

**ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED  
RIETKLOOF WIND FARM (PTY) LTD – 132KV DISTRIBUTION LINE,  
WESTERN CAPE AND NORTHERN CAPE PROVINCES,  
SOUTH AFRICA**

**VERSION 4 - STATUS: FINAL**

**ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)**

Prepared for:



**Rietkloof Wind Farm (Pty) Ltd**

5th Floor,  
125 Buitengracht Street,  
8001  
Cape Town

Prepared by:



**EOH Coastal & Environmental Services**

The Point, Suite 408, 4th Floor,  
76 Regent Road, Sea Point,  
8005.

Cape Town  
(021) 045 0900

*Also in East London, Port Elizabeth, Cape Town,  
Johannesburg and Maputo (Mozambique)*

[www.cesnet.co.za](http://www.cesnet.co.za)

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<b>Authors</b>	
<b>Name</b>	<b>Responsibility</b>
Gideon Raath	Author
Mr Marc Hardy	Reviewer

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## LIST OF ACRONYMS/ABBREVIATIONS

BA	Basic Assessment
CAA	Civil Aviation Authorities
CITES	Convention of International Trade in Endangered Species
CLO	Community Liaison Officer
CSF	Co-ordinating Social Facilitator
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DENC	Department of Environment and Nature Conservation (Northern Cape)
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme report (this report)
EMS	Environmental Management Systems
ER	Engineers Representative
ESO	Environmental Site Officer
GWH	Giga-Watt Hours
HWC	Heritage Western Cape
I&AP	Interested and Affected Party
IEC	Independent Environmental Consultant
IEM	Integrated Environmental Management
IPP	Integrated Power Producers
KPI	Key Performance Indicator
MW	Mega-Watt
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
OHSA	Occupational Health and Safety Act
PC	Principal Contractor
PSC	Project Steering Committee
S&EIR	Scoping and Environmental impact assessment process
SAHRA	South African Heritage Resource Agency
SWMP	Storm Water Management Plan
WEF	Wind Energy Facility

## DEFINITIONS

The definitions contained within this document are for explanatory purposes only. In the event that any conflict occurs between the definitions herein and those contained within the final Contract, those within the Contract shall prevail.

**Alien Vegetation:** Alien vegetation is defined as undesirable plant growth which shall include, but not be limited to all declared category 1 and 2 listed invader species as set out in the Conservation of Agricultural Resources Act (CARA) and the National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations, 2014 (GNR 598). Other vegetation deemed to be alien shall be those plant species that show the potential to occupy in number, any area within the defined construction area and which are declared to be undesirable.

**Construction Camp:** Construction camp (site camps) refers to all storage and stockpile sites, site offices, container sites, workshops and testing facilities, and other areas required for undertaking construction activities.

**Electrical infrastructure:** For the purpose of this EMPr, this refers to the 33/132kV onsite substation and the overhead 132kV distribution line, associated 31m servitude and service roads.

**Environmental Site Officer (ESO):** An ESO is the site-based designated person responsible for implementing the environmental provisions of the construction contract and is appointed by the service provider that carries-out construction activities. The ESO shall be the designated responsible person, for implementing any remedial measures as required from time to time and for any authorisations/licences that are required in terms of the service contract. The ESO shall record and communicate environmental issues (as they occur) to the contractor and maintain records thereof. The ESO shall report concurrently to the contractor and the Environmental Control Officer (ECO).

**Environmental Control Officer (ECO):** A suitably qualified and experienced person or entity appointed for the construction works, to perform the obligations specified in the EA. The ECO's duties shall include (*inter alia*):

- Confirming that all required EAs and permits, where necessary, have been obtained from the relevant authority(ies);
- Monitoring all activities relating to the project, on a daily basis (or as agreed), for compliance with the provisions of the EA, environmental legislation and recommendations of the EMPr; and
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project.

**Environment:** Environment means the surroundings within which humans exist and that could be made up of:-

- The land, water and atmosphere of the earth;
- Micro-organisms, plant and animal life;
- Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

**Environmental Aspect:** An environmental aspect is any component of a contractor's construction activity that is likely to interact with the environment.

**Environmental Authorisation (EA) (formerly known as, Record of Decision):** A written statement from the relevant environmental authority, with or without conditions, that records its approval of a planned undertaking to build or upgrade a section of road and the mitigating

measures required to prevent or reduce the effects of environmental impacts during the life of a contract.

**Environmental Impact:** An impact or environmental impact is the change to the environment, whether desirable or undesirable, that will result from the effect of a construction activity. An impact may be the direct or indirect consequence of a construction activity.

**Environmental Impact Assessment:** The process of examining the environmental effects of a development. The assessment requires detailed/specialist studies of significant issues that have been identified during the environmental scoping.

**Environmental Management Programme:** An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

**Environmental Management System:** The internationally accepted and recognized environmental management system (EMS) which enables companies, organizations and operations to systematically manage, prevent and reduce environmental problems and associated costs. In terms of ISO 14001 and EMS is defined as, "*that part of the overall management system includes organizational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, reviewing and maintaining the environmental policy.*"

**Environmental Policy:** A statement by the organisation of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets.

**External Auditor:** A suitably qualified and experienced independent expert as per the required auditor qualifications.

**Independent Environmental Consultant:** A suitably qualified and experienced independent environmental consultant (IEC) appointed by the Engineer to perform the obligations specified in the Contract. The IEC shall provide reports to the regulatory authority, the Engineer and any other parties as specified by the regulatory authority.

**Interested and Affected Party (I&AP):** Refers to an I&AP party contemplated in section 24(4)(d) of the NEMA (1998, Act No. 107) and which, in terms of that section, includes –

- a) *Any person, groups of persons, organisation interested in or affected by an activity, and;*
- b) *Any organ of state that may have jurisdiction over any aspect of the activity.*

**Liaison Committee:** A liaison committee consisting of a representative from Rietkloof Wind Farm (Pty) Ltd, the Contractor, the Project Manager, and any other role-player deemed necessary by the members of the committee (the 'Liaison Committee') to review the progress of the contract in implementing and complying with its obligations in terms of this EMPr.

**Method Statement:** A written submission by the contractor in response to the specification or a request by the Project Manager, setting-out the plant, materials, labour and method the contractor proposes using to carry-out an activity, identified by the relevant specification or the IEC when requesting the method statement, in such detail that the IEC is enabled to assess whether the contractor's proposal is in accordance with the EMPr and associated specifications.

**Mitigate:** The implementation of practical measures to reduce the adverse impacts, or to enhance beneficial impacts of a particular action.

**Ngwao Boswa Kapa Bokone:** The Northern Cape Heritage Authority, to which regional and

provincial heritage applications and development notices are to be issued.

**No-Go Area:** Areas where construction activities are prohibited.

**Open Space:** For the purposes of this Management Plan, Open Space areas include all areas impacted by construction activities including all approved buffers.

**Pollution:** According to the NEMA (Act No. 107 of 1998), pollution can be defined as, “*Any change in the environment caused by (i) substances; (ii) radioactive or other waves; or (iii) noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future*”.

**Rehabilitation:** To re-establish or restore to a healthy, sustainable capacity or state.

**Site:** The area in which construction is taking place.

**Species of Special/Conservation Concern (SSC or SCC):** Those species listed in the rare, indeterminate, or monitoring categories of the South African Red Data Books, and/or species listed in globally near threatened, nationally threatened or nationally near threatened categories (Barnes, 1998).

**Threatened species:** Threatened species are defined as: a) species listed in the endangered or vulnerable categories in the revised South African Red Data Books or listed in the globally threatened category; b) species of special conservation concern (i.e. taxa described since the relevant South African Red Data Books, or whose conservation status has been highlighted subsequent to 1984); c) species which are included in other international lists; or d) species included in Appendix 1 or 2 of the Convention of International Trade in Endangered Species (CITES).

**Topsoil:** The top 100mm of soil and may include top material e.g. vegetation and leaf litter.

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# 1 INTRODUCTION

Rietkloof Wind Farm (Pty) Ltd propose to develop electrical infrastructure in the form of a single 132 kilovolt (kV), above-ground electrical power line (distribution line). This line will be required to evacuate up to 140 megawatt (MW) of energy (via a 33/132kV on-site substation) from the proposed Rietkloof Wind Energy Facility (WEF), located near Laingsburg in the Western Cape Province of South Africa (see Figure 1-1 and Table 1-1 for the project location).

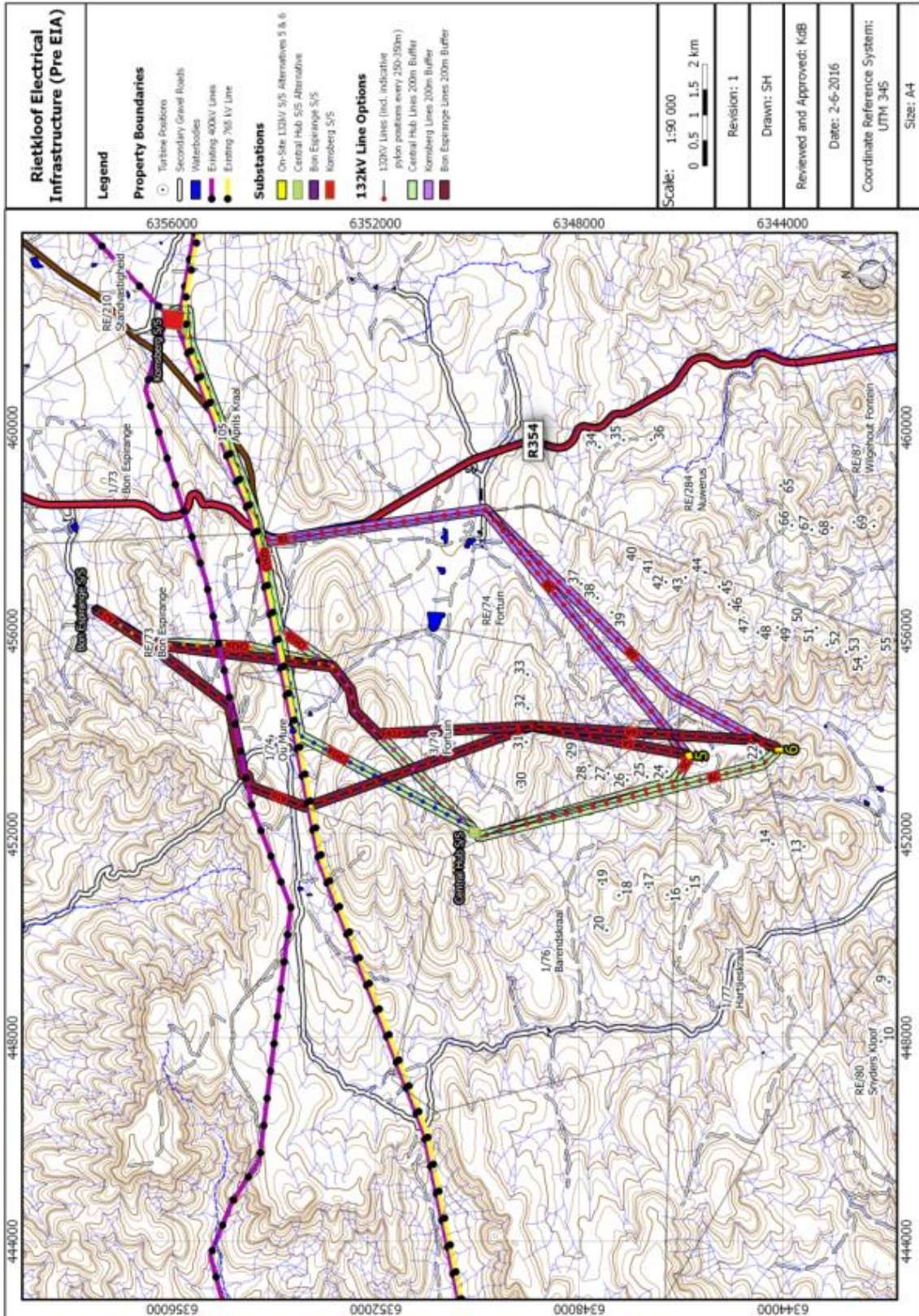


Figure 1-1: Final locality map, indicating the different property portions relevant to this project

**Table 1-1: Project property portions.**

Portion and Farm	Name	Farm	Surveyor ID
RE/210	Standvastigheid Familie Trust	Standvastigheid	C07200000000021000000
2/210	Eskom SOC Limited	Standvastigheid	C07200000000021000002
1/73	Douglas & Esme Caldo	Bon Espirange	C04300000000007300001
RE/74	A D V Le Roux Family Trust c/o Andries Le Roux	Fortuin	C04300000000007400000
3/74	A D V Le Roux Family Trust c/o Andries Le Roux	Fortuin	C04300000000007400003
1/75	A D V Le Roux Family Trust c/o Andries Le Roux	Brandvalley	C04300000000007500001
1/76	Mooi Nooientjies Trust c/o Christo Matthee	Barendskraal	C04300000000007600001
1/77	Du Toit Thiersen (Pty) Ltd c/o Johan du Toit	Hartjieskraal	C04300000000007700001
RE/77	Ernest Marais	Hartjieskraal	C04300000000007700000
105	Douglas & Esme Caldo	Aprils Kraal	C04300000000010500000
RE/73	Piet Conradie	Bon Espirange	C04300000000007300000
1/74	Ou Mure Boerdery c/o Polla van der Westhuizen	Ou Mure	C04300000000007400001
1/76	Mooi Nooientjies Trust c/o Christo Matthee	Barendskraal	C04300000000007600001
RE/284	ZB Loots Familie Trust / Ziegfriedt Loots	Nuwerus	C04300000000028400000

This Environmental Management Programme (EMPr) is a set of requirements to manage environmental impacts anticipated during the planning, construction, operation and decommissioning phases. This EMPr was compiled as part of an Environmental Impact Assessment (EIA) process undertaken in terms of the 2014 EIA Regulations of the National Environmental Management Act (Act 107 of 1998) (as amended) (NEMA) for the Rietkloof 132kV electrical infrastructure.

The structure of the EMPr is as follows:

- **Chapter 1:** Provides an introduction to the EMPr, an overview of the EMPr objectives, the legal requirements and the scope and content of the EMPr t;
- **Chapter 2:** Provides a breakdown of the Environmental Impact Assessment team;
- **Chapter 3:** This Chapter outlines the project description, including the site location;
- **Chapter 4:** Detailed environmental impact and sensitivities (including specialist assessments) for the Rietkloof WEF powerline site;
- **Chapter 5:** Details of the scope of the EMPr based on the four relevant phases of the development (namely, design and planning, construction, operation and decommissioning);
- **Chapter 6:** Details the Roles and Responsibilities of the relevant parties involved in the development, implementation and management of the EMPr;
- **Chapter 7:** Details the requirements and methods of reporting during the implementation and monitoring of the EMPr;
- **Chapter 8:** Details the general and avifaunal monitoring required during the construction and operational phases of the powerline;
- **Chapter 9:** Provides an outline of the environmental awareness process, including the monitoring thereof;
- **Chapter 10:** Outlines the compliance procedures of the EMPr;
- **Chapter 11:** Details the list of mitigation and management requirements for the four phases

- of the project lifecycle
- Chapter 12: Outlines the specific Management Plans which form part of the EMPr
- Chapter 13: Outlines the Closure Planning procedure;
- Chapter 14: Outlines the Grievance procedures relevant to the EMPr;
- Chapter 15: Summarises the concluding statements relevant to the EMPr at the time of publication (Draft, version 2); and
- Chapter 16: Contains a list of Appendices.

It is important to note that the EMPr is a dynamic document and will be amended throughout the life-cycle of the project.

## 1.1 Objectives of an EMPr

The Environmental Management Programme EMPr has been compiled to provide recommendations and guidelines according to which compliance monitoring must be conducted during the design, construction, operational and rehabilitation phases of the project, as well as to ensure that all relevant factors are considered to ensure for environmentally responsible development. The EMPr is specific to the proposed 33/132kV onsite substation, 132kV overhead distribution line and grid connection for the proposed 140 megawatt (MW) Rietkloof Wind Farm, proposed by Rietkloof Wind Farm (Pty) Ltd.

This EMPr informs all relevant parties [the Holder of the EA, the Contractor, the Environmental Control Officer (ECO) and all other staff, contractors and consultants employed by Rietkloof Wind Farm (Pty) Ltd responsible for the implementation of the power line at the site] as to their duties in the fulfilment of the legal requirements for the design, construction, operation and rehabilitation of the Rietkloof Wind Farm (Pty) Ltd 132kV electrical infrastructure project, with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

All parties should note that obligations imposed by the EMPr are legally binding in terms of the environmental authorisation (EA), granted by the relevant environmental permitting authority. The objectives of an EMPr are to:

- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and/or international;
- Ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts;
- Verify environmental performance through information on impacts as they occur;
- Respond to unforeseen events;
- Provide feedback for continual improvement in environmental performance;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- Detail specific actions deemed necessary to assist in mitigating the environmental or social impact of the project;
- Identify measures that could optimize beneficial impacts;
- Create management structures that addresses the concerns and complaints of Interested and Affected Parties (I&APs) with regards to the development;
- Establish a method of monitoring and auditing environmental management practices during all phases of the activity;
- Ensure that safety recommendations are complied with;
- Specify time periods within which the measures contemplated in the final environmental management programme must be implemented, where appropriate.

## 1.2 Form and function of an EMPr

An EMPr focuses on sound environmental management practices, which will be undertaken to minimise adverse impacts on the environment through the lifetime of a development. In addition,



an EMPr identifies what measures will be in place or will be implemented to manage any incidents and emergencies that may occur during operation of the facility. As such the EMPr provides specifications that must be adhered to, in order to minimise adverse environmental impacts associated with the operations of the facility.

The content of the EMPr is consistent with the requirements as set out in Regulation 23 and Appendix 4 of the 2014 EIA Regulations stated in Table 1-2 below.

### 1.3 Legal requirements

Construction must be undertaken according to the best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the contractor as to his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction, operation and decommissioning activities associated with the project. The Contractor should note that obligations imposed by the approved EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project. In the event that any rights and obligations contained in this document contradict those specified in the standard or project specifications then the latter shall prevail.

The contractor must identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the design, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:-

- The Constitution of the Republic of South Africa Act 108 of 1996;
- Environment Conservation Act 73 of 1989;
- National Environmental Management Act 107 of 1998;
- National Environmental Management: Protected Areas Act 57 of 2003;
- National Environmental Management: Biodiversity Act 10 of 2004;
- National Forests Act 43 of 1983;
- National Water Act 36 of 1998;
- Conservation of Agricultural Resources Act 43 of 1983;
- National Veld and Forest Fire Act 101 of 1998;
- Hazardous Substances Act 15 of 1973;
- National Heritage Resources Act 25 of 1999;
- Atmospheric Pollution Prevention Act 45 of 1965;
- National Environmental Management: Air Quality Act 39 of 2004;
- National Environmental Management: Waste Management Act 59 of 2008;
- Mineral and Petroleum Resources Development Act 28 of 2002;
- Health Act 63 of 1977;
- Electrical Machinery Regulations, 2011 (OHSA 1993);
- Fertilisers, farm feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947) – herbicide use;
- Occupational Health and Safety Act 85 of 1993;
- White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity; and
- All relevant provincial legislation, Municipal by-laws and ordinances.

The permitting applicable to this project is indicated in Table 1-3 of this report.

The contractor shall establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes.

The contents of the Environmental Management Programme report (EMPr) are consistent with the

requirements as set out in Appendix 4 of the EIA Regulations published as Government Notice No R. 982 in Government Gazette No 38282 of 4 December 2014 in terms of Chapter 5 of the National Environmental Management Act No 107 of 1998 (NEMA). Table 1-2 provides a list of this information and where in the report it can be found.

**Table 1-2: Legislative requirements and location in document.**

Requirement	EMPr Reference
<b>EMP REQUIREMENTS IN TERMS OF APPENDIX 4 OF EIA REGULATIONS</b>	
(a) details of— (i) the EAP who prepared the EMPr; and (ii) the expertise of the EAP to prepare an EMPr	Section 2.1 and 2.2
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Chapter 3
(c) a description of the impact management objectives, including management statements, identifying the impacts that need to be avoided, managed and/or mitigated as identified through the environmental impact assessment process for all phases of the development including— (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iii) where relevant operation activities; and (iv) rehabilitation of the environment after construction and where applicable post closure;	Chapter 11
(d) a description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph (c);	Chapter 11
(e) a description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved, and may include actions to — (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; (iii) comply with any prescribed environmental management standards or practices; (iv) comply with any applicable provisions of the Act regarding closure, where applicable; (v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	Chapter 11
(f) the method of monitoring the implementation of the impact management actions contemplated in paragraph (e);	Chapter 11
(g) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (e);	Chapter 11
(h) an indication of the persons who will be responsible for the implementation of the impact management actions;	Chapter 11
(i) the time periods within which the impact management actions contemplated in paragraph (e) must be implemented;	Chapter 11
(j) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (e);	Chapter 11
(k) a program for reporting on compliance, taking into account the requirements as prescribed by these Regulations; and	Chapter 7
(l) an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.	Chapter 9

#### 1.4 Permits required

The following permits (Table 1-3) have been identified as being required prior to construction commencing. It is the Holder of the Environmental Authorisation's (assuming a positive decision is reached on this Basic Assessment application) responsibility to obtain the appropriate permits.

**Table 1-3: Permitting required for this electrical infrastructure.**

Relevant legislation	Compliance requirement	Timeframe
National Environmental Management Act (107 of 1998) (NEMA) AND Environmental Impact Assessment (EIA) Regulations, 2014	Application for authorisation	An EA must be obtained prior to commencing with listed activities. The final BA documentation, including this EMPr, must be submitted by the EAP to the DEA.
The National Environment Management: Biodiversity Act (10 of 2004)	If the specialist ecology assessment (during the final site walkthrough) identifies protected or endangered flora species on site that will be removed or damaged due to project related activities, the Holder of the EA will need to apply for the necessary permit(s) in terms of this Act;	Permit applications must be submitted by the Holder of the EA to Cape Nature during the planning phase.
Nature and Environmental Conservation Ordinance 1974	If the specialist ecology assessment (during the final site walkthrough) identifies protected and endangered flora species within the Western Cape that will be pluck due to project related activities, the Holder of the EA will need to apply for the necessary permit(s) in terms of this Act;	Permit applications must be submitted by the Holder of the EA to Cape Nature prior to the planning phase.
NEM: BA Northern Cape Conservation Ordinance	A permit may be required in the event that a listed plant species onsite will need to be removed, disturbed or destroyed within the Northern Cape. This will be informed by the final site walk through by the ecologist.	Permit applications must be submitted to the DENC (in the Northern Cape) during the planning phase.
National Water Act (36 of 1998)	The distribution line and its associated service roads may alter the bed, banks, course or characteristics of a watercourse or impede the flow of a watercourse. In terms of Section 21 c and i, applications for these activities must be submitted to the relevant Catchment Management Agency in order to obtain a General Authorisation or Water Use Licence.	Permit to be obtained prior to the commencement of the construction phase.
National Forests Act (84 of 1998)	The ecological specialist has confirmed that there are no trees that will be impacted by the proposed layout. However, should any protected trees (in terms of this Act) occur on site and need to be removed, the Holder of the EA will require a permit from the Department of Agriculture, Forestry and Fisheries (DAFF) in order to perform any of the above-listed activities	Permit applications must be submitted by the Holder of the EA to Cape Nature during the planning phase.
Subdivision of Agricultural Land Act (No. 70 of 1970)	Long-term lease agreements (over 10 years) on portion/s of agricultural land require the consent from the Minister of Agriculture, Forestry and Fisheries before they can be registered. Some of the leases for the project may be on agricultural land and will require consent from DAFF.	Prior to construction commencing, for submission to DAFF by the Holder of the EA.
Mineral and Petroleum Resources Development Act (107 of 2002) (MPRDA)	No borrow pits or mining activities will be required.	N/A
National Heritage Resources Act (25 of 1999)	The project will be registered with South African Heritage Resource Agency (SAHRA) and Heritage Western Cape (HWC). A phase I heritage assessment has been undertaken to determine if heritage features occur on site and what level impact assessment (if any) maybe required (see Chapter 4). In the event that archaeological or historically significant sites would be destroyed, damaged, excavated, altered or defaced by the proposed project activity the relevant permit will need to be granted before the project can continue. A Notice of Intent to Develop (NID) will be submitted to Heritage Western Cape (HWC) and SAHRA.	Registration: Prior to construction commencing  If applicable, applications must be submitted the Heritage Western Cape.
National Road Traffic Act (No. 93 of 1996)	All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed power line.	For all project phases, to be managed by the Holder of the EA.
Civil Aviation Act (Act No. 13	Due to requirements of the Act to ensure the	Prior to construction



of 2009): 13th Amendment of the Civil Aviation Regulations (2011)	safety of aircrafts, and as power lines, overhead wires and cables are considered as flight obstacles, the developer must engage directly with the Civil Aviation Authority (CAA) regarding the structural details of the facility.	commencing, to be managed by the Holder of the EA and submitted to the CAA.
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### 1.5 Environmental authorisation

In accordance with the requirements of the National Environmental Management Act (Act No 107 of 1998) (NEMA), and relevant EIA regulations made in terms of this Act as promulgated in December, 2014 (Government Notice R 982), and listed activities under (Government Notice R 983, 984, 985), the proposed Rietkloof Wind Farm (Pty) Ltd distribution line project was subjected to a Basic Assessment Process.

In terms of the Basic Assessment (BA) process, all reports generated from the environmental studies form part of a series of documents for the project. The Basic Assessment Report (BAR) identified potentially significant environmental impacts and was the main report in the series. Additional Specialist Assessments served to supplement the assessment contained in the BAR.

This Environmental Management Programme (EMPr) interprets the findings of the BAR, and prescribes project-specific specifications to be achieved. In addition to the requirements of GNR 982, this EMPr is based on the principles of Integrated Environmental Management (IEM).

The BA documents will be submitted to the National Department of Environmental Affairs (DEA) for decision-making. Should the project be accepted, the DEA will issue an Environmental Authorisation.

As the EMPr is a progressive working document, it will be updated based on the relevant conditions stipulated in the Environmental Authorisation (should a positive decision be issued). Once the layout is optimised, the final layout will be submitted to DEA for approval.

## 2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT TEAM

**According to regulation 982, National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014, Appendix 4, an environmental management programme must include:**

Details of –

The person who prepared the environmental management programme; and

The expertise of that EAP to prepare an EMPr, including a curriculum vitae;

### 2.1 Environmental Consulting Company and Project Team

EOH Coastal & Environmental Services

The Point, Suite 408, 4th Floor,

76 Regent Road, Sea Point, 8005.

Cape Town,

Western Cape,

South Africa

Tel: (021) 045 0900

Email: [cesct@cesnet.co.za](mailto:cesct@cesnet.co.za)

The following environmental assessment practitioners (EAP) prepared this EMPr:

- Mr Marc Hardy
- Mr Gideon Raath

Coastal & Environmental Services (EOH CES) was commissioned by the applicant, G7 Renewable Energy (Pty) Ltd., to prepare an Environmental Management Programme (EMPr) that seeks to comply with the EIA regulations. In fulfilment of this requirement, provided below (Table 2-1) are the details of EAP:

**Table 2-1: Details of the EAP.**

<b>EAP</b>	Marc Hardy
<b>Company</b>	Coastal and Environmental Services, trading as EOH Coastal & Environmental Services (EOH CES), Cape Town branch.
<b>Physical Address</b>	The Point, Suite 408, 4th Floor, 76 Regent Road Sea Point, Cape Town, 8001
<b>Postal Address</b>	Same as above
<b>Telephone</b>	+27 21 045 0900
<b>Fax</b>	046 622 6564
	<a href="http://www.cesnet.co.za">www.cesnet.co.za</a>
<b>Email</b>	<a href="mailto:m.hardy@cesnet.co.za">m.hardy@cesnet.co.za</a> ; <a href="mailto:g.raath@cesnet.co.za">g.raath@cesnet.co.za</a>

Coastal & Environmental Services (EOH CES), established in 1990, is a specialist environmental consulting company based in South Africa with offices in Port Elizabeth, Grahamstown, East London, Cape Town, Maputo and Johannesburg. We believe that a balance between development and environmental protection can be achieved by skilful, considerate and careful planning. EOH CES has considerable experience in terrestrial, marine and freshwater ecology, the Social Impact Assessment (SIA) process, and state of environment reporting (SOER), Integrated Waste Management Plans (IWMP), Spatial Development Frameworks (SDF), public participation, as well as the management and co-ordination of all aspects of the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) processes. EOH CES has been active in all of the above fields, and in so doing have made a positive contribution to towards environmental management and sustainable development in South Africa and many other African countries.

### 2.2 Expertise of the EAP

Please find attached in Appendix A, the CV's of all project team members.

### 2.2.1 *Dr Ted Avis Pr.Sci.Nat (Study Leader)*

Ted Avis is a leading expert in the field of Environmental Impact Assessments, having project-managed numerous large-scale ESIA's to international standards (e.g. International Finance Corporation). Ted was principle consultant to Corridor Sands Limitada for the development of all environment aspects for the US\$1billion Corridor Sands Project. He has managed ESIA studies and related environmental assessments of similar scope in Kenya, Madagascar, Egypt, Malawi, Zambia and South Africa. Ted has worked across Africa, and also has experience in large scale Strategic Environmental Assessments in southern Africa, and has been engaged by the International Finance Corporation (IFC) on a number of projects. He has delivered papers and published in the field of EIA, Strategic Environmental Assessment and Integrated Coastal Zone Management and has been a principal of EOH CES since its inception in 1990, and Managing Director since 1998. Ted holds a PhD in Botany, and was awarded a bronze medal by the South African Association of Botanists for the best PhD adjudicated in that year, entitled "Coastal Dune Ecology and Management in the Eastern Cape". Ted is a Certified Environmental Assessment Practitioner (since 2002) and a professional member of the South African Council for Natural Scientific Professionals (since 1993).

### 2.2.2 *Mr Marc Hardy (EAP)*

Marc holds a M. Phil in Environmental Management from the Stellenbosch University of School of Public Management and Planning. His professional interests include environmental impact reporting for linear, energy and large infrastructure projects, strategic environmental policy development and reporting, due diligence studies, compliance monitoring and environmental auditing. Marc is currently tasked with managing various large infrastructure, mining and renewable energy projects throughout Africa.

### 2.2.3 *Mr Gideon Raath (Report Production)*

Environmental Consultant, holds an MSc (Geography and Environmental Management; SU), a BSc Honours (Ecology and Environmental Studies - Cum laude; Wits) and a BSc (Geography and Environmental Management; UJ). His MSc thesis focussed on the hydrological impact on the spatial distribution of invasive Eucalyptus trees along the Breede River, while his honours thesis evaluated ethnobotanical relationships around the Rio Tinto copper mine in Phalaborwa. Most recently he has worked as the Monitoring & Evaluation Project Manager for the City of Cape Town's invasive species unit. Gideon's consulting expertise includes project management, EIA and EMPr documentation development, integrated water use licence applications, specialist botanical impact assessments, specialist wetland delineation and impact assessments, as well as GIS applications and mapping. Gideon works from the Cape Town office, and is interested in invasion ecology, treatment of groundwater pollution through phytoremediation, botanical and wetland specialist studies, GIS application to ecology and environmental management, and EIA processes in general.

## 2.3 Specialists

The following specialists were included for this project (Table 2-2):

**Table 2-2: Specialists and specialist studies conducted to form part of this EMPr.**

Specialist field	Specialist	
Archaeological Impact Assessment	Ms Celeste Booth	Booth Heritage Consulting (Pty) Ltd
Avifaunal Impact Assessment	Dr Tony Williams	African Insights
Ecological Impact Assessment	Mr Simon Todd	Independent Ecological Consultant
Social Impact Assessment	Mr Tony Barbour	Independent Consultant
Traffic Impact Assessment	Mr Hermanus Steyn	Aurecon South Africa (Pty) Ltd

### 3 PROPOSED PROJECT DESCRIPTION

According to Appendix 4 of GNR 982, an environmental management programme must include:

- (b) detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.

#### 3.1 Description of proposed activity

The current EMPr relates to the following project:

##### 3.1.1 Background

Rietkloof Wind Farm (Pty) Ltd, a subsidiary of G7 Renewable Energies (Pty) Ltd, propose to develop electrical infrastructure in the form of a single 132 kilovolt (kV), above-ground electrical power line (distribution line). This line will be required to evacuate up to 147 megawatt (MW) of energy from the proposed Rietkloof Wind Energy Facility (WEF), located near Laingsburg in the Western Cape Province of South Africa. This energy will ultimately be distributed to the national grid, through connections with an external Eskom substation. Rietkloof WEF is being developed in parallel to a second 140MW WEF (Brandvalley WEF)<sup>1</sup>, proposed by Brandvalley Wind Farm (Pty) Ltd, another subsidiary of G7.

While the two projects are related, only the electrical distribution line is the focus of this EMPr (i.e. this document only concerns the power line and not the wind farm). The Rietkloof WEF has not yet been authorised, and is currently in the EIR phase under a separate and distinct EIA application (DEA Ref Number: 14/12/16/3/3/2/899), which is entirely unrelated to this EMPr (for administrative purposes).

##### 3.1.2 Project description

A generalised depiction of the infrastructure associated with this application is shown in Figure 3-1 below. The project entails connection from an on-site substation (A), evacuation via a 132kV overhead line (B), and the ultimate connection with an Eskom substation (C).

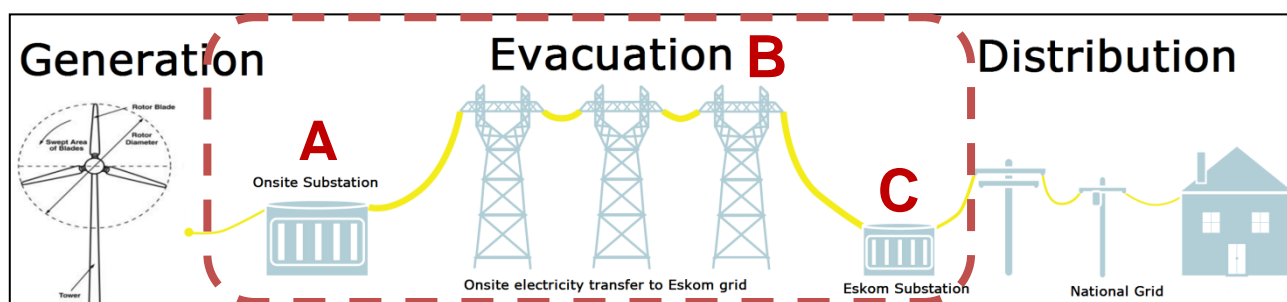


Figure 3-1: Typical WEF electricity evacuation process. The red dotted square indicates the components relevant to this document.

**A. One 33/132Kv Substation (A)** including the internal components such as transformers, isolators, cabling and light mast, as required by Eskom. This 33/132kV on-site substation will have a footprint of up to 200m x 200m that that will be inclusive of site offices, storage areas, ablution facilities and the maintenance building. While there are a few alternative locations proposed for this substation, only one will be constructed for this project. This substation will be the interface between the different connections from the wind turbines (from the WEF mentioned above), by receiving all the 33kV connection cables and powerlines from the

<sup>1</sup> DEA reference number: 14/12/16/3/3/2/900

individual turbines, from where one 132kV line will evacuate the power to an external substation owned by Eskom. The on-site substation is denoted with a large, red “A” on Figure 3-1 above.

**B. 132kV overhead distribution line (B)** to connect the onsite 33/132kV substation mentioned above, to the national grid. The pylons for this line will have an average spacing between 250m and 300m, and will consist of a mixture of self-supporting monopoles, guyed monopoles as well as lattice structures. The maximum height will be up to 32m, regardless of the design type used. The servitude will be up to 31m wide. A 200m wide corridor will be applied for to allow for micro-sitting. This distribution line is denoted with a large, red “B” on Figure 3-1 above.

**C. Connection to the national grid (C)** in order to connect to the Rietkloof Wind Farm (as mentioned above, the Rietkloof Wind Farm has not been authorised yet). Three (3) alternatives for grid connection have been assessed as part of this report and the preferred alternative were informed by environmental and technical considerations and Eskoms preference:

1. Connection to the existing Komsberg Substation currently proposed to be upgraded with a 132/400kV transformer. This substation is located approximately 12km from the project site and is owned and managed by Eskom; or
2. Connection to the Bon Espirange satellite 132kV substation located approximately 7km from the project boundary. The Bon Espirange satellite substation has not yet been built, but is planned by Eskom and other IPPs, as an alternative to connecting all the wind farms west of Komsberg Substation, directly to the Eskom Komsberg Substation. The central idea to this Substation is the location, whereby WEFs to the West and North of the project region may also connect to the national grid, and thus reduce the infrastructure required to service each project. The Bon Espirange Substation will be managed by Eskom.
3. Construction of a central switching station (up to 200m x 200m) to be shared by both Brandvalley and Rietkloof WEFs (if both are awarded preferred bidder status). For the purposes of this application, this substation is referred to as the “Central Hub Substation”. The construction of this Substation depends on a few factors:
  - The environmental sensitivities of the location;
  - The cost of the construction;
  - The capacity of the Komsberg or Bon Espirange Substations to couple and successfully take off the combined power generated by the Brandvalley and Rietkloof WEFs (i.e. if the receiving Substation has the capacity to connect and receive such power);
  - Whether Eskom approve the connection (this will largely be based on the capacity available as well).

If the Central Hub Substation is ultimately approved for connection by Eskom, each project will construct their own 33/132kV substation on-site, and connect to the Central Hub Substation from there. From the Central Hub Substation an additional, single 132kV line for both projects will then be constructed to lead to either the Komsberg or the Bon Espirange Substation, and ultimately the national grid. This option is denoted with a large, red “C” in the above Figure 3-1.

### 3.2 Site Location

The proposed project is located within the same property and adjacent to the proposed Rietkloof WEF (DEA Reference Number: 14/12/16/3/3/2/899), roughly 15km along the R354 heading north towards Sutherland. The properties included in this are provided in Figure 3-2 and 3-3 below.

The majority of the project footprint lies within the Western Cape Province. The project is located within Ward 1 of the Laingsburg Local Municipality seated within the Central Karoo District Municipality (located in the Western Cape).

The properties East of Komsberg Substation fall within the Northern Cape Province. These properties are located within Ward 3 of the Karoo Hoogland Local Municipality seated within the Namakwa District Municipality (located in the Northern Cape).



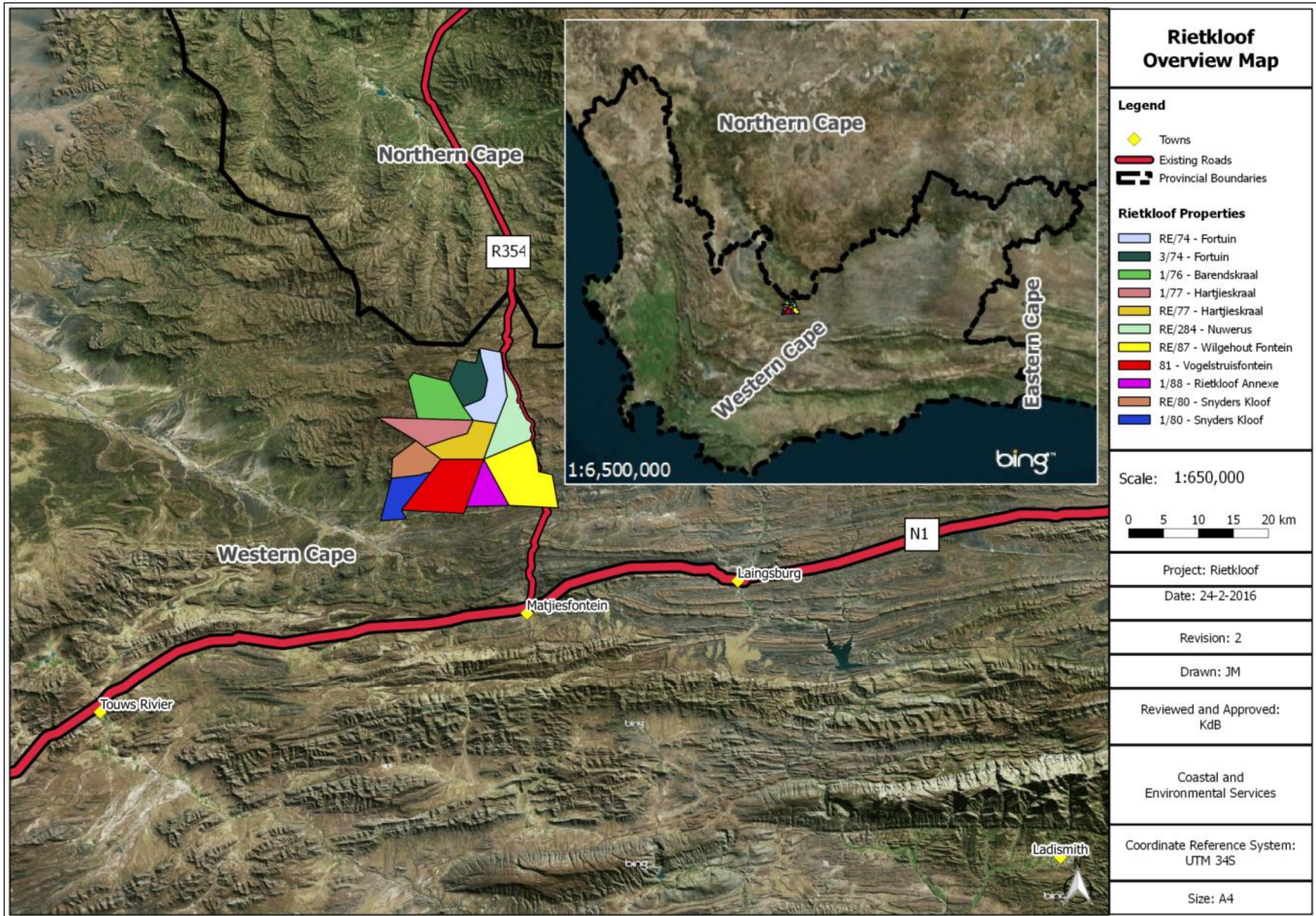


Figure 3-2: Project locality map, indicating the general location of the project study area.



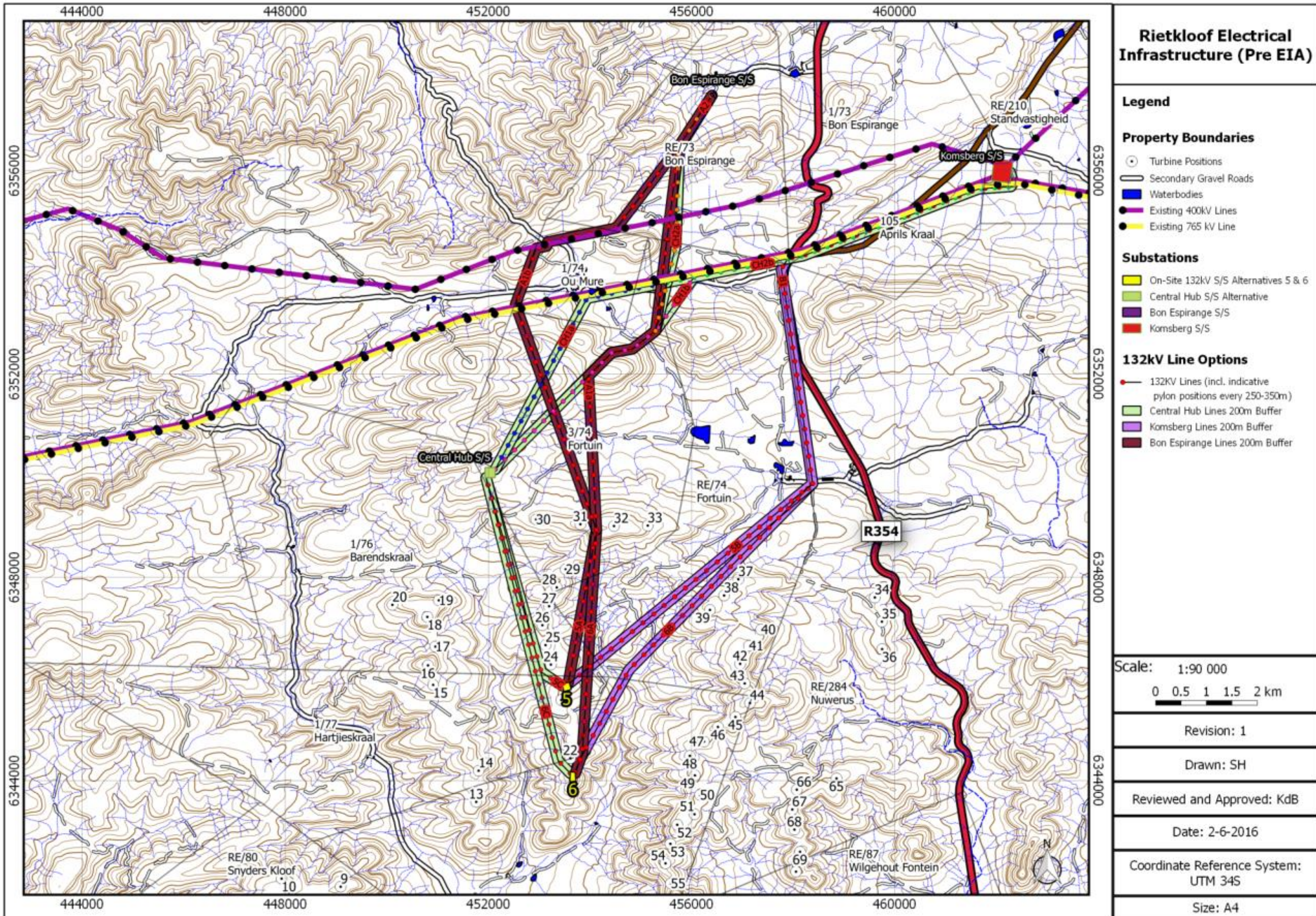


Figure 3-3: Proposed 132kV distribution line layout alternatives.



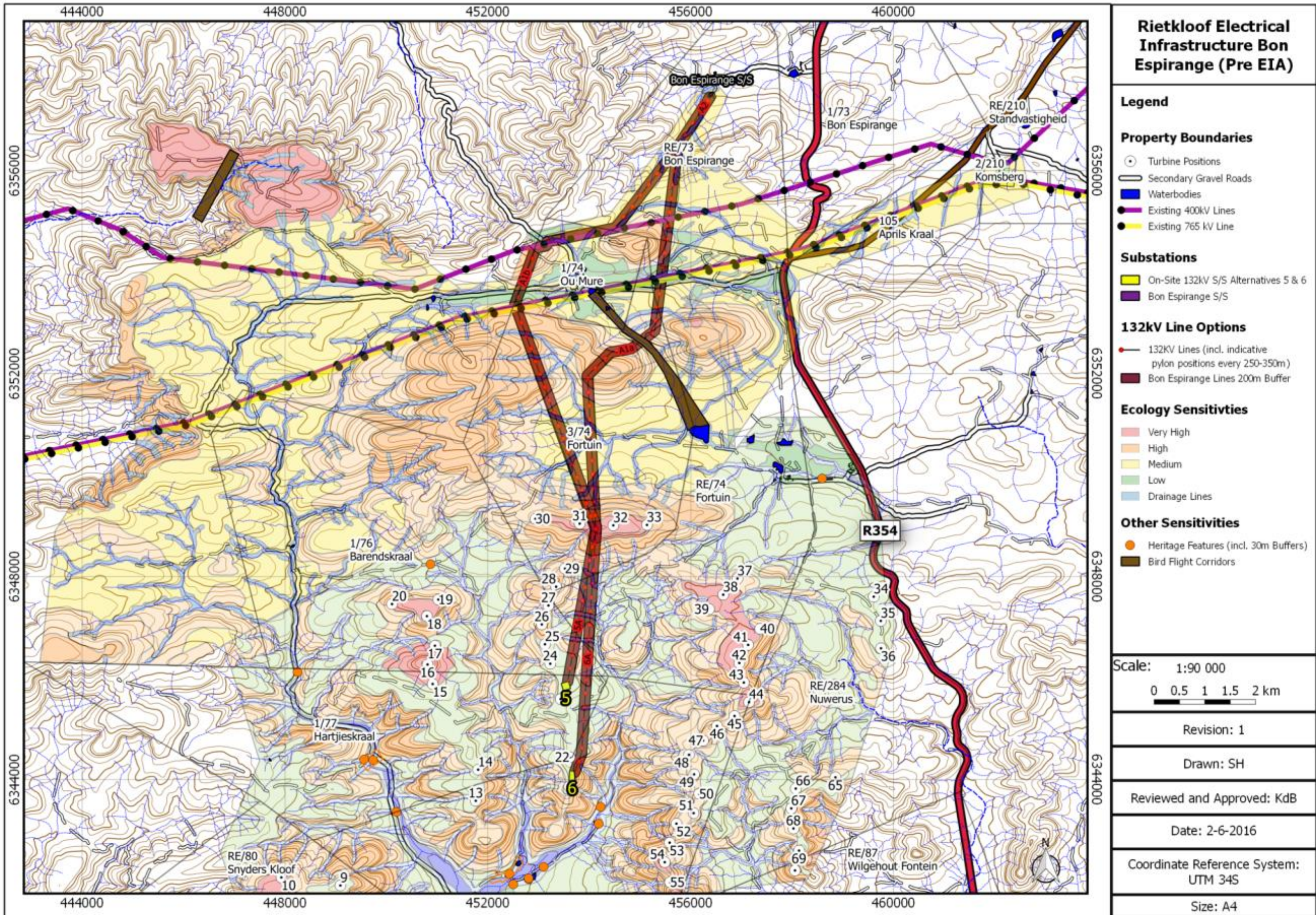


Figure 3-4: Bon Espirange alternatives sensitivity for the project.



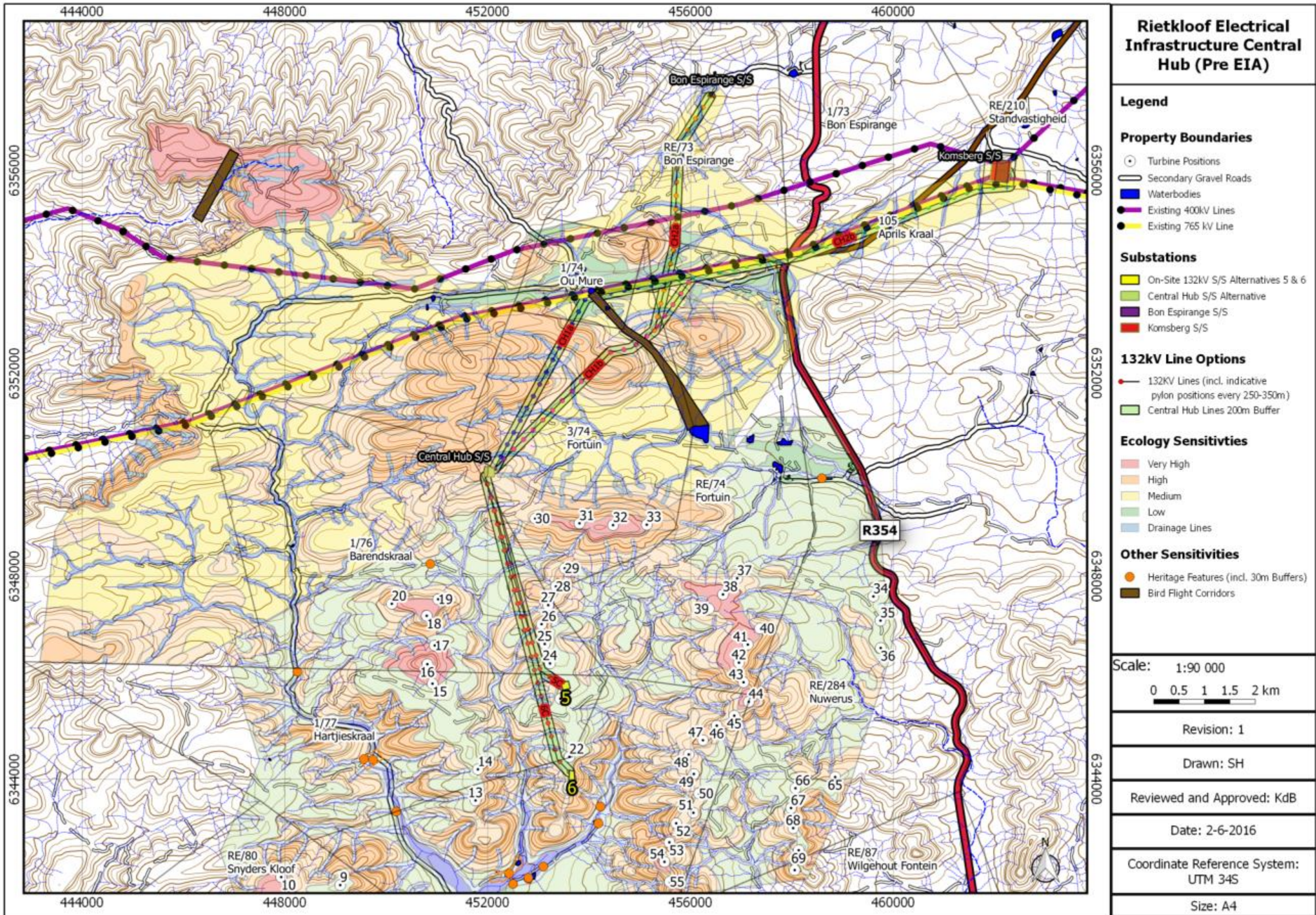


Figure 3-5: Central Hub alternatives sensitivity for the project.



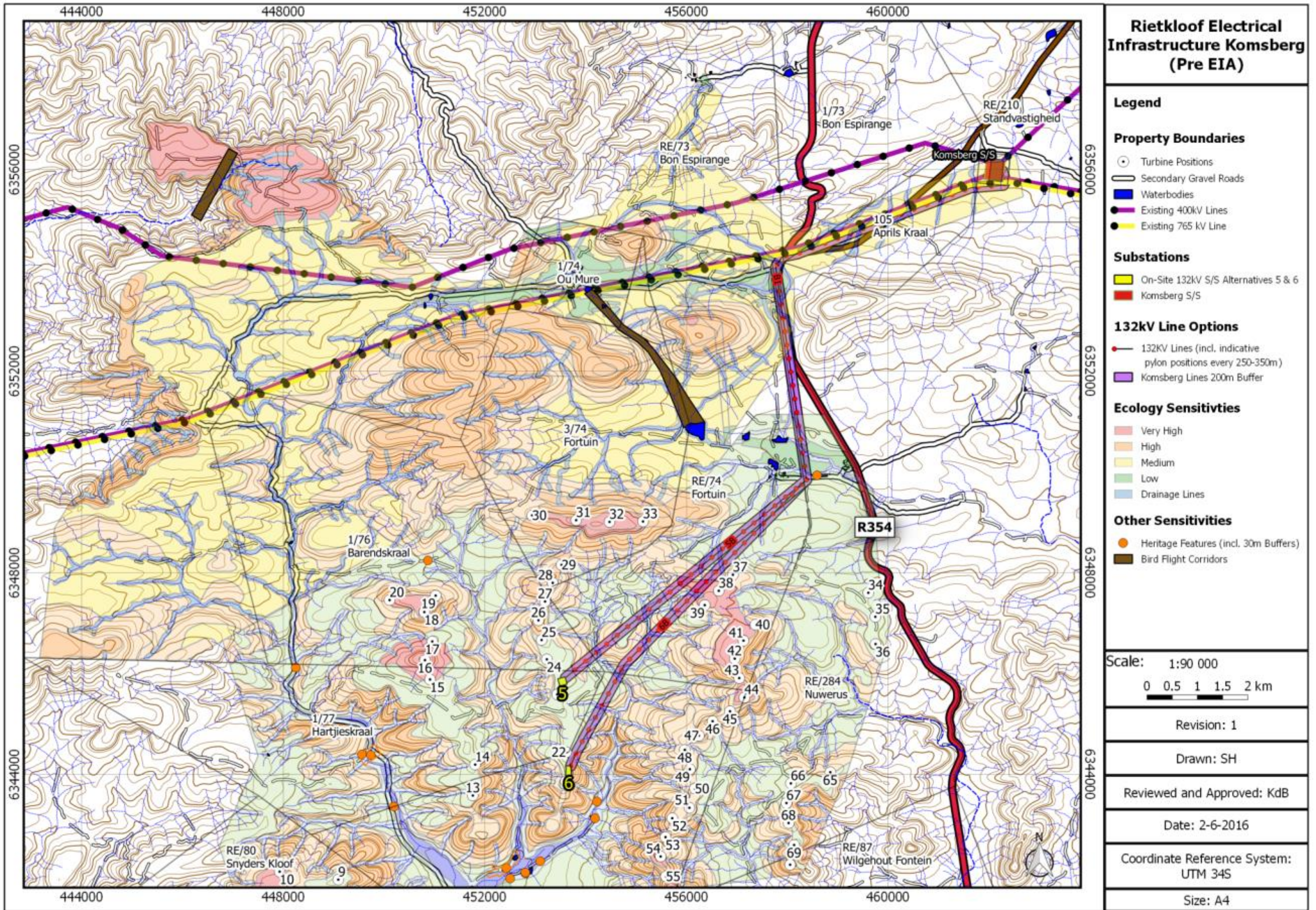


Figure 3-6: Komsberg alternatives sensitivity for the project.



### 3.3 Activities associated with the project life-cycle

The following activities (Table 3-1) are expected and likely to impact on the environment.

**Table 3-1: Summary of various activities throughout the project life-cycle.**

Phase	Duration	Activities
Planning phase	Approximately 2 years	<ol style="list-style-type: none"> <li>Detailed geotechnical investigations to inform designs</li> <li>Final site walkthroughs by specialists to inform micro-sitting</li> </ol>
Construction phase	12-18 months	<b>Site Establishment</b> <ol style="list-style-type: none"> <li>Setting out of construction area</li> <li>Delivery of equipment to site</li> </ol>
Civil and Electrical Works		<ol style="list-style-type: none"> <li>Topsoil stripping, where necessary, and bulk earthworks (if needed) for roads, hardstanding and pylon foundations.</li> <li>Concrete works</li> <li>Fixing reinforcement</li> <li>Cable ducting, trenching and laying</li> <li>Road and hardstanding construction (placement of aggregate layers)</li> <li>Guy-wiring of pylons</li> <li>Pylon erection and electrical cable stringing (where there is an overhead power line)</li> <li>Above activities but within the substation and relevant to substation construction and including building construction works e.g. bricklaying, roofing, installation and testing of electrical equipment such as transformers and switchgear</li> <li>Testing and commissioning of pylons and conductors</li> </ol>
Operational phase	20 years as a minimum	<ol style="list-style-type: none"> <li>Maintenance of the infrastructure</li> </ol>

### 3.4 Operational phase

During the operational phase, the pylons and substation would need to be accessed for routine maintenance. The frequency will be on a needs be basis. In order to access the pylons, the access road would need to be maintained in a state that allows for 4x4 access i.e. jeep track. The servitude will be maintained and monitored to avoid erosion and the establishment of alien invasive plant species.

## 4 ENVIRONMENTAL IMPACTS AND SENSITIVITIES

### 4.1 Sensitivity maps

Each of the specialists listed in Section 2.3, identified areas considered environmentally sensitive to the proposed development. Please see the key findings described in Section 4.3 below for a summary of the environmental sensitivities found during the specialist phase, including:

1. Heritage features
2. Avifaunal sensitive flightpath
3. Ecological features

All of these sensitive features will be taken into account when optimising and finalising the site development plan. In other cases, relevant specialists have indicated where it is not necessary to undertake detailed assessment or have referred to other studies.

### 4.2 Impacts summary

Each of the specialists listed in Section 2.3, assessed the potential impacts associated with the proposed project using the CES assessment methodology. To ensure a direct comparison between various specialist studies, the CES standard rating scale were used to assess and quantify the identified impacts (see Appendix B for the methodology used).

Four factors were considered for each of the impacts, namely:

1. Relationship of the impact to **temporal** scales - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
2. Relationship of the impact to **spatial** scales - the spatial scale defines the physical extent of the impact.
3. The severity of the impact - the **severity/beneficial** scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word 'mitigation' means not just 'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.
4. The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion was ranked with scores assigned as presented in Appendix B to determine the overall **significance** of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix, to determine the overall significance of the impact. The overall significance is either negative or positive.

Table 4.1 indicates the impacts determined during the environmental impact assessment process, as per the basic assessment report.

**Table 4-1: Summary of impacts for this project, as determined in the Basic Assessment Report.**

Impact	Significance category – BEFORE mitigation	Significance category – AFTER mitigation
1. Heritage Impact	<p><b>Construction phase</b>  <b>The Destruction of Precolonial / Stone Age material (BV_SA1 – BV_SA2)</b>            Duration: Permanent            Extent: Regional            Consequence: Very severe            Probability: Definite</p> <p><b>VERY HIGH -</b></p>	<p><b>Construction phase</b>  <b>The Destruction of Precolonial / Stone Age material (BV_SA1 – BV_SA2)</b>            Duration: Permanent            Extent: Regional            Consequence: Slight            Probability: Definite</p> <p><b>MODERATE -</b></p>
	<p><b>Construction phase</b>  <b>Damage to stone walling features (BV_SW1 – BV_SW2)</b>            Duration: Permanent            Extent: Study site            Consequence: Very severe            Probability: May occur</p> <p><b>VERY HIGH -</b></p>	<p><b>Construction phase</b>  <b>Damage to stone walling features (BV_SW1 – BV_SW2)</b>            Duration: Long term            Extent: Study site            Consequence: Slight            Probability: May occur</p> <p><b>MODERATE -</b></p>
	<p><b>Construction phase</b>  <b>The destruction of Graves (formal and informal burials) (RKPL_G1 – RKPL_G2)</b>            Duration: Permanent            Extent: Study site            Consequence: Very severe            Probability: May occur</p> <p><b>VERY HIGH -</b></p>	<p><b>Construction phase</b>  <b>The destruction of Graves (formal and informal burials) (RKPL_G1 – RKPL_G2)</b>            Duration: Long term            Extent: Study site            Consequence: Slight            Probability: May occur</p> <p><b>VERY HIGH -</b></p>
	<p><b>Construction phase</b>  <b>Damage to Homesteads / Farmhouse Complexes (BV_HS1 – BV_HS4)</b>            Duration: Permanent            Extent: Study site            Consequence: Very severe            Probability: Definite</p> <p><b>VERY HIGH -</b></p>	<p><b>Construction phase</b>  <b>Damage to Homesteads / Farmhouse Complexes (BV_HS1 – BV_HS4)</b>            Duration: Long term            Extent: Study site            Consequence: Slight            Probability: Definite</p> <p><b>MODERATE -</b></p>
	<p><b>Operation phase</b>  <b>Change of character of the region and subsequent cultural Landscape impact</b>            Duration: Long term            Extent: Study site            Consequence: Very severe            Probability: Definite</p> <p><b>VERY HIGH -</b></p>	<p><b>Operation phase</b>  <b>Change of character of the region and subsequent cultural Landscape impact</b>            Duration: Medium term            Extent: Study site            Consequence: Moderate            Probability: Definite</p> <p><b>MODERATE -</b></p>
	<p><b>Cumulative Impact</b>  <b>Impact of the construction of the proposed substation and powerlines on the cultural landscape</b>            Duration: Long term            Extent: Study site            Consequence: Very severe            Probability: Definite</p> <p><b>VERY HIGH -</b></p>	<p><b>Cumulative Impact</b>  <b>Impact of the construction of the proposed substation and powerlines on the cultural landscape</b>            Duration: Medium term            Extent: Study site            Consequence: Moderate            Probability: Definite</p> <p><b>MODERATE -</b></p>
2. Impact to Palaeontology	<p><b>Construction</b>  <b>Impacts to fossil heritage resources</b>            Duration: Permanent            Extent: Localised            Consequence: Moderate            Probability: May occur</p> <p><b>MODERATE –</b></p>	<p><b>Construction</b>  <b>Impacts to fossil heritage resources</b>            Duration: Permanent            Extent: Localised            Consequence: Slight            Probability: May occur</p> <p><b>LOW –</b></p>
	<p><b>Cumulative Impacts</b>  <b>Cumulative Impact to fossil heritage resources</b></p>	<p><b>Cumulative Impacts</b>  <b>Cumulative Impact to fossil heritage resources</b></p>

	<p>Duration: Permanent Extent: Localised Consequence: Slight Probability: Definite</p> <p><b>LOW -</b></p>	<p>Duration: Permanent Extent: Localised Consequence: Slight Probability: Definite</p> <p><b>LOW -</b></p>
3. Avifauna Impacts	<p><b>Construction phase</b> Disturbance during construction of the sub-stations and power lines (relevant to all power line alternatives and all four sub-station locations). Duration: Short term Extent: Localised Consequence: Slight Probability: Definite</p> <p><b>LOW -</b></p>	<p><b>Construction phase</b> Disturbance during construction of the sub-stations and power lines (relevant to all power line alternatives and all four sub-station locations). Duration: Short term Extent: Localised Consequence: Slight Probability: Definite</p> <p><b>LOW -</b></p>
	<p><b>Construction phase</b> Loss of habitat as result of grounded features – namely the sub-stations, pylon bases, and associated service tracks during the construction phase. Duration: Long term Extent: Localised Consequence: Slight Probability: Definite</p> <p><b>MODERATE -</b></p>	<p><b>Construction phase</b> Loss of habitat as result of grounded features – namely the sub-stations, pylon bases, and associated service tracks during the construction phase. Duration: Long term Extent: Localised Consequence: Slight Probability: Definite</p> <p><b>MODERATE -</b></p>
	<p><b>Operational phase</b> Bird mortality through collision with the overhead lines during the operational phase (relevant to all powerline alternatives). Duration: Long term Extent: Localised Consequence: Moderate Probability: Definite</p> <p><b>MODERATE -</b></p>	<p><b>Operational phase</b> Bird mortality through collision with the overhead lines during the operational phase (relevant to all powerline alternatives). Duration: Long term Extent: Localised Consequence: Moderate Probability: Definite</p> <p><b>MODERATE -</b></p>
	<p><b>Operation phase</b> All alternative lines barring CH1a and CH1b (see below)  Duration: Long term Extent: Localised Consequence: Moderate Probability: Definite</p> <p><b>MODERATE -</b></p>	<p><b>Operation phase</b> All alternative lines barring CH1a and CH1b (see below)  Duration: Long term Extent: Localised Consequence: Slight Probability: May occur</p> <p><b>LOW -</b></p>
	<p><b>Operation phase</b> CH1a and CH1b  Duration: Long term Extent: Localised Consequence: Severe Probability: Definite</p> <p><b>HIGH -</b></p>	<p><b>Operation phase</b> CH1a and CH1b  Duration: Long term Extent: Localised Consequence: Slight Probability: Definite</p> <p><b>MODERATE -</b></p>
	<p><b>Operation phase</b> <b>Indirect impacts</b> Duration: Long term Extent: Localised Consequence: Slight Probability: Unlikely Mitigation: Easy</p> <p><b>LOW -</b></p>	<p><b>Operation phase</b> <b>Indirect Impacts</b> Duration: Long term Extent: Localised Consequence: Slight Probability: Unlikely Mitigation: Easy</p> <p><b>LOW -</b></p>
	<p><b>Cumulative Impact – Electrocutation</b> Duration: Long term Extent: Regional Consequence: Slight Probability: May Occur</p> <p><b>LOW -</b></p>	<p><b>Cumulative Impacts – Electrocutation</b> Duration: Long term Extent: Regional Consequence: Slight Probability: May Occur</p> <p><b>LOW -</b></p>

	<p><b>Cumulative Impact – Habitat Destruction</b> Duration: Long term Extent: Regional Consequence: Slight Probability: Will Occur</p> <p><b>LOW –</b></p>	<p><b>Cumulative Impact – Habitat Destruction</b> Duration: Long term Extent: Regional Consequence: Slight Probability: Will Occur</p> <p><b>LOW –</b></p>
	<p><b>Cumulative Impact – Displacement</b> Duration: Long term Extent: Localised Consequence: Slight Probability: May Occur</p> <p><b>LOW –</b></p>	<p><b>Cumulative Impact – Displacement</b> Duration: Medium-Long term Extent: Localised Consequence: Slight Probability: May Occur</p> <p><b>LOW –</b></p>
	<p><b>Cumulative Impact – Solar Array Collision</b> Duration: Long term Extent: Regional Consequence: Moderate Probability: May Occur</p> <p><b>LOW –</b></p>	<p><b>Cumulative Impact - Solar Array Collision</b> Duration: Long term Extent: Regional Consequence: Low Probability: May Occur</p> <p><b>LOW –</b></p>
	<p><b>Cumulative Impact – Wind Turbine Collision</b> Duration: Long term Extent: Regional Consequence: Low Probability: May Occur</p> <p><b>LOW –</b></p>	<p><b>Cumulative Impact – Wind Turbine Collision</b> Duration: Long term Extent: Regional Consequence: Low Probability: May Occur</p> <p><b>LOW –</b></p>
	<p><b>Cumulative Impacts</b> Duration: Long term Extent: Regional Consequence: Moderate Probability: Will Occur</p> <p><b>LOW –</b></p>	<p><b>Cumulative Impacts</b> Duration: Long term Extent: Regional Consequence: Low Probability: May Occur</p> <p><b>LOW –</b></p>
4. Social Impacts	<p><b>Social and visual impact of the power line</b> Duration: Medium term Extent: Study area Consequence: Slight Probability: Probable</p> <p><b>LOW –</b></p>	<p><b>Social and visual impact of the power line</b> Duration: Medium term Extent: Study area Consequence: Slight Probability: Probable</p> <p><b>LOW –</b></p>
	<p><b>Cumulative impact</b> Duration: Medium term Extent: Regional Consequence: Slight Probability: Probable</p> <p><b>LOW –</b></p>	<p><b>Cumulative impact</b> Duration: Medium term Extent: Regional Consequence: Slight Probability: Probable</p> <p><b>LOW -</b></p>
5. Ecological Impacts	<p><b>Construction phase Impact on vegetation and listed plant species due to transformation within the development footprint.</b> Duration: Permanent Extent: Localised Consequence: Moderate Probability: Definite</p> <p><b>MODERATE –</b></p>	<p><b>Construction phase Impact on vegetation and listed plant species due to transformation within the development footprint.</b> Duration: Permanent Extent: Localised Consequence: Slight Probability: Probable</p> <p><b>LOW –</b></p>
	<p><b>Construction phase Direct faunal impacts due to construction phase noise and physical disturbance.</b> Duration: Short term Extent: Localised Consequence: Severe</p>	<p><b>Construction phase Direct faunal impacts due to construction phase noise and physical disturbance.</b> Duration: Short term Extent: Localised Consequence: Moderate</p>

	<p>Probability: Probable</p> <p><b>MODERATE –</b></p>	<p>Probability: May Occur</p> <p><b>LOW –</b></p>
	<p><b>Operation phase</b>  <b>Following construction, the site will be highly vulnerable to soil erosion</b>                      Duration: Medium term                      Extent: Localised                      Consequence: Severe                      Probability: Definite</p> <p><b>MODERATE -</b></p>	<p><b>Operation phase</b>  <b>Following construction, the site will be highly vulnerable to soil erosion</b>                      Duration: Short term                      Extent: Localised                      Consequence: Moderate                      Probability: Probable</p> <p><b>LOW –</b></p>
	<p><b>Operation phase</b>  <b>Following construction, the site will be highly vulnerable to alien plant invasion</b>                      Duration: Permanent                      Extent: Study area                      Consequence: Moderate                      Probability: Probable</p> <p><b>MODERATE –</b></p>	<p><b>Operation phase</b>  <b>Following construction, the site will be highly vulnerable to alien plant invasion</b>                      Duration: Short term                      Extent: Localised                      Consequence: Low                      Probability: May occur</p> <p><b>LOW –</b></p>
	<p><b>Decommissioning phase</b>  <b>Faunal Impacts due to Decommissioning Phase activities such as noise and disturbance due to the presence of construction staff and the operation of heavy machinery</b>                      Duration: Short term                      Extent: Study area                      Consequence: Moderate                      Probability: Probable</p> <p><b>MODERATE –</b></p>	<p><b>Decommissioning phase</b>  <b>Faunal Impacts due to Decommissioning Phase activities such as noise and disturbance due to the presence of construction staff and the operation of heavy machinery</b>                      Duration: Short term                      Extent: Study area                      Consequence: Moderate                      Probability: May occur</p> <p><b>LOW-</b></p>
	<p><b>Decommissioning phase</b>  <b>Soil Erosion Risk</b>                      Duration: Long term                      Extent: Localised                      Consequence: Moderate                      Probability: Probable</p> <p><b>MODERATE –</b></p>	<p><b>Decommissioning phase</b>  <b>Soil Erosion Risk</b>                      Duration: Medium term                      Extent: Localised                      Consequence: Slight                      Probability: Probable</p> <p><b>LOW –</b></p>
	<p><b>Decommissioning phase</b>  <b>Alien plant invasion will be highly likely within disturbed areas following decommissioning</b>                      Duration: Long term                      Extent: Study area                      Consequence: Moderate                      Probability: Probable</p> <p><b>MODERATE –</b></p>	<p><b>Decommissioning phase</b>  <b>Alien plant invasion will be highly likely within disturbed areas following decommissioning</b>                      Duration: Medium term                      Extent: Localised                      Consequence: Slight                      Probability: Probable</p> <p><b>LOW –</b></p>
	<p><b>Cumulative Impact</b>  <b>Impacts on Critical Biodiversity Areas and broad-scale ecological processes</b>                      Duration: Long term                      Extent: Study area                      Consequence: Moderate                      Probability: Probable</p> <p><b>MODERATE –</b></p>	<p><b>Cumulative Impact</b>  <b>Impacts on Critical Biodiversity Areas and broad-scale ecological processes</b>                      Duration: Long term                      Extent: Study area                      Consequence: Slight                      Probability: Probable</p> <p><b>LOW -</b></p>
6. Traffic impacts	<p><b>Construction phase</b>                      Duration: Short term                      Extent: Regional                      Consequence: Slight                      Probability: Definite</p>	<p><b>Construction phase</b>                      Duration: Short term                      Extent: Regional                      Consequence: Slight                      Probability: Definite</p>



	<b>LOW -</b>	<b>LOW -</b>
	<p><b>Construction phase</b> Duration: Short term Extent: Regional Consequence: Moderate Probability: Definite</p> <p><b>MODERATE -</b></p>	<p><b>Construction phase</b> Duration: Short term Extent: Regional Consequence: Slight Probability: Definite</p> <p><b>LOW -</b></p>
7. Visual impact	<p><b>Operation phase</b> Duration: Long term Extent: Localised Consequence: Slight Probability: May occur</p> <p><b>LOW -</b></p>	<p><b>Operation phase</b> Duration: Long term Extent: Localised Consequence: Slight Probability: May occur</p> <p><b>LOW -</b></p>
	<p><b>Cumulative Impact</b> Duration: Long term Extent: Localised Consequence: Severe Probability: Definite</p> <p><b>HIGH -</b></p>	<p><b>Cumulative Impact</b> Duration: Long term Extent: Localised Consequence: Moderate Probability: May occur</p> <p><b>MODERATE -</b></p>
8. Surface water impacts	<p><b>Construction phase</b> Duration: Short term Extent: Localised Consequence: Moderate Probability: May occur</p> <p><b>MODERATE -</b></p>	<p><b>Construction phase</b> Duration: Short term Extent: Localised Consequence: Slight Probability: Unlikely</p> <p><b>LOW -</b></p>
9. Erosion impact	<p><b>Construction phase</b> Duration: Short term Extent: Localised Consequence: Severe Probability: Definite</p> <p><b>MODERATE -</b></p>	<p><b>Construction phase</b> Duration: Short term Extent: Localised Consequence: Moderate Probability: Probable</p> <p><b>LOW -</b></p>
	<p><b>Decommissioning phase</b> Duration: Long term Extent: Localised Consequence: Moderate Probability: Probable</p> <p><b>MODERATE -</b></p>	<p><b>Decommissioning phase</b> Duration: Medium term Extent: Localised Consequence: Slight Probability: Probable</p> <p><b>LOW -</b></p>
	<p><b>Cumulative impact</b> Duration: Short term Extent: Regional Consequence: Moderate Probability: Definite</p> <p><b>MODERATE -</b></p>	<p><b>Cumulative impact</b> Duration: Short term Extent: Localised Consequence: Slight Probability: May occur</p> <p><b>LOW -</b></p>
10. Impact on energy production;	<p><b>Operation phase</b> Duration: Long term Extent: National Consequence: Slight Probability: Definite</p> <p><b>MODERATE +</b></p>	<p><b>Operation phase</b> Duration: Long term Extent: National Consequence: Moderately beneficial Probability: Definite</p> <p><b>MODERATE +</b></p>
11. Impact to soil and land capabilities	<p><b>Construction phase</b> <b>Loss of agricultural land. The proposed layout</b></p>	<p><b>Construction phase</b> <b>Loss of agricultural land. The proposed layout</b></p>

	<p><b>avoids all cultivated land. Once construction is completed, the servitude can continue to be used as grazing.</b>                  Duration: Short term                  Extent: Study area                  Consequence: Moderate                  Probability: Probable</p> <p><b>MODERATE -</b></p>	<p><b>avoids all cultivated land. Once construction is completed, the servitude can continue to be used as grazing.</b>                  Duration: Short term                  Extent: Study area                  Consequence: Slight                  Probability: Probable</p> <p><b>MODERATE -</b></p>
	<p><b>Cumulative impact</b>  <b>Cumulative soil erosion from adjacent project works</b>                  Duration: Short term                  Extent: Regional                  Consequence: Moderate                  Probability: Probable</p> <p><b>MODERATE -</b></p>	<p><b>Cumulative impact</b>  <b>Cumulative soil erosion from adjacent project works</b>                  Duration: Short term                  Extent: Localised                  Consequence: Slight                  Probability: May occur</p> <p><b>LOW -</b></p>
<p>12. Noise impacts associated with the construction phase</p>	<p><b>Construction phase</b>  <b>Construction phase activities will incur elevated noise levels through machinery, staff on site and vehicles</b>                  Duration: Short term                  Extent: Study area                  Consequence: Slight                  Probability: Definite</p> <p><b>LOW -</b></p>	<p><b>Construction phase</b>  <b>Construction phase activities will incur elevated noise levels through machinery, staff on site and vehicles</b>                  Duration: Short term                  Extent: Study area                  Consequence: Slight                  Probability: May occur</p> <p><b>LOW -</b></p>
<p>13. Dust impacts associated with the construction phase impacting on SALT, SKA or SAO</p>	<p><b>Construction phase</b>  <b>Construction phase activities will liberate greater quantities of dust than the current land use, albeit temporarily</b>                  Duration: Short term                  Extent: Study area                  Consequence: Slight                  Probability: Definite</p> <p><b>LOW -</b></p>	<p><b>Construction phase</b>  <b>Construction phase activities will liberate greater quantities of dust than the current land use, albeit temporarily</b>                  Duration: Short term                  Extent: Study area                  Consequence: Slight                  Probability: May occur</p> <p><b>LOW -</b></p>
	<p><b>Cumulative impact</b>                  Duration: Short term                  Extent: Study area                  Consequence: Slight                  Probability: Definite</p> <p><b>LOW -</b></p>	<p><b>Cumulative impact</b>                  Duration: Short term                  Extent: Study area                  Consequence: Slight                  Probability: May occur</p> <p><b>LOW -</b></p>

### 4.3 Specialist Key findings

The following sections summarise the key specialist issues determined during the specialist phase.

#### 4.3.1 Heritage

A phase 1 archaeological impact assessment (AIA) was undertaken by Booth Heritage Consulting to assess heritage features<sup>2</sup>, including the built environment and other cultural heritage resources, located within the project footprint.

The survey was conducted to determine the range and importance of the exposed and in situ archaeological heritage material remains, sites and features; to establish the potential impact of the development; and to make recommendations to minimize possible damage to the archaeological heritage. The assessment informed the Basic Assessment process for the proposed Rietkloof WEF electrical infrastructure to ensure that negative impacts are mitigated if avoidance is not possible and to enhance any positive impacts.

It must be noted that the layout for the final powerline alternatives were not finalised by the time that the survey was conducted for the Rietkloof WEF, associated infrastructure and access roads, therefore the brief summary of findings is a generalised summary observed during the survey of the WEF. Heritage resources located nearby, within 200m, to the proposed powerline route have been identified and included in this report. It must be emphasized that once the final layout for the powerlines has been confirmed an archaeological heritage walk-through will be conducted to determine the positioning of the pylons and make further recommendations.

The assumption of the field study was to locate very little precolonial archaeological heritage material and several historical features and associated artefacts. This assumption arose from previous studies conducted on parts of site and proximity (ACO Associates 2011, 2013, 2014), and from the author's experience in conducting studies for the Hidden Valley (now Karusa, Soetwater and the Great Karoo) WEFs (Booth 2010, 2011, 2015).

As assumed the area held several of historical features (stone walling kraals and cottages) some with associated historical artefacts situated along the access roads in the valleys and associated with the homestead settlements. The area, however, also held evidence of both Middle and Later Stone Age stone artefacts alongside water courses and on the flat floodplains. The heritage resources encountered are briefly explained below:

- **Precolonial / Stone Age material (RKPL\_SA1 – RKPL\_SA4)**

Both Later Stone Age and Middle Stone Age stone artefact scatters were identified mainly on the flat floodplains up to the foot of the mountains as well as within the valleys along water courses. The artefacts were manufactured from fine-grained chalcedony material as well as hornfels and local shale raw materials.

No other cultural or organic archaeological heritage materials were assumed to be directly related or associated with the stone artefact scatters. In several instances stone artefacts would occur within the same vicinity as historical built environment structures, stone walling features as well as historical artefact scatters, similarly situated on the flat floodplains and within the valleys close to water courses.

- **Stone Walling Features (RKPL\_SW1 - RKPL\_SW3)**

<sup>2</sup> Booth C 2016. A Phase 1 archaeological Impact Assessment (AIA) for the proposed powerline alternatives and substation for the Rietkloof Wind Energy Facility (WEF) situated in the Karoo Hoogland Local Municipality (Namakwa District Municipality), the Witzenberg Local Municipality (Cape Winelands District Municipality) and the Laingsburg local municipality (Central Karoo District Municipality)

Up to three (3) stone walling features were documented along the access routes on the flat floodplains and in the valleys. These features include historical stone packed dwellings / cottages as well as kraals, pens, and a threshing floor. Historical artefacts were also located within the vicinity of some of the stone packed dwellings and kraals.

- **Historical Artefact Scatters (RKPL\_Hist1)**

The historical artefacts scatter include fragments of glass, ceramics and metal material probably dating to the late 19th century. These scatters are mainly identified to be associated within the vicinity of stone packed dwellings / cottages and/or stone packed kraals.

- **Built Environment Structures (RKPL\_BE1 – RKPL\_BE3)**

These exclude structures that have been constructed by the historical stone packing method. The structures may be younger than 60 years and with very little or no heritage significance. These include abandoned buildings, used and unused reservoirs and drinking troughs. These structures occur across the landscape along the existing access roads.

The farm houses and associated buildings situated on the homestead / farm complex have been outlined and as a whole are considered as homesteads (described below).

- **Graves (formal and informal burials) (RKPL\_G1 – RKPL\_G2)**

The historical family cemeteries are usually situated within close proximity or apart of the homestead. RKPL\_G1 is a family cemetery situated across a watercourse from the Hartjieskraal homestead. RKPL\_G2 resemble informal stone packed burials that may be associated with the ruins of a stone walling cottage situated in a valley next to a watercourse on the farm Hartjieskraal 77.

- **Homesteads / Farmhouse Complexes (RKPL\_HS1 – RKPL\_HS2)**

Four homesteads / farm complexes were identified and demarcated where the proposed power line routes will pass. These have been demarcated purely for ease of reference, description and mitigation measures. Most of these homesteads / farm complexes include historically stone packed features including kraals and dwellings as well as nineteenth century farmhouses, modern buildings and typically historical graveyards. These earlier buildings and features have most likely been modified over time for maintenance purposes for continued and contemporary occupation. The homesteads are situated either adjacent to the proposed access roads or in some cases the proposed internal access roads are expected to go through the homesteads.

These homesteads include the farm house and associated staff accommodation, outbuildings and stone walling features and built environment structures.

#### **4.3.2 Avifaunal**

An avifauna impact assessment was undertaken African Insights<sup>3</sup> to assess the potential impacts on avifauna. The findings indicate that there are three groups of birds (1. Bustards; 2. Birds of prey; 3. Waterbirds) potentially at risk of collision with the overhead line:

The following avifauna sensitive features were identified onsite:

1. Farm dams and cultivated fields
2. Flightpath between the Ou Mure and Fortuin farm dams

Provided the final routing takes full cognisance of the avifaunal preferences (bearing in mind the preferences of other specialists and the technical requirements), and the suggested mitigation

<sup>3</sup> Williams AJ 2016. Avifaunal Impact Assessment of the proposed 132kV overhead powerlines to connect the proposed Rietkloof WEF to the grid

measures are followed, the disturbance and habitat loss resulting from the proposed development are, though of negative impact, minor and inconsequential in regional terms even allowing for cumulative impact.

The risk of bird deaths as a result of collision with infrastructure, though negative, is extremely low for the greater part of the local avifauna and, though somewhat higher, is also considered low – and at an acceptable level – for the three groups of birds of anticipated greater risk. Again the contribution to the likely cumulative threat is minor and acceptable.

If the Central Hub option is chosen then, from an avifaunal perspective, the amended routes north of the col are, by far the preferred route as it avoids both the col and the Fortuin area. The second choice is amended routes across the col as it will cross the col at a height considered to be above that at which most birds will fly when using this part of their flight-path. The routes to the south of the col are, avifaunally, the least preferred. Any of the powerlines from the onsite substations to the central hub can proceed.

If the Bon Espirange option is chosen then, from an avifaunal perspective, the routes north of the col are, by far the preferred route. The second choice are the routes across the col followed by the routes to the south of the col which is, avifaunally, the least preferred. Any of the powerline routes from the onsite substations to Komsberg can proceed. All proposed substation locations are acceptable.

### **4.3.3 Ecology**

An ecological impact assessment<sup>4</sup> was undertaken by Simon Todd Consulting to assess the potential impacts on ecological features.

Although there are some areas within the study area and within the powerline corridors that are considered high sensitivity, the footprint of the development is low and the powerlines themselves are sufficiently flexible that any sensitive features potentially within the footprint can be avoided. As a result, the direct impact of habitat loss resulting from the development of the grid connection infrastructure is seen to be low. The major concerns regarding the development of the Rietkloof grid connection infrastructure is likely to stem from secondary impacts such as erosion. Several of the routes traverse steep slopes and the access roads required for construction of the power lines in these areas will remain vulnerable to erosion for the life of the development. This can however be well mitigated through the use of erosion control structures and regular monitoring during the lifespan of the development.

Overall and with the suggested mitigation measures applied, the impact of the Rietkloof Grid Connection infrastructure would be local in nature and of low significance.

The preferred alternatives from an ecological point of view are:

#### On-site substation to Central Hub Substation to Komsberg or Bon Espirange:

- The shorter routes are preferable, except for the connection to Komsberg which is seen as preferable to the connection to Bon Espirange as there is already an existing 400kV line along the large part of the route to Komsberg SS.

#### Rietkloof on-site substation to Bon Espirange East:

- The shorter routes are preferable and the option from Substation 1 is the preferred option.
- The route from substation 3 is least preferred.

#### Rietkloof on-site substation to Bon Espirange Substation West

<sup>4</sup> Todd, S. 2016. Basic Assessment for the Proposed 132kv Overhead Power Line and Substation for the Brandvallei Wind Farm. Fauna & Flora Specialist Basic Assessment Report

- Most of these options traverse the high-lying ground in the centre of the site which is considered sensitive. As a result, the options from substations 3,4,5,6 and 7 are least desirable, but are not considered fatally flawed.

#### 4.3.4 Other specialists

DEA&DP and Heritage Western Cape (see Appendix E of the BAR for copies of these comments) requested that a **Visual Impact Assessment** be undertaken to inform the Basic Assessment process. Although, an overhead 132kV distribution line could typically result in visual impact to the surrounding environment, a visual impact assessment was not undertaken. The proposed overhead 132kV distribution line will run along the existing 400kV and 765kV Eskom power lines within the project area and along the existing 11kV power line from the project area to the Bon Espirange Substation. Therefore, there are likely to be no additional visual impacts to the visual impacts already experienced as a result of the existing Eskom 765kV, 400kV and 11kV lines. In addition, there's very little mitigation options to reduce the visibility of an overhead powerline. The proposed layout applied the mitigation measure of following existing infrastructure as far as possible in order to not impact new areas. Therefore, a visual impact assessment was not undertaken.

Heritage Western Cape furthermore requested that a **Palaeontology Impact Assessment (PIA)** be undertaken for the proposed development. Dr. John Almond, a palaeontology specialist responded to this request by confirming that the entire 132kV distribution line project footprint has already been assessed in terms of palaeontological heritage impacts in the course of combined desktop and field-based studies by himself for the two WEFs (including relevant substations) as well as for several neighbouring transmission line, substation and alternative energy projects. All these previous studies have concluded that, while fossil material such as Palaeozoic vertebrate, trace fossil and petrified wood remains do indeed occur in this region of the Karoo, the overall palaeontological sensitivity here is generally low because well-preserved, scientifically important fossils are very rare. None of the few, small areas of high palaeontological sensitivity that have been identified in previous field assessment reports will be directly impacted by the distribution lines. Bedrock excavations into potentially fossiliferous bedrocks during construction of the 132kV distribution line pylons and associated access roads are likely to be small in volume. The impact significance of the proposed 132kV distribution lines is therefore rated as Low (negative). Given their low impact significance and the fact that the entire development footprint has been previously assessed, no further specialist palaeontological studies are considered necessary in this regard (Please see addendum letter and PIA in Appendix D of the BAR).

A comment was also received from DEA requiring a social impact assessment and a **Traffic Impact Assessment**. The traffic impact assessment (Aurecon, 2016) assessed the traffic associated with the construction and operation of the 132kV distribution line and substation and therefore informed this assessment. The traffic and transport plan are included in Appendix D.

The **Social Impact Assessment (SIA)** undertaken to inform the WEF EIA, was considered sufficient to inform this BA process. The SIA (Barbour and van der Merwe, July 2016) found that the potential social impacts associated with the establishment of 33kV overhead power lines and the associated substation will be limited, specifically within the context of the establishment of the wind turbines associated with the proposed WEF. In addition, the power lines are located on the site. The proposed 132kV distribution lines for the proposed Brandvalley WEF will follow the existing 765kV Eskom power line for 5km before heading north for 1.2km and then follow the existing 400kV distribution line before linking up with the Bon Espirange substation. The short sections where the distribution line does not follow existing Eskom powerlines are located within the development footprint. The significance of the visual and associated social impacts associated with the establishment of a new 132kV line is therefore likely to be Low Negative. In addition, as indicated in the SIA of the 33kV lines, the impact of a powerline should be viewed within the context of the establishment of the wind turbines associated with the proposed WEF. Also note that this study area has been identified as a Renewable Energy Development Zone by the Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa undertaken by the

CSIR (2015). The area has therefore been identified as an area where renewable energy should be concentrated. Based on this information and the social specialist's experience of the study area, a SIA is not required for the proposed 132 kV distribution line (Please see addendum letter and SIA in Appendix D of the BAR).

#### 4.4 Amended Layout

In order to avoid sensitive features identified by specialists, the following amendments were made to the preliminary layout:

- **Substation alternative 5 (preferred alternative)** was rotated less than 45 degrees in order to avoid the 200m buffer zone proposed around high-sensitive bat areas identified by an assessment undertaken for the WEF. It should be noted that the bat sensitivity buffer was only recommended for wind turbine positions and are not applicable to the other infrastructure. However, the layout was amended nonetheless. There were no avifaunal, heritage or surface water features identified in the vicinity of the 33/132kV onsite substation 5. Substation position 5 are located within a medium-low ecological sensitive area and therefore no further amendments are required to the layout.
- **The 33/132kV onsite substation alternative 6** was shifted 50m west from the initial proposed location in order to avoid the 200m buffer zone proposed around high-sensitive bat areas identified by an assessment undertaken for the WEF. It should be noted that the bat sensitivity buffer was only recommended for wind turbine positions and are not applicable to the other infrastructure. However, the layout was amended nonetheless. There were no avifaunal, heritage or surface water features identified in the vicinity of the 33/132kV onsite substation 6. Substation position 6 are located within a medium-low ecological sensitive area and therefore no further amendments are required to the layout.
- The majority of the **132kV distribution line 200m buffer corridors** remained unchanged as the sensitive features identified can be avoided through micro-sitting the pylon positions. However, a slight shift in the corridors were required in order for it to align with the newly amended positions for the onsite substations 5 and 6. The 132kV distribution line corridors (200m) were shifted slightly in order to connect with the amended substation position 5, 6 and central hub-substation. The majority of the corridor remained unchanged as the watercourses and 32m buffer zone, wetlands, heritage features and associated buffers and avifaunal sensitive areas can be avoided through micro-sitting within the 200m corridor.
- **The central hub substation** was moved approximately 100m south from the initial proposed location in order to avoid the very-high sensitive ecological area. The amended layout avoids all watercourses and 32m buffer zones. There are no avifaunal or heritage sensitive features within the vicinity of the central hub substation.

The final sensitivity map of all alternatives as well as the preferred alternatives are included as Figures 4-1 and 4-2.



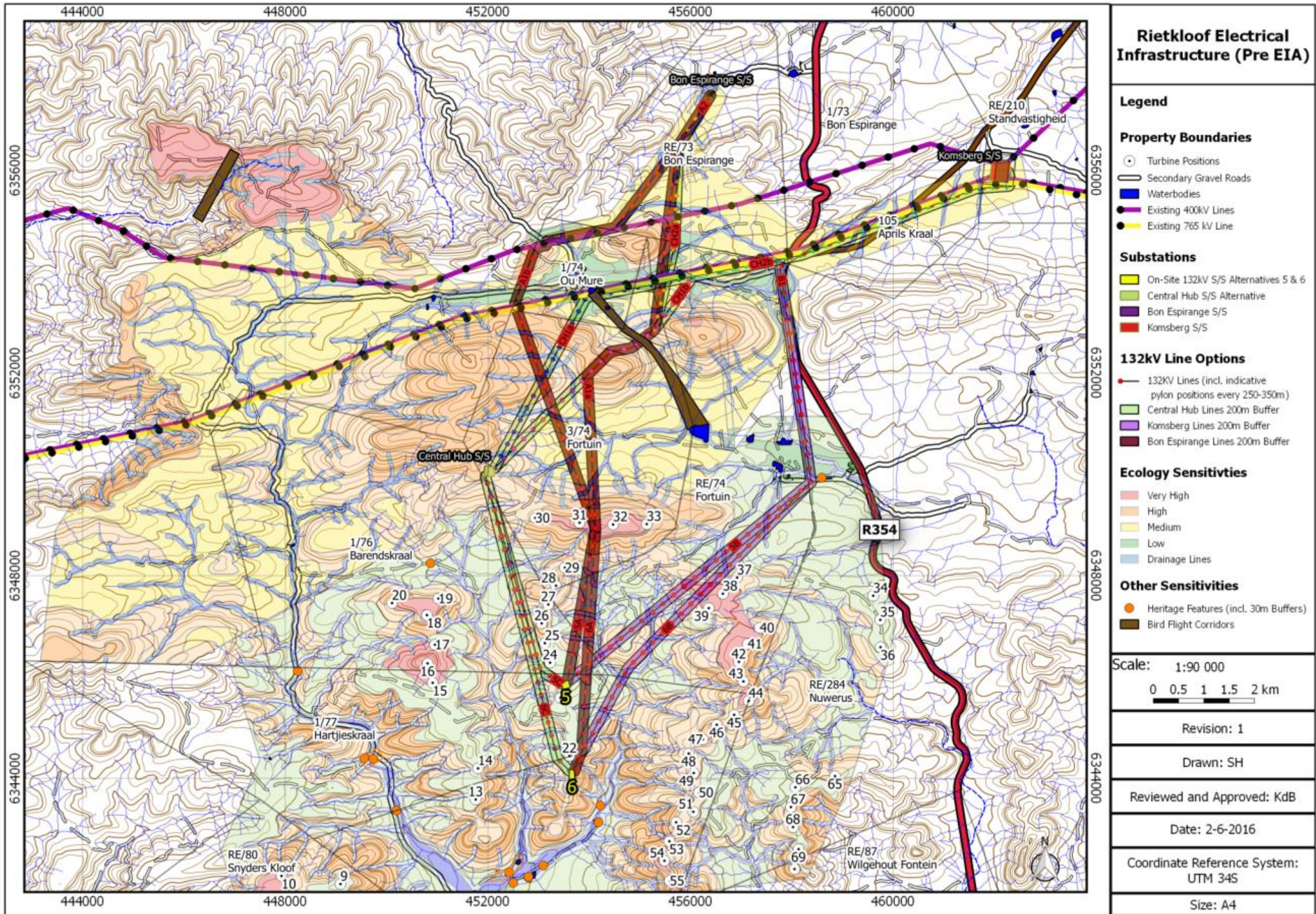


Figure 4-1: Combined alternatives sensitivity for the project.



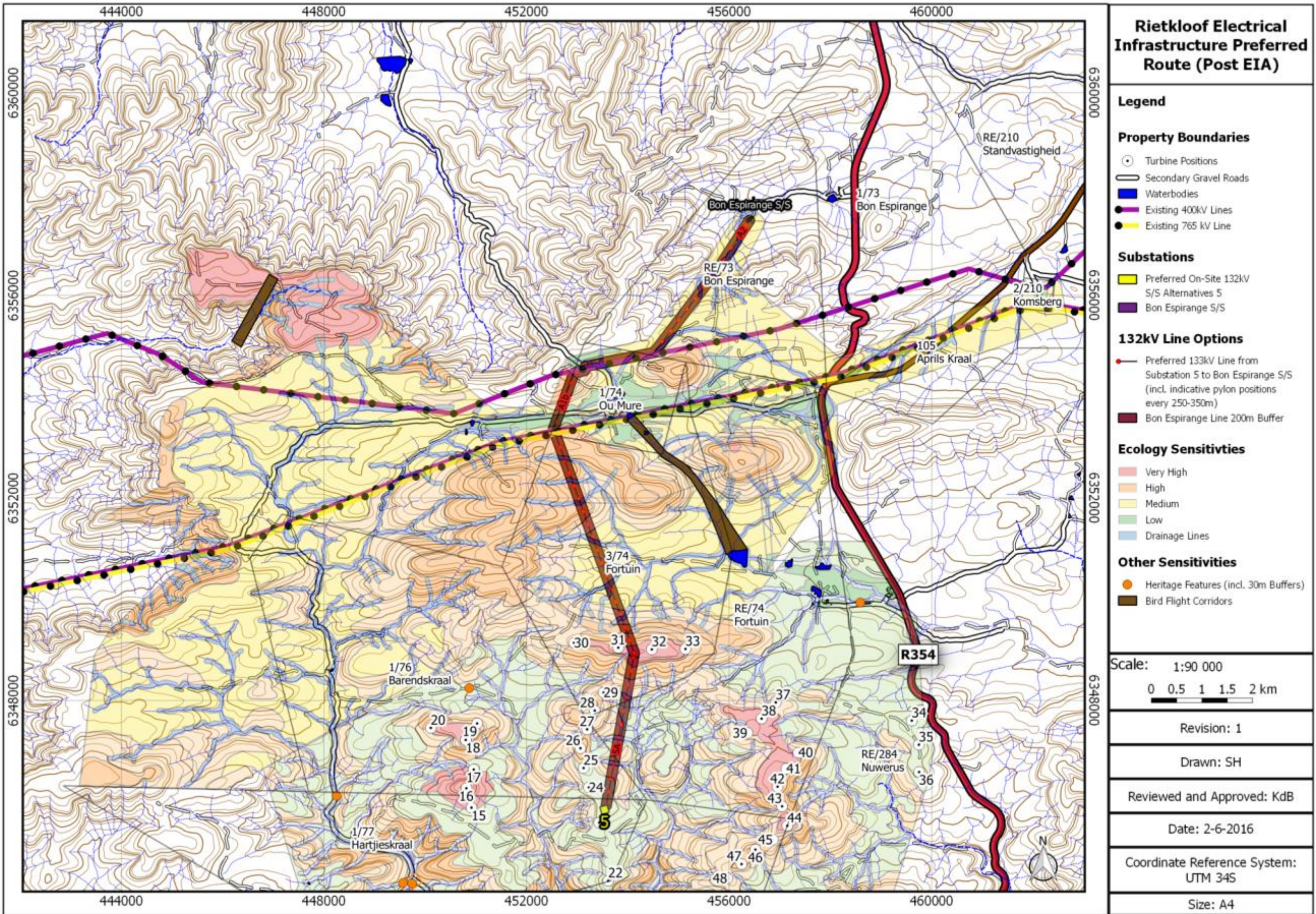


Figure 4-2: Preferred alternative substation 5 and connection to Bon Espirance Substation.



## **5 SCOPE OF THE EMPr**

In order to ensure a holistic approach to the management of environmental impacts during the design, construction, operation of the proposed distribution line, this EMPr sets out the methods by which proper environmental controls are to be implemented by the Contractor and all other parties involved.

The EMPr is a dynamic document subject to influences and changes as are wrought by variations to the provisions of the project specification.

### **5.1 Layout of the EMPr**

The EMPr is divided into four phases of development. Each phase has specific issues unique to that period of the construction and operation of the distribution line and associated infrastructure. The impacts are identified and given a brief description. The three phases of the development are then identified as below:

#### **5.1.1 Design and planning Phase**

This section provides specifications for actions to be completed prior to the construction work commencing. Generally it involves due diligence, planning design and layout, specifying contractor's method statements, roles and responsibilities, as well as acquiring all authorisation documents (EA, permits, and licences).

#### **5.1.2 Construction Phase**

This section of the EMPr provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfaction of the Holder of the EA and ECO.

#### **5.1.3 Operational and Maintenance Phase**

This section of the EMPr provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required during the operation and maintenance phase are specified.

#### **5.1.4 Decommissioning Phase**

This section includes principles for the decommissioning and closure phase of the project. At this point in time, decommissioning of the electrical infrastructure is not foreseen. However, should the line be decommissioned after the 20-year operational phase, the impacts will be more or less the same as during construction. This section will be required to be re-visited and updated at the time of rehabilitation.

## 6 ROLES AND RESPONSIBILITIES

According to Appendix 4 of GN R 982, an environmental management programme must include:

- (i) an indication of the persons who will be responsible for the implementation of the impact management actions

### 6.1 Management structure

Rietkloof Wind Farm will be responsible for the implementation of the proposed 132kV distribution line and associated infrastructure described in Chapter 3, to ensure compliance with the requirements of all environmental authorisations and permits, and meet the obligations. This EMPr plays a role in meeting this requirement and should therefore be included in all contract documentation. In line with this EMPr, all parties involved in the implementation of the project must be made aware of their environmental responsibilities, accountability and liability.

All official communication and reporting lines including instructions, directives and information need to be developed for the organisation structure shown in Figure 6-1.

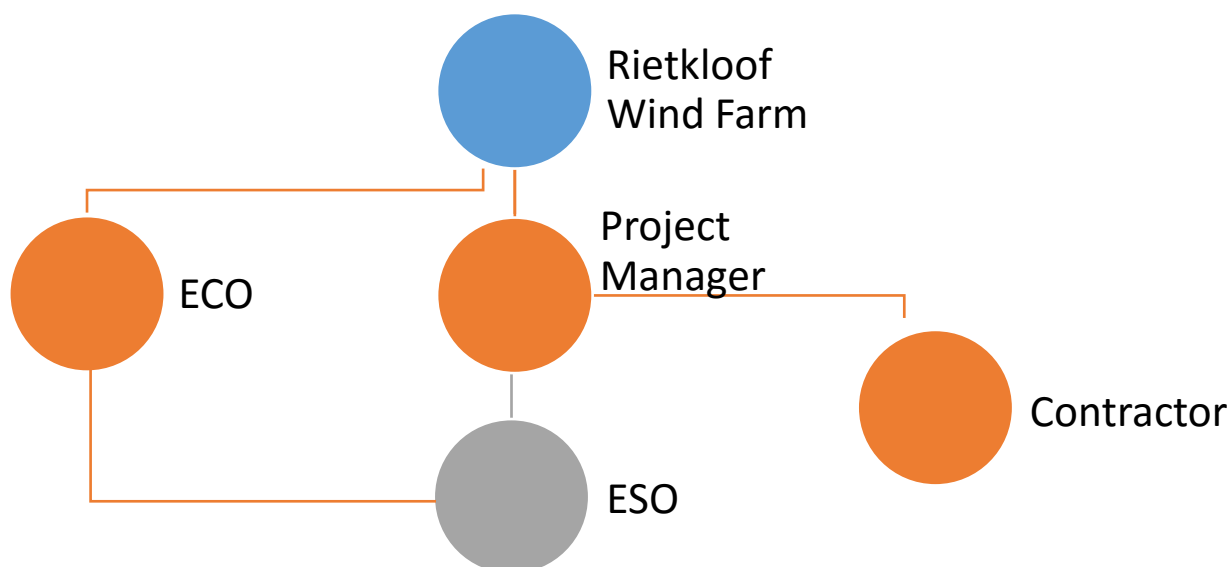


Figure 6-1: Draft organisation structure.

### 6.2 Holder of the EA / Rietkloof Wind Farm (Pty) Ltd

Rietkloof Wind Farm (Pty) Ltd is the applicant and the Holder of the EA should DEA decide to issue a positive EA. Rietkloof Wind Farm shall therefore be the entity responsible for the monitoring and implementation of the EMPr and compliance with the authorisation. Responsibilities include:

- Assume overall responsibility for the implementation of the EMPr and adherence to all relevant legislation;
- Ensure that the facility is designed to meet all the specified environmental parameters and legal requirements as specified in the EMPr and EA; and
- Liaise with authorities.

### 6.3 Project Manager

The overall Project Manager will be appointed by Rietkloof Wind Farm (Pty) Ltd and will be

required to oversee the construction programme and construction activities performed by all Contractors. The Project Manager is expected to liaise with the Contractor, Environmental Site Officer (ESO) and Environmental Control Officer (ECO) on environmental matters, as well as any pertinent engineering matters where these may have environmental consequences. The Project Manager, with support from the ESO (see section 6.5) will oversee the general compliance of the Contractor with the EMPr and other pertinent site specifications. The Project Manager will also be required to be familiar with the EMPr and further monitor the Contractor's compliance with the EMPr on a daily basis, through the site diary, and enforce compliance.

The Project Manager shall have the following responsibilities:

- Oversee the construction programme and construction activities performed by all Contractors.
- Appointing an ESO (see section 6.5) and Independent ECO (see section 6.5) for the duration of the construction phase.
- Regular liaison with the ECO and ESO during the construction phase to ensure compliance with the EMPr.
- Ensuring that all contractors received the required environmental training and adhere to the requirements of the EMPr.
- Review Method Statements.
- Stop work in emergency situations.
- Liaison with Interested and Affected Parties.

The Project Manager should also consider establishing a liaison committee consisting of a representative from Rietkloof Wind Farm (Pty) Ltd, the contractor (s), the relevant engineers, and any other role-player deemed necessary by the members of the committee (the 'Liaison Committee') that will meet monthly to review the progress of the contract in implementing and complying with its obligations in terms of this EMPr.

#### **6.4 Contractor (Primary)**

The successful Contractor shall:

- Be responsible for the overall implementation of the EMPr in accordance with the requirements of Rietkloof Wind Farm (Pty) Ltd and the EA;
- Be responsible for preparing method statements for approval;
- Respond to all instructions made by the Project Manager, ESO and ECO;
- Ensure that all third parties (i.e. secondary contractors or other parties) who carry out all or part of the contractor's obligations under the contract comply with the requirements of this EMPr;
- Ensure that all staff attend environmental awareness training; and
- Prepare monitoring reports demonstrating compliance with this EMPr.

#### **6.5 Environmental Site Officer**

The Project Manager shall appoint a nominated representative as the ESO for the contract. The ESO will be site-based and shall be the responsible person for implementing the environmental provisions of the construction contract. There shall be an approved ESO on the site at all times. The ESO can be internal or an external party can fulfil the role. It may be necessary to have more than one ESO. The ESO's duties will include, *inter alia*, the following:

- Ensuring that the EA and permits required in terms of the applicable legislation have been obtained prior to the commencement of construction;
- Reviewing construction method statements and provide input to the ECO and Project Manager, where necessary, in order to ensure that the environmental specifications contained within the construction contract are adhered to;

- Assisting the Contractor in finding environmentally responsible solutions to problems;
- Keeping accurate and detailed records of all construction activities on site;
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints;
- Ensuring that the required actions are undertaken to mitigate the impacts resulting from non-compliance; and
- Reporting all incidences of non-compliance to the Project Manager, ECO and or Contractor.

The ESO shall submit regular written reports to the ECO, but not less frequently than once a month.

The ESO must have:

- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems;
- The ESO must be fully conversant with the Basic Assessment Report and EMPr for the electrical infrastructure and all relevant environmental legislation; and,
- The ESO must have received professional training, including training in the skills necessary to be able to amicably and diplomatically deal with the public as outlined in bullet point one above.

The ECO shall be in the position to determine whether or not the ESO has adequately demonstrated his/her capabilities to carry-out the tasks at hand and in a professional manner. The ECO shall therefore have the authority to instruct the Project Manager to replace the ESO if, in the ECO's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the construction contract. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

## **6.6 Environmental Control Officer**

For the purposes of implementing the conditions contained herein, Rietkloof Wind Farm (Pty) Ltd shall appoint an ECO for the duration of the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMPr as well as the EA are complied with during the construction period. The ECO will be responsible for issuing instructions to the Contractor where environmental considerations call for action to be taken. The ECO shall submit regular written reports to Rietkloof Wind Farm (Pty) Ltd, but not less frequently than once a month.

The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMPr and conditions of the EA by the Contractor. The ECO's duties in this regard will include, *inter alia*, the following:

- Confirming that the EA and permits required in terms of the applicable legislation have been obtained prior to construction commencing;
- Monitoring and verifying that the EMPr and EA are adhered to at all times and taking action if specifications are not followed;
- Monitoring and verifying that environmental impacts are kept to a minimum;
- Reviewing and approving construction method statements with input from the ESO and Project Manager, where necessary, in order to ensure that the environmental specifications contained within this EMPr and EA are adhered to;
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr and EA;
- Verify that the attendance records for environmental awareness training for all new personnel on site provided by the Contractor are complete;
- Monitoring that activities on site comply with all relevant environmental legislation;

- Addressing non-compliance with the EMPr and/or EA through measures included in Chapter 10;
- Undertaking a continual internal review of the EMPr and submitting any changes to Rietkloof Wind Farm (Pty) Ltd and / or DEA (in case of major changes) for review and approval;
- Checking the register of complaints kept on site and maintained by the ESO and ensuring that the correct actions are/were taken in response to these complaints;
- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance;
- Reporting all incidences of non-compliance to Rietkloof Wind Farm (Pty) Ltd;
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project. The ECO shall also submit compliance audit reports to DEA, in accordance with the requirements of the environmental authorisation. Such reports shall be reviewed by Rietkloof Wind Farm (Pty) Ltd, prior to submission;
- Keeping a photographic record of progress on site from an environmental perspective. This can be conducted in conjunction with the ESO as the ESO will be the person that will be onsite at all times and can therefore take photographic records weekly. The ECO would need to check and ensure that the ESO understands the task at hand;
- Recommending additional environmental protection measures, should this be necessary; and
- Providing report back on any environmental issues at site meetings.

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- The ability to conduct inspections and audits and to produce thorough, readable and informative reports;
- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- Proven competence in the application of the following integrated environmental management tools as relevant:
  - Environmental Impact Assessment;
  - Environmental management programmes;
  - Environmental auditing;
  - Mitigation and optimisation of impacts;
  - Monitoring and evaluation of impacts; and
  - Environmental Management Systems.

The ECO must be fully conversant with the EIA process and BA report, this EMPr, EA and all relevant environmental legislation for the Wind Farm Project.

Rietkloof Wind Farm (Pty) Ltd shall have the authority to replace the ECO if, in their opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMPr or this specification. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

## **6.7 Liaison Committee**

A liaison committee consisting of a representative from Rietkloof Wind Farm (Pty) Ltd, the Contractor, the Project Manager, and any other role-player deemed necessary by the members of the committee (the 'Liaison Committee') will meet every month to review the progress of the contract in implementing and complying with its obligations in terms of this EMPr.

## **7 REPORTING**

### **7.1 Method statements**

Before the Contractor begins each construction activity, the Contractor shall give to the ECO and Project Manager a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities or aspects that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of impacted environment.

The ESO and Project Manager can review the Method Statements for approval by the ECO. The Contractor must submit any changes or new submissions to the ECO and/or Project Manager whenever there is a change or variation to the original. Variations must be approved before commencing with the activity.

The ECO and/or Project Manager may provide comment on the methodology and procedures proposed by the Contractor but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems.

### **7.2 Good housekeeping**

The Contractor shall undertake "good housekeeping" practices during construction. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of weather to include the care for and preservation of the environment within which the site is situated.

### **7.3 Record keeping**

The Project Manager and the ESO will continuously monitor the Contractor's adherence to the approved impact prevention procedures and the Project Manager shall issue to the Contractor a notice of non-compliance whenever transgressions are observed. The ESO should document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance shall be documented and reported to the Project Manager and ECO in the monthly report. These reports shall be made available to DEA when requested.

The Project Manager shall ensure that an electronic filing system identifying all documentation related to the EMPr is established. All Contractors, the ESO and ECO shall adhere to this filing system.

A list of reports likely to be generated during all phases of the Project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Final Basic Assessment Report.
- Environmental Management Programme.
- Final design documents and diagrams issued to and by the Contractor.
- All communications detailing changes of design/scope that may have environmental implications.

- Daily, weekly and monthly site monitoring reports.
- Complaints register.
- Medical reports.
- Training manual.
- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Copies of all relevant environmental legislation.
- Permits and legal documents, including letters authorising specific personnel of their duties as part of emergency preparedness teams e.g. fire teams, etc.
- Crisis communication manual.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- Environmental Authorisation on the BAR from the DEA.
- All method statements from the Contractor for all phases of the project.

#### 7.4 Document control

The Contractor and Project Manager shall be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.
- Every document should identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution.
- All documents should be dated, provided with a revision number and reference number, filed systematically, and retained for a five year period.

The Contractor shall ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMPr are performed. All documents shall be made available to the independent external auditor.

#### 7.5 Emergency preparedness

The Project Manager and or Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the life cycle of the project. Such activities may include, *inter alia*:

- Accidental discharges to water and land;
- Accidental exposure of employees to hazardous substances;
- Accidental veld or forest fires;
- Accidental spillage of hazardous substances; and
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans should include:

- Emergency organisation (manpower) and responsibilities, accountability and liability;
- A list of key personnel;



- Details of emergency services applicable to the various areas along the route that electrical infrastructure components will need to be transported and for the site itself (e.g. the fire department, spill clean-up services, etc.);
- Internal and external communication plans, including prescribed reporting procedures where required by legislation;
- Actions to be taken in the event of different types of emergencies;
- Incident recording, progress reporting and remediation measures required to be implemented;
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release; and
- Training plans, testing exercises and schedules for effectiveness.

The Contractor shall comply with the emergency preparedness and incident and accident reporting requirements, as required by the Occupational Health and Safety Act (OHSA, Act No. 85 of 1993) and the 2014 Construction Regulations (GN R 84), the NEMA (Act No 107 of 1998), the National Water Act (Act No. 36 of 1998) and the National Veld and Forest Fire Act (Act No. 101 of 1998) as amended and/or any other relevant legislation.

### **7.6 Corrective action for non-compliance**

Non-compliance with the specifications of the EMPr and/or conditions of the EA, both of which will be present on-site at all times, constitutes a breach of contract for which the Contractor may be liable to pay penalties to be determined by the ECO for approval by the Project Manager. The Contractor is deemed not to have complied with the EMPr if:

- There is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and haul/access roads;
- There is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site;
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or
- The Contractor fails to comply with corrective or other instructions issued by the Project Manager and/or ECO within a specific time period.

The Contractor shall act immediately when a notice of non-compliance is received and correct whatever was the cause for the issuing of the notice.

The ECO's decision with regard to what is considered a violation, its seriousness and the action to be taken against the Contractor shall be final. Failure to redress the cause shall be reported to the relevant authority. The responsible provincial or national authorities shall ensure compliance and impose penalties relevant to the transgression as allowed for within its statutory powers.

### **7.7 Complaints Register**

The Contractor will ensure that a dedicated complaints register is kept on site at all times. The register will contain the details of the person who made the complaint, the nature of the complaint received, the date on which the complaint was made and the response noted with the date and action taken. The register will be kept in accordance with the requirements of the ECO. This record shall be submitted with the monthly reports and an oral report given at the monthly site meetings.

Please see the "Grievance Procedures" chapter (Chapter 14) for specific instructions regarding the different actions to be taken in the event of a grievance.

### **7.8 Inspections**

Ongoing visual inspections will be conducted daily by the ESO. The ESO will spend the bulk of

his/her time on site on the lookout for any unsafe acts and activities that transgress the requirements as specified in the EMPr. The ESO compiles the site register and the ECO maintains the complaints register and any other records required in the EA (the ESO would also have input into this as well, as he/she would be site-based).

## 7.9 Spot Fines

The ESO and ECO shall be authorised to impose spot fines for any of the transgressions detailed below:

- Littering on site;
- Lighting of illegal fires on site;
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated 'no-go' areas (especially for significant cultural resources such as nearby graves etc.);
- Creating dust or noise;
- Possession or use of intoxicating substances or weapons on site;
- Trapping, hunting or trading of fauna and / or plants on site;
- Any vehicles being driven in excess of designated speed limits;
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site; and
- Urination and defecation anywhere other than using the toilet facilities that have been provided.

These activities, along with the appropriate guidelines to determining the fines, shall be agreed to by Rietkloof Wind Farm (Pty) Ltd, the Project Manager and the Contractor. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications and or legal obligations. Rietkloof Wind Farm (Pty) Ltd or Project Manager will inform the Contractor of the contravention and the amount of the fine.

## 7.10 Penalty Fines

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the Contractor shall be liable to pay a penalty fine. The following transgressions should be penalised:

- Hazardous chemical/oil spill;
- Avoidable damage to sensitive environments without the relevant permits;
- Avoidable damage to cultural and historical sites without the relevant permits;
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas;
- Uncontrolled/unmanaged erosion;
- Unauthorised blasting activities; and
- Violation of environmental authorisation conditions.

These activities, along with the appropriate guidelines to determining fines, shall be agreed to by Rietkloof Wind Farm (Pty) Ltd, the Project Manager and Contractor, and will be included within the final EMPr. In addition to penalties, the Project Manager has the power to remove from site any person who is in contravention of the EMPr, and if necessary, the Project Manager can suspend part of or all of the works, as required.

## 7.11 Audits

Where the monitoring data and the inspections highlight any problems, an internal audit will be initiated by the ECO. The purpose of the audit is to ascertain the source of the problem and to define what action shall be taken to rectify the problem and prevent its reoccurrence.

Audit reports shall conform to the requirements as per the 2014 EIA regulations (Appendix 4), namely:

## **7.12 Environmental Audit Report**

1. The environmental audit report must provide for recommendations regarding the need to amend the EMPr.

### **7.12.1 Objective of the environmental audit report**

The objective of the environmental audit report is to-

- a. report on-
  - (i) the level of compliance with the conditions of the environmental authorisation and the EMPr, and where applicable, the closure plan; and
  - (ii) the extent to which the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan achieve the objectives and outcomes of the EMPr, and closure plan.
- b. identify and assess any new impacts and risks as a result of undertaking the activity;
- c. evaluate the effectiveness of the EMPr, and where applicable, the closure plan;
- d. identify shortcomings in the EMPr, and where applicable, the closure plan; and
- e. identify the need for any changes to the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan.

### **7.12.2 Content of environmental audit reports**

An environmental audit report prepared in terms of these Regulations must contain-

- a) details of-
  - (i) the independent person who prepared the environmental audit report; and
  - (ii) the expertise of independent person that compiled the environmental audit report;
- b) a declaration that the independent auditor is independent in a form as may be specified by the competent authority;
- c) an indication of the scope of, and the purpose for which, the environmental audit report was prepared;
- d) a description of the methodology adopted in preparing the environmental audit report;
- e) an indication of the ability of the EMPr, and where applicable, the closure plan to-
  - (i) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;
  - (ii) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
  - (iii) ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;
- f) a description of any assumptions made, and any uncertainties or gaps in knowledge;
- g) a description of any consultation process that was undertaken during the course of carrying out the environmental audit report;
- j) a summary and copies of any comments that were received during any consultation process; and
- k) any other information requested by the competent authority.

The frequency of environmental audits will be determined in the EA.

## **7.13 Incident Reporting and Remedy**

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident (within 24 hours). The following information must be provided:

- The location;



- The nature of the load; and
- The status at the site of the accident itself (i.e. whether further leakage is still occurring, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

#### **7.14 Verbal instructions**

Verbal instructions are likely to be the most frequently used form of corrective action and are given in response to transgressions that are evident during routine site inspections by the ESO and/or ECO. Verbal instructions are also used to create further awareness amongst employees as often transgressions are a function of ignorance rather than vindictiveness. Workers must obey verbal instructions through formally recording the actions taken to resolve the matter so that the instruction could be successfully finalised and recorded. Maximum allowable response time: two working days.

#### **7.15 Written instructions**

Written instructions will be given following an audit. The written instructions will indicate the source or sources of the problems identified on site and propose solutions to those problems. The implementation of solutions will be assessed in a follow-up audit and further written instructions issued if required. Maximum allowable response time: four working days.

#### **7.16 Public Communication and Liaison with Interested and Affected Parties**

The Contractor shall comply with the requirements for public consultation as required by the Constitution Act (Act No. 108 of 1996) and the NEMA (Act No. 107 of 1998).

During the construction phase of the project, the Contractor shall be responsible for erecting information boards, in the position, quantity, design and dimensions approved by the Project Manager. The information boards shall contain relevant information regarding the construction activity and the relevant contact details to assist persons who wish to submit complaints regarding construction activities.

#### **7.17 Review and Amendment of the EMPr**

A formal management review needs to be conducted on a regular basis in which the audit reports written by the ECO based on frequent inspections and interactions with the ESO, will be reviewed. The purpose of the review is to critically examine the effectiveness of the EMPr and its implementation and to decide on potential modifications to the EMPr as and when necessary. The process of management review is in keeping with the principle of continual improvement.

Amendments of the EMPr can be undertaken in terms of Sections 34-37 of the 2014 EIA Regulations. Any amendments requiring approval, shall be submitted to the Department of Environmental Affairs (DEA) as the competent authority.

## 8 ENVIRONMENTAL MONITORING

**According to Appendix 4 of GN R 982, an environmental management programme must include:**

- (g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
- (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);

### 8.1 General environmental monitoring

A monitoring programme will be implemented for the duration of the construction of the Rietkloof 132kV overhead distribution line project, including the associated infrastructure. This programme will include:

- Establishing a baseline through the taking of photographs of identified environmental aspects and potential impact sites along the routes prior to construction.
- Bi-weekly (fortnightly) monitoring during the first month of construction where after monthly audits will be conducted by the ECO for the remainder of the construction phase to ensure compliance to the EMPr conditions, and where necessary make recommendations for corrective action. These audits can be conducted randomly and do not require prior arrangement with the Project Manager. The ESO, who will report to the ECO, will be on site daily to monitor the above.
- Compilation of an audit report with a rating of compliance with the EMPr. The ECO shall keep a photographic record of any damage to areas outside the demarcated site and construction area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the ECO for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the Landowner or community. All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

### 8.2 Avifaunal Monitoring

Prior to construction, an avifaunal specialist should be consulted in order to determine the requirements for monitoring of the avifauna present in the vicinity of the Rietkloof Wind Farm 132kV distribution line, pre-and post-construction. The suggested monitoring programme should be incorporated into the final EMPr.

## 9 ENVIRONMENTAL AWARENESS

**According to Appendix 4 of GN R 982, an environmental management programme must include:**

- (m) an environmental awareness plan describing the manner in which-
- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
- (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the ECO where necessary.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. Environmental awareness training programmes shall contain the following information:

- The names, positions and responsibilities of personnel to be trained.
- The framework for appropriate training plans.
- The summarised content of each training course.
- A schedule for the presentation of the training courses.

The ECO shall ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMPr. The training records shall verify each of the targeted personnel's training experience.

The ESO shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness and the content of the EMPr. The presentation needs to be conducted in the language of the employees to ensure it is understood. The environmental training shall, as a minimum, include the following:

- The importance of conformance with all environmental policies.
- The environmental impacts, actual or potential, of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the EMPr.
- The potential consequences of departure from specified operating procedures;
- The mitigation measures required to be implemented when carrying out their work activities.
- Environmental legal requirements and obligations.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the construction of the bridge, main access roads or approach roads.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.
- The procedure which should be followed should a grave be encountered, or unearthed during the construction phase.



## **9.1 Monitoring of environmental training**

The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. If necessary, the ECO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.

## 10 COMPLIANCE WITH THE EMPr

According to Appendix 4 of GN R 982, an environmental management programme must include:

- (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

A copy of the EMPr must be kept on site at all times during the construction period. The EMPr will be binding on all contractors operating on the site and must be included within the Contractual Clauses. It should be noted that in terms of the National Environmental Management Act No 107 of 1998 (Section 28) those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (The 'polluter pays' principle).

### 10.1 Non-compliance

The contractors shall act immediately when notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints.

Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant authority for them to deal with the transgression, as it deems fit. The Contractor is deemed not to have complied with the EMPr if, *inter alia*:

- there is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and roads;
- there is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site.
- environmental damage ensues due to negligence;
- construction activities take place outside the defined boundaries of the site; and/or
- the Contractor fails to comply with corrective or other instructions issued by the Project Manager within a specific time period.

It is recommended that the Project Manager /contractors institute penalties for the following less serious violations and any others determined during the course of work as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere except at designated facilities.

### 10.2 Emergency preparedness

The Contractor shall compile and maintain environmental emergency procedures to ensure that

there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the construction period. Such activities and impacts may include, *inter alia*:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental fires.
- Accidental spillage of hazardous substances.
- Accidental toxic emissions into the air.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans shall include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel and contact details.
- Details of emergency services available (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor shall comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the NEMA, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

### **10.3 Incident reporting and remedy**

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident. The following information must be provided:

- the location;
- the nature of the load;
- the extent of the impact; and
- the status at the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

### **10.4 Penalties**

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the developer and/or Contractor shall be liable and penalties imposed if any permit conditions are contravened. The following violations, and any others determined during the course of work, should be penalised:



- Hazardous chemical/oil spill and/or dumping in non-approved sites.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Unauthorised blasting activities (if applicable).
- Pollution of water sources.
- Unnecessary removal or damage to trees.

## 11 ENVIRONMENTAL SPECIFICATIONS FOR THE PROJECT LIFE CYCLE

**According to Appendix 4 of GN R 982, an environmental management programme must include:**

A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including –

- (i) planning and design;
- (ii) pre-construction activities;
- (iii) construction activities;
- (iv) rehabilitation of the environment after construction and where applicable post closure; and
- (v) where relevant, operation activities;

A variety of potential impacts are associated with the planning & design, construction, operation and rehabilitation activities for this project. These impacts can be categorised as general impacts as well as site specific impacts. General best practice rules to construction should be followed at all times. In addition to this the specific mitigation measures and recommendations as highlighted by the BAR are highlighted below. Codes used for the tables are explained below (Table 11-1):

**Table 11-1: Reference to acronyms used in Chapter 11**

<b>Responsibility</b>	<b>Time Frames (Phasing)</b>
RE = Resident Engineer	DP = Entirety of the Design Phase
PM = Project Manager	CP = Entirety of the Construction Phase
ECO = Environmental Control Officer	OP = Entirety of the Operation Phase
PC = Primary Contractor	RP = Entirety of the Rehabilitation phase
ESO = Environmental Site Officer	PL = Entirety of the Project Lifecycle (All phases)
EAP = Environmental Assessment Practitioner	
LC = Liaison Committee	
D = ProponentHolder of the EA/Rietkloof Wind Farm Pty Ltd	

### Interpretation

Responsibility is written in order of relevance. i.e. should an activity be the responsibility of the more than one party, the first mentioned party will be primarily responsible for the implementation of said activity, with the second, third and fourth mentioned the second, third and fourth responsible party, respectively. Regardless of whether there is more than one party stated for a particular activity, the primary responsible party remains responsible for the action in its entirety, unless all parties are collectively required for the completion of such task, in which case all parties are liable for their component of the completion. Should uncertainty or ambiguity exist, the responsibilities shall be determined in consultation with the Project Manager and the ECO onsite, and it is the responsibility of all parties to identify where such uncertainty exists, prior to construction commencing. An example is stated below:

*Issue:* Invasive species management on-site (control activities)

*Mitigation measures:* Monitoring of a control programme; Schedules of a control programme; implementation of a control programme; ensuring all staff conduct work using safety equipment.

*Responsible:* ECO; PC; ESO. *Timeframes:* PL.

This activity thus required the ECO for monitoring and scheduling of the control programme, and Primary contractor for implementation and safety gear, and the ESO for mediation and arbitration of issues should they occur, for the entirety of the project life cycle.

# **PLANNING AND DESIGN PHASE**



## 11.1 Planning &amp; Design Phase

DESIGN PHASE MITIGATION MEASURES									
#	Aspect	Objective	Potential Impact	Mitigation measures	Outcomes	Indicator and monitoring	Responsibility	Timeframe	
1	Traffic & Transport	Minimise disturbance and safety concerns related to the increase in elevated vehicles volumes	Roads condition may deteriorate and become unsafe due to higher volume of traffic on roads	<ol style="list-style-type: none"> <li>Project planning must include a plan for transport management plan that will be implemented especially during the construction phase of the development.</li> <li>The necessary road traffic permits must be obtained for transporting parts, containers, materials and construction equipment to the site.</li> <li>Careful planning of the routes taken by heavy vehicles must highlight areas of road that may need to be upgraded in order to accommodate these vehicles. Once identified these areas must be upgraded if necessary.</li> </ol>	<ul style="list-style-type: none"> <li>Approved transport management plan exists</li> <li>Appropriate road permits obtained</li> <li>Identified areas upgraded prior to traffic increase, if required</li> </ul>	<ul style="list-style-type: none"> <li>All permits obtained prior to construction;</li> <li>Routes planned ahead and approved by the EA holder prior to construction;</li> <li>Once off monitoring prior to construction by ECO</li> </ul>	PM ; PC; ECO	DP	
3	Ecological Open space management plan	Minimise impacts to sensitive ecology	Habitat loss through incorrect placement of infrastructure	<ol style="list-style-type: none"> <li>A search and rescue operation must be undertaken by a qualified botanist/ horticulturalist prior to commencement of construction. All Species of Conservation Concern (SCC) identified within the development footprints must be transplanted to a refuge area.</li> <li>No collection of indigenous plants may be allowed on the property outside of those undertaken by the designated person(s).</li> <li>Employees should undergo environmental awareness training and be sensitized to the need to avoid disturbance to the indigenous vegetation outside the development footprints.</li> <li>All recommendations of the Alien Vegetation, Rehabilitation, Fire and Flora and Fauna Management Plans are applicable to Open Space Areas.</li> <li>The applicant must consider reducing the development footprint to avoid or minimise the clearance of vegetation and habitat disturbance;</li> </ol> <p><i>*For the purposes of this Management Plan, Open Space areas should include all areas impacted by construction activities including all approved buffers.</i></p>	<ul style="list-style-type: none"> <li>A search and rescue plan approved and implemented (if recommended by the ecologist) prior to construction</li> <li>Environmental awareness training prior to construction phase, as produced by ECO and approved by PM.</li> </ul>	<ul style="list-style-type: none"> <li>Less than 2 staff members on site not having been through environmental awareness training during at all times;</li> <li>Specific management plans as mentioned conducted appropriately, as determined by ECO</li> </ul>	PC, ECO	DP and CP	
4	Ecological degradation	Promote ecological vigour and sustainability on site throughout design phase	Habitat destruction from improper planning	<ol style="list-style-type: none"> <li>Routes should also be adjusted within the 200m corridor to avoid areas of high sensitivity, as far as possible, as informed by a preconstruction walk-through survey.</li> <li>Minimise development footprint within the Very High sensitivity parts of the site as informed by the preconstruction walk-through survey.</li> <li>Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.</li> <li>Avoid impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the facility area as far as possible.</li> <li>Demarcate all areas to be cleared with construction tape or similar material. However caution should be exercised to avoid using material that might entangle fauna.</li> <li>A pre-construction walk-through survey of the final layout of the distribution lines should be conducted by an ecological specialists to assess where further mitigation measures and recommendations are required with respect to potentially sensitive environmental heritage features.</li> <li>The number of access and service tracks should be limited as far as possible.</li> <li>Only areas absolutely necessary required should be cleared within the proposed servitude for the distribution line.</li> <li>The final routes must be adjusted within their corridors to avoid areas of high sensitivity as far as possible, as informed by a pre-construction walk-through survey;</li> </ol>	<ul style="list-style-type: none"> <li>High sensitivity areas avoided where possible</li> </ul>	<ul style="list-style-type: none"> <li>All cleared areas demarcated prior to clearing</li> <li>Demarcations correspond to the EA boundaries, as determined by the ECO;</li> <li>Once off monitoring prior to construction clearing</li> </ul>	PC ; ECO	DP	
5	Environmental Legislation and Policy	Ensure all pertinent guidelines and legislation is incorporated into project planning	Criminal prosecution, project cease and desist or hefty fines may be levied on parties breaking the law pertaining to the environment. Additionally, harm will be incurred to the environment should proper process not be followed	<ol style="list-style-type: none"> <li>Ensure that all relevant legislation and policy is consulted and further ensure that the project is compliant with such legislation and policy. In addition, planning for the construction and operation of the proposed energy facility should consider available best practice guidelines.</li> <li>The applicant must apply for the 'mitigation hierarchy' prior to submitting the final proposal to the competent authority for consideration.</li> <li>These should include (but are not restricted to): <ol style="list-style-type: none"> <li>Local and District Spatial Development Frameworks; and</li> <li>Local Municipal bylaws.</li> </ol> </li> </ol>	<ul style="list-style-type: none"> <li>All permits, licencing and authorisations have been obtained</li> </ul>	<ul style="list-style-type: none"> <li>All permits, licencing and authorisations have been obtained prior to construction commencing;</li> <li>Method statements approved prior to construction;</li> <li>Once off monitoring ECO</li> </ul>	Holder of the EA (all); EAP (authorisations & licencing); ECO ; PC (permits);	PL	
6	Stormwater Management Plan and Erosion	Manage surface runoff to minimise pollution and erosion on site	An increase in erosion potential and topsoil loss will be incurred from insufficient planning and management of stormwater flow during the project	<ol style="list-style-type: none"> <li>Structures must be located at least 32 m away from identified drainage lines. If this is not technically feasible, the required approvals must be obtained in terms of the NWA.</li> <li>Water Use Licences will be required, where relevant, prior to construction.</li> <li>A Storm Water Management Plan must be designed and implemented to ensure maximum water seepage at the source of water flow.</li> <li>The plan must include management mitigation measures for water pollution, waste water management and the management of surface erosion e.g. by considering the applicability of contouring, etc.</li> <li>Although no hard stand is currently located within 32 m of a channel edge, future deviations of the layout must take in consideration the no hard standing surfaces must be constructed within 32 m from a channel edge, except for roads.</li> <li>Any stormwater management features must be suitably designed and constructed to maintain stormwater flow to acceptable levels and minimise risk of erosion and scouring.</li> <li>No stormwater runoff should be discharged directly into the drainage line/seep, where it could lead to erosion.</li> </ol>	<ul style="list-style-type: none"> <li>Final design including necessary stormwater infrastructure to manage runoff</li> </ul>	<ul style="list-style-type: none"> <li>Stormwater management plan developed prior to construction commencing</li> <li>Method statement complies with SWMP</li> </ul>	PM	PL	
7	Waste Management Plan	Reduce contamination and health risks	Environmental harm may be induced through poor waste management	<ol style="list-style-type: none"> <li>Must develop a waste management plan for handling on site waste.</li> <li>Designate an appropriate area where waste can be stored before disposal.</li> </ol>	<ul style="list-style-type: none"> <li>Waste management plan developed prior to construction commencing</li> </ul>	<ul style="list-style-type: none"> <li>Waste manage plan, as well as storage and disposal areas approved by ECO prior to construction;</li> </ul>	PM, ECO	PL	
8	Electromagnetic Interference	No interference with existing communication systems	Incorrect placement of the pylons could impact on existing communication systems; Corona effect from high voltage lines may cause disturbance to fauna in the area	<ol style="list-style-type: none"> <li>Accurate siting of pylons must take place in the planning and design phase to reduce these effects.</li> <li>If complaints are received from surrounding landowners regarding this issue, the Holder of the EA must investigate and mitigate these issues to the best of their abilities.</li> </ol>	<ul style="list-style-type: none"> <li>Final design avoids interference with existing communication systems</li> </ul>	<ul style="list-style-type: none"> <li>Approved layout and siting as per EA;</li> <li>Once off monitoring by ECO prior to construction</li> </ul>	D ; PM ; ECO	DP	
9	Architecture of ancillary	Reduce visual impact of	Visual impact from ancillary	<ol style="list-style-type: none"> <li>Ensure that the surfaces of all project structures and buildings visible to the public are maintained such that:</li> </ol>	<ul style="list-style-type: none"> <li>Appropriate colour, finishes and</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate colour, finishes</li> </ul>	D ; PM ; PC	PL	

DESIGN PHASE MITIGATION MEASURES								
#	Aspect	Objective	Potential Impact	Mitigation measures	Outcomes	Indicator and monitoring	Responsibility	Timeframe
	infrastructure	facility	infrastructure	1. their colours minimize visual intrusion and contrast by blending with the existing colours of the surrounding landscape, 2. their colours and finishes do not create excessive glare, and 33. Their colours and finishes are consistent with local policies and ordinances.	siting of ancillary structures	and siting of ancillary structures; No monitoring required		
10	Flight safety	Ensure facility registered with aviation authorities to reduce flight safety risk	Although unlikely, a power line represents a flight path risk, and as such should be conducted and planned for appropriately	34. Inform the civil aviation authority (CAA) of the finalised layout and location of the power lines, including the technical descriptions of the project (for example, height, pylon type, highest point, voltage, maintenance periods etc.).	<ul style="list-style-type: none"> <li>CAA fully informed of the proposed development</li> </ul>	Authorities informed prior to submission of final BAR.	D ; EAP	DP
11	Heritage	Preserve and/or minimise damage to heritage resources	Irreparable heritage resource loss during project	35. Substation 7 situated south on the Farm Hartjiesfontein 81 not favoured for the establishment of the substation based on archaeological sensitivities identified. 36. An archaeological heritage walk-through survey of the final layout of the preferred power line route must be conducted to assess the changes where further recommendations and mitigatory measures may be made if necessary. 37. A walk-through of the final layout of the preferred power line alternative should be conducted before any final mitigation measures can be established 38. This EMPr must be submitted to Heritage Western Cape (HWC), the heritage authority for any Western Cape developments, and as a commenting authority in terms of the National Heritage Resources Act 25 of 1999, Section 38.	<ul style="list-style-type: none"> <li>Walk through conducted prior to clearing</li> <li>Heritage reports submitted to HWC during the EIA process.</li> </ul>	<ul style="list-style-type: none"> <li>Walk through conducted and sensitive zones demarcated;</li> </ul>	Holder of the EA, PC; ECO	DP
12	Avifaunal	Reduce bird fatalities from collision and electrocution with overhead powerlines	Bird mortality from collision and electrocution with cable conductors, habitat loss	39. Minimization of the loss of bird habitat by not clearing vegetation from the entire service tract and where possible using a single track to install and service the local power lines. 40. No powerline routes 1) near Fortuin dam and 2) through, or across, the col between Ou Mure and Fortuin farms, or for these localities unless powerlines are elevated. 41. Where overhead powerlines cross valleys, bird flight diverters should be placed on the line at a spacing of 5m. In the identified avifaunally sensitive area (Ou Mure-Fortuin) day and night visible bird flight diverters should be placed at 2 m intervals. It is accepted that diverters are likely to deteriorate across the operational life of the lines. The main aim is to alert bird to the lines in the immediate post-construction years when the lines will be a novel risk which locally resident birds will, over years, learn to compensate for. 42. Avoidance of construction of sub-stations during the main breeding season for local birds which is the period August to October inclusive, as far as possible.	<ul style="list-style-type: none"> <li>Design of facility as per avifaunal recommendations</li> </ul>	<ul style="list-style-type: none"> <li>Final design</li> </ul>	Holder of the EA, PC; ECO	DP

# CONSTRUCTION PHASE



## 11.2 Construction Phase

CONSTRUCTION PHASE MITIGATION MEASURES								
	Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe
13	Storage of Hazardous substances	Minimise pollution and safety risks through proper planning	Accidental spillage or leaks of hazardous materials pose health and environmental harm risk	<p>43. All hazardous substances such as paints, diesel and cement must be stored in a bunded area with an impermeable surface beneath them.</p> <p>44. Cement mixing must be done at a single location which should be suitably located.</p>	<ul style="list-style-type: none"> <li>Storage of hazardous substances in compliance with the approved Method Statement</li> </ul>	<ul style="list-style-type: none"> <li>Method Statement (to be developed by the Contractor for approval by the ECO.)</li> </ul>	PC ; ECO	Immediately prior to CP
14	Open space management plan and Site Management	Necessary services secured	Health and safety concerns relating to poor sanitation; Environmental harm from poor waste management; Fauna and flora disturbance.	<p>45. The contractor shall establish all infrastructure as per the agreed site layout plan in a manner that does not adversely affect the environment.</p> <p>46. The contractor shall submit a method statement for site clearance for approval by the ECO in consultation with the Project Manager and ESO. Site establishment shall take place in an orderly manner and all required amenities shall be installed prior to the main workforce moving onto site.</p> <p>47. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.</p> <p>48. Safe drinking water for human consumption shall be available at convenient locations on site. All water used on site must be taken from a legal source and comply with the recognised standards for potable and other uses.</p> <p>49. The contractor shall provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings.</p> <p>50. The contractor shall ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.</p> <p>51. The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at a municipal registered landfill. These bins must be equipped with animal proof lids to ensure the contents are not accessible to wild or domestic animals. A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement (i.e. how and where he intends to dispose of the waste) with regard to waste management. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt on site.</p> <p>52. ECO to assist in siting of structures and supervise any bush clearing for the construction camp. Construction camp should be fenced to avoid sprawl.</p> <p>53. Open space areas should be kept as contiguous blocks of vegetation as far as possible and no additional barriers (except for approved roads and fences) should be constructed that may impede faunal movement;</p> <p>54. All open space areas must be kept alien and weed free;</p> <p>55. Only indigenous species from a list approved by the Environmental Control Officer (ECO) may be used for any rehabilitation work in open space areas;</p> <p>56. No waste should be disposed of in open space areas, including but not restricted to cigarette butts and uneaten foodstuffs (i.e. fruit cores and peels) that may attract scavengers. It is recommended that receptacles be placed strategically to minimise this, especially during the construction phase;</p> <p>57. An archaeological and ecological walk through of the site must be conducted prior to construction commencing, in order to ascertain where sensitive areas are and where micro-siting of the pylons must occur. These measures must be strictly adhered to during construction. Micro-siting will involve the precise placement of the pylon structures being moved slightly in order to accommodate any fine scale ecological or heritage features of importance.</p>	<ul style="list-style-type: none"> <li>Water, sanitation, electricity and waste services secured in line with the approved Method Statement</li> </ul>	<ul style="list-style-type: none"> <li>One portable toilet per 10 staff members roughly equally spaced or at strategic intersections of the site;</li> <li>At least 20L potable water on site per staff member per day from the commencement of construction;</li> <li>Waste disposal systems in place and in working order, as determined by the ECO, from the onset of construction;</li> <li>Ablution facilities maintained, cleaned and emptied daily;</li> <li>Alien management plan implemented throughout construction phase</li> </ul>	PC ; PM ; ESO	Immediately prior to DP and throughout the CP
15	Vegetation Clearing	Minimise vegetation clearing in order to promote ecological sustainability and vigour and minimise erosion	Fauna and flora disturbance and harm via uncontrolled and unplanned clearing; Increased erosion and runoff from poorly laid out spoil sites	<p>58. Site clearing must take place in phased manner, as and when required. Areas must not be cleared by more than two months in advance, in order to reduce erosion risks. The area to be cleared must be clearly demarcated and this footprint strictly maintained.</p> <p>59. Vegetation clearing must be restricted to the identified sites for the substation, distribution line servitude (if required) and ancillary infrastructure lay down areas that have been identified as necessary for development of the project.</p> <p>60. Silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. These include steep areas.</p> <p>61. The Contractor shall ensure that all work is undertaken in a manner which minimises the impact on vegetation outside the immediate area of the Works. No tree or shrub outside the area of the Works shall be felled, topped, cut or pruned until it has been clearly marked for this purpose by the Project Coordinator. The method of marking will be specified by the Project Coordinator, and the Contractor will be informed in writing; and no tree outside the area of the works shall be burned for any purpose.</p> <p>62. Before clearing of vegetation, the Contractor shall ensure that all litter and non-organic material is removed from the area to be cleared.</p> <p>63. Vegetation clearing shall take place in a phased manner in order to retain vegetation cover for as long as possible in order to reduce the size of areas where dust can be generated by wind.</p>	<ul style="list-style-type: none"> <li>Site clearing minimised as far as possible and compliant to the approved Method Statement to reduce impacts to the environment</li> </ul>	<ul style="list-style-type: none"> <li>Cleared areas rehabilitation commences within 1 week of fallow land use (i.e. no active construction ongoing anymore) – as determined by ECO;</li> <li>Less than 2 non-compliance reports for lack of rehabilitation throughout entire construction phase;</li> <li>Zero instances of clearance of vegetation not in the approved design plans;</li> <li>No removed vegetation will be dumped onto adjacent intact vegetation and topsoil will be removed separately;</li> <li>Site method statements approved by ECO prior to clearing commencing</li> </ul>	PC ; ESO ; ECO	CP

CONSTRUCTION PHASE MITIGATION MEASURES								
Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe	
			64. All seed bearing invasive alien vegetation shall be removed from site. 65. No removed vegetation will be dumped onto adjacent intact vegetation and topsoil will be removed separately. 66. All indigenous plant material removed from cleared areas shall be stockpiled for mulching or temporarily stockpiled in a demarcated area, which meets the satisfaction of the PM or ECO, before disposal at an approved landfill site. 67. The use of herbicides is prohibited unless approved by the PM and ECO. 68. The Contractor shall submit a site clearing Method Statement to the PM and ECO. This Method Statement shall clearly detail the phasing of the clearing and how this will be done, where and how cleared material will be stored or disposed of, etc. 69. Temporary infrastructure construction lay-down areas should be located within low sensitivity areas as far as feasibly possible.					
16	Soil Impacts	Reduce soil erosion and promote soil fertility	Increase soil erosion from poor management practices; Environmental pollution from concrete spillage or contamination; hazardous material spillages; health and safety impacts from poor bunding.	<p><b>Topsoil</b></p> 70. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of major earthworks. This should include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed areas. 71. Care must be taken not to mix topsoil and subsoil during stripping. 72. Polluted topsoil must be disposed of at a licensed landfill site. Waste manifests must be kept to prove that this has been disposed of legally. 73. Topsoil (an approximately 100 - 150 mm layer) shall be removed from areas to be disturbed during construction and safely stockpiled for landscaping purposes. 74. All plant material (grasses, herbs and larger bush clump species) removed from the site are to be mixed into the topsoil. 75. Topsoil stockpiles shall be convex and no more than 2 m high. 76. Stockpiles shall be located in areas agreed to by the ECO or PM. 77. Topsoil stockpiles shall not be subject to compaction greater than 1 500 kg/m <sup>2</sup> and shall not be pushed by a bulldozer for more than 50 m. 78. Topsoil stockpiles shall be monitored regularly to identify any alien plants, which shall be removed when they germinate to prevent contamination of the seed bank. 79. Where feasible, spoil must be used for rehabilitation on-site. Where this is not possible spoil that is removed from the site must be removed to an approved spoil site or municipal licensed landfill site. 80. Appropriate measures, as agreed with the ECO/PM, shall be taken to protect topsoil stockpiles from erosion by wind or water by providing suitable stormwater and cut off drains, containment using hessian or similar material and/or by establishing suitable temporary vegetation. 81. Stockpiles shall not be covered with materials such as plastic that may cause it to compost or would kill the seed bank. 82. The Contractor shall be held responsible for the replacement, at his/her own cost, for any unnecessary loss of topsoil due to his failure to work according to the requirements of this Management Plan and Method Statement.	<ul style="list-style-type: none"> <li>• Stockpiles with low berms or brick walls present;</li> <li>• No concrete transport vehicle washed on site;</li> <li>• Subsoil and topsoil stockpiled separately;</li> <li>• Hazardous material banded appropriately, with sufficient storage space;</li> <li>• Sufficient practices in place to actively manage erosion to avoid and or reduce it</li> </ul>	<ul style="list-style-type: none"> <li>• Stockpile locations as per agreed by ECO and PM prior to construction commencing;</li> <li>• No mixing of topsoil and subsoil layers on stockpiles;</li> <li>• Stockpiles covered appropriately, as determined by ECO, to reduce erosion;</li> <li>• Less than 3 Non-compliance reports for incorrect stockpiling or any of the soil mitigation measures contained in this aspect.</li> </ul>	PC ; PM ; ESO ; ECO	CP
			<p><b>Soil Stripping</b></p> 83. No soil stripping must take place on areas within the site that the contractor does not require for construction works, or on areas of retained vegetation. 84. Subsoil and topsoil should, in all construction and lay down areas, be stockpiled separately to be returned for backfilling in the correct soil horizon order. 85. Construction vehicles must only be allowed to utilise existing tracks or pre-planned access routes.					
			<p><b>Stockpiles</b></p> 86. Stockpiles should not be situated such that they obstruct natural water pathways and drainage channels. 87. Stockpiles should not exceed 1.5m in height. 88. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth. 89. Stockpiles may further be protected by the construction of berms or low brick walls around their bases. 90. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding.					
			<p><b>Fuel storage</b></p> 91. Topsoil and subsoil to be protected from contamination. 92. Fuel and material storage must be away from stockpiles. 93. Cement, concrete and chemicals must be mixed on an impermeable surface and provisions should be made to contain spillages or overflows into the soil. 94. Any storage tanks containing hazardous materials must be placed in banded containment areas with sealed surfaces. The bund walls must be					

CONSTRUCTION PHASE MITIGATION MEASURES								
Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe	
			<p>high enough to contain 110% of the total volume of the stored hazardous material.</p> <p>95. Contaminated soil must be contained and disposed of off-site at an approved landfill site. Waste manifests must be kept to prove that this has been disposed of legally.</p> <p><b>Concrete mixing</b></p> <p>96. No vehicles transporting concrete to the site may be washed on site.</p> <p>97. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated run-off from the batch plant must not be allowed to get into the storm water system or any rivers, streams, wetlands or existing erosion channels / dongas.</p> <p>98. If it is impractical to dispose of water at a WWTW then a Method Statement should be compiled to make provision for a system that will not allow waste water to contaminate the surrounding area.</p> <p>99. Drip trays should be used when off-loading concrete trucks to collect any concrete that spills.</p> <p><b>Earthworks</b></p> <p>100. To take into consideration:</p> <p>101. Soils compacted during construction should be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil should be spread over landscaped areas.</p> <p>102. Wind screening and stormwater control should be undertaken to prevent soil loss from the site.</p> <p>103. All erosion control mechanisms need to be regularly maintained.</p> <p>104. Retention of vegetation where possible to avoid soil erosion</p> <p>105. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.</p> <p>106. Re-vegetation of disturbed surfaces should occur immediately after the construction activities are completed. No impediment to the natural water flow other than approved erosion control works is permitted.</p>					
17	Air Quality	Reduce dust from construction activities to acceptable levels, avoid fires onsite as far as possible	High levels of dust from construction activities and personnel; fire risk due to poor control measures	<p><b>Dust control</b></p> <p>107. Damping down of un-surfaced and un-vegetated areas during dusty periods is required. Potable water must not be used for this and only water abstracted from sources approved by DWS in agreement with the landowners is permitted.</p> <p>108. Retention of vegetation where possible will reduce dust travel.</p> <p>109. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas.</p> <p>110. The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the Landowner or neighbouring Communities.</p> <p>111. A notice at the junction of the R354 and the access road must be installed with a phone number that public can use to lodge complaints about dust.</p> <p>112. A speed limit of 30km/h must not be exceeded on dirt roads (if any).</p> <p>113. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor.</p> <p><b>Emissions control</b></p> <p>114. Regular servicing of vehicles in order to limit gaseous emissions (to be done off-site).</p> <p>115. Regular servicing of on-site toilets to avoid potential odours.</p> <p>116. Allocated cooking areas must be provided.</p> <p><b>Fire prevention</b></p> <p>117. All cooking shall be done in demarcated areas that are safe in terms of runaway or uncontrolled fires. It is recommended that a formal "braai area" is constructed at the site office for cooking.</p> <p>118. The Contractor shall have operational firefighting equipment available on site at all times. The level of firefighting equipment must be assessed and evaluated through a typical risk assessment process. It may be required to increase the level of protection, especially during the winter months.</p>	<ul style="list-style-type: none"> <li>No open fires on site;</li> <li>No dust levels beyond emission standards;</li> </ul>	<ul style="list-style-type: none"> <li>Zero non-compliance reports for work outside agreed to work hours, as determined by ECO;</li> <li>Less than 2 speeding incidents every two weeks as determined by the ECO;</li> <li>Less than 2 dust complaints per month in complaints register;</li> <li>Firefighting equipment available on site at all times;</li> <li>Zero non-compliance with firefighting equipment on-site;</li> <li>Monthly monitoring ECO</li> </ul>	PC ; ESO ; PM ; ECO	CP, OP
18	Water Quality	Manage risk of pollution and contamination to water sources on site	Contamination of natural water resources through spillages of hazardous materials; ecosystem damage from illegal water use; health and safety risks from poor sanitation and potable water supply on-site;	<p><b>Sanitation</b></p> <p>119. Adequate sanitary and ablutions facilities must be provided for construction workers</p> <p>120. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution.</p> <p><b>Hazardous materials</b></p> <p>121. Use and /or storage of materials, fuels and chemicals which could potentially leak into the ground must be controlled in a manner that prevents such occurrences.</p> <p>122. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces.</p> <p>123. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential high</p>	<ul style="list-style-type: none"> <li>Ablution facilities available on-site within first day on-site;</li> <li>Appropriate bunding in place, with correct quantities and quality material used</li> <li>Staff trained in natural water use</li> <li>Management measures in place to avoid pollution and contamination of surface water features</li> </ul>	<ul style="list-style-type: none"> <li>Hazardous chemical stored appropriately and locked away with access control, as determined by the ECO;</li> <li>Hazardous substances storage less than 100m away from water sources;</li> <li>Zero hazardous waste non-compliance reports for entire phase;</li> <li>Monthly ECO monitoring</li> </ul>	PC ; ESO ; PM ; ECO	CP, OP



CONSTRUCTION PHASE MITIGATION MEASURES								
Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe	
			runoff stormwater events. 124. Any hazardous substances must be stored at least 100m from any of the water bodies on site. 125. Contaminated wastewater (such as concrete wastewater) must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility. 126. Waste manifests must be kept to prove legal disposal at a hazardous landfill site  <b>Water resources</b> 127. Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction related activities. 128. Municipal water (or another source approved by the ECO) should be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting, etc. 129. Compaction of backfilled material must attain low soil permeability. 130. Site design and operation must that surface/storm water is diverted away from excavation trenches. 131. Backfilling of trenches must be done in such a way that water ponding and erosion of the backfilled trench are avoided. 132. Avoid impacting potential corridors, such as the riparian corridors with associated larger drainage lines through careful placement of pylon positions.  <b>Stormwater</b> 133. The site must be managed in a manner that prevents pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants. 134. Temporary cut-off drains and berms may be required to capture stormwater and promote infiltration. 135. Hazardous substances must be stored at least 100m away from any water bodies on site to avoid pollution.					
19	Noise	Reduce noise levels on site to acceptable levels	High noise levels from construction activities; disturbance to fauna; noise complaints from.	136. Construction site yards, workshops, and other noisy fixed facilities should be located well away from noise sensitive areas. Once the proposed final layouts are made available by the contractor(s), the sites must be evaluated in detail and specific mitigation measures designed into the system. 137. Noise levels must be kept within acceptable limits. All noise and sounds generated must adhere to SABS 0103 specifications for maximum allowable noise levels for residential areas. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies.	<ul style="list-style-type: none"> <li>Noise receptors included in layout design;</li> <li>Machinery used on-site are maintained;</li> </ul>	Noise generating equipment and construction site sited as per EA accepted layout plan; Noise levels within acceptable levels; Less than 2 noise complaints in register per month; Monthly Eco monitoring	PC ; ESO ; ECO ; PM	DP, CP
20	Biodiversity	Minimise impacts to fauna throughout the construction phase	Disturbance and harm to fauna and flora near the construction site reducing onsite biodiversity;	138. Any animals rescued or recovered will be relocated in suitable habitat away from the substation and line infrastructure. An expert who holds a Competency Certificate to handle Dangerous and Venomous Reptiles should be contracted to remove any animals 139. Cleared vegetation can be used to form wood piles and logs and stumps. Dead or decaying wood piles should be created as these will provide valuable refuge areas especially due to the clearance of vegetation cover. 140. Logs and stumps also provide important habitats for several reptile species as well as smaller mammals, amphibians, arachnids and scorpions. With time they will eventually be reduced to valuable compost by several animal species. Dead trees and stumps will also be used for nesting purposes by barbets, hoopoes, owls, hornbills as well as perching or hunting platforms for birds like the kingfisher. 141. Any lizards, gecko's, monitors or snakes encountered should be allowed to escape to suitable habitat away from the disturbance. No reptile should be intentionally killed, caught or collected during any phase of the project. 142. General avoidance of snakes is the best policy if encountered. Snakes should not be intentionally harmed or killed and allowed free movement away from the area. 143. Appropriate footwear should be worn in the field. 144. During construction activities wherever possible work should be restricted to one area at a time. This will give smaller birds, mammals, reptiles and amphibians an opportunity to move into undisturbed areas close to their natural habitat. The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase. 145. No further vegetation clearance except for the removal of alien invasive species. All remaining indigenous vegetation not affected by the approved layout must be conserved wherever possible. 146. No roads shall be cut through river- and stream banks (riparian vegetation) without obtaining the required approvals in terms of the NWA and active management to avoid erosion. 147. There must be no unnecessary disturbance of natural vegetation. Where unavoidable, such disturbed areas must be rehabilitated. 148. Implement a worker environmental education program and implement best management practices.	<ul style="list-style-type: none"> <li>Construction undertaken in a manner to reduce impacts to fauna</li> </ul>	<ul style="list-style-type: none"> <li>Less than 1 animal fatality per month;</li> <li>No disturbance of hydrological features on-site;</li> <li>No hydrological contamination from construction activities;</li> <li>Safety wear worn at all times in field;</li> <li>Less than 2 non-compliance reports for safety wear per month;</li> <li>Monthly ECO monitoring</li> </ul>	PC ; ESO ; ECO	PL

CONSTRUCTION PHASE MITIGATION MEASURES

21	Aspect Waste Management	Objective Manage health and safety risks associated with waste on-site	Potential Impact Environmental contamination from poor waste management, leaking or spilled hazardous materials.	Specification <b>Construction rubble</b> 149. Construction rubble shall be disposed of in pre-agreed, demarcated spoil dumps that have been approved by the relevant Municipality. Waste manifests must be kept to prove that this has been disposed of legally. <b>Litter management</b> 150. Sufficient waste bins (with animal proof lids) must be provided at the construction site for different types of waste disposal and for recycling purposes. 151. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. 152. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. 153. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite. 154. Sanitary bins must be provided for women. 155. All waste must be removed from the site and transported to a landfill site as approved by the relevant Municipality. <b>Hazardous waste</b> 156. All waste hazardous materials must be carefully stored as advised by the ECO, and then disposed of off-site at a licensed landfill site. 157. Contaminants to be stored safely to avoid spillage 158. Machinery must be properly maintained to keep oil leaks in check. <b>Sanitation</b> 159. The Contractor shall install mobile chemical toilets on the site. 160. Staff shall be sensitised to the fact that they should use these facilities at all times. 161. No indiscriminate sanitary activities on site shall be allowed. 162. Ablution facilities shall be within 100m from workplaces but not closer than 100m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce. Male and females must be accommodated separately where possible. Alternatively ablution facilities may be located in a place approved by the ECO. 163. Toilets shall be serviced regularly and the ECO shall inspect toilets regularly. 164. Potable water must be provided for all construction staff. <b>Remedial actions</b> 165. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. 166. The ECO must determine the precise method of treatment of polluted soil. 167. This could involve the application of soil absorbent materials or oil-digestive powders to the contaminated soil. 168. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials. 169. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal. 170. Spill kits must be provided at strategic points within the construction site and all construction vehicles must have a spill kit to deal with small spills.	Outcome • Waste management and management of hazardous materials Method Statement to be developed by the Contractor for approval by the ECO.	Indicator and monitoring • Spill kit on-site at all times; • Waste bins on-site from first week, at appropriate locations and sufficient number present. ; • Waste collected daily, removed weekly; • Appropriate bunding for hazardous materials, with sufficient storage; • Zero hazardous waste environmental incidents; • Sufficient number and placed chemical toilets available on site; • Emergency response methods statements approve by ECO and PM prior to construction commencing; • Staff trained in emergency response procedures • Appropriate amount of spill kits on site at all times; • Emergency response training conducted for all staff; • Emergency response protocol available in softcopy on site; • Sanitary bins provided in each toilet (1 per 10 staff members) located spaced throughout site; • Effluent removed from site once weekly, and daily emptying of effluent from portable toilets; • Less than 2 construction or litter non-compliance reports per month; • Zero hazardous waste, sanitation and remedial action non-compliance for the entire phase, as determined by ECO; • Monthly monitoring by ECO	Responsibility PC ; ESO ; PM ; ECO	Timeframe CP, OP, RP
22	Health and Safety	Reduce health and safety risk on site	Health and safety risk from poor safety planning and procedures	<b>Worker safety</b> 171. Implementation of safety measures, work procedures and first aid must be implemented on site. 172. A health and safety plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety. 173. Contractors must ensure that all equipment is maintained in a safe operating condition. 174. A record of health and safety incidents must be kept on site. 175. Any health and safety incidents must be reported to the Project Coordinator immediately. 176. First aid facilities must be available on site at all times. 177. Workers have the right to refuse work in unsafe conditions. 178. Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers.  <b>Worker facilities</b> 179. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness  <b>Protective gear</b> 180. Personal Protective Equipment (PPE) must be made available to all construction staff and the wearing and use of PPE must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn where necessary i.e. dust masks, ear plugs, hard hat, safety boots and overalls etc. 181. No person is to enter the site without the necessary PPE.	• Health and Safety Plan to be developed by Contractor for approval by the ECO.	• Staff trained in appropriate safety procedures; • Health and safety record log book initiated; • Sufficient quantity and quality of protective gear available on-site; • Firefighting equipment in working condition, present on site from day one; • Emergency numbers clearly displayed; • Speed limit issued and communicated to all; • Less than 3 speeding incidents each week on-site; • Spill emergency response procedures communicated; • No open fires on site; • Designated smoking area created and adhered to. • First aid kit available on site at all times;	PC ; ESO ; ECO ; PM	PL

CONSTRUCTION PHASE MITIGATION MEASURES								
Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe	
			<p>182. The construction camp must remain fenced for the entire construction period.</p> <p>183. Potentially hazardous areas such as trenches are to be demarcated and clearly marked with orange snow netting. The ESO must check the trenches before work commences to ensure that no animal species have fallen in.</p> <p>184. Adequate warning signs of hazardous working areas must be erected in suitable locations.</p> <p>185. Uncovered manholes and excavations must be clearly demarcated</p> <p>186. Emergency numbers for local police, fire department, Eskom and the Municipality must be placed in a prominent area.</p> <p>187. Firefighting equipment must be placed in prominent positions across the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank.</p> <p>188. A speed limit of 30km/h must be adhered to by all vehicles and machinery.</p> <p><b>Hazardous Material Storage</b></p> <p>189. Staff that will be handling hazardous materials must be trained to do so.</p> <p>190. Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor.</p> <p>191. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material.</p> <p>192. The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practise must be adhered to. This applies to solvents and other chemicals possibly used in the construction time.</p> <p><b>Procedure in the event of a petrochemical spill</b></p> <p>193. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Coordinator, ECO and or Contractor as soon as reasonably possible.</p> <p>194. The problem must be assessed and the necessary actions required will be undertaken.</p> <p>195. The immediate response must be to contain the spill.</p> <p><b>Fire management</b></p> <p>196. Firefighting equipment should be present on site at all times as per Occupational Health and Safety Act.</p> <p>197. All construction staff must be trained in fire hazard control and firefighting techniques.</p> <p>198. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances.</p> <p>199. No open fires will be allowed on site unless in a demarcated area identified by the ECO. This area must be equipped with fire extinguishers.</p> <p>200. Smoking may only be conducted in demarcated areas as agreed upon by the ECO and contractor. This area must be equipped with fire extinguishers.</p>		<ul style="list-style-type: none"> <li>At least two first aid trained staff members on site at all times;</li> <li>Health and safety record implemented and available for inspection;</li> <li>Eating areas services twice-weekly;</li> <li>Zero non-compliance incidents with PPE on site;</li> <li>Hazardous chemical bunded sufficiently, as determined by ECO, with appropriate safety specifications;</li> <li>Monthly monitoring by ECO</li> <li>Staff trained in appropriate safety procedures;</li> <li>Firefighting equipment in working condition, present on site from day one;</li> <li>Emergency numbers clearly displayed;</li> <li>Speed limit issued and communicated to all;</li> <li>Less than 3 speeding incidents each week on-site;</li> <li>Spill emergency response procedures communicated;</li> <li>No open fires on site;</li> <li>Designated smoking area created and adhered to.</li> </ul>			
23	Security	Promote safety and security on site, and control for violence or unrest as far as possible	Safety risk from uncontrolled access to site, theft or property damage risks.	<p>201. Antisocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling on site are prohibited.</p> <p>202. Any persons found to be engaged in such activities shall have disciplinary and / or criminal action taken against them.</p> <p>203. No person shall enter the site unless authorised to do so by the contractor, Project Coordinator and ECO. All visitors must report to the site office on arrival, undergo induction training, sign an indemnity form and be in possession of the correct PPE clothing to wear while on site.</p> <p>204. If any fencing interferes with the construction process, such fencing shall be deviated until construction is completed. The deviation of fences shall be negotiated and agreed with the landowner in writing by the ECO.</p> <p>205. Trespassing on private / commercial properties adjoining the site is forbidden.</p> <p>206. The site must be secured in order to reduce the opportunity for criminal activity in the locality of the construction site</p> <p>207. No drugs, alcohol, fire arms or weapons of any kind allowed on site (barring medication);</p> <p>208. No hunting, trading or selling of items of any kind allowed on or near site;</p> <p>209. Intoxication while on site will not be allowed. If necessary, breathalysing may be instigated for staff members.</p>	<ul style="list-style-type: none"> <li>Access control to and from site arranged and active;</li> </ul>	<ul style="list-style-type: none"> <li>No theft incidents on-site;</li> <li>Zero persons injured;</li> <li>No hunting or harvesting or informal trade on-site;</li> <li>access control in place and efficient from day one;</li> <li>Zero weapons on site at all times;</li> <li>Less than 2 unauthorised entries to site per months;</li> <li>Less than 2 intoxicated staff members found on site per month;</li> <li>Zero trade found on site;</li> <li>Monthly monitoring ECO</li> </ul>	PC ; ESO ; PM ; ECO	CP, OP
24	Social Environment	Manage procurement, labour, and community members to avoid social unrest of violence	Social unrest, protest or work stoppages due to the social upheaval	<p>210. All contact with affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times.</p> <p>211. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This register is to be tabled during monthly site meetings.</p> <p>212. No interruptions other than those negotiated shall be allowed to any essential services.</p> <p>213. Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site.</p> <p>214. Road rehabilitation should take place during and once construction is completed.</p> <p>215. Construction traffic should only make use of approved routes.</p>	<ul style="list-style-type: none"> <li>Complaints register initiated and maintained;</li> <li>Transport and traffic managed according to approved Method Statement;</li> <li>Local community to benefit from procurement of services and goods as far as possible</li> </ul>	<ul style="list-style-type: none"> <li>Complaints register maintained on site at all times;</li> <li>Less than three complaints logged every two weeks;</li> <li>No planned pickets or work stoppages (mediation prior required);</li> <li>Monthly monitoring by ECO</li> </ul>	PM ; D ; ESO ; ECO ;	PL



CONSTRUCTION PHASE MITIGATION MEASURES								
Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe	
			216. Where possible unskilled job opportunities should be afforded to local community members. 217. Equal opportunities for employment should be created to ensure that the local female population also have access to these opportunities. Females should be encouraged to apply for positions. 218. Payment should comply with applicable Labour Law legislation in terms of minimum wages. 219. Local companies should be given the opportunity to tender for the provision of locally-sourced materials, labour, plant, transport, etc.					
25	Cultural and Heritage Artefacts	Avoid, as far as possible, damage to heritage resources on-site	Irreparable damage to heritage resources within the project region	220. Local museums as well as the South African Heritage Resource Agency (SAHRA) and the Heritage Western Cape (HWC) should be informed if any artefacts are uncovered in the affected area and mitigation measures recommended by SAHRA should be followed. 221. The contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 222. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. 223. Permits shall be obtained from the Heritage Resource Agency	<ul style="list-style-type: none"> <li>Work undertaken near identified heritage resources as per the approved Method Statement; any new significant heritage resources uncovered communicated to the appropriate Heritage Authority (HWC or SAHRA)</li> </ul>	<ul style="list-style-type: none"> <li>All resources found on site left in-situ and reported to the appropriate heritage authority;</li> <li>No damage to heritage resources throughout the PL;</li> <li>Resources found communicated to SAHRA and HWC within three days;</li> <li>All efforts made to assist date collection on-site;</li> <li>Monthly monitoring ECO</li> </ul>	All parties while present on-site	PL
26	Construction site decommissioning	Reduce biodiversity impact from construction closeout activities prior to commencement of operational phase	Environmental contamination from decommissioning activities (spills and leaks)	<p><b>Removal of equipment</b></p> 224. All structures comprising the construction camp are to be removed from site. 225. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc., and these shall be cleaned up and contaminants disposed of appropriately. 226. All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and rehabilitated using the guidelines as set out in the section on Flora and Fauna that forms part of this document.	<ul style="list-style-type: none"> <li>ECO signoff on final EMPr guidelines and measures for rehabilitation and decommissioning prior to final closure of site.</li> <li>Construction close-out is in line with approved Method Statement which is to be developed by the Contractor for approval by the ECO.</li> </ul>	<ul style="list-style-type: none"> <li>No structures left behind on site;</li> <li>Topsoil rehabilitated as per topsoil management set out in this document;</li> <li>All rubble and waste disposed of at a suitable disposal facility;</li> <li>No burial of rubble on site;</li> <li>Soil stockpiles spread and shaped as required in this document;</li> <li>Less than 5cm rubble left on site after clearance cumulatively, as determined by ECO;</li> <li>95% of hardened surfaces ripped prior to closure;</li> <li>All litter removed from site;</li> <li>All stockpiles spread in accordance with soil management plan;</li> <li>Monthly monitoring ECO No temporary structures, equipment or material left on site;</li> <li>Topsoil managed as per topsoil management set out in this document;</li> <li>All rubble and waste disposed of at a suitable disposal facility;</li> <li>No burial of rubble on site;</li> <li>Soil stockpiles spread and shaped as required in this document;</li> </ul>	PC ; SC ; ESO ; PM ; ECO	RP
			<p><b>Temporary services</b></p> 227. The Contractor must arrange the cancellation of all temporary services. 228. Temporary roads must be closed and access across these blocked. 229. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO.					
			<p><b>Associated infrastructure</b></p> 230. Surfaces are to be checked for waste products from activities such as concrete batching and cleared in a manner approved by the ECO. 231. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed. 232. All rubble is to be removed from the site to an approved disposal site as approved by the ECO. Burying of rubble on site is prohibited. Waste manifests must be kept to prove that this has been disposed of legally. 233. The site is to be cleared of all litter. Waste manifests must be kept to prove that this has been disposed of legally. 234. The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials. 235. Fences, barriers and demarcations associated with the construction phase are to be removed from the site. 236. All residual stockpiles must be removed or spread on site as directed by the ECO. 237. All unused building materials must be removed from the site. 238. The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management.					
			<p><b>Rehabilitation</b></p> 239. Disturbed areas of natural vegetation as well as cut and fills must be rehabilitated as soon as possible to prevent further soil erosion. 240. Re-seeding shall be done on disturbed areas as directed by the ECO. Only seeds of indigenous plants must be used. 241. Recommended rehabilitation is in the form of active re-vegetation of affected areas, including areas where surface disturbances resulted from construction, as well as areas that were used for alternative or other functions, such as storage areas, parking bays, etc.; 242. Existing access roads should be left 'as is' for future use during maintenance operations; 243. In accordance with the Conservation of Agricultural Resources Act, No 43 of 1983, slopes in excess of 2% must be contoured and slopes in excess of 12% must be terraced. Other methods of rehabilitation may also be used at the discretion of the ECO, e.g. stone pitching, logging, etc. Contour banks shall be spaced according to the slope on tower sites. The type of soil shall also be					

CONSTRUCTION PHASE MITIGATION MEASURES								
Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe	
			<p>taken into consideration.</p> <p>244. Final inspection in order to ensure adherence to EMPr guidelines, completion of localised/ remaining areas of impact, monitoring of rehabilitation success, etc.</p>					
27	Fire management plan	The site is prone to fire and it is imperative that the necessary precautionary measures implemented to minimise fire risk.	Runaway fires, habitat loss, faunal mortality, loss of plant SCCS	<p>245. Ensure that all personnel are aware of the fire risk and the need to extinguish cigarettes before disposal, in appropriate waste disposal container.</p> <p>246. The risk of fire is highest in the late summer and autumn months, during high wind velocities and dry periods. To avoid and manage fire risk the following steps should be implemented:</p> <p>247. Have on site fire-fighting equipment and ensure that all personnel are educated how to use it and procedures to be followed in the event of a fire.</p> <p>248. Identify the relevant authorities and structures responsible for fighting fires in the area and shall liaise with them regarding procedures should a fire commence.</p> <p>249. Ensure that all the necessary telephone numbers etc. are posted at conspicuous and relevant locations in the event of an emergency.</p> <p>250. Should a contractor be found responsible for the outbreak of a fire, he shall be liable for any associated costs.</p> <p>251. No open fires shall be allowed on site for the purpose of cooking or warmth. Bona fide braai fires (such braai fires shall be limited to the traditional "month end" braais and not individual daily cooking fires) may be lit within the construction camp or site.</p> <p>252. The Contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire. The Contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire. The Contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.</p> <p>253. The Contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters. The Contractor shall pay the costs incurred by organisations called to put out fires started by himself/herself, his/her staff or any sub-contractor. The Contractor shall also pay the costs incurred to reinstate burnt areas as deemed necessary the PM.</p> <p>254. Any work that requires the use of fire may only take place at that designated area and as approved by the PM. Fire-fighting equipment shall be available in these areas.</p> <p>255. The Contractor shall ensure that the telephone number of the local Fire and Emergency Service are displayed at the site offices.</p> <p>256. The Independent Contractor is to ascertain the fire requirements and shall submit a fire contingency plan Method Statement to the PM and ECO</p>	<ul style="list-style-type: none"> <li>Firefighting equipment available on site and in working condition</li> </ul>	<ul style="list-style-type: none"> <li>All personnel trained for fire risk prior to conducting work;</li> <li>Zero open fires on site at all times</li> <li>No unauthorised fires on site at any given time;</li> <li>Monthly ECO monitoring</li> </ul>	PC; ECO	CP
28	Ecological	Reduce general construction impacts on ecology and ecosystems; Reduce habitat loss, hydrological contamination and floral and faunal disturbance	Habitat loss, hydrological contamination, floral SCC loss, faunal disturbance and mortality,	<p>257. The illegal 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 construction site.</p> <p>258. The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.</p> <p>259. Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.</p> <p>260. Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.</p> <p>261. No dogs or cats should be allowed on site apart from that of the landowners.</p> <p>262. No fires should be allowed within the site as there is a risk of runaway veld fires.</p> <p>263. No fuelwood collection should be allowed on-site.</p> <p>264. No unauthorized persons should be allowed onto the site and site access should be strictly controlled and vehicles which need to roam around the site should be accompanied by the ECO or security personnel.</p> <p>265. Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as <i>Prosopis</i> are already present in the area and are likely to increase rapidly if not controlled.</p> <p>266. During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.</p> <p>267. Ensure that temporary infrastructure areas are within low sensitivity areas, preferably previously transformed areas if possible.</p> <p>268. Erosion management should take place according to the Erosion and Rehabilitation Plan.</p> <p>269. If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.</p>	<ul style="list-style-type: none"> <li>All construction activities undertaken must be in line with approved Method Statements with the aim to reduce impacts to fauna and flora. The method statement must be developed by the Contractor for approval by the ECO.</li> <li>Rehabilitation (revegetation of disturbed areas)</li> <li>Cleared areas demarcated</li> </ul>	<ul style="list-style-type: none"> <li>No hunting, harvesting or trading on site;</li> <li>Only demarcated areas in the design phase pre-construction area cleared of vegetation;</li> <li>No pets allowed on site;</li> <li>Runoff control features implemented</li> <li>Zero incidents of illegal farming, hunting, collections or trading of any kind on-site, as determined by the ECO;</li> <li>Zero pets on site at all times, less than 2 non-compliance reports for pets per month;</li> <li>Alien control plan implemented;</li> <li>Monthly monitoring ECO</li> </ul>	PC; PM ; ECO	CP + OP

CONSTRUCTION PHASE MITIGATION MEASURES

Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe
			270. All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition. 271. 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. 272. Any potentially dangerous fauna such snakes or fauna threatened by the decommissioning activities should be removed to a safe location. 273. Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. 274. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 275. 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. 276. All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.				
29	Manage relocation of plants and animals appropriately to reduce harm, promote growth and establishment, and conserve floral and faunal components on site	Faunal general: Faunal mortality, faunal disturbance	277. No fauna present on the property may be wilfully harmed unless it threatens the life of an employee. 278. Hunting, disturbance and collection of animals in the area must be prohibited. 279. Construction areas must be screened for slow moving fauna before any activities commence and removed if necessary. 280. Any animals injured by the construction activities should be taken to a veterinarian for treatment. 281. Minimise impacts on faunal habitat by adhering to the vegetation specialist recommendations. 282. Vehicle speeds should be kept to a minimum (no greater than 30km/h on-site) by using informative signage and speed humps. 283. If certain areas are found to involve unusually high mortality rates, then suitable mitigation (e.g. the erection of low fences alongside the problem area) may be required. Seasonal mortality to amphibians moving to breeding sites around dams should be monitored and road traffic at night during peak amphibian breeding periods should be controlled. 284. Monitor excavations daily and rescue any trapped fauna. When filled with water the excavations should be checked twice a day. Release the rescued fauna in a suitable habitat adjacent to the study area. 285. The removal of trees should not be undertaken during the breeding season (September to November). 286. Domestic waste should be placed in suitable covered containers and removed from the site on a regular basis to reduce the attraction of scavenging animals, e.g. gulls and monkeys. 287. External and internal fences must be monitored for traps.	<ul style="list-style-type: none"> <li>Relocation of fauna and flora compliant to the approved Method Statement (to be developed by the Contractor for approval by the ECO.)</li> </ul>	<ul style="list-style-type: none"> <li>Minimal disturbance to fauna and flora of the project region.</li> <li>Appropriate capturing devices employed</li> <li>Professional relocation for large mammals required</li> <li>Zero hunting on site;</li> <li>Less than 3 speeding incidents per month on site;</li> <li>Monthly monitoring by ECO</li> <li>Zero harm to reptiles relocated;</li> <li>Search and rescue conducted prior to clearance of an area if recommended by the ecologist in light of the walkthrough;</li> <li>Large mammals found on site (that cannot be herded away to another suitable camp) must be relocated by a professional;</li> <li>Zero immobilisers or tranquilisers used on large mammals found on site;</li> <li>Zero avoidable harm to amphibians on site;</li> <li>Amphibians to be transported on moist substrate;</li> <li>Less than three non-compliance reports for combined relocation objective per month</li> <li>Monthly monitoring ECO</li> </ul>	PC; PM ; ECO PC, ECO	CP + OP CP
288. An on foot search conducted by a professional reptile team is to be carried out to search for reptiles within every possible habitat. This is achieved by walking to find reptiles during the day which are sun basking, hunting etc.; lifting features such as rock, where reptiles may be retreating etc.; and searching the roads after dark in the immediate areas around the proposed development site. The last mentioned method is only used when practical. The theory behind this method is that nocturnal reptile species often cross roads at night or moon bask after dark (sleep on the road surface to absorb heat from the road). 289. Once caught, each reptile will be placed into transport containers suited for that individual reptile. 290. Cannibalistic reptiles will be transported separately. 291. The transport containers will be kept cool to decrease stress for the reptiles. 292. The reptiles will be relocated as soon as possible after they have been caught. 293. Professional equipment (such as hook sticks and goggles) will be used to ensure limited harm to the reptiles and to prevent the team members from being bitten by venomous snakes and to prevent venom sprayed into one's eyes from Rinkhals. 294. Baited traps will not be used. 295. Nooses will not be used as this causes injury to lizards. 296. Safety procedures will be in place for the reptile's release.							
Reptile: Reptile disturbance and mortality							
30			297. In terms of the conducted survey, the areas demarcated for clearing do not pose a risk/threat to mammals, for example: the presence of mammals was minimal. 298. If a mammal is trapped within an area where construction is taking place then a professional handler will be called upon to remove the mammal. 299. Protective clothing such as gloves will be used when handling mammals. 300. All staff used in the capture and relocation of mammals will be inoculated against Rabies and Tetanus.				
31		Mammals: Mammal mortality and disturbance					



CONSTRUCTION PHASE MITIGATION MEASURES								
Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe	
32			<p>301. No immobilizers or tranquilizers will be used on the mammals.</p> <p>Amphibians: Amphibian mortality and disturbance</p> <p>302. Amphibians will be caught by hand and net. 303. Amphibians will be placed into transport containers with damp substrates to avoid dehydration. 304. Tadpoles may be collected; they will be placed into water containers and released as soon as possible. 305. During release, the tadpoles will be allowed to acclimatize to the new water in terms of temperature, pH etc. 306. Breeding adult frogs and toads may be captured at night when they are exposed.</p>					
33		Vegetation: Loss of habitat, loss of plant SCC	<p>Protected plant species will be removed from the designated construction footprint and relocated to adjacent areas of similar habitat that will not be affected by construction. Plant search and rescue will only be conducted within the area where direct construction activities are to occur as per the approved project EMPr. In terms of the site survey conducted, it is noted that the type of plant species together with the amount of plant species impacted is not significant enough to justify the setting up a nursery for this project.</p> <p>307. A qualified botanist must conduct a Search &amp; Rescue operation prior to commencement of construction, in consulted with the appointed ECO to remove all SCC from impacted areas. 308. Areas to be cleared of vegetation must be clearly demarcated before clearing commences. 309. Areas must only be stripped of vegetation as and when required and in particular only once all SCC have been relocated for that area. 310. Once site boundaries are demarcated, the area to be cleared of vegetation will be surveyed by the plant search and rescue team under the supervision of the botanist and ECO to identify species suitable for rescue and commence removal of plants. 311. This material should be appropriately removed from its locality and immediately relocated into adjacent areas of similar habitat that will not be disturbed by construction. 312. Wherever possibly any seed-bearing material will be collected immediately and planted as soon as possible. 313. All applicable permits must be kept on site and in the possession of the flora search and rescue team at all times. 314. Should a portion of an access road be newly constructed, the route shall be selected to have a minimal disturbance to natural vegetation under the guidance of the ECO and botanical specialist. No other routes shall be used by vehicles or personnel for the purpose of gaining access to the site. 315. Once search and rescue and plant relocation is complete, a short audit report and certificate of clearance will be issued by the respective contractor or botanical specialist and copies will be supplied to DEA and DAFF.</p>	<ul style="list-style-type: none"> <li>Search and rescue implemented by a professional botanist prior to construction clearing;</li> <li>Where possible, seed collected and storage appropriately for rehabilitation use;</li> </ul>	<ul style="list-style-type: none"> <li>Zero known SCC present harmed through clearing activities;</li> <li>Seeds stored as per a professional botanist' instruction for ongoing rehabilitation throughout the construction and operation phase;</li> <li>Less than 3 non-compliance reports for this objective per month;</li> <li>Monthly monitoring by ECO</li> </ul>	PC, ECO	CP + OP	
34	Avifauna	Minimise bird mortality	<p>Collision mortality and electrocution mortality of birds</p> <p>316. Construction of the substation must not occur during the main breeding season for local birds, namely August to October. 317. Avoidance of construction of sub-stations during the main breeding season for local birds which is the period August to October inclusive, as far as possible. 318. Where overhead powerlines cross valleys, bird flight diverters should be placed on the line at a spacing of 5m. In the identified avifaunally sensitive area (Ou Mure-Fortuin) day and night visible bird flight diverters should be placed at 2 m intervals. Avoidance of construction of sub-stations during the main breeding season for local birds, which is the period August to October inclusive, as far as possible. 319. Clear only areas where absolutely necessary, not from the entire servitude of the line. 320. Minimise the number of service tracks</p>	<ul style="list-style-type: none"> <li>Minimise vegetation clearing to reduce impacts to avifauna</li> </ul>	<ul style="list-style-type: none"> <li>Reduce incidental vegetation clearance and habitat loss</li> <li>Monthly monitoring ECO</li> </ul>	PC ; ECO	CP	

# OPERATIONAL PHASE

## 11.3 Operational Phase

OPERATIONAL PHASE MITIGATION MEASURES								
#	Aspect	Objective	Potential Impact	Specification	Outcome	Indicator and monitoring	Responsibility	Timeframe
35	Ecology	Minimise faunal harm and floral loss	Fauna mortality and impacts to flora from maintenance vehicle crossing	<p>321. Ensure that maintenance staff and vehicles remain on designated roads and paths within the site.</p> <p>322. Avoid unnecessary disturbance of existing bush/thicket patches.</p> <p>323. Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.</p> <p>324. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.</p> <p>325. Limit vehicles on site;</p> <p>326. Limit roads on site</p>	<ul style="list-style-type: none"> <li>Control measures implemented to manage invasive alien species;</li> <li>Ongoing rehabilitation of areas disturbed during the construction phase</li> </ul>	<ul style="list-style-type: none"> <li>Zero unnecessary roads established on site;</li> <li>Monthly invasive species clearing programme conducted;</li> <li>Monthly invasive species monitoring</li> <li>Monthly ECO monitoring</li> </ul>	PC, ECO	OP + RP
36	Avifaunal	Reduce collision mortality and electrocution of avifauna as far as possible	Avifaunal mortality from collision with overhead conductors or accidental electrocution	<p>327. Route lines to avoid sensitive areas or bird flight corridors;</p> <p>328. Monitoring for high number of bird incidents, and investigate additional measures should high mortality rates be reported (in conjunction with an avifaunal specialist).</p> <p>329. Where overhead power lines cross valleys, bird flight diverters should be placed on the line at a spacing of 5m. In the identified avifaunal sensitive area (Ou Mure-Fortuin) day and night visible bird flight diverters should be placed at 2 m intervals. It is accepted that diverters are likely to deteriorate across the operational life of the lines. The main aim is to alert bird to the lines in the immediate post-construction years when the lines will be a novel risk which locally resident birds will, over years, learn to compensate for.</p>	<ul style="list-style-type: none"> <li>Monitoring programme in place;</li> <li>Flight diverters placed;</li> <li>Planning appropriately implemented to avoid sensitive areas</li> </ul>	<ul style="list-style-type: none"> <li>Less than 3 bustard, bird of prey or water bird deaths from overhead collisions every 6 months. Avifauna monitoring to be undertaken and appropriate adaptive management implemented should unacceptable levels of mortality be recorded.</li> <li>Flight diverters at 5m intervals spaced and present on each conductor placed on pylons across water features;</li> <li>EA arrived design implemented;</li> <li>Monthly monitoring by ECO</li> </ul>	PM ; D ; PC	OP
37	Socio-economic	Minimise social unrest and maximise benefits to the local community	Enhancing the positive social impacts and mitigating the negative social impacts	330. Ensure that if the community trust business model is implemented, the board of trustees is representative of the surrounding communities, and that proper oversight procedures are established prior to operation of the facility.	<ul style="list-style-type: none"> <li>Monitoring of social commitments</li> </ul>	<ul style="list-style-type: none"> <li>Oversight procedures established, trust and board established;</li> <li>No monitoring required</li> </ul>	D ; PM	PL
38	Storage of hazardous substances	Control hazardous substances on site during operation	Health and safety risk represented by hazardous substance leakages	331. Ensure that all hazardous substances are stored in appropriately banded locations.	<ul style="list-style-type: none"> <li>Hazardous substances management subject to an approved management plan which must be developed by the Contractor for approval by the ECO.</li> </ul>	<ul style="list-style-type: none"> <li>Zero hazardous substance spillage or containment incident per year</li> </ul>	PM ; PC ; ESO	OP
39	Operating equipment	Reduce noise on site during operation	High noise levels	332. Lower noise emission levels from inverters and transformers can be achieved by housing them in enclosed structures.	<ul style="list-style-type: none"> <li>Noise emissions managed to acceptable levels</li> </ul>	<ul style="list-style-type: none"> <li>Less than 1 noise complaint per month</li> </ul>	PM ; PC ;	OP
40	Stormwater management	Reduce erosion on site	Increased erosion risk	<p>333. Maintain recommendations of the Storm Water Management Plan.</p> <p>334. Ongoing monitoring must be undertaken for erosion and establishment of alien invasive plant species.</p>	<ul style="list-style-type: none"> <li>Storm water management plan implemented according to the approved method statement (to be developed by the Contractor for approval by the ECO) and maintained throughout operation phase</li> </ul>	<ul style="list-style-type: none"> <li>Storm water plan implemented and maintained throughout operation phase</li> </ul>	PC ; PM ; ESO	OP
41	Waste management	Control waste produced	Health and safety risk associated with poor waste management practices	<p>335. Develop and implement a waste management plan incorporating recycling and waste minimization and legal aspects into the plan.</p> <p>336. Develop and implement a worker education plan for waste management in the work environment.</p>	<ul style="list-style-type: none"> <li>Waste management plan implemented throughout operational phase</li> </ul>	<ul style="list-style-type: none"> <li>Waste management plan implemented throughout operational phase</li> </ul>	PC ; PM ; ESO	OP
42	Fire management plan	Fire management measures in place	Runaway fire risk, habitat loss, faunal disturbance	<p>Any requirements of the local Fire Protection Association must be adhered in consultation with the relevant landowners as per the requirements of the National Veld and Forest Fire legislation which may include:</p> <p>337. Formation of a Fire Protection Association (FPA);</p> <p>338. Duty to prepare and maintain firebreaks;</p> <p>339. Requirements for firebreaks;</p> <p>340. Readiness for firefighting;</p> <p>341. Actions to fight fires.</p> <p>342. In areas other than designated development footprints within the Open Space area, a network of firebreaks must be maintained and overlap with any firebreaks managed by the landowners to ensure that fires are not able to spread over the development.</p> <p style="padding-left: 20px;">I. All road reserves will serve as firebreak;</p> <p style="padding-left: 20px;">II. All firebreaks must be maintained as required by the local Fire Chief</p> <p>343. Firebreaks are to be positioned and prepared in such a way as to cause the least disturbance to soil and biodiversity. Firebreaks should be free from combustible material, e.g. pruning's and leaf litter.</p> <p>344. Ensure firefighting equipment is maintained and in good working order before the start of each fire season.</p> <p>345. Smoking outside of designated safe areas must not be permitted. Flicking of cigarette butts into adjacent vegetation will not be permitted.</p> <p>346. Suitable signage must be provided on site, including entrance warning of fire risk and warnings not to flick cigarette butts into vegetated areas.</p>	<ul style="list-style-type: none"> <li>Prepare firebreaks in accordance with the FPA;</li> <li>Zero smoking on site</li> <li>Approved measures in place to avoid accidental fires</li> </ul>	<ul style="list-style-type: none"> <li>Prepare firebreaks in accordance with the FPA;</li> <li>Zero smoking on site</li> </ul>	PC ; PM ; ECO	OP



# REHABILITATION PHASE

## 11.4 Rehabilitation Phase

REHABILITATION PHASE MITIGATION MEASURES								
	Aspect	Objective	Potential Impact	Specification	Outcomes	Indicator and Monitoring	Responsibility	Timeframe
43	Ecology	Minimise harm to fauna and flora on site from rehabilitation activities	Inappropriate rehabilitation, restoration resulting in environmental degradation	<p>347. Construction vehicles and machinery should make use of existing infrastructure such as roads as far as possible to minimise disturbance on the receiving environment.</p> <p>348. Ensure that all bare land is rehabilitated after decommissioning.</p> <p>349. Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.</p> <p>350. Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.</p> <p>351. There should be regular monitoring for erosion for at least 2 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures.</p> <p>352. The recovery of the indigenous shrub layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.</p> <p>353. Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned.</p> <p>354. All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact.</p> <p>355. All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.</p> <p>356. All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.</p> <p>357. Recovery/rehabilitation of the indigenous shrub layer must be conducted with specialist restorative ecological input.</p>	<ul style="list-style-type: none"> <li>All bare land associated with the construction phase rehabilitated using appropriate vegetation</li> </ul>	<ul style="list-style-type: none"> <li>No new access roads created;</li> <li>Zero above ground infrastructure remaining after decommissioning;</li> <li>95% of all disturbed areas revegetated as per rehabilitation plan;</li> <li>Monthly monitoring ECO</li> </ul>	PC ; ESO ; ECO	RP
44	Noise sensitive receptors	Reduce noise associated with decommission and rehabilitation works	Decommissioning activities may induce high noise volumes	358. Machinery that causes noise must only be operated at appropriate times (during the day and at normal working hours).	<ul style="list-style-type: none"> <li>Noise emissions reduced to an acceptable level</li> </ul>	<ul style="list-style-type: none"> <li>Less than two noise complaints per week of rehabilitation;</li> <li>Monthly monitoring ECO</li> </ul>	PC ; ESO ; ECO	RP
45	Pollution	Minimise and control pollution on site	Decommission, spills and leaks of hazardous waste and litter can pollute and contaminate habitats	<p>359. Littering must be avoided and litter bins should be made available at various strategic points on site. Refuse from the construction site should be collected on a regular basis and deposited at an appropriate landfill.</p> <p>360. No storage of fuels and hazardous materials should be permitted near sensitive water resources. All hazardous substances (e.g. diesel, oil drums, etc.) to be stored in a bunded area.</p> <p>361. Ensure adequate storm water management by implementing recommendations of the Storm Water Management Plan during construction.</p>	<ul style="list-style-type: none"> <li>Rehabilitation activities undertaken as per plan developed by the Contractor for approval by the ECO.</li> </ul>	<ul style="list-style-type: none"> <li>Zero hazardous waste non-compliance reports;</li> <li>Waste disposed of at appropriate facilities;</li> <li>No rubble burying;</li> <li>All project related items are removed from project region;</li> <li>No hazardous material incidents during rehabilitation</li> </ul> <p>Less than two littering fines or non-compliance reports per week issued;</p> <p>Monthly monitoring by ECO</p>	PC ; ESO ; ECO	RP
46	Dust	Manage dust emissions	Decommissioning activities will increase dust levels in the immediate vicinity of the project	<p>362. Reduce fugitive/nuisance dust by implementing the following:</p> <ol style="list-style-type: none"> <li>Damping down of un-surfaced and un-vegetated areas;</li> <li>Retention of vegetation where possible;</li> <li>Demolitions and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas;</li> <li>A speed limit of 30km/h must not be exceeded on dirt roads.</li> </ol> <p>363. Any complaints or claims emanating from the lack of dust control should be attended to immediately by the Contractor.</p>	<ul style="list-style-type: none"> <li>Speed limit introduced;</li> <li>Dust emissions reduced to an acceptable level using appropriate and approved methods</li> </ul>	<ul style="list-style-type: none"> <li>Less than one speed incident per week;</li> <li>Less than two dust complaints per week;</li> </ul>	PC ; ESO ; ECO	RP
47	Traffic & Transport	Control vehicle movements to and from the site	Increased traffic will be induced through the transport of waste, rubble and project equipment to and from site during rehabilitation	<p>364. Deconstruction vehicles and machinery should make use of existing infrastructure such as roads as far as possible to minimise disturbance on the receiving environment.</p> <p>365. There must be no unnecessary disturbance of existing vegetation.</p>	<ul style="list-style-type: none"> <li>No unauthorised routes being used by vehicles</li> </ul>		PC ; ESO ; ECO	RP
48	Soil Erosion	Reduce soil loss and promote ongoing soil fertility	An increase in soil erosion and surface flow may result from the decommissioning and closure of old infrastructure and buildings related to the project	366. After the removal of all project-related structures, the disturbed soils should be re-vegetated to avoid unnecessary soil erosion.	<ul style="list-style-type: none"> <li>Rehabilitation plan to be developed by the Contractor for approval by the ECO.</li> <li>Contractor to implement and monitor approved Rehabilitation Plan</li> </ul>		PC ; ESO ; ECO	RP
49	Land use	Manage site for future land use	Land use alteration is required after the closure of the project. Land use changes may not be required should zoning remaining consistent.	367. Ensure that an appropriate land use is adopted.	<ul style="list-style-type: none"> <li>Land use zoning changes investigated and effected if applicable</li> </ul>	<ul style="list-style-type: none"> <li>Rezoning (if required) or properties to agriculture prior to decommissioning;</li> <li>Once off monitoring by ECO prior to site closure</li> </ul>	PM ; D	RP
50	Heritage	Reduce impacts to heritage resources	Irreparable damage to heritage resources on site	<p>368. Effective rehabilitation of the landscape after decommissioning must be implemented</p> <p>369. Buffers around heritage resources are to be respected by the vehicles passing through the site</p>	<ul style="list-style-type: none"> <li>Buffers around sensitive heritage features in place and maintained</li> </ul>	<ul style="list-style-type: none"> <li>Buffers in place and maintained</li> </ul>	PC ; ECO	RP
51	Open space management plan	Manage open areas to promote rehabilitation	Loss of habitat, loss of plant SCC	<p>370. Cleared vegetation must not be piled onto adjacent intact vegetation outside of the designated footprint, even for temporary storage.</p> <p>371. Rehabilitation guidelines for the development as a whole must prioritise the use of indigenous grass, tree and shrub species are to be used in the soil stabilisation landscaping of the development once construction is completed, if required.</p>	<ul style="list-style-type: none"> <li>Indigenous plants used for rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>Indigenous plants used for rehabilitation;</li> <li>Monthly monitoring by ECO</li> </ul>	PC ; ECO	RP

## 12 SPECIFIED MANAGEMENT PLANS

### 12.1 Rehabilitation and Landscape Management Plan

Re-vegetating and rehabilitating the site once constructed through a comprehensive landscaping effort will benefit the potential faunal species that may find refuge on the site, and promote ecological function and connectivity on site. Linked to this, is the creation, preservation and maintenance of tracts of natural and ornamental vegetation in all stages of ecological succession, interconnected by corridors or green belts for escape, foraging, breeding and exploratory movements. In terms of the scope of the construction activities, landscaping and rehabilitation will be minimal; many instances will require clean-up activities together with planting ground stabilizing vegetation. If extensive rehabilitation is required then the approved site EMPr will be addressed for further assistance. The Rehabilitation and Landscaping Plan will focus on the following areas:

- Road verges during and after road construction is completed;
- Stormwater soak away features and landscaped areas;
- The transformed portions of the site not developed must be rehabilitated by planting indigenous plant species occurring in the area.
- Areas where pockets of alien invasive species have been removed.
- A list of indigenous plants used during rehabilitation must be approved by the ECO prior to commencement of rehabilitation activities.

#### 12.1.1 Vegetation

The re-vegetation process will not only focus on the rehabilitation of the road verges but also on all exposed soil, transformed areas and areas where alien invasive species have been removed within the site. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.

#### ***Re-vegetation Procedures***

According to the national vegetation map (Mucina & Rutherford, 2006) the vast majority of the power line routes are within the Central Mountain Shale Renosterveld vegetation, while only a small area around the Komsberg substation falls within the Koedoesberge-Moordenaars Karoo vegetation type.

#### **Central Mountain Shale Renosterveld**

All plants collected from this vegetation type prior to construction must be transplanted in similar environments onsite in the Rehabilitation Phase. In addition, a seeding programme must be initiated in order to promote growth, as this region has slow expected growth rates. The approach should rather be to avoid impacting this vegetation type in preference, so disturbance should be kept to a minimum.

#### **Koedoesberge-Moordenaars Karoo**

All plants collected from this vegetation type prior to construction must be transplanted in similar environments onsite in the Rehabilitation Phase. The following is required:

- Spread stockpiled subsoil to an average depth of 1m
- Spread stockpiled topsoil to a minimum depth of 10cm
- Avoid impacting any large bush clumps.

#### ***Out-planting Procedures***

<b><u>Plot preparation</u></b>	The plots will be prepared as follows: <ol style="list-style-type: none"> <li>1. Prior to rehabilitation of the site, all remnants of foreign debris shall be removed from the site.</li> <li>2. All plots will be covered first with 1m deep subsoil and then with topsoil (minimum of 10cm deep). Soils will be manually spread evenly over the surface. Topsoil must be spread to</li> </ol>
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	<p>the original depth (10cm), and deeper where sufficient top soil remains.</p> <p>3. As topsoil will contain all cleared vegetation, no additional treatment will be required.</p>
<b><u>Plant Preparation</u></b>	<p>Plants must undergo a period of 'hardening-off' during which they have been exposed to full, direct sunlight and been under a reduced watering regime.</p> <p>The individual plants destined for each plot will be grouped into plot-specific, marked baskets, before they leave the nursery. Each plant will be labelled with an aluminium label, giving species code, and a specific numeral identifying the plot.</p> <p>Before the out-planting commences, the equipment necessary for the proper handling and placing of all required materials shall be on hand, in good condition and to acceptable approved standards.</p> <ul style="list-style-type: none"> <li>• Planting should preferably be done during the rainy season.</li> <li>• Unless otherwise specified by the ESO / ECO, excavate square holes of 800mm x 800mm x 800mm on average for trees and 500mm x 500mm x 500mm on average for shrubs.</li> <li>• Backfill planting holes with topsoil. As much of the soil from container plants as possible must be retained around the roots of the plant during planting.</li> <li>• The soil must cover all the roots and be well firmed down to a level equal to that of the surrounding in situ material</li> <li>• After planting, each plant must be well watered, adding more soil upon settlement if necessary.</li> <li>• Stake all trees and tall aloes using three weather resistant wooden or steel stakes anchored firmly into the ground. Two of the three stakes are to be located on the windward side of the plant. Galvanised wire binding, 3 mm thick, covered with a 20mm diameter plastic hosepipe must be tied tightly to the stakes, half to two thirds the height of the tree above the ground and looped around the trunk of the tree.</li> <li>• Place stakes at least 500mm apart and away from the stem and roots of the tree, so as not to damage the tree or its roots.</li> <li>• Thoroughly water plants as required until the plants are able to survive independently (i.e. depending on the rainfall).</li> <li>• A raised circular 200mm high subsoil berm, placed 500mm (shrubs) to 750mm (trees) from the plant's stem must be provided for the watering. Do not simply leave the excavated plant hole partially backfilled for this purpose – the berm must be raised above the natural soil level.</li> <li>• Water aloes and bulbs once directly after transplanting to settle the soil</li> <li>• Remove stakes and wire binds over time as required, as plants become established.</li> </ul>
<b><u>Seeding</u></b>	<ul style="list-style-type: none"> <li>• A professional botanist knowledgeable regarding this vegetation type should conduct a seed collection exercise during early summer, in order to enrich the seed bank of the existing topsoil. This is necessary as out-planting is typically not very successful, with high mortality expected. An additional seed bank will assist in restoring the area, including sowing for a larger variety of species than that planted.</li> <li>• Sow seed into topsoil prior to spreading, in order to mix throughout the layer</li> <li>• Addition of a mulch layer may assist with the survival of the seedlings</li> <li>• Reseeding after the 1<sup>st</sup> year may be required in order to promote further succession of native species;</li> <li>• For rehabilitation to be successful, the final vegetation covers should resemble composition and density of non-disturbed vegetation (prior to construction), with invasive species at maintenance levels;</li> </ul>
<b><u>Maintenance</u></b>	<ul style="list-style-type: none"> <li>• Water all transplanted plants as specified.</li> <li>• Watering must commence and continue immediately after transplanted.</li> <li>• Check all plants for pests and diseases on a regular basis and treat the plants accordingly, using approved method and products as per manufacturers specifications.</li> <li>• Once revegetated, areas should be protected from trampling and soil erosion, as well as unauthorised personnel, vehicles and construction equipment;</li> <li>• Should areas be converted to grazing, consultation with the landowner is necessary to come to terms regarding the exclusion of the plot for a while, to allow for plant to mature prior to grazing commencing. Plots should be isolated for at least 2 years, as slow growth is expected in this area.</li> <li>• Isolated areas are to be fenced off. Fencing shall be removed once the area is deemed sufficiently rehabilitated.</li> <li>• Control weeds by means of extraction, cutting or other approved methods.</li> <li>• For planted areas that have failed to establish, replace plants with the same species as originally specified. The same species as originally specified must be used unless otherwise specified by the ESO / ECO.</li> </ul>

In order to rehabilitate transformed and invaded areas, the following landscaping techniques will be employed:

- Clearing of vegetation should take place in accordance with the construction programme, instead of exposing large tracts of land simultaneously.
- Clearing of invaded areas should be undertaken as per the Alien Management Plan;
- No re-useable topsoil should be removed from the site.
- Sods used in re-vegetation should be obtained directly from the veld, but not from the sensitive areas on site. Veld sods shall contain at least a 50 mm topsoil layer and the roots shall be minimally disturbed. They shall be obtained either from the near vicinity of the site from an area selected by the Project Manager or ECO, or from areas of the proposed development site that are earmarked for development. The soil shall be compatible with that removed from the area to be re-vegetated and shall not have been compacted by heavy machinery.
- Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of alien invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites;
- The stockpiled vegetation from the clearing operations should be reduced to mulch;
- Indigenous plant material must be kept separate from alien material. The indigenous vegetative material shall be reduced by either mechanically means (chipper) or by hand-axing to sticks no longer than 100 mm. The chipped material should be mixed with the topsoil at a ratio not exceeding 1:1;
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants;
- No harvesting of vegetation may be done outside the area to be disturbed by construction activities;
- Mulches shall be collected in such a manner as to restrict the loss of seed;
- Brush-cut mulch shall be stored for as short a period as possible, and seed released from stockpiles shall be collected for use in the rehabilitation process.
- Re-vegetated areas should be monitored every 3 months for the first 12 months and every 6 months thereafter;
- Re-vegetated areas showing inadequate surface coverage (less than 30% within 9 months after re-vegetation) should be intensely managed to improve scratcher-vegetation;
- All seeded, planted or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals;
- Where herbicides are used to clear vegetation, species-specific chemicals should be applied to individual plants only. General spraying should be strictly prohibited;
- All horticultural activities should meet the following requirements:
  - Activities must be limited to the building environs and certain landscaped areas;
  - fertiliser, pesticide and herbicide use should be strictly controlled;
- Invertebrate pests should be controlled using the least environmentally damaging insecticides. Pyrethroids and Phenylpyrazoles are preferable to Acetylcholines. Insecticides that are specific to the pest (species specific) should be favoured. The lowest effective dosages must be applied. Supplier's advice should be sought. Fungal pathogens should be used in preference to chemical insecticides; and no dumping of any materials in undeveloped open areas and buffer strips (biological corridors) should be permitted. Activities in the surrounding open undeveloped areas must be strictly regulated.

### **12.1.2 Weeds and Alien Vegetation**

- The Contractor will be responsible for controlling any alien invasive species. The Contractor shall ensure that all weeds and alien invasive species are removed.
- Alien management should be as per recommendation of the Alien Management Plan.
- Ongoing monitoring must be undertaken for erosion and establishment of alien invasive plant species.
- If during the establishment period, non-indigenous weeds or other non-indigenous plants

- are present in the planted areas, such vegetation shall be removed by hand.
- The areas where alien vegetation must be removed:
  - Areas within the demarcated wider development footprint
  - If alien vegetation is currently used by people such as farm workers etc. for fire wood, then the vegetation may be left for this purpose.

### **12.1.3 Soil Stabilisation & Stockpiling**

As several of the routes and access roads required for the construction of the power lines traverse steep slopes, exposed regions will remain vulnerable to erosion for the entire lifespan of the proposed development. As such, the following mechanisms and mitigation measures are to be employed for the construction and operation phases, in order to minimise this concern.

#### *Control Structures:*

The use of fibre rolls should be investigated for linear erosion control on each side of the access roads specifically, as this has been identified as one area where significant erosion may occur. Fibre rolls are composed of hessian bag material, straw or other suitable natural fibre material formed and compressed into a tubular shape. These structures, when placed into small dug depressions of 5cm deep and staked down with wooden stakes or dowel sticks, may allow for erosion control in regions of moderate rainfall. These materials are relatively inert, low cost, moderately biodegradable and allow water to pass through, while silt is held back. Placing these structured in short succession (2-5m apart) in very steep areas may assist in reducing the runoff and erosion experienced during rainfall events. An alternative to fibre rolls by the use of short (25cm tall), geotextile silt-fences, staked every three metres, placed on each side along access roads, for the length of the roads. These nets will capture windblown and waterborne soil up to knee height, and reduce wind and water erosion.

#### *Monitoring:*

As a basis for monitoring, it is essential to ensure that the erosion and sediment control measures are properly installed, well maintained and functioning as intended on a daily basis. A timely response by the contractor to any noted deficiencies is highly important to prevent, minimise and control erosion, as well as demonstrating due diligence in compliance with regulatory requirements. A regular inspection program should be planned and implemented to determine when erosion control measures need maintenance and/or repair. Documentation of all inspections should be kept on site throughout the construction phase and at a minimum up to one year after the operation phase commences. To monitor, the ECO shall:

- Identify personnel: Names and contact information of project members assigned to each task.
- A communication protocol should also be developed to ensure effective reporting and compliance.
- Obtain construction drawings detailing the erosion and sediment controls installed, which must be updated through the construction period, and once at the commencement of the operational phase.
- High risk areas (such as areas with greatest gradient) should be identified on these drawings and routinely evaluated.
- Conduct visual inspections of the erosion control mechanisms, to indicate regions where measures any have failed and are in need of repair, or where installation was unsatisfactory and requires redoing.
- Should a large storm event be anticipated, monitoring should commence as soon as possible and damage repaired prior to the event, if possible.
- All damaged erosion control measures should be repaired and/or replacement within 48 hours of the inspection.

Monitoring frequency shall be:

- On a weekly basis;

- After every rainfall event;
- Daily during extended rainfall periods.

Mitigation measures:

- Soil stockpiles during the construction phase should be placed in such a manner that natural drainage pattern is not disrupted (i.e. no stockpiles should be located in or adjacent to any seepage or drainage areas);
- Topsoil stockpiles older than six months should be enriched prior to use in rehabilitation activities to ensure the effectiveness of the topsoil;
- No imported soil material should be used on the property, unless it can be ensured that it is free of exotic and alien vegetation seeds;
- Where necessary, appropriate dust suppression techniques should be employed, such as regular watering of exposed areas and stockpiles;
- It is recommended that exposed areas of soil be stabilised as soon as possible, either through appropriate surfacing (e.g. roads) or through landscaping (e.g. servitudes, etc.); and
- It is recommended that topsoil be stockpiled separately to subsoil for use as the final soil layer during rehabilitation.
- The natural topography of the site should, as far as possible, be maintained during and after construction (i.e. indiscriminate levelling or elevating of the site should be avoided);
- Where any additional slope elevation has occurred this must be levelled and contoured to reduce the slope as well as erosion potential while un-vegetated.
- In the case of surface wash-away or wind erosion, the Contractor shall implement remedial measures as soon as possible in order to prevent further erosion;
- Appropriate erosion control/ soil stabilisation measures are to be implemented;
- During construction the Contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.
- Any runnels or erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted by the Contractor, and the areas restored to a proper condition;
- Installing silt fences wherever surface runoff is likely to occur;
- Additional stabilisation of cleared areas to prevent and control erosion must be actively managed. The method of stabilisation should be determined in consultation with the ECO and Project Manager. The following methods (or a combination) may be considered, depending on the specific conditions of the site:
  - Brushcut packing
  - Mulch or chip cover
  - Straw stabilising (at the rate of one bale/m<sup>2</sup> and rotated into the top 100mm of the completed earthworks)
  - Watering
  - Planting / sodding
  - Hand seeding
  - Hydroseeding
  - Soil binders and anti-erosion compounds
  - Mechanical cover or packing structures:
    - Geofabric
    - Hessian cover
    - Armourflex
    - Log / pole fencing
    - Retaining walls
- Traffic and movement over stabilised areas is to be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the ECO;
- Anti-erosion compounds, consisting of an organic or inorganic material, may be employed



to bind soil particles together. Products used must be proven able to suppress dust and erosion; and

- Areas to be landscaped that have been compacted to the development activity must be ripped and seeded.
- Wind screening and stormwater control should be undertaken to prevent soil loss from the site.
- All erosion control mechanisms need to be regularly maintained.
- Retention of vegetation where possible to avoid soil erosion
- Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.
- Re-vegetation of disturbed surfaces should occur immediately after the construction activities are completed.
- No impediment to the natural water flow other than approved erosion control works is permitted.

#### **12.1.4 Monitoring**

A monitoring programme shall be put in place not only to ensure compliance with the approved site EMPr throughout the construction phase, but also to monitor any environmental issues and impacts which require attention over the vegetation establishment phase, post construction.

An ECO must be appointed to ensure compliance with the EMPr and to carry out monitoring activities, which may be required on an annual or biannual basis for the lifespan of the wind farm.

#### **12.2 Search and Rescue Plan**

A search and rescue plan shall be developed prior to the commencement of the construction phase to manage the impact of the proposed development on plant species.

Threatened and Protected Species are protected and regulated by the National Environment Management: Biodiversity Act (10 of 2004), Northern Cape Conservation Ordinance of 1974, the Nature and Environmental Conservation Ordinance 1974 and Western Cape Nature Conservation Laws Amendment Act of 2000.

The following measures must be taken to finalise the search and rescue plan:

1. Prior to commencement of construction, a final site walkthrough will be undertaken by an ecologist to record the presence of any species of conservation concern within the final footprint of all infrastructure including pylon positions, substation and any access roads.
2. The final site walkthrough shall be undertaken during the wet seasons, typically August and September in order to locate and identify all listed and protected species within the footprint.
3. The mitigation hierarchy that shall be applied must strive to move/ microsite the infrastructure to avoid the species. Due to various constraints, avoidance might not be feasible. If avoidance is not possible and plants species would be impacted, the ecologist will consider translocation of the plants.
4. A plan shall be prepared detailing the number of plants per species, the locations of the suitable plant species that are candidates for translocation, the area where the plants must be translocated to and any further mitigation measures to ensure successful translocation.
5. It should be noted that not all species are necessarily good candidates for translocation. However, the plan shall strive to allow for maximum transplantation of conservation important species.
6. Any further mitigation and monitoring measures to be implemented during the construction and operational phases will be included in the updated EMPr.

The relevant permits will be applied for prior to undertaking any activities that could impact on Threatened and Protected Species.

#### **12.3 Alien Vegetation Management Plan**

### 12.3.1 Background and Legislative Framework

The Department of Environmental Affairs (DEA) manages Invasive Alien Species under the National Environmental Management: Biodiversity (NEMBA) Act 10 of 2004. In addition, this regulation published in the Government Gazette on 1 August 2014, stipulate categories for the classification of invasive potential (and thus risk), of the different known problem species in the country. These classes loosely model that of Henderson (2001), which provides the invasive status classification, as outlined in the Conservation of Agricultural Resources Act (No. 43 of 1983a). These plants can be classified as Category 1, 2 or 3 species, and as a 'Declared Weed' or 'Declared Invader' according to their level of invasiveness in South Africa. The description of the abovementioned classifications are:

- **Category 1a:** invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1a species include, for example, the yellow water lily (*Nuphar lutea*), yellow flag (*Iris pseudocorus*), bur cactus (*Opuntia salmiana*), hop wattle (*Acacia stricta*) and kangaroo wattle (*Acacia paradoxa*).
- **Category 1b:** Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway.
- **Category 2** plants: (Commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread
- **Category 3** plants: (Ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading there of, except within the floodline of watercourses and wetlands
- **Declared weed** (category 1): Prohibited on any land or water surface in South Africa, Must be controlled, or eradicated where possible (except in biological control reserves)
- **Declared invader** (category 2): Allowed only in demarcated areas under controlled conditions, Import of propagative material and trading allowed only by permit holders, Outside demarcated areas must be controlled, or eradicated where possible (except in biological reserves), Prohibited within 30 m of the 1:50 year floodline of watercourses or wetlands unless authorization obtained.
- **Declared invader (category 3):** No further plantings allowed (except with special permission), No trade of propagative material, Existing plants may remain but must be prevented from spreading, Prohibited within 30m or the 1:50 year floodline of watercourses or wetlands, or as directed by the executive officer.

It is essential that alien invasive species be removed from the study area. Following the Working for Water guidelines for effective alien vegetation removal (DWAf, 2009), this alien removal programme should consist of the following three phases:

1. Initial control: Clearing and eradication of alien invasive stands so as to drastically reduce the existing population. This control is conducted at the onset of the construction phase;
2. Follow-up control: Control of re-growth (including seedlings, root suckers and coppice growth); which should be conducted annually for the first 5 years of operation, 6-monthly for the construction period;
3. Maintenance control: Sustain alien plant numbers with on-going annual monitoring for the life of the project, and if necessary implement additional control methods to avoid re-establishment of alien invasive stands.

### 12.3.2 Potential Alien Invasive Plant Species on site

A few alien plant species were recorded on-site, which require management. These species are indicated in the below, with their common names and their risk classification.

Species name	Common name	Classification*
<i>Prosopis</i> spp.	Mesquite	1b species in Western Cape, category 3 in the Northern Cape.

<i>Bromus spp.</i>	Cheat grass / ripgut	Naturalised invader, not listed
<i>Lolium spp.</i>	Perennial rye grass	Naturalised invader, not listed
<i>Avena fatua</i>	Wild Oat	Naturalised invader, not listed
<i>Salsola kali</i>	Tumbleweed	1b
<i>Dittrichia graveolens</i>	Stinkwort	Naturalised invader, not listed
<i>Amsinckia retrorsa</i>	Rigid fiddleneck	Naturalised invader, not listed
<i>Conyza bonariensis</i>	Hairy Fleabane / Horseweed	Naturalised invader, not listed

### 12.3.3 General measures to reduce invasion of alien species

- Cuttings must be burnt in an open clearing where the risk of spreading fire is minimal, in order to kill the seeds on the plants.
- Should any invasive Acacia species be present on site, burning shall not be applied.
- Follow up to cleared site must be conducted every three months to remove upcoming seedlings.
- In cases where large scale alien plant removal has been conducted, measures to stabilise the soil from wind and water erosion must be taken. Soils may be mulched and planted with indigenous pioneer species.
- Continued monitoring throughout the life of the project will be required as the risk of alien plant species invasion is never eliminated.
- Limit access roads to as few as possible, utilising existing tracks where feasible.
- Ensure specific areas for turning are provided for heavy vehicles so that unnecessary vegetation disturbance is minimised.
- Employ locally sourced soil for construction as far as possible, in order to limit the import of seed-laden soil from other parts of the country.
- Prioritise containment of existing invasions (in terms of area covered) over larger invasions. Containment is the goal.
- Prioritise sparse populations of existing aliens (in terms of density) over that of dense populations. Limiting spread is the goal.
- Identify and plan control and monitoring efforts to aid one another.
- Train staff in invasive species spread and control efforts during induction training, to increase awareness surrounding the issue.

Control operations shall be conducted with the following frequency on a needs basis determined through monitoring (see below):

- *Initial control:* Once upon commencement of construction
- *Follow up control:* once every three months for the entirety of the construction period. Annually for the first 5 years of the operational period.
- *Maintenance control:* Conducted annually for the operational phase, and once every three months for the decommissioning and rehabilitation phase.

Monitoring operations shall be conducted with the following frequency:

- Initial control inspection: Once prior to construction commencing, encompassing the whole site (where disturbance will occur, i.e. on the layout footprint). A post-clearance inspection must also be conducted within one week of the clearing operation, to ensure the operation was effective and to identify regions for future clearing.
- Follow up inspections: Once every three months, to identify problematic areas or regions where growth has started to take hold again, and to ensure easier control of the newly emerged seedlings or herbs.
- Maintenance control: Once an area has been cleared of 95% of the invasive species, it is deemed under maintenance. Control actions for these regions should occur annually, or sooner if required. Monitoring must occur once every 6 months to ensure all areas remain under maintenance conditions.
- Decommissioning monitoring: Due to elevated disturbance occurring during

decommissioning, monthly inspections are required for the duration of this phase. These inspections will help identify areas of new growth that may become problematic after closure, and as such early action can be taken.

#### 12.3.4 Weed Removal (Initial Control Programme)

There are a number of possible methods which can be used to control alien invasive species; these include mechanical, chemical and biological control. The sections below outline possible techniques used in mechanical and chemical control methods. Table 12-1 (below) outlines specific management details for each of the alien invasive species identified on site.

As the species identified in the ecological report for this region include mainly grasses and herbs, mechanical clearing methods are limited in efficacy. Cut stump and frill treatments are also traditionally reserved for woody plant species, and as such are not applicable in the treatment of species found in this particular instance.

According to Todd (2011), mowing, fire, herbicide application and grazing are the four general categories of grass control in South Africa. Fire and mowing are difficult practically for control, as it means that natural vegetation will suffer if not applied correctly. Often, circumstances do not allow for successful physical control of the region, and the only available option is herbicide application. Due to the good condition of the study area, with mainly natural vegetation of similar height to that of the invasive grasses (i.e. roughly knee height), mowing and fire are not practical options. Especially in the light of fire tolerance and fire adapted grass species, such as *Avena spp.*, for which fire may actually increase the reproductive potential of the species. It is for this reason that chemical control is the primary suggested control method for invasive alien species in the study area. Fire and mowing are not discussed, as they are not regarded feasible for the existing land use and for the effective control of the herbs.

#### Mechanical Control Methods

Mechanical methods for alien plant removal may include felling, removing or burning invading alien plants. The following mechanical methods for felling are recommended:

- Hand pulling: Grip the young plant low down and pull out by hand (using gloves).
- Ring barking: Bark is removed to from the bottom of the stem to a height of 0.75-1.0 m to below ground level. Bush knives or hatchets can be used for debarking.
- Frill or Ring-bark: Using an axe or bush knife, angled cuts are made downward into the cambium layer through the bark in a ring; herbicide is applied into the cuts.
- Cut stump treatment: Stems should be cut as low as practical as stipulated on the herbicide label. Chemical herbicides are applied in diesel or water as recommended. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

#### Chemical Control Methods

Chemical methods for alien plant removal include using a number of approved environmentally safe herbicides, which are applied to the leaves, stems or stumps of alien invader species (details of herbicides suitable for the various species are provided in Table 12-1).

**Table 12-1. Summary of methods to be used for removal of alien invasive species identified on site.**

Species name	Hand pull or hoe*	Herbicide
<i>Prosopis spp.</i>	Seedlings and saplings	The chemical and mechanical control of Mesquite has been found to be unfeasible financially, as control costs outweigh property values (Zachariades, Hoffman & Roberts 2011). As such, biological control is suggested, under supervision of the Agricultural Research Council (ARC), employing approved insects. Should smaller populations occur on site, mechanical clearing of new growth, coupled with regular herbicidal treatment should continue until populations are at maintenance levels. Cut stump treatment with Picloram has been shown to be effective in SMALL populations in the past. <ul style="list-style-type: none"> <li>• Basal Bark/Cut Stump Treatment</li> </ul>



		<p>The basal bark application of usually 'Garlon 600' mixed in diesel onto the bark from ground level to knee height all the way around the Stem, during the active growing season. Cut stump treatments on any size plant at any time of the year using similar herbicides are also useful.</p> <ul style="list-style-type: none"> <li>Foliar (Overall) Spray Treatment</li> </ul> <p>Foliar sprays are best applied on dense thickets of seedlings less than 1.5 metres tall. The plants must be actively growing with a large area of foliage. A wetting agent must be added to the mix. Garlon, Grazon DS and Access are all herbicides that can be used.</p>
<i>Bromus spp.</i>	Seedlings or entire plant	According to CABI (2016), a range of herbicide treatments has been successfully used for control of <i>B. diandrus</i> in South Africa: In cereals, pre-emergence applications of cyanazine + terbuthylazine, chlorsulfuron + terbuthylazine, and metribuzin (Dastgeib et al., 2003) or post-emergence applications of clethodim, haloxyfop (Nott, 2002); or sulfosulfuron (Agenbag and Crous, 1999). In legumes, post-emergence treatments fluazifop, quizalofop (le Roux et al., 1995) and simazine + paraquat (Leys and Plater, 1993).
<i>Lolium spp.</i>	Seedlings or entire plant	Foliar application during the active growing season of tepraloxymid (cyclohexanone) 50 g / L (Aramo <sup>®</sup> herbicide).
<i>Avena fatua</i>	Seedlings or entire plant	Pre-emergent soil application of Pyroxasulfone (Pyrazole) 850 g/kg (Sakura <sup>®</sup> herbicide). Care must be taken to not spray soil outside of the edges of current infestations, and to reduce spray drift and unintended exposure to other plants.
<i>Salsola kali</i>	Seedlings or entire plant	Nicosulfuron (sulfonyl urea) 750 g/kg (Accent <sup>®</sup> ) as foliar spray, post-emergence. Contains 720 g / l dimethenamid-P (Frontier <sup>®</sup> Optima) for pre-emergence application. Care must be taken to not spray soil outside of the edges of current infestations, and to reduce spray drift and unintended exposure to other plants.
<i>Dittrichia graveolens</i>	Seedlings or entire plant	The salt formulation of triclopyr (Garlon 3A <sup>®</sup> ) in a post-emergence, foliar spray application while plants are still young. Waxes on mature leaves create uptake problems, and as such earlier control efforts will be more effective. For Stinkwort, this is generally just before or at the time of bolting. Triclopyr is selective and relatively safe on grasses, and may be also be used. Glyphosate (Roundup Pro) may also be used.
<i>Amsinckia retrorsa</i>	Seedlings or entire plant	Glyphosate (Round-Up Biactive <sup>®</sup> , Weedmaster Duo <sup>®</sup> (360 g/L); Metsulfuron-methyl (Brush-Off <sup>®</sup> , Associate <sup>®</sup> (600 g/Kg)) or Metsulfuron-methyl + glyphosate (Trounce <sup>®</sup> , Cut-Out <sup>®</sup> (various formulations), applied during the active growing season. Different application rates are suggested for different size target plant. Further reading available at <a href="http://dpi.pw.gov.au/invasive-species-site/Pages/Amsinckia---Herbicides-for-Control.aspx">http://dpi.pw.gov.au/invasive-species-site/Pages/Amsinckia---Herbicides-for-Control.aspx</a>
<i>Conyza bonariensis</i>	Entire plant	MCPA <sup>®</sup> and Sorgomil Gold 600 <sup>®</sup> , or paraquat and glyphosate based products (though resistance has been shown). Treat plants using foliar spray soon after bolting.

\*Avoid mechanically clearing during dry periods or when plants are desiccated, in particular tumbleweed. This is primarily due to the seed dispersal mechanisms for most grasses and tumbleweed being through dessication and wind-blow dispersal. Control should be focussed on new growth using chemical means, as more uptake will occur and greater absorption will lead to greater efficacy.

### 12.3.5 Visual Manual for Alien Invasive Plant species identification

The following plates provide a guide to the alien invasive plant species found within the power line project site. Each species is described in terms of how it looks, timing of flowering and/or fruiting.

#### PROSOPIS SPP. (Mesquite)

<b>Scientific name</b>	<i>P. glandulosa</i> var. <i>torreyana</i> (honey mesquite) and <i>P. velutina</i> (velvet mesquite)
<b>Common name(s)</b>	Mesquite
<b>Description</b>	<i>Prosopis glandulosa</i> exhibits drooping branches with feathery foliage and straight, paired spines. The species can grow up to 15 m, at a medium growth rate.
<b>Leaves</b>	Leaves are deciduous, twice compound, bright-green and feathery, with leaflets up to 5cm long and 7cm wide.
<b>Flowers</b>	Flowers have pale, yellow, elongated spikes with straight, yellow seedpods.
<b>Fruits</b>	Fruit display a long, yellowish brown pod at maturity, somewhat flattened and with slight constrictions between the seeds.



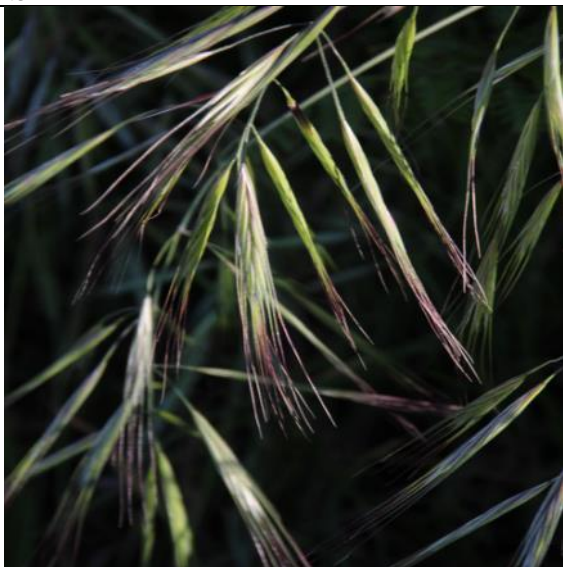
## Proposed control methods

<b>Seedlings</b>	Hand pull or hoe over small areas Foliar spray
<b>Mature or large plants</b>	Foliar spray Cut stump and herbicide Biological control (should only be conducted in cooperation with the department of agriculture).

(Pictures source: Wikipedia, 2016).

**BROMUS SPP. (Ripgut)**

<b>Scientific name</b>	<i>Bromus diandrus</i>
<b>Common name(s)</b>	Ripgut
<b>Description</b>	<i>B. diandrus</i> is an annual tufted grass with unbranched culms, occurring throughout much of the western cape, and southern part of the Northern Cape, flowering from September to January.
<b>Leaves</b>	Great brome leaves are rough, hairy, dull and often have visible purple stripes along the leaf veins. The leaf sheath is tubular, the ligule is prominent and membranous, and the stems are hairy
<b>Flowers</b>	Flowers are a loose, nodding panicle with long stalked spikelets
<b>Fruits</b>	



Source: T. Rebelo, iSpot.co.za (2015)



Source: S. Navie, Biosecurity Queensland (2016)

## Proposed control methods

Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

**LOLIUM SPP. (Perennial rye grass)**

Scientific name	<i>Lolium perenne</i>
Common name(s)	Perennial ryegrass
Description	The plant is a low-growing, tufted, hairless grass, with a bunching growth habit.
Leaves	The leaves are dark green, smooth and glossy on the lower surface, with untoothed parallel sides and prominent parallel veins on the upper surface. The leaves are folded lengthwise in bud or rolled ( <i>Lolium multiflorum</i> ), and has an overall flat appearance. Leaf sheaths at the base are usually tinged pink and hairless. Stems grow up to 90 cm. (Wikipedia, 2016)
Flowers	The inflorescence is unbranched, with spikelets on alternating sides edgewise-on to the stem.
Fruits	The anthers are pale yellow. Perennial ryegrass has a fibrous root system, with thick main roots and thinner lateral branches. Roots are usually arbuscular mycorrhizal. (Wikipedia, 2016)



Source: www.horsedvm.com, 2016



Source: S. Navie, Biosecurity Queensland (2016)



**Proposed control methods**

Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages



**AVENA FATUA (wild oat)**

Scientific name	<i>Avena fatua</i>
Common name(s)	Wild oat
Description	<i>A. fatua</i> is an annual tufted grass with erect culms, varying from 25 to 120 cm. (CABI, 2016)
Leaves	Leaf blades are dark green, up to 40 cm long and with a membranous ligule, which is 1 to 6 mm long and often irregularly toothed. Sheaths are smooth or slightly hairy, especially in younger plants. (CABI, 2016)
Flowers	The inflorescence of <i>A. fatua</i> is a loose, open panicle with 2 to 3-flowered pedicelled spikelets. (CABI, 2016)
Fruits	Grains are 6 to 8 mm long.



	
Source: S. Navie, Biosecurity Queensland (2016)	Source: S. Navie, Biosecurity Queensland (2016)
<b>Proposed control methods</b>	
<b>Seedlings</b>	Hand pull or hoe over small areas Foliar spray
<b>Mature or large plants</b>	Foliar spray Mowing at selective growth stages



### SALSOLA KALI (common saltwort)

<b>Scientific name</b>	<i>Salsola kali</i>
<b>Common name(s)</b>	Common saltwort
<b>Description</b>	<i>S. kali</i> is a low herb, 5-50 cm tall, papillose to hispid or, occasionally, glabrous. Stems are erect to ascending, branching from the base (CABI, 2016).
<b>Leaves</b>	Leaves are alternate with linear blades, roughly 1-2 mm wide, fleshy, usually not swollen at base, apex acuminate, forming a firm spine, 1-1.5-2.2 mm long. (CABI, 2016)
<b>Flowers</b>	"Flowers with bracteoles free or becoming connate and adnate to perianth base; perianth segments with comparatively narrow wing, or in lower flowers occasionally wingless, with weak or firm, acute apex, glabrous; fruiting perianth 4-6(-8) mm diameter" (CABI, 2016)
<b>Fruits</b>	"Inflorescences interrupted at maturity, usually 1-flower per axil of bract; bracts alternate, not imbricate at maturity, reflexed, not distinctly swollen at base, apex narrowing into subulate spine" (CABI, 2016).
	
Source: www.invasives.org.za, 2016	Source: Eattheweeds.com, 2016
<b>Proposed control methods</b>	



<b>Seedlings</b>	Hand pull or hoe over small areas Foliar spray
<b>Mature or large plants</b>	Foliar spray Mowing at selective growth stages

**DITTRICHIA GRAVEOLENS (Stinkwort)**



<b>Scientific name</b>	<i>Dittrichia graveolens</i>
<b>Common name(s)</b>	Stinkwort
<b>Description</b>	<i>Dittrichia graveolens</i> is a branching subshrub, growing to 130 cm tall, with a pungent smell. (Wikipedia, 2016)
<b>Leaves</b>	Leaves are long and narrow, pointed at each end, with small teeth along the edges and glandular hairs on the surfaces (Wikipedia, 2016).
<b>Flowers</b>	One plant can produce numerous yellow flower heads with as many as 16 ray florets and 40 disc florets (Wikipedia, 2016).
<b>Fruits</b>	
	
Source: mundaringps.wa.edu.au (2016)	Source: Wikipedia (2016)

**Proposed control methods**



<b>Seedlings</b>	Hand pull or hoe over small areas Foliar spray
<b>Mature or large plants</b>	Foliar spray Mowing at selective growth stages

**AMSINCKIA RETRORSA (Rough Fiddleneck)**

<b>Scientific name</b>	<i>Amsinckia retrorsa</i>
<b>Common name(s)</b>	Rough fiddleneck
<b>Description</b>	Rigid fiddleneck is a colourful annual and weed. Plants have erect, simple to few-branched stems from 10- 100 cm high. The stems are covered with long, spreading, stiff hairs with and undercoat of shorter, softer hairs that point downwards. ( <a href="http://science.halleyhosting.com/">http://science.halleyhosting.com/</a> , 2016)
<b>Leaves</b>	The leaves are linear to linear-oblong in shape, measuring up to 12 cm long and up to 1 cm wide. The herbage of the leaves is similar to that of the stems, but the hairs may be more appressed. The basal leaves are more numerous and crowded, while those of the stems are more widely spaced and are reduced in size. ( <a href="http://science.halleyhosting.com/">http://science.halleyhosting.com/</a> , 2016)
<b>Flowers</b>	The inflorescence consists of a scorpioid spike which uncoils and elongates with age. The 5 sepals are generally equal in size and shape and measure from 5-12 mm long. Individual sepals are linear to linear-lanceolate in shape and measure from 7-10 mm long. The corolla consists of a tube from 5-8 mm long that is barely exerted from the calyx while the limbs or lobes of the corolla range from 1.5-5 mm long. The corolla is typically orange or orange-yellow with reddish markings in the open throat.
<b>Fruits</b>	

	( <a href="http://science.halleyhosting.com/">http://science.halleyhosting.com/</a> , 2016)
	
Source: <a href="http://www.tss.oregonstate.edu">www.tss.oregonstate.edu</a> , 2016	Source: <a href="http://malag.aes.oregonstate.edu">malag.aes.oregonstate.edu</a> , 2016.
<b>Proposed control methods</b>	
<b>Seedlings</b>	Hand pull or hoe over small areas Foliar spray
<b>Mature or large plants</b>	Foliar spray Mowing at selective growth stages

### CONYZA BONARIENSIS (Hairy fleabane)

<b>Scientific name</b>	<i>Conyza bonariensis</i>
<b>Common name(s)</b>	Hairy fleabane
<b>Description</b>	" <i>C. bonariensis</i> is an erect annual with one or more stems from a basal rosette, up to 60 cm or occasionally 100 cm in height. All parts of the plant are finely pubescent and greyish in colour." (CABI, 2016)
<b>Leaves</b>	"Leaves linear to oblanceolate, mostly about 5 mm wide, entire, but often wavy-edged, with very short or hooked hairs less than 0.5 mm long." (CABI, 2016)
<b>Flowers</b>	The inflorescence has long branches resulting in an almost corymbose effect, with most flowering heads about the same level. Individual flower heads are greyish-green, 4-5 mm diameter when fresh (broader in pressed specimens) with cream-coloured disc florets and no ray florets. (CABI, 2016)
<b>Fruits</b>	The pappus is white or pinkish and 4-5 mm long; seeds are about 1 mm long. (CABI, 2016)
	
Source: <a href="http://iSpot.co.za">iSpot.co.za</a> , 2016.	Source: <a href="http://www.roundthebend.org.au">www.roundthebend.org.au</a> , 2016.
<b>Proposed control methods</b>	
<b>Seedlings</b>	Hand pull or hoe over small areas Foliar spray
<b>Mature or large plants</b>	Foliar spray Mowing at selective growth stages

### **12.3.6 Monitoring**

Due to their persistent nature and prodigious seeding and reproduction, invasive alien plants require coordinated, consistent monitoring and control efforts. For this project, where invasive species are mainly located along already disturbed regions such as farmsteads, roads, cattle feedstock's, pens, and farm dams, the monitoring efforts should be focussed on these areas. This is especially important as the majority of the project region is currently under good, natural veld with little invasion. Monitoring should be conducted by the ECO (contractually), and ESO (incidentally, or on an ad-hoc basis). The ECO should familiarise himself/herself with the identification of the species mentioned above, and be able to identify them in-field. Should any doubt exist, a professional botanist should be consulted in order to ensure the ECO is able to identify these species accurately.

The ESO shall survey all high priority regions (disturbed areas) every two weeks throughout the construction phase, and include in his monthly report finding from these surveys. The objective will be to identify the presence of absence of target species on-site, and to identify the efficacy and ongoing clearance control offered by the methods mentioned above. New occurrences of problem species must be noted for clearance, and included in the clearing teams' objective for clearing to commence within two weeks of positive identification.

During the operation phase, monitoring may be relaxed to a once every six months event, where surveys for all disturbed regions (i.e. all regions cleared and frequented by the construction efforts) is to be conducted. Findings shall be captured yearly and included in the rehabilitation reporting. Reports should be made available upon request.

### **12.3.7 General control efforts**

In general, control efforts must:

- Avoid fire as a clearing / control method;
- Avoid mowing as a clearing / control method;
- All biocontrol measures must be conducted in consultation with the Plant Protection Research Institute (DoA – Pretoria), in order to ensure the correct agent is being employed, and the region isn't at risk.
- A clearing roster must be drawn up by the ECO and approved by the developer prior to clearing commencing, in order to allow for a work schedule for all invasive species occurrences on-site. This roster will be updated as clearing occurs and new instances are observed. This roster will be used to track progress and act as proof of clearing conducted;
- Prioritise small populations over large populations;
- Prioritise less dense infestations to denser infestations;
- Ensure clearing of fringes of existing populations prior to the clearing of the centre (i.e. outside inward, not inwards to the outside clearing);
- Ensure all control teams are equipped with the appropriate Protective wear and do not conduct work without them on;
- Apply herbicide to plants at new growth, as opposed to mature plants (this improves uptake);
- Ensure the correct herbicide is selected for each species, and the correct dosage is used. Dosage must at all times follow that of the label;
- Ensure the correct clearing method is selected and used for each species;
- Clearing must be conducted every three months for herbaceous species, and once every six months for Mesquite. Once maintenance levels have been achieved, clearance may occur annually for the duration of the operation phase.
- Should these clearing methods above prove ineffectual, a professional clearing organisation or botanist (Working for Water, or the City of Cape Town invasive Species Unit) must be approached for a species-specific management plan, to be followed for each species.

## 12.4 Traffic Management Plan

A management plan has been included in Appendix C and additional mitigation measures are included in this section to ensure traffic is managed.

### 12.4.1 Introduction

The purpose of this plan is to ensure that traffic management is undertaken in a safe and efficient manner in order to avoid negative traffic impacts under routine and non-routine circumstances. The requirements presented in this plan shall apply to all construction personnel.

### 12.4.2 Compliance with traffic rules

The following measures must be implemented:

- A Traffic Control Officer or Officers must be appointed.
- All construction vehicles and vehicles associated with the project must comply with the relevant traffic and transport licencing requirements.
- Operators and drivers must have the relevant licences / permits to operate the vehicles.
- All contractors and construction vehicles must comply with traffic rules on public and other roads within the project area.
- Where construction will obstruct existing access alternative temporary access routes must be provided.
- Arrangements for abnormal loads to be authorised by the relevant authorities, and the local population to be informed of routes and times of deliveries.
- A disciplinary procedure to address incidents of speeding or other traffic offences by site personnel and subcontractors, including the possibility of dismissal for repeat offences.
- A procedure to monitor the loads of vehicles to ensure adherence to statutory load restrictions, and for dealing with transgressions of vehicle loading limits.

Traffic safety procedures, transport routes and construction schedules intended to be applied during the construction phase must be in consultation with members of the local community, the local authority and affected landowners prior to the common concrete of construction activities. The scope of such engagement should include the designation of routes for construction vehicles, procedures for complaints and emergency procedures shall be concluded in consultation with local community members, affected land owners and local emergency and traffic authorities. In this regard, appropriate measures shall be taken to ensure that:

- The routes used by construction vehicles (as far as possible) avoid areas of high pedestrian traffic;
- Adequate signage is used to warn local community members of hazards (e.g. site access, construction vehicles turning);
- Information dissemination and awareness is conducted to inform community members of increased traffic risks and appropriate precautionary measures; and
- Community members are aware of the Contractors' construction (and delivery) schedules.

### 12.4.3 Traffic Signage

Traffic signage is to be securely erected at appropriate points (ensuring visibility) along all access roads and public roads (in consultation with the relevant traffic authorities) to indicate the following:

- Road hazards such as blind corners or loose gravel;
- appropriate speed limits;
- turning traffic;
- the Site access;
- routes to be used by construction vehicles, where appropriate;
- that caution should be taken by motorists or pedestrians;
- no-go areas for vehicles; and



- any relevant traffic control information.

#### **12.4.4 Roads**

- All access roads must be clearly demarcated and “No Entry” signs must clearly indicate those roads that are not to be used by contractors or delivery vehicles.
- Make use of existing roads and tracks where feasible, rather than creating new routes.
- Routes should not traverse slopes with gradients in excess of 8%. Where this is unavoidable the road surface must be stabilised using methods approved by the Engineer.
- Avoid routes through drainage lines and riparian zones wherever possible. Where access through drainage lines and riparian zones is unavoidable, only one road is permitted, constructed perpendicular to the drainage line. Avoid roads that follow drainage lines within the floodplain.
- Allow for safe pedestrian crossing where necessary.
- All the necessary temporary road traffic signs should be erected to ensure safe traffic flow conditions.
- Where temporary road closures are necessary the dates and durations of the closures must be signposted well in advance at the entrances and exits of the affected roads, and alternative routes clearly indicated.

#### **12.4.5 Road Maintenance**

- A procedure for reporting and addressing hazards, accidents and other emergency situations shall be established by the Project Manager and implemented.
- Clean and make good any damage to private roads caused by the Contractor during the construction phase.
- Should any damage occur on private access roads that will not be upgraded during the construction phase, these roads must be rehabilitated to a pre-construction state.
- Dust suppression on gravel roads and control of material being transported to and from the site must be managed to reduce the impact of dust to surrounding landowners.
- The provincial roads department must be informed of any damage to public roads that occurs as a result of use by construction traffic.
- Where possible, existing roads on Site shall be used as access roads.
- Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage.
- Repair rutting and potholing and maintain stormwater control mechanisms.
- Spillages of materials on public roads must be cleaned up immediately they occur.

#### **12.4.6 Project Vehicles**

- Deliveries of normal load construction materials to the site, should, as far as possible, be scheduled to avoid peak hours to reduce the hourly volumes of heavy traffic.
- Enforce speed limits at all times on site roads. The movement of construction vehicles shall not be undertaken during peak morning and afternoon traffic times so as to avoid causing an impact on commuters. Materials and labour shall, as far as possible, be sourced locally in order to minimise transport related impacts and transport safety risks.
- Vehicles may not leave the designated roads and tracks and turnaround points must be limited to specific sites.
- The movement of all vehicles within the Site must be along designated roadways.
- Restrictions on the times at which heavy vehicles are permitted to travel on public roads. As far as possible heavy traffic should avoid morning and evening peak traffic periods. Heavy vehicles should as far as possible travel on public roads only during weekdays. High volumes of heavy vehicles should be avoided on Saturday mornings, and no heavy vehicles should travel on public roads on Saturday afternoons, all day Sunday and on public holidays unless approved by the relevant transport authorities.
- Abnormal loads must, as far as possible, be scheduled to avoid peak hours, to minimise disruption to peak-hour traffic.

- The contractor must provide high-occupancy transport for as many of its workers as possible to reduce the number of peak-hour vehicle trips.

#### **12.4.7 Vehicle Maintenance**

- All vehicles and machinery used during the Project shall be regularly maintained and repaired where necessary.
- Passenger vehicles must be inspected on a regular basis to ensure that they are in good working order and are not overloaded.

#### **12.4.8 Transportation of Construction Equipment and Materials**

- Construction equipment and materials must be properly secured to / contained in the appropriate vehicle.
- The weight bearing capacity of construction vehicles must be adhered to.

#### **12.4.9 Passenger Safety**

- The carrying capacity of passenger vehicles must be adhered to;
- No employee shall be transported on the back of open trucks;
- Assembly points for construction workers to be located in a safe area (reasonable distance from high volume traffic or danger zones);
- The contractor is to conduct vehicle and passenger safety training, emphasizing any risks/dangers of construction traffic and explain precautionary measures to be taken.

### **12.5 Fire Management Plan**

The Contractor shall take all the necessary precautions to ensure that fires are not started as a consequence of his activities on site. The Contractor, sub-contractors and all employees are expected to be conscious of fire risks. The Contractor shall hold fire prevention talks with staff to create an awareness of the risks of fire. Regular reminders to his staff on this issue are required.

#### **12.5.1 Fire Prevention**

- A fire officer is to be appointed by the contractor;
- "No-smoking" signs to be placed in areas used for storage of oil and fuel;
- Basic fire fighting equipment shall be readily available on site;
- Employees shall be made aware of the procedures in the event of a fire;
- Smoking shall only be permitted in designated smoking areas. Fire extinguishers will be available in these areas at all times;
- Prevention of runaway fires by keeping vegetation short in working areas;
- Ensure that no fires are lit close to the natural bush or plantations;

#### **12.5.2 Fire control**

- The Contractor shall take all the necessary precautions to ensure that fires are not started as a result of his activities on site. If any fires occur the Fire Department of the nearest municipality should be notified;
- All fires must be prohibited on site and only designated cooking areas will be allowed where fire-fighting equipment is available;
- Any fires that occur shall be reported to the ECO immediately who will then liaise with the local Fire Protection Agency;
- Fires and fire hazards need to be managed appropriately. Smoking should only be allowed in a designated area where a fire hydrant is available;
- The Contractor shall appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedures to be followed;

- The Contractor shall forward the name of the Fire Officer to the ECO for his approval within 7 days of being on site;
- The Contractor shall ensure that there is basic fire fighting equipment available on site at all times. This shall include at least rubber beaters when working in urban open spaces and natural areas, and at least one fire extinguisher of the appropriate type when welding or other “hot” activities are undertaken;
- The Contractor shall be liable for any expenses incurred by any organisations called to assist with fighting fires that were started as a result of his activities or personnel, and for any cost relating to the rehabilitation of burnt areas, or consequential damages.

### **12.5.3 Emergency Procedures**

- The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it;
- If any fires occur the Fire Department of the nearest municipality should be notified;
- Any fires that occur shall be reported to the ECO immediately who will liaise with the local Fire Protection Agency;
- The Contractor shall ensure that his employees are aware of the procedures to be followed in the event of a fire.
- Fire extinguishers to be serviced by an accredited service provider on an annual basis.

## **12.6 Erosion management plan**

### **12.6.1 Purpose**

Exposed and unprotected soils are the main cause of erosion in most situations. The Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

- A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction-related activities;
- An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

### **12.6.2 Erosion and Sediment Control Principles**

The goal of erosion control during and after construction within the study area should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-off water from undisturbed upslope areas through the study area without allowing it to cause erosion within the site or become contaminated with sediment;
- Progressively re-vegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

### **12.6.3 General Erosion Control**

The Contractor should take all reasonable measures to prevent soil erosion resulting from the construction activities as well as to prevent the restriction or increase in the flow of storm water caused by the presence of temporary / permanent works. Erosion prevention measures must be implemented to the satisfaction of the Engineer and the ECO. Areas affected by construction related activities must be monitored regularly for evidence of erosion. Areas particularly susceptible to erosion include areas stripped of topsoil and soil stockpiles and steep slopes (gradients > 6 %). Where evidence of erosion appears, the construction of contour berms, cut-off drains or planting of grass sods may be necessary. Where soil erosion does occur, the Contractor shall reinstate such areas and areas damaged by the erosion, at his own cost and to the satisfaction of the Engineer and ECO.

### **12.6.4 Preventative Measures**

- The Contractor is to provide a method statement on erosion control showing clearly how cleared surfaces and stormwater will be managed on site during construction and rehabilitation;
- Wind screening and stormwater control will be undertaken to prevent soil loss from the study site;
- All erosion control mechanisms will be regularly maintained;
- Re-vegetation of disturbed surfaces will occur immediately after the construction activities are completed;
- In the case of existing surface wash-away and wind erosion, the Contractor shall implement remedial measures as soon as possible in order to prevent further erosion;
- During construction, the Contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas;
- Traffic and movement over stabilised areas is to be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the ECO.

### **12.6.5 Erosion and Sediment Control Measures**

- Re-vegetate areas that have been disturbed as soon as possible;
- Cut and fill slopes must be made stable and be re-vegetated as soon as possible during the construction phase;
- Newly formed terraces within the facility must be vegetated in order to stabilise the soil;
- Where erosion and/or sedimentation, whether on or off the site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the ECO;
- Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the ECO and at the expense of the Contractor;
- If the Site is closed for a period exceeding 5 days, the Contractor, in consultation with the ECO, shall carry out the following checklist procedure:
  - Excavated and filled slopes and stockpiles are at a stable angle and capable of accommodating normal expected water flows;
  - Re-vegetated areas have a watering schedule and the supply to such areas is secured.

## **12.7 Hazardous Substances Plan**



The special mitigation measures pertaining to the hazardous substance bunding and monitoring have been included in the construction and operation measures, contained in Chapter 11 of this report. However, in general, the contractor shall be responsible for the implementation of hazardous substance management measures, as detailed below. This plan therefore provides specific measures to control, monitoring and limit hazardous substance spillage and environmental damage resulting therefrom. The Project Manager shall ensure effective and accurate implementation of hazardous substance management, the ECO shall ensure compliance monitoring with below specifications and reporting thereon. The timeframe shall be the duration of the construction phase.

### **12.7.1 Training**

Ensure that all personnel that use or handle hazardous material are trained:

- In the use and potential dangers of the materials.
- To understand what a Materials Safety Data Sheet (MSDS) is, and be able to interpret the information thereon.
- On emergency response procedures required to counter the nature and hazards of an accidental release.
- The handling and storage practices, for all containers with which they will come into contact.

### **12.7.2 Material types**

- Use materials with low life cycle impact.
- Use materials with low embodied energy (i.e. materials that require less total energy to extract, manufacture, transport, construct, maintain and dispose of).
- Reduce materials containing volatile organic compounds and formaldehyde.
- Avoid xylene and toluene solvents in paints, glues and carpets as well as polyurethane.
- Where possible use water based paint.
- Do not use chlorofluorocarbons (CFCs), polychlorinated biphenyl (PCBs), persistent organic pollutants (POPs) (in pesticides), ozone depleting substances (ODSs) and materials containing asbestos.

### **12.7.3 Control planning for hazardous materials on site**

- Document the types and quantities of hazardous materials present on the proposed project site, including the following information:
  - Name and description (e.g. composition of a mixture) of the hazardous material.
  - Classification (e.g. code, class or division) of the hazardous material.
  - Regulatory reporting threshold quantity of the hazardous material.
  - Quantity of hazardous material used per month.
  - Characteristic(s) that make(s) the hazardous material hazardous (e.g. flammability, toxicity, etc.).
  - Analysis of potential spill and release scenarios using available industry statistics on spills and accidents where available.
  - Analysis of the potential for uncontrolled reactions such as fire and explosions.
  - Analysis of potential consequences based on the physical geographical characteristics of the site, including aspects such as its distance to settlements, water resources, and other environmentally sensitive areas.
- Identify locations of hazardous materials and associated activities on an emergency plan site map.
- Detail the availability of specific personal protective equipment and training needed to respond to an emergency.
- Detail availability of spill response equipment sufficient to handle at least initial stages of a spill and a list of external resources for equipment and personnel, if necessary, to supplement internal resources.

#### **12.7.4 Uncontrolled Releases**

- Prevent uncontrolled releases of hazardous material to the environment or uncontrolled reactions that might result in fire or explosion using engineering controls (containment, automatic alarms, and shut-off systems) commensurate with the nature of the hazard.
- Implement management controls (procedures, inspections, communications, training, and drills) to address residual risks that have not been prevented and controlled through engineering measures.
- Store all hazardous (reactive, flammable, corrosive and toxic) materials in clearly identified, fit-for-purpose containers or vessels.
- Clean any accidental spills immediately, and treat the spilled material and use cleaning products as hazardous waste.
- Describe response activities in the event of a spill, release, or other chemical emergency in an incident report that must include, inter alia:
  - Internal and external notification procedures.
  - Specific responsibilities of individuals or groups.
  - Decision process for assessing severity of the release, and determining appropriate actions.
  - Facility evacuation routes.
  - Post-event activities such as clean-up and disposal, incident investigation, employee re-entry, and restoration of spill response equipment.

#### **12.7.5 Reaction, fire and explosion prevention**

Reactive, flammable, and explosive materials must be managed to avoid uncontrolled reactions or conditions resulting in fire or explosion. Such prevention practices include:

- Storage of incompatible materials (acids, bases, flammables, oxidizers, reactive chemicals) in separate areas, and with containment facilities separating material storage areas.
- Provision of material-specific storage for extremely hazardous or reactive materials.
- Use of flame arresting devices on vents from flammable storage containers.
- Storage of hazardous materials in an area of the facility separated from the main construction activities.

#### **12.7.6 Planning coordination**

Procedures should be prepared for:

- Informing the public and emergency response agencies.
- Documenting first aid and emergency medical treatment.
- Taking emergency response actions.
- Reviewing and updating the emergency response plan to reflect changes and ensuring that the employees are informed of such changes.
- Using, inspecting, resting and maintaining the emergency response equipment.

#### **12.7.7 Storage of hazardous materials**

- Locate chemicals stored in drums in areas with a secondary containment capacity of at least 10% exceeding of the maximum stored quantity of chemicals.
- Drum stack heights must not exceed two drum heights on pallets. All defective pallets must be replaced immediately. A minimum space of 80 cm must be left open between stacks and 100 cm between stacks and a wall.
- Chemical products must be secured when not needed to prevent tampering and vandalism.
- Provide warning notices, fire-fighting facilities and protection from weather damage.
- Keep products in their original containers unless they are not re-sealable, with all stored products and containers being labelled, and original labels and MSDS retained.
- Store acetylene, propane, and oxygen cylinders in dedicated areas where they will be protected from collision or ignition sources.

- Label containers so that the hazard nature of the material is clear.
- Ensure compliance with all national, regional and local legislation with regard to the storage, transport and use of hydrocarbons, chemicals, solvents, explosives and any other harmful and hazardous substances and materials.
- The Contractor must provide proof to the Project Manager that, if required, the relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials must be clearly displayed on the storage facility or containment structure.
- Petrochemicals, oils and identified hazardous substances must only be stored under controlled conditions. All hazardous materials (e.g. bitumen binders) must be stored in a secured, appointed area that is fenced and has restricted entry. Storage of bituminous products must only be in suitable containers approved by the Project Manager.
- Keep a record of all hazardous substances stored on site for submission to the ESO and for verification to the ECO.
- Store all hazardous substances in secure, safe and weatherproof facilities, underlain by a bunded concrete slab to protect against soil and water pollution.

#### **12.7.8 Handling of hazardous materials**

- Ensure that personnel who handle hazardous substances have been educated and trained in terms of the correct handling, use and disposal thereof.
- Empty containers in which hazardous substances were kept are to be treated as hazardous waste. Such containers must not be reused for any purpose.
- Obtain Material Safety Data Sheets (MSDS) for all hazardous chemical formulations before use and all materials must be handled according to the instructions.
- In response to and in addition to the information contained on the MSDS the following must also be determined:
  - What personal protective equipment (PPE) is required.
  - What emergency actions may be needed (i.e. first aid, firefighting media, etc.).
  - The weight of the container so that proper personnel and/or equipment will be utilised during handling.
  - Access and egress routes.
  - Containers holding flammable materials to be grounded during transfers of contents.

#### **12.7.9 Transport of hazardous materials**

- Provide for controlled loading/unloading areas, underlain by an impervious paving or PVC sheet to protect against soil and water pollution.
- All hazardous waste containers designated for off-site transport to be secured and labelled with the contents and associated hazards, be properly loaded and be accompanied by a shipping paper (i.e. manifest) describing the loads and its associated hazards.
- Transporters of hazardous materials must ensure that:
  - The vehicle is suitable and registered for the purpose it is being used.
  - The vehicle displays clear markings in English indicating the nature of the materials being carried, what to do in the event of an emergency, and an emergency telephone number (24 hour) of a responsible person who can provide advice in the event of an emergency.

#### **12.7.10 Detection of leakage or spillage of hazardous material**

All bunded areas containing hazardous material shall be visually inspected daily to determine whether any spillage or leakages occurred. If a spill or leakage is detected, it shall be reported to the ESO, ECO and Project Manager and be dealt with according to this Hazardous Substances Plan.

#### **12.7.11 Flammable liquids**

- No combustible material (e.g. wood, rags, paper, carton boxes) are to be kept in the

- presence of flammable liquids.
- 'No Open Flames' and 'No Smoking' symbolic signs are to be displayed in the vicinity of the flammable liquid storage areas. Flammable liquids are to be issued only on a need-to-use basis and strict control is to be exercised to ensure that persons do not draw more than what is needed for the specific job.
- An adequate number and type of fire-fighting equipment is to be available in the close vicinity of the flammable liquid store.
- Flammable liquid stores are to be equipped with approved flameproof electrical equipment.
- Flammable liquid containers in the flammable liquid stores are to be clearly marked/labelled as to their contents. They are to be provided with earthed drip trays.
- Locations are to display MSDS information and handling/storage instructions. MSDSs are to be available for all flammable/hazardous products at the location where such substances are present.
- The number of 200 litre drums containing flammable liquids is to be kept to a minimum and the position is to be strictly controlled. The necessary signs should be visible at these storage areas.
- Flammable liquid tanks are to be properly earthed in order to prevent static electricity accumulating.
- Drainage points on flammable liquid tanks are to be provided with threaded caps or blanking plates.
- Bund walls are to surround storage tanks containing flammable liquids and these must be able to contain the entire volume of the contents plus 10% in case of spillage.
- Adequate precautions must be taken, such as wearing relevant protective equipment when handling substances.

## **12.8 Protection of Hydrological Features and Sensitive Areas**

The following measures will be used to protect hydrological features (streams, rivers, pans, wetlands, dams and catchment) and other environmentally sensitive areas from impacts associated with construction. These measures must be read in conjunction with those contained in Chapter 11, as they relate to surface water management.

### **12.8.1 Water use**

- Water may not be sourced from the river for any purposes during the construction process;
- The Contractor shall not permit his employees to make use of any natural water sources for the purposes of swimming, personal washing and the washing of machinery or clothes.
- Where possible all wash water will be recycled for use, as wash water again or for dust suppression where applicable;

### **12.8.2 Protection from direct or indirect spillage of pollutants**

Streams, rivers, underground water and dams will be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, wash water, organic materials and bituminous products.

- Potential pollutants of any kind and in any form shall be kept, stored, and used in such a manner that any escape can be contained and that the water table and surface water is not endangered. Water containing such pollutants as chemicals, washing detergents, sewerage, fuels, paints and solvents and hydrocarbons shall be contained and discharged into an impermeable storage facility for removal from the site or for recycling; This particularly applies to runoff from fuel depots/workshops/truck washing areas;
- Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. The Contractor shall notify the ECO immediately of any pollution incidents on Site;
- As part of the Pollution Control Method Statement, the Contractor shall submit a plan to the ECO detailing how the contaminated water will be managed on site;



- No maintenance, including emergency maintenance, of plant can take place within 50m of any hydrological features;
- No toilets will be erected within 50m of any hydrological features;
- If the Site is closed for a period exceeding 5 days, the Contractor, in consultation with the ECO, shall carry out the following checklist procedure:
  - Hazardous fuel stores are secure;
  - Cement and materials stores are secure;
  - Toilets are empty and secured;
  - Refuse bins are empty and secured;
  - Bunding is clean and treated with appropriate material that will absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage;
  - Drip trays are empty & secure.

### ***12.8.3 Measures to protect surface water features from stormwater runoff***

There are various drainage lines and other watercourses within the proposed development area. Although the project area receives low levels of rainfall per annum, the rain events can be short and intense. By increasing the hardened surfaces within the project area through gravel road construction, it could impact surface water features through increased runoff during these rainfall events.

Once the servitude and location of the access roads are confirmed, the runoff can be determined. This will inform the specific storm water infrastructure to be used to manage runoff. The design of the road should include measures to ensure that water runoff from gravel roads should not be directly channelled towards drainage lines by including measures to dissipate the runoff to reduce velocity and thereby risk of erosion. Ongoing monitoring of storm water control features shall be undertaken during the operational phase.

## **13 CLOSURE PLANNING**

**Final site cleaning** - the contractor shall clear and clean the site and ensure that everything not forming part of the permanent works is removed from site before issuing the completion certificate or as otherwise agreed.

**Rehabilitation** - the contractor (landscape architect/horticulturist) shall be responsible for rehabilitating and re-vegetation of all areas disturbed/areas earmarked for rehabilitation during construction to the satisfaction of the Project Manager and ECO.

### **13.1 Post-Construction environmental audit**

Typically, a post-construction environmental audit must be carried out and submitted to DEA at the expense of the Holder of the EA so as to fulfil conditions of the EA granted. Objectives should be to audit compliances with the key components of the EMPr, to identify main areas requiring attention and recommend priority actions. The audit should be undertaken annually during the operational phase and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring.

Results of the audits should inform changes required to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

### **13.2 Management review and revision of the EMPr**

The EMPr is to be reviewed annually for the first three years from the commencement of construction and then once every five years thereafter, by an independent environmental consultant, unless otherwise specified by the authorities. The auditor is to highlight issues to be addressed in the EMPr or changes required during the annual audit. These points are to be included as an annexure to the EMPr and to be considered during the review process. Any recommended changes to the EMPr requiring approval from DEA, should be submitted to DEA for approval.

### **13.3 General review of EMPr**

The EMPr will be reviewed by the ECO on an ongoing basis throughout the construction phase. Based on observations during site inspections and issues raised at site meetings, the ECO will determine whether any procedures require modification to improve the efficiency and applicability of the EMPr on site.

Any such changes or updates will be registered in the ECO's record, as well as being included as an annexure to this document. Annexure of this nature must be distributed to all relevant parties.

## 14 GRIEVANCE PROCEDURE

Whilst the mitigation measures contained within this report aim to reduce and minimise harm to the environment, whilst facilitation and guiding the construction and rehabilitation efforts, grievances are likely to surface throughout the construction and operation phases. As such, mechanism for the effective processing, capture and management of grievances is required. This chapter aim thus aims to provide guidance measures, to be put in place by the construction crew and management team, in order to process and minimise grievances throughout construction and operation. All measures for grievance are required to be:

- Fair and equitable;
- Open and transparent;
- Accountable and efficient;

These grievance procedures do not negate the availability of legal action should that course be desired, however, is rather aimed at avoidance of a potentially costly and time consuming legal process.

The following proposed grievance procedures are to be complied with throughout all project phases.

- An electronic and hardcopy of these grievance procedures shall be kept on site at all times, throughout all project phases for open access to any aggrieved person or general public.
- A presentative will be appointed as the contact person for grievances. The name and contact details of the contact person will be provided to local landowners, communities and authorities or be contained within this document. The representative shall be either the Project Manager or the ESO.
- Project related grievances relating to the construction, operational and or decommissioning phase must be addressed in writing to the contact person.
- Should any party lack resources to submit grievances, the contact person will be required to facilitate as far as reasonable, the written recording and response to such grievance.
- A grievance register shall be kept on site (in electronic format, so as to facilitate editing and updating), and shall be made available to all parties wishing to gain access thereto.
- Grievances received in writing shall be registered with the contact person, captured in the grievance register, and responded to within 2 working days of receipt of the grievance. Response shall entail contacting the complainant to discuss the grievance and agree on a suitable date and time for a meeting. The meeting shall be scheduled as soon as reasonable possible, with no undue delay in the processing thereof.
- The contact person shall communicate receipt of grievance to the complainant in writing within 7 calendar days of receipt. The receipt notification shall include the following details:
  - The name and contact details of the complainant;
  - The nature of the grievance;
  - Dates raised, received and for which the meeting was arranged; and
  - Persons elected to attend the meeting (which will depend on the grievance);
  - A clear statement that the grievance procedure is, in itself, not a legal process. Should such avenues be pursued, they must be conducted in a separate process.
- The meeting shall be conducted on the agreed date and time and with the agreed personnel, taking minutes and chairing the meeting as a formal affair. The costs associated with hiring venues will be covered by the Holder of the EA. The Holder of the EA will also cover travel costs incurred by the complainant within reason, specifically in the case of local, resource poor communities.
- Draft copies of the meeting will be made available to all parties having attended the meeting, within 5 working days of the meeting.
- The meeting agenda shall be primarily the discussion of the grievance, avoidance and mitigation measures available and proposed by all parties, as well as a clear indication of the future actions and responsibilities, in order to effect the proposed measures and

interventions.

- The commitments stated and recorded within the meeting minutes shall be held to by all parties.
- Should a grievance be satisfactorily resolved, the outcome shall be recorded and signed off by the relevant parties, recorded and stored electronically. A copy of the notice shall be issued in writing to all parties having attended the meeting. The notice shall include:
  - Date of the meeting, parties attending and the meeting agenda;
  - Meeting minutes;
  - Measures, roles and responsibilities identified and agreed to during the meeting;
  - The date and manner of completion of each of the agreed to measures;
  - A description of the current status of each measure and the overall compliance of the measures to the outcomes of the meeting;
- Should a dispute arise between the complainant and the Holder of the EA regarding the grievance, the option of appointing an independent mediator to assist with resolving the issue should be discussed.
- A record of the dispute shall be maintained and circulated to all parties having attended the meeting(s), in order to provide a paper trail of disputes.
- Should a mediator be required, the costs thereof shall be borne by the Holder of the EA.
- Should a dispute not be resolved, a draft report shall be compiled by the representative, summarising the nature of the grievance and the dispute, and include a recommendation by the mediator. The draft report shall be made available to all parties having attended the meeting(s), and is to be signed off by all parties. This document will be forwarded to all parties within 5 working days.

The way forward will then be informed by the recommendations of the mediator and the nature of the grievance.



## 15 CONCLUSION

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the Rietkloof Wind Farm (Pty) Ltd 132kV electrical infrastructure. The EMPr could thus change daily, and if managed correctly lead to successful planning & design, construction, operational and decommissioning phases.

Further guidance should also be taken from any conditions contained in the EA, if the project is granted approval, and that these DEA conditions must be incorporated into the final EMPr.

All attempts should be made to have this EMPr available, as part of any tender documentation, so that the engineers and contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.

## APPENDIX A – CV OF EAP AND AUTHOR

### MR. MARC RICHARD HARDY

Born: May 1972

#### ACADEMIC QUALIFICATIONS

- 2001 - B.Soc.Sci. Development Studies (University of Cape Town)
- 2002 - B.Soc.Sci. (Hons) Environmental and Geographical Science (U.C.T.)
- 2009 - M.Phil Environmental Management (Stellenbosch University)

#### EMPLOYMENT HISTORY

- November 2009 – Present: Principal Environmental Consultant and Mozambique Country Manager: EOH Coastal and Environmental Services (Grahamstown office, Eastern Cape).
- January 2008 – October 2009: Senior Environmental Consultant: Stewart Scott International (SSI) Engineers and Environmental Consultants – now Royal Haskoning DHV (Johannesburg, Gauteng).
- January 2006 – December 2007: Principal Environmental Officer/Acting Assistant Director: Gauteng Provincial Department of Agriculture, Conservation and Environment – Environmental Planning and Impact Assessment Directorate (Johannesburg, Gauteng).
- January 2003 – December 2005: Environmental Consultant/Research Assistant: Various research organisations and consultancies (Cape Town, Western Cape).
- June – November 2004: Temporary Lecturer - Department of Environmental and Geographical Science, University of Cape Town.
- 1999 – 2002: Full time studies at the University of Cape Town.
- 1992 – 1998: Commercial Diver/Diving Supervisor: Commercial diving, marine and alluvial diamond recovery operations in South Africa, Namibia and Angola.
- 1990 – 1991: Learner Official Mining: mining engineering training programme (St. Helena Gold Mine – Welkom, Free State).

#### COURSES ATTENDED

- Institute of Environmental Management and Assessment (IEMA) Certificate course in ISO 14001 Auditing, June 2007.
- Certificate course in Project Management, U.C.T. Graduate School of Business, May 2009.
- Coastal setback line determination, Department of Port & Coastal Engineering, Stellenbosch University, September 2010.
- Achieving better resettlement outcomes in development projects, Rhodes University, July 2013 (NQF 6).

#### RESEARCH, CONSULTING & PROFESSIONAL EXPERIENCE

Subsequent to completing his full time studies Marc was involved in research projects through various organisations on behalf the Department of Marine and Coastal Management (MCM) pertaining to various fisheries along the South African coast as research team member for the following:

- On-board monitoring of rock lobster fishing vessels in the Hangklip concession area, False Bay as part of the MCM fishery monitoring program, Cape Town (Research Assistant);
- Compilation of a fishery permit holder database and implementation of a community-based catch monitoring system for the Cape South Coast oyster picking fishery for the MCM (Research Assistant);

- The identification and development of potential additional livelihood options, key intervention strategies, as well as the implementation of a community-based catch monitoring system for the west coast Olifants River subsistence fisher community for the Environmental Evaluation Unit – U.C.T. (Research Assistant).

In the environmental management and assessment field Marc has been project manager or team member for the following projects and processes -

### **Regulatory**

- Appointed to various panels tasked with developing Spatial Development Frameworks, Urban Edge Policy and Environmental Management Frameworks for local/provincial government while employed by GDACE;
- Team member of a unit tasked with the development of GDACE Departmental EIA review and Basic Assessment Report (BAR) format and reporting requirement guidelines in line with 2006 NEMA EIA Regulations.
- Review and management of all EIA applications for the Ekurhuleni region and associated intra-government consultation and forum representation related thereto;
- Joint reviewer for the Gautrain Rapid Rail Project variation alignment applications, as well as numerous linear, service supply and large infrastructure project applications while employed by GDACE, and represented the Department of the Gautrain Environmental Monitoring Committee.

### **Strategic environmental management processes**

- The Ekurhuleni Metropolitan Municipality Environmental Management Framework (EMF), Gauteng Province;
- The Dinokeng EMF, Gauteng Province;
- The Tlokwe (Potchefstroom) EMF, North West Province;
- Strategic assessment and environmental risk analysis for 12 potential wind farm projects Western and Northern Cape provinces;
- Environmental risk assessment for a proposed cement manufacturing facility in Tete, Tete Province, Mozambique;
- Rapid Assessment Study for a proposed resettlement project for the Anadarko Petroleum Corporation, Palma District, Cabo Delgado Province, Mozambique;
- Environmental risk assessment for the proposed Kenmare Nataka titanium mineral sands mining expansion project, Nampula Province, Mozambique;
- Environmental risk assessment for Frontier RareEarths proposed graphite mining project in Cabo Delgado Province, Mozambique;
- Environmental risk assessment for the proposed Kenmare Pilivilli and Congolone mining expansion projects, Nampula Province, Mozambique.

### **Environmental monitoring, due diligence and compliance auditing**

- New Vaal Colliery EMPr compliance audit, Vereeniging, Gauteng Province;
- Gauteng Freeway Improvement Project (GFIP) Construction EMP compliance audits, Johannesburg, Gauteng Province;
- Cerebos Salt due diligence audit, Coega IDZ, Eastern Cape Province;
- Komati Power Station return to service Construction EMP compliance audits, Mpumalanga Province;
- Camden Power Station return to service Construction EMP compliance audits, Mpumalanga Province;
- Grootvlei Power Station return to service Construction EMP compliance audits, Mpumalanga Province;
- Environmental due diligence assessment for Zone 5 of the Coega Industrial Development Zone, Eastern Cape Province;

- Port Alfred Waste Water Treatment works expansion project, Environmental Control Officer (ECO) and Construction EMP compliance audits, Eastern Cape Province;
- Egazini Memorial Precinct Project, ECO and Construction EMP compliance audits, Grahamstown, Eastern Cape Province;
- Green Resources Forestry Company plantation and pole treatment works environmental and social due diligence audit against International Finance Corporation (IFC) Performance Standards (PS), Jinja and Lira, Uganda;
- Environmental and Social Due Diligence (ESDD) audit of a proposed photovoltaic solar electricity generation facility (against IFC PS and EHS guidelines) on behalf of the Standard Bank Group, De Aar, Northern Cape Province;
- ESDD of the ESIA and Draft Resettlement Action Plan (against IFC PS/EHS guidelines) for the Copperbelt Energy Company's proposed Kabompo Gorge Hydroelectric scheme on behalf of the Standard Bank Group, North-Western Province, Zambia;
- IFC PS deviation assessment for Kenmare mineral sands, Moma, Nampula Province, Mozambique;
- Construction EMP compliance audits for the Kenmare Namalope mineral sands expansion project, Moma, Mozambique;
- Construction phase compliance monitoring of the Solar Capital Ilanga Lethemba 1 photovoltaic facility, De Aar, Northern Cape Province;
- Kenmare titanium mineral sands mining project, Project Lender's Completion Test compliance audit, Moma, Nampula Province, Mozambique;
- Usutu Forestry plantation and pulp mill due diligence audit on behalf of the Deutsche Investitions und Entwicklungsgesellschaft bank (DEG), Bhunya, Swaziland;
- Copperbelt Energy Corporation corporate Environmental and Social Management System IFC PS compliance review, Solwezi, North-Western Province, Zambia;
- Independent Environmental and Social Monitor (IESM) for the operation of the Kenya-Uganda (Mombasa to Kampala) railway line, on behalf of Rift Valley Railways Kenya Ltd. (RVRK) and Rift Valley Railways Uganda Ltd. (RVRU) as the IESM for the operation of the Kenya-Uganda railways line system of a total track length of approximately 2,350 km. The project involves an investment by various international investors including the IFC, the AfDB, the FMO, DEG, KfW, PROPARGO and the Equity Bank of Kenya;
- IFC PS Gap Analysis for the proposed Ossiomo Petrochemical Ammonia-Urea Project on behalf of SWEDFUND, Ologbo, Edo State, Nigeria;
- IFC PS Gap Analysis, First Quantum Minerals, Kalumbila Copper Project, North Western Province, Zambia;
- ESDD for Chikweti Forest of Niassa (Global Solidarity Forest Fund) operations on behalf of a potential investor, Lichinga, Niassa Province, Mozambique;
- Phase 1 Environmental Assessment on a South African based agro-chemical (pesticides and fungicides) manufacturer, importer and distributing entity on behalf of Winfield Land 'O Lakes, Texas, U.S.A.;
- ESDD for the proposed Graphit Kropfmühl graphite mining project situated in Ancuabe (Cabo Delgado Province), Mozambique on behalf of DEG;
- ESDD for the proposed Kabanga Nickel mine in, Kagera District, Tanzania, on behalf of the Independent Group;
- Construction phase compliance monitoring of the SCDA 3 photovoltaic facility, De Aar, Northern Cape Province;
- Environmental scans on 2 properties (Luanda, Angola and Beira, Mozambique) on behalf of the Church of Latter Day Saints;
- E&S Compliance monitoring for Green Resources AS forestry operations in Uganda, Tanzania and Mozambique;
- ESDD on Depthwise Limited, a shallow water and swamp barge oil and gas drilling contractor operating in the Delta region on behalf of the Africa Finance Corporation, Delta State, Nigeria.

### **Power generation, transmission and renewable energy projects**



- Upgrade of the ashwater return process at Eskom's Arnot Power Station, Mpumalanga Province (Basic Assessment);
- 3MW alien invasive wood fired electrical energy project, Grahamstown, Eastern Cape Province, (Basic Assessment);
- EA Energy 13 MW photovoltaic electricity generation project, Coega IDZ, Eastern Cape Province, (Basic Assessment);
- Matla Power Station to Jupiter B-Sebenza 400kV overhead powerlines and Substations, Mpumalanga and Gauteng Provinces (Full EIA);
- Johannesburg East electricity supply strengthening project: 400/132KV overhead powerlines and Substations, Gauteng Province (EIA);
- Witkloof-Thuli 132kV overhead power line, Mpumalanga Province (EIA);
- Vryburg 400kV/132kV Substation and loop in lines North-West Province (EIA);
- Boulders-Malelane 132kV overhead power line, Mpumalanga Province (EIA);
- Tarlton-Magaliesburg 132kV overhead power line, North-West Province (EIA);
- Watershed-Sephaku 132kV overhead power line, North-West Province (EIA);
- Cookhouse wind energy project, Eastern Cape Province (EIA);
- Grahamstown wind energy project, Eastern Cape Province (EIA);
- Riebeeck East wind energy project, Eastern Cape Province (Scoping);
- Beaufort West wind energy project, Western Cape Province (Scoping);
- Poortjie Wes wind energy project, Western Cape Province (Scoping);
- Carolina wind energy project, Mpumalanga Province (EIA);
- Nanagha Hills wind energy project, Eastern Cape Province (Scoping);
- Brakkefontein wind energy project, Western Cape Province (Scoping);
- Vrede wind energy project, Eastern Cape Province (Scoping);
- Richards Bay wind energy project, Kwa-Zulu Natal Province (EIA);
- St Lucia wind energy project, Kwa-Zulu Natal Province (Scoping);
- Hluhluwe wind energy project, Kwa-Zulu Natal Province (EIA);
- Peddie wind energy project, Eastern Cape Province (EIA);
- Richards Bay wind energy project, Kwa-Zulu Natal Province (EIA);
- Mossel Bay wind energy project, Western Cape Province (EIA);
- Grassridge-Coega IDZ wind energy project, Eastern Cape Province (EIA);
- Brandvallei and Rietkloof wind energy project - Laingsburg, Western and Northern Cape (EIAs);
- Coega IDZ wind energy project, additional turbines and substations (Basic Assessment).

### General

- Numerous meteorological monitoring masts for wind energy projects nationally (Basic Assessments);
- Coega IDZ (St Georges Interchange) filling stations, Eastern Cape Province (Scoping);
- Hopewell Private Game Reserve lodge expansion, Alexandria, Eastern Cape (Basic Assessment);
- Greys Gift lodge development, Makana, Eastern Cape (Basic Assessment);
- Egazini Memorial Precinct Project, Grahamstown, Eastern Cape Province (Basic Assessment);
- Pinedale eco-estate residential development, Bathurst area, Eastern Cape Province (EIA);
- EMP revision for the N2 highway bridge upgrades between Umtata and Butterworth, Eastern Cape Province (EMP);
- Improvement of National Route N2 from Caledon to Riviersonderend, Western Cape (Basic Assessment and construction phase ECO) on behalf of SANRAL;
- Ecological Fatal Flaw Assessment for the proposed Diaz Road Arterial from the Port Elizabeth CBD to Rocklands, Eastern Cape Province.

### Waste management, large and bulk service infrastructure

- Ingagane Power Station domestic waste landfill closure, Newcastle, KZN Province (Basic Assessment and landfill closure permit);
- Regional Hazardous Waste Disposal Facility for the Coega IDZ, Port Elizabeth, Eastern Cape Province (Full EIA and Permit Application Report - PAR).
- Rooiwal Waste Water treatment Works (WWTW) infrastructure and sludge treatment works upgrades, Pretoria Gauteng Province (Basic Assessment and waste permit application);
- Fishwater Flats Wastewater Treatment Works Upgrade, Port Elizabeth, Eastern Cape Province (Full EIA);
- Gansbaai Waste Water treatment Works (WWTW) EMP development, Western Cape Province (EMP);
- Regional Hazardous Waste Disposal Facility for the Coega IDZ, Port Elizabeth, Eastern Cape Province (Addendum EIA);
- Numerous potable water bulk supply pipeline applications for Rand Water, Gauteng Province (Basic Assessments);
- Environmental Management Plans (EMPs) for storm water management system upgrades, Port Elizabeth, Eastern Cape Province.
- Eskom multi products fuel transport infrastructure (rail and pipeline) from Milnerton refinery to Atlantis Power Station, Cape Town, Western Cape Province (EIA);
- Transnet New Multi Products Pipeline (NMPP), Jameson Park to Langlaagte route alignment, Gauteng and Mpumalanga Provinces (EIA);
- Biodiversity survey of area of concern on the proposed pipeline routes from the port of Saldanha to Ankerlig power station on behalf of the Central Energy Fund (CEF) and iGas, Western Cape;
- Socio-Economic Baseline Study on behalf of the Lesotho Highlands Development Agency (LHDA) for the proposed Polihali Dam - Phase 3 of the Lesotho Highlands Water Scheme – survey of 11 000 households in the catchment and downstream areas of the proposed dam – including Social Baseline and Income and Expenditure Reports, Mokhotlong, Lesotho;
- Biological Resources Baseline Study of the proposed Polihali Dam catchment area on behalf of the LHDA, Mokhotlong, Lesotho.

## Mining

- Xstrata Ferrochrome bag filter plant upgrades, North-West Province (Basic Assessment);
- GS Cimentos cement factory in the Mozal IDZ and associated limestone mine, Maputo and Salamanga, Mozambique (Full ESIA).
- Kenmare Namalope mineral sands expansion project, Moma, Nampula Province, Mozambique (Addendum EIA);
- Kenmare Nataka expansion project, Nataka, Nampula Province, Mozambique (Full ESHIA to IFC PS);
- First Quantum Minerals, Kalumbila Copper Project, North Western Province, Zambia (Full ESIA and RAP to IFC PS);
- World Titanium Resources Toliara mineral sands project, Ranobe and Toliara, Madagascar (Full ESIA and RAP to IFC PS);
- Syrah Resources graphite mining project, Balama, Cabo Delgado Province, Mozambique (Full ESIA and RAP to IFC PS);
- Zirco mineral sands mine, Groenrivier, Northern Cape, South Africa (Full ESHIA to IFC PS);
- Kenmare Pilivilli and Congolone expansion projects, Nampula Province, Mozambique (Scoping);
- Baobab Resources iron ore mining project, Tete, Mozambique (Full ESHIA to IFC PS);
- Triton Minerals Nicanda Hill graphite mining project, Cabo Delgado Province, Mozambique (Full ESHIA to IFC PS);
- Triton Minerals Ancuabe graphite mining project, Cabo Delgado Province, Mozambique (Full ESHIA and RAP to IFC PS);
- MPC SPRL & Alphamin Resources Corporation Bisie tin mining project, Bisie, North Kivu Province, Democratic Republic of Congo (Socio-Economic Baseline Study);

- Alphamin Bisie Mining SPRL tin mining project, Bisie, North Kivu Province, DRC (Full ESHIA to IFC PS).

### **Commercial agriculture, plantations and biofuels**

- Addax Bioenergy sugarcane to ethanol biofuel project, Makeni, Sierra Leone (Full Environmental, Social and Health Impact Assessment – ESHIA – to IFC and RSB standards including the Resettlement Action Plan - RAP);
- Equatorial Palm Oil expansion projects, Butaw and Palm Bay, Grand Bassa and Sinoe Counties, Liberia (Full ESHIA and RAP– to AfDB and RSPO standards)
- Nedoil Lokomasama palm oil project, Port Loko District, Sierra Leone (Scoping);
- Green Resources Niassa forestry project, Lichinga, Niassa Province, Mozambique (Full ESIA);
- Green Resources Lurio forestry project, Nampula Province, Mozambique (Full ESIA and RAP);
- Eleqtra/Envalor sugarcane to ethanol biofuel project, Sena, Sofala Province, Mozambique (Socio-Economic Baseline Study);
- EcoFarm Mozambique (Ltd) organic sugarcane growing project, Chemba District, Sofala Province, Mozambique (Full ESIA);
- Balmed Holdings cocoa and coffee outgrowers scheme Kenema, Sierra Leone (Social and Environmental Assessment - SEA - as aligned with the Africa Agriculture and Trade Investment Fund - AATIF – environmental and social reporting requirements);
- Zambeef Holdings (Community Engagement and Biodiversity Management Plans for Zambeef's Zambian operations, notably, five major agricultural production estates situated throughout the country), Zambia;
- Envalor sugarcane to ethanol biofuel project, Sena, Sofala Province, Mozambique (ESIA);
- Croke Brothers Ltd (Murrimo Farming Lda) - Resettlement Action Plan for the MFL Macadamia, Potato and Grains Project at Gurue, Zambezia Province, Mozambique;
- Ugandan Ministry of Agriculture Animal Industry and Fisheries - Buvuma Island vegetable oil development project, Lake Victoria, Uganda (Full ESHIA).

During the course of his professional career Marc has worked in Angola, Liberia, Sierra Leone, Madagascar, Mozambique, Namibia, Nigeria, Democratic Republic of Congo, Zambia, Swaziland, Lesotho, Kenya, Uganda, Tanzania and South Africa. Marc has been actively involved in lecturing and presenting environmental management training content over the last few years as a course presenter for the CES hosted annual EIA training courses, as well as the presenting of undergraduate and postgraduate environmental management course modules at Rhodes University.

### **SKILLS**

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Planning and management of projects and research/specialist teams or support staff; preparation and management of budgets in excess of \$500 000; EIA and socio-economic impact reporting for linear, energy and bulk infrastructure, mining and renewable energy projects (to World Bank and International Finance Corporation Performance Standards); environmental and due diligence auditing, compliance monitoring; strategic policy planning and reporting. Business development and marketing functions concomitant with my current position are also fulfilled in a strategic and daily operational basis.

### **PROFESSIONAL MEMBERSHIP**

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- International Association for Impact Assessment (IAIAsa – Member No: 2416)

## **GIDEON RAATH (M.Sc)**

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Date of Birth: 11-12-1987 in Johannesburg, South Africa.

Language: Proficient in English and Afrikaans.

Drivers licence: Code B.

## **QUALIFICATIONS**

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- M.Sc Geography and Environmental Science (University of Stellenbosch).
- B.Sc Hons. Ecology, Environment and Conservation (Wits University) cum laude.
- B.Sc Life and Environmental Sciences (University of Johannesburg).

## **MEMBERSHIPS**

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- Golden Key International Honour Society.
- IAIAsa (No. 3619)

## **EMPLOYMENT HISTORY**

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February 2015 – Present: Environmental Consultant (EOH Coastal and Environmental Services, Cape Town).

July 2014 – January 2015: Project Manager (Invasive Species Unit, Environmental Resources Management Department, City of Cape Town). Entrusted with the monitoring & evaluation project portfolio, which entailed the establishment of an invasive species monitoring & evaluation system for the ISU, as well as database management, quality assurance and reporting thereof.

March 2012 – July 2014: Department Assistant (University of Stellenbosch). Technical thesis formatting, data capturing and teaching assistant; obtained additional GIS experience through brief work conducted for the 'Centre for Geographical Analysis' (CGA).

February 2011 – December 2011: Teaching Assistant (Wits University). Assisted 1st year Health Sciences students with completion of biological laboratory practicals, including Microscopy, Virology, Histology, Genetics and Sensory Perception. Organised and supervised students during practicals; graded reports.

January 2006 – November 2010: Co-founder and member (Codeon Networking CC). Web designer and developer; small business owner.

## **RESEARCH, CONSULTING AND PROFESSIONAL EXPERIENCE**

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Integrated water use licence applications (numerous water uses):

- Zirco Resources Kamiesberg heavy mineral sand mine [2015].
- Boschendal Wine Estate hydro-electric power station [2015].
- Biotherm Energy Golden Valley Wind Energy Facility [2015].
- SANRAL N2 Section 3 road upgrade BAR [2016].

Botanical / Ecological specialist studies:

- SANRAL N2 Section 3 Ecological Impact Assessment [2016].
- City of Johannesburg nature reserve proclamation [2015].
- Central Energy Fund iGas integrated biodiversity report contributions [2015].
- Western Cape Government (PGWC) Bloekombos (Kraaifontein) botanical baseline and impact assessment report [2015].

GIS:



- City of Johannesburg nature reserve proclamation boundary verification [2015].
- CEF iGas desktop biodiversity-based route calculation [2015].
- G7 Renewable Energy (Pty) Ltd Brandvalley and Rietkloof EIA contributions [2015/2016].
- Mapping for numerous projects [2015].
- Triton Minerals Limited Ancuabe and Nicanda Hills contributions [2015].

Wetland specialist studies:

- Western Cape Government (PGWC) Bloekombos (Kraaifontein) wetland delineation and impact assessment report [2015].

Public participation involvement:

- G7 Renewable Energy (Pty) Ltd 132kV BAR [2016].
- SANRAL N2 Section 3 road upgrade BAR [2016].
- Kenhardt Northern Cape tin prospecting BAR [2015].
- Almenar Northern Cape tin prospecting BAR [2015].
- G7 Renewable Energies Fortuin WEF S&EIR [2015].
- SANRAL N2 section 3 road upgrade BAR [2015].
- Central Energy Fund iGas biodiversity survey faunal assistant [2015].

Authorisations and applications:

- G7 Renewable Energy (Pty) Ltd 132kV BAR [2016].
- Mosselbay Energy IPP (Pty) Ltd EA Amendment [2016].
- SANRAL N2 section 3 road upgrade BAR [2015].
- PRDW Cape Town harbour breakwater rehabilitation EMPr [2015].
- Mayfield Quarry Rehabilitation plan [2015].
- Woodbridge Island revetment exemption [2015].
- Boschendal Wine Estate S24G rectification application [2015].
- BioTherm Energy (Pty) Ltd ESAP [2015].
- Frontier Rare Earths Limited Risk Assessment report contributions [2015].
  
- Thesis for MSc: The study of the invasive plant species *Eucalyptus camaldulensis* along the Breede River in the Western Cape. The research evaluated the impact that high rainfall and flood events had on the spatial extent, density and dispersal of *E. camaldulensis* along the river channel, and made management recommendations to regional and national resource managers [2014].
- Thesis for Honours: An evaluation of the informal plant harvesting by surrounding communities near the Palabora Mining Company, with specific focus on the potential human health and plant conservation implications of such harvesting and plant use [2011].

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**SKILLS**

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- QGIS, ArcGIS, DNR garmin and GPS use.
- Statistical analysis using SPSS, MS Excel and 'R'.
- Scientific research, report writing, presentations.
- Rudimentary photogrammetry - Exelis' ENVI and PCI Geomatics' OrthoEngine.
- Botanical specialist studies and taxonomy.
- Ecological specialist studies and taxonomy.
- Wetland delineation and impact assessment specialist studies.
- Planning and management of projects.
- Management of research/specialist teams and support staff.
- Proposals and budgets.
- EIA reporting and EMPr development.
- Integrated water use licence applications.

**COURSES ATTENDED**

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- IAIAasa Public Participation Process Workshop [2016].
- EIA course, EOH Coastal and Environmental Services [2015].
- Water safety training, City of Cape Town [2014].
- Herbicide safety and application for weed control, City of Cape Town [2014].
- Snake awareness training, City of Cape Town [2014].
- Habitable Planet Workshop UCT [2011].

## APPENDIX B – CES ASSESSMENT METHODOLOGY

### Methodology for Assessing the Significance of Impacts

Positive or Negative: The impact is first classified as a positive or negative impact. The impact then undergoes an evaluation according to a set of criteria.

#### Evaluation Criteria:

<b>Effect</b>	<b>Temporal Scale</b>		
	Short term	Less than 5 years	
	Medium term	Between 5 and 20 years	
	Long term	Between 20 and 40 years (a generation) and from a human perspective also permanent	
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there	
	<b>Spatial Scale</b>		
	Localised	At localised scale and a few hectares in extent	
	Study Area	The proposed site and its immediate environs	
	Regional	District and Provincial level	
	National	Country	
	International	Internationally	
	<b>Severity</b>	<i>Severity</i>	<i>Benefit</i>
	Slight	Slight impacts on the affected system(s) or party(ies)	Slightly beneficial to the affected system(s) and party(ies)
Moderate	Moderate impacts on the affected system(s) or party(ies)	Moderately beneficial to the affected system(s) and party(ies)	
Severe/Beneficial	Severe impacts on the affected system(s) or party(ies)	Substantially beneficial to the affected system(s) and party(ies)	
Very Severe/ Beneficial	Very severe impacts on the affected system(s) or party(ies)	Very substantially beneficial to the affected system(s) and party(ies)	
<b>Likelihood</b>	<b>Likelihood</b>		
	Unlikely	The likelihood of these impacts occurring is slight	
	May Occur	The likelihood of these impacts occurring is possible	
	Probable	The likelihood of these impacts occurring is probable	
	Definite	The likelihood is that this impact will definitely occur	

#### Description of Impact Significance:

Significance Rate		Description
Low -	Low +	An acceptable impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment
Moderate -	Moderate +	An important impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in either a positive or negative medium to long term effect on the social and/or natural environment
High -	High +	A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually long-term change to the (natural and/or social) environment and result in severe effects or beneficial effect.
Very High -	Very High +	A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects, or very beneficial effects.

**APPENDIX C – TRAFFIC AND TRANSPORT MANAGEMENT PLAN**