be low as only limited habitat will be lost which in its current state already contain limited species diversity. Furthermore, the vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place.

Disturbance

Impact Nature: Due to highly degraded condition, biodiversity was low and comprised of highly adaptable avifaunal species that will simply move away, following a disturbance and may in the future again utilize the newly created anthropogenic "habitats" (i.e. power line towers). Due to a lack of suitable habitat within the study area minimal additional disturbance of avifaunal species will occur and will have very little impact on sensitive ground-nesting species, cumulative, as well as on the community structure of avifauna of the region.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (3)
Probability	Improbable (2)	Probable (3)
Significance	Low (14)	Low (24)
Status	Neutral to Slightly Negative	Neutral to Slightly Negative
Reversibility	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes	

Mitigation

- Strict control must be maintained over all activities associated with the development, in line with an approved EMPr.
- During all phases associated with the development, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice.
- The equipment camps must be as close to the site as possible.
- Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.
- Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.

Residual Impacts

Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some form of disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilising this area.

Electrocution of birds due to switching station infrastructure

Impact Nature: Potential cumulative impacts are regarded as low due to the limited extent of infrastructure posing a potential electrocution threat, subsequently contributing a small to minor fraction to this cumulative impact within the larger region. Furthermore, due to limited suitable habitat and foraging, diversity of avifaunal species was low with no records of any Red Data species and important population with the study area and as such it can be concluded that the proposed development will contribute very little to this cumulative impact, especially regarding this threat towards Red Data species.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (0)	Minor (2)
Probability	Improbable (2)	Slightly Probable (2)
Significance	Low (10)	Low (16)
Status	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources	No additional loss of resources expected	No additional loss of resources expected
Can impacts be mitigated?	Yes	

Mitigation

- All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting, 2002).
- Installation of artificial bird space perches and nesting platforms, at a safe distance from energised

components (Goudie, 2006; Prinsen et al., 2012).

Residual Impacts

The proposed development will be within the area over a long period of time, if not permanently. However, if the infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

Electrocution of birds due to overhead power lines

Impact Nature: The proposed loop-in loop-out power lines are extremely short and cover a disturbed area with low avifaunal diversity. As such, the additional chickadee loop-in-loop-out power lines will not likely exponentially increase the risk of avian electrocutions as this risk already occurs.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (0)	Low (3)
Probability	Improbable (2)	Probable (3)
Significance	Low (10)	Low (27)
Status	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources	No additional loss of resources expected	No additional loss of resources expected
Can impacts be mitigated?	Yes	

Mitigation

- A "Bird Friendly" structure, with a bird perch (as per standard Eskom guidelines) must be used for the tower structures.
- All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002).
- Installation of artificial bird space perches and nesting platforms should be installed, at a safe distance from energised components (Goudie 2006; Prinsen et al. 2012).
- Line inspections should be ongoing for the operational life of the lines.

Residual Impacts

The proposed development will be within the area over a long period of time, if not permanently. However, if the infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

Collisions of birds with overhead power lines

Impact Nature: Potential cumulative impacts are regarded as low due to the limited extent of infrastructure posing a potential collision threat, subsequently contributing a small to minor fraction to this cumulative impact within the larger region. Furthermore, due to limited suitable habitat and foraging, diversity of avifaunal species was low with no records of any Red Data species and important population with the study area. Subsequently the presence of potential candidates to collide with infrastructure is limited. As such it can be concluded that the proposed development will contribute very little to this cumulative impact, especially regarding this threat towards Red Data species.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	Low (14)	Low (24)
Status	Neutral to Slightly Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No additional loss of resources expected	No additional loss of resources expected
Can impacts be mitigated?	Yes	
Mitigation		

» Mark sections of the lines in High to Medium-High sensitive areas with anti-collision marking de-vices (diurnal and nocturnal diverters) to increase the visibility of the power line and reduce likelihood of collisions. Marking devices should be spaced 10 m apart, and must be installed as soon as the conductors are strung. » These line marking devices include spiral vibration dampers, strips, Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags and aviation balls (Prinsen et al. 2012). » Construction of the power lines in close proximity to the existing power line will reduce the cumulative impacts and collision risk. All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002). » Line inspections should be ongoing for the operational life of the line.
Residual Impacts The proposed development will be within the area over a long period of time, if not permanently. However, if the infrastructure is removed the impacts associated (avian injuries and mortalities) will cease.

4.5.3 Archaeology

The development of the project will result in cumulative impacts which includes (**Appendix D3**):

Impact Nature: During the pre-construction and construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects within the area**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (24)
Status	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources	No resources were recorded therefore no loss is expected	No resources were recorded therefore no loss is expected
Can impacts be mitigated?	Yes, a chance find procedure should be implemented.	
Mitigation » Chance Find Procedure should be implemented for the project should any sites be identified during the construction process.		
Residual If sites are destroyed it will results in the depletion of the heritage sites relating to the cultural landscape of the area. However, if sites are recorded and preserved or mitigated this adds to the record of the area.		

4.5.4 Palaeontology

From a palaeontological perspective, the cumulative impacts are considered to be low as a result of the low significance of fossil heritage present (scarcity of fossil heritage and a lack of appropriate exposure in the study area). Therefore, no unacceptable loss or risks is considered with the development of the project (**Appendix D4**).

<u>Cumulative impacts on palaeontological resources</u>

Impact Nature: Cumulative impacts on fossil remains preserved at or beneath the ground surface. The proposed development includes the Zonnebloem Switching Station (132/22kV) and two loop-in loop-out power lines from the existing

Mafube/Pan Traction power line. Each power line will be 500m in length. The infrastructure associated with the switching station will include a new access road and a communication tower. There are also other similar infrastructure within a 10km radius.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects within the area**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (1)
Significance	Low (16)	Low (8)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	

Mitigation

» The site is underlain by the Vryheid Formation (Ecca Group) and Damwal Formation and Rashoop Granophyryre Suite of the Bushveld. The Vryheid Formation (Ecca Group) has a very high Palaeontological sensitivity while the Damwal Formation and Rashoop Granophyryre Suite of the Bushveld Complex consist of igneous rock which is unfossiliferous and has a very low palaeontological sensitivity. The lack of appropriate exposure at the proposed development footprint (including all two road alternatives) indicates that the impact of the development is of low significance in palaeontological terms and no mitigation measures are necessary.

Residual

Loss of palaeontological heritage.

4.6 NO-GO ALTERNATIVE

The No-go option implies that the Project does not proceed. This means that the status quo of the environment would remain unchanged and no impacts would occur.

However, the implementation of the No-go alternative will also result in a situation where none of the benefits associated with the proposed project and expansion of the mining operations will be realised and the new coal mining point for the Zonnebloem Coal Mine approximately 6km west of the study area, will not be connected to the National Eskom electricity grid. This may lead to the mining operations being constrained and may ultimately not be able to expand. As there are no impacts of high significance associated with the proposed new switching station and all associated infrastructure, the implementation of the project is considered acceptable. The benefits of implementing the project (i.e. from a socio-economic perspective) are expected to outweigh the negative impacts. The no-go alternative is therefore not considered to be preferred.

4.7 COMPARATIVE ASSESSMENT OF ALTERNATIVES

The table below provides a comparative assessment of the alternative access road options in order to provide clarity on which option is preferred within which specialist fields, as assessed in the sections above.

Specialist Study	Alternative A	Alternative B	Conclusion
Ecology	Preferred	Not Preferred unless re-aligned	A small, highly transformed depression wetland located on the the western boundary of the study area will be traversed by Alternative B. The depression wetland is considered to be of medium to high sensitivity Access road Alternative B will have a slight impact on this wetland. The ecologist therefore suggested that either Alternative B be slightly re-aligned to join the existing road some 70m north of this point or to regard Alternative A as the preferred option.
Avifauna	Acceptable	Acceptable	The proposed impacts to avifauna is expected to be similar for both access road alternatives as both are located within similar habitat types characterised by a highly transformed vegetation cover (comprising of predominantly tall weeds and alien plants) providing habitat for a very limited amount of avifaunal species. As such both access routes are suitable and can be considered acceptable from an avifaunal perspective.
Archaeology	Acceptable	Acceptable	From an archaeological perspective the impacts associated with both access road alternatives are considered to be the same and is of low significance. Both alternatives are deemed appropriate and feasible and will not lead to detrimental impacts on the archaeological features of the area.
Palaeontology	Acceptable	Acceptable	From a palaeontological perspective the impacts associated with both access road alternatives are considered to be the same. Both alternatives are deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

From the above, it can be concluded that the preferred access road alignment by all specialist studies undertaken is Alternative A. Access road Alternative A is therefore recommended for implementation unless the applicant re-aligns Alternative B, which in-turn will result in Alternative B being acceptable as well.

4.8 SENSITIVITY ANALYSIS

Through the undertaking of the Basic Assessment and in consultation with the independent specialists, sensitivities were identified to be associated with the development of the new Zonnebloem Switching Station, two LILO power lines and associated infrastructure situated within the study area of 84ha in extent.

The following sensitive areas/environmental features have been identified to be associated with the study area and immediate surroundings:

Ecology:

Four vegetation habitats have been identified that would be affected by the development (refer to **Figure 2.8**).

» Vegetation Unit 1 and 2 are considered to be of a low ecological sensitivity as these units are highly degraded and transformed grassland re-established on historically ploughed land and old woodlot areas. The majority of the development footprint falls within these units.
» Vegetation Unit 3 is considered to be of a medium to high ecological sensitivity and should be regarded as no-go areas. This vegetation unit is mostly associated with the wetland flat and valley-bottom wetland. Disturbances within the wetlands themselves as well as within the catchment has resulted in the significant alteration of the hydrological and morphological character of these wetland areas, subsequently resulting in an alteration/transformation of the species composition of these areas leaving some locations exposed to invasion with alien plants. This vegetation unit is excluded from the development footprint and will not be impacted.
» Vegetation Unit 4 is considered to be of a medium to high ecological sensitivity and should be regarded as no-go areas. This unit comprise two hydrological zones (temporary and seasonal saturated zones) and can be described as a mixture of moisture loving graminoids. One Red Data Species (*Hypoxis hemerocallidea* – Declining) and four MPNCA Protected species (*Eucomis autumnalis, Habenaria galpinii, Gladiolus* spp. and *Aloe ecklonis*) have been recorded within this unit. None of these species occurred within the development footprint and will subsequently not be impacted by the proposed development. Access road Alternative B traverses a depression wetland within this unit.

Avifauna:

The majority of the study area and surrounding surveyed area has been assessed as being of low sensitivity from an avifaunal perspective. The entire footprint area is located within a low sensitive area as a result of historical disturbances (cultivation) which has led to a severely altered and degraded area resulting in some loss of appropriate habitat and foraging area.

» A temporary wetland has been identified on the northern boundary of the study area and is considered to be a medium to low avifaunal sensitivity as these habitats may temporary provide potential preferable habitat for waterfowl and waders (during periods of inundation). No project infrastructure is situated within this sensitivity.
» A valley-bottom wetland and associated seepages have been identified along the eastern section of the study area and are considered to be of a medium to high sensitivity due to its connectivity to downstream wetland and aquatic habitats as well as the fact that this area may provide a corridor of

movement / migration for several bird species. No project infrastructure is situated within this sensitivity.

» A 100m avifaunal buffer has been awarded to the valley-bottom wetland and associated seepages and is applicable for power line infrastructure and communication tower only and is considered to be of a medium to high sensitivity.

Archaeology:

» Four features were recorded during the site survey of which two are of no heritage significance. Feature 3, a dug out hole/reservoir with stone-built walling against the sides, are assumed to be associated with Feature 4 and is therefore considered to be of low sensitivity. Feature 4, which is partially demolished sand stone structures, are not older than 60 years but does form part of the cultural landscape relating to farming practises in the area and are therefore of low heritage sensitivity. Feature 1, remnants of a stone and cement wall, is the only feature to be traversed by the development footprint.

Palaeontology:

» During the field survey of the development footprint (including the two access road alternatives), no fossiliferous outcrops were found. For this reason, a low palaeontological sensitivity is allocated to the development footprint.

Apart from the medium and high sensitivities identified above, the remaining habitat within the study area is considered to be of low sensitivity. Therefore, from an overall environmental sensitivity analysis the location of the development footprint (excluding access road Alternative B) is considered as the most appropriate location for the construction and operation of the project and will not result in detrimental environmental or social impacts.

An environmental sensitivity map was compiled using sensitivity data provided by the independent specialists to illustrate the sensitivities associated with the site, as well as provide a sensitivity rating to the features identified (refer to **Figure 4.1**).

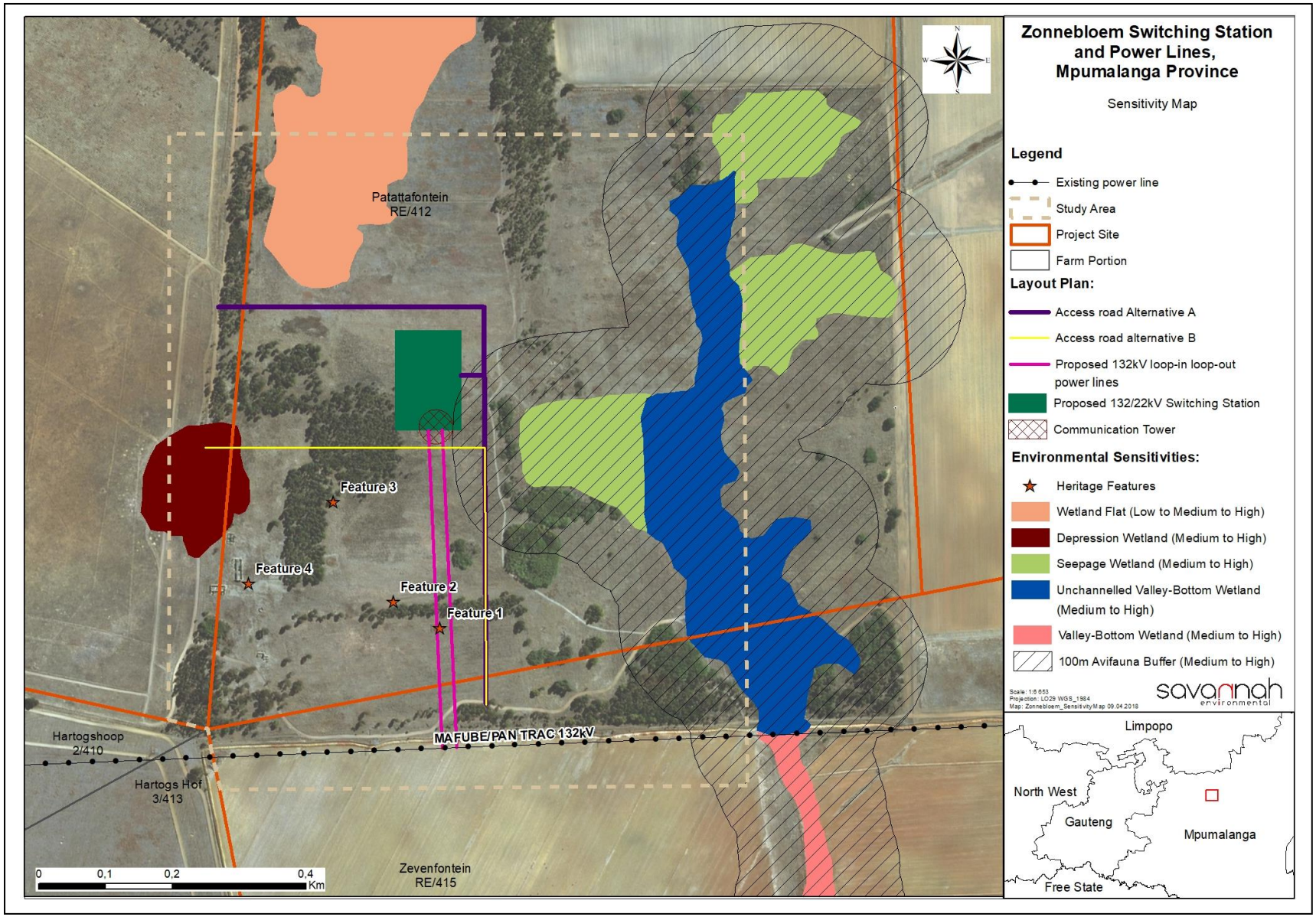

Figure 11: Environmental and sensitivity map of the study area and immediate surrounding area proposed for the development of the project

4.9 ENVIRONMENTAL IMPACT STATEMENT

When considering the above impact assessment undertaken as part of the Basic Assessment Process for the proposed Zonnebloem Switching Station, two LILO power lines and associated infrastructure, the following impact statements regarding the development have been identified.

4.9.1 Ecological Impact Statement

Ecological impacts identified to be associated with the development of the project has a low impact rating, subject to the implementation of the recommended mitigation measures. The impacts relate mainly to the clearance of vegetation as well as disturbance to the area.

The majority of the study area is considered to be of low ecological sensitivity with the exception of the wetland habitat types which is regarded as medium to high sensitive. Most of these Medium-High wetland habitats falls outside of the development footprint and will not be impacted by the development apart from a small depression wetland located in the central portion of the western boundary of the study area. It should be noted that the ecological condition of these azonal habitats varies from severely degraded and transformed (depression wetland, wetland flat and some of the seepages) to mostly disturbed and transformed (valley-bottom wetland and remaining seepages). As a result, there are no ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

Five species of conservation concern were recorded within the study area. However, none of these species occurred within the development footprint and will not be impacted through the proposed development. The identified species are as follows:

- Red Data Species: *Hypoxis hemerocallidea* (Declining);
- Protected according to Schedule 11 of the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (MNCA): *Aloe ecklonis, Eucomis autumnalis, Habenaria galpinii, Gladiolus spp*.

All of these species do not have deep rooting systems and can be successfully removed and relocated to a similar habitat if some species were to be encountered with the development area during the walkthrough. These species may not be disturbed/destroyed or relocated without the necessary permits obtained from the relevant authority (Mpumalanga Tourism and Parks Agency).

From an ecological perspective it was concluded that access road Alternative A is the preferred alternative unless the applicant re-aligns Alternative B, which in-turn will result in Alternative B being acceptable as well.

4.9.2 Avifauna Impact Statement

Avifauna impacts associated with the development of the project relate mainly to disturbance, habitat destruction, electrocution as a result of the switching station and power line infrastructure and the risk of collision. However, the impacts associated with the development have been assessed as being of a low significance, subject to the implementation of the recommended mitigation measures.

This is mainly due to the highly degraded and transformed nature of the study area with a mostly uniform vegetation composition as well as avifaunal composition (low diversity comprising of mostly adaptable species with no recorded Red Data species).

When considering the impacts associated with the two access road alternatives, both alternatives are preferred. The proposed impacts to avifauna is expected to be similar for both access road alternatives as both are located within similar habitat types providing habitat for a very limited amount of avifaunal species.

There are no fatal flaws associate with the study area and the significance of the impact has been identified as being low.

4.9.3 Archaeology Impact Statement

No Stone Age sites, ceramics or stone walls attributed to the Iron Age were recorded. The lack of Stone Age sites can be attributed to the lack of raw material suitable for stone tool manufacture in the study area. No burial sites were recorded within the study area. Four features (built environment) have been recorded within the study area of only one feature (Feature 1) will be impacted on by the current development footprint.

Based on the findings of the Heritage Impact Assessment the study area is considered to be of low archaeological significance. The impact of the development of the project in the study area, with the implementation of the appropriate and recommended and appropriate mitigation measures is considered to be of a low significance. There are no fatal flaws associate with the study area.

When considering the impacts associated with the access road alternatives, both alternatives are considered as the preferred for implementation.

4.9.4 Palaeontology Impact Statement

No fossiliferous outcrops were identified within the study area. The impacts associated with the development of the project relate mainly to the potential impact to palaeontological resources The impact associated with the development has been assessed as being of a low significance, subject to the implementation of the recommended mitigation measures.

From a palaeontological perspective the impacts associated with both access road alternatives are considered to be the same. Both alternatives are deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

4.9.5 Overall Impact Statement

Overall, the impacts associated with the development of the Zonnebloem Switching Station, two LILO power lines and associated infrastructure are considered to be of an acceptable significance and can be mitigated successfully in order to ensure that the development will not create any detrimental environmental impacts that will be long-term and unacceptable.

From the assessment, and through a comparative assessment of the access road alternatives, it is concluded that access road Alternative A is the preferred alternative by all specialist studies undertaken unless the applicant re-aligns Alternative B, which in-turn will result in Alternative B being acceptable as well.

CHAPTER 5: CONCLUSION AND RECOMMENDATION OF PRACTITIONER

5.1 CONCLUSION

The need for this project is based on the requirement to accommodate the expansion of the Zonnebloem coal mine situated approximately 6km east of the study area. The Mpumalanga region as a whole has been earmarked for the development and expansion of various mining developments and operations. The mining industry not only provides numerous employment opportunities, it also provides opportunities for skills development. The development of the Zonnebloem Switching Station, LILO power lines and associated infrastructure will assist with the need in this regard within the area.

From the Impact Statement for the project presented within Chapter 4, it is concluded that the project is suitable from an ecological, avifauna, heritage and palaeontological perspective and will not result in any detrimental impacts on the environment. This is also the preferred technical alternative. Access road Alternative B is considered to be the preferred alternative. .

5.2 PRACTITIONER RECOMMENDATION

It is recommended by the Environmental Assessment Practitioner that the development including the Zonnebloem Switching Station, two LILO power lines and associated infrastructure be authorised, subject to the implementation of the recommended mitigation measures.

The following recommendations are made with regards to mitigating the potential impacts of the proposed project and should be included within the Environmental Authorisation.

Construction Phase:

- Should access road Alternative B be the preferred alternative for the applicant, the road layout should be realigned to avoid the depression wetland situated on the western boundary of the study area.
- A chance find procedure should be implemented should any stone tool scatters, artefacts or bone or fossil remains be identified within the development footprint of the facility
- All relevant practical and reasonable mitigation measures detailed within this report and within the EMPr must be implemented.
- The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed in this report.
- An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.
- All declared alien plants must be identified and managed in accordance with the relevant legislation. The implementation of an on-going monitoring programme in this regard is recommended.
- Care must be taken with the topsoil during and after construction on the site. If required, measures to reduce erosion to be employed, such as keeping the soil covered by straw, mulch, erosion control mats, etc., until a healthy plant cover is again established.
- Rehabilitation of disturbed areas are important. Disturbed areas containing no infrastructure and hard surfaces should be allowed to rehabilitate with natural vegetation as soon as possible to avoid the potential of erosion and invasion with alien plants.

- Erosion control measures must be utilised during construction, operations, decommissioning and rehabilitation of the project. Any erosion problems observed should be rectified immediately and monitored thereafter to ensure that they do not re-occur.
- Contractors must be informed before construction starts on the possible types of heritage sites and cultural material they **may** encounter and the procedures to follow should they find sites.
- The developer should obtain all necessary permits prior to the commencement of construction.

Operation Phase:

The mitigation and management measures previously listed in this Basic Assessment Report should be implemented in order to minimise potential environmental impacts. The following mitigation measures should also be implemented.

- On-going monitoring of the development site to detect and restrict the spread of alien plant species.

Decommissioning Phase:

- All disturbed areas should be rehabilitated with a cover of natural vegetation.
- Regular monitoring (bi-annual) for alien plants within the development footprint for 2-3 years after decommissioning.
- Strict control must be maintained over all activities during decommissioning, in line with an approved construction EMPr.